SOCIOLOGY OF ENVIRONMENT

Unit-I

Environmental Sociology:

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Environmental Sociology

Introduction

1.0 Man and Environment:

Environment can be defined as the sum total of materials and forces surrounding the living organism. Gisbert defined environment as "anything immediately surrounding an object and exerting a direct influence on it." It is the sum total of conditions that surrounds us at a given point at space and time. Thus, environment is comprised of the interacting systems of physical, biological and cultural elements and these are interlinked individually and collectively in various ways.

The word environment is derived from the French verb 'environer' which means to 'encircle or surround.' Thus our environment can be defined as the physical, chemical and biological world that surround as well as the complex of social and cultural affecting an individual or community. This broad definition includes the natural world and the technological environment as well as the cultural and social context that shape human lives. It includes all factors living and non living that affect an individual organism or population at any point in the life cycle. Set of circumstances surrounding a particular occurrence and all the things that surround us.

It is essentially a multidisciplinary approach and its components include biology, geology, chemistry, physics, engineering, sociology, health sciences, anthropology, economics, statistics and philosophy. .Environmental science is a Interdisciplinary subject which deals with each and every aspect of life i.e. related with us. It requires the knowledge of various other subjects like biology, chemistry, physics, statistics, micro-biology, bio-chemistry, geology, economics, law, sociology etc.

Environmental science integrates physical and biological sciences, to the study of the environment, and the solution of environmental problems. Environmental science provides an integrated, quantitative, approach to

the study of environmental systems. Related areas of study include environmental studies and environmental engineering. Environmental studies incorporate more of the social sciences for understanding human relationships, perceptions and policies towards the environment. Environmental engineering focuses on design and technology for improving environmental quality in every aspect. Environmental scientists work on subjects like the understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management, and the effects of global climate change. Environmental issues almost always include an interaction of physical, chemical, biological and socio-cultural processes. Environmental scientists bring a systems approach to the analysis of environmental problems.

Environmental science came alive as a substantive, active field of scientific investigation in the 1960s and 1970s driven by (a) the need for a multi-disciplinary approach to analyze complex environmental problems, (b) the arrival of substantive environmental laws requiring specific environmental protocols of investigation and (c) the growing public awareness of a need for action in addressing environmental problems. It is a relatively new field of study which has evolved from integrated use of many disciplines. It creates awareness and understanding of environmental concepts which may be scientific, social and ecological systems thereby providing a platform for solution to various environmental problems.

Environment regulates the life of the organisms including human beings. Man being the most intelligent creature, interacts with the environment more vigorously than does any other organism. There is no end to human needs. With the growth of human civilization, there has been an exponential increase in the demands for materials. As a result, man has started exploiting nature mercilessly to meet the demands of his comfort and to feed the mouths of increased population. Though deterioration of environmental condition is brought about by extreme events like natural catastrophes and calamities, man-made hazards, physical pollution and social pollution, man has a major role in it.

The earth has only a certain amount of air, water, soil, raw materials and minerals- the natural resources. But these resources are being recklessly exploited, consumed or wasted. It is feared that many of these non-renewable resources will be exhausted soon. It is impossible to replace or recreate fuels like coal, gas and oil. Thus, we human beings, exploit, alter, destroy and pollute the environment around us. But as a rational and social creature we also realize the importance of environment and hence make efforts for its conservation or protection in order to ensure for ourselves a healthy and comfortable living.

1.1 Impact of Human Activities on Environment:

Man is the most intelligent animal on the surface of the earth. Intelligence and creativity have led man to discover, to invent, to manipulate, to exploit, to construct and also to destroy things around him. Civilization and rapid growth of human population have engaged man in various activities- both constructive and destructive. But the outcomes of most of the human activities have contributed significantly to the degradation of the environment around us. Human activities have given rise to problems like urbanization, deforestation, and increased consumption of natural resources, production of solid, liquid and gaseous wastes, ground water depletion, production of toxic substances, extinction of wild life, soil erosion as well as environmental pollution.

1.2 Meaning of Environmental Sociology

The association between societal well-being and environmental quality is increasingly becoming a topic of sociological interest. Environmental sociology is a sub discipline within the field of sociology that studies of the interactions between the physical environment, social organization, and social behavior. Environmental sociologists typically place special emphasis on studying the social factors that cause environmental problems, the societal impacts of those problems, and efforts to solve the problems. They also look at the social processes by which certain environmental conditions become socially defined as problems.

For instance, environmental sociologists aim to understand environmentalism as a **social movement**, the ways in which members of society perceive environmental problems, and the origins of human-induced environmental

decline. Another area of environmental sociological research is the unequal distribution of environmental hazards. These researchers examine the process by which socially disadvantaged populations come to experience greater exposures to various environmental hazards, including natural disasters.

Sociology of the environment is a new field of sociology that has developed in relation to people's growing concern about environmental issues. It has a dual focus. On the one hand it deals with the ways in which people in society relate to the natural world. On the other hand it deals with 'environmentalism' as a social movement; the development of concern about the environment and the social context of actions about the environment. It could be argued that the way people relate to the natural world has always been a concern of sociologists. When Karl Marx talks about 'production' he is talking about a relationship between workers and the natural objects they work up as products. Anthropologists have always believed that natural objects have symbolic significance and this approach can also be used by sociologists. What is the social meaning of the kangaroo, for example? The environmentalist movement as a topic of sociology can be related to the growing concern with environmental problems. The birth of the movement is normally dated to the publication of *Silent Spring* by Rachel Carson in 1962, a book which documented the effect of toxic pesticides on birds and other animals. The 'hippy' movement that developed later in the 1960s was the first large-scale popular subculture to develop themes from environmentalism.

The technical definition of environmental sociology is the sociological study of how humans interact with the various aspects of the environment. In other words; how people treat the various aspects of the environment such as pollution, conservation and recycling. This type of study is one that is vital when it comes to helping find better ways for both nature and mankind to interact, propagate and thrive.

There are two schools of thought when it comes to environmental sociology; constructivism and realism. The constructivist's tend to be those individuals who develop ways that will help to improve the environment, however, they do tend to be on the more extremist side in their methods. The realists are those who want to help find the solutions needed to improve the environment.

The association between societal well-being and environmental quality is an important topic of Sociological inquiry. Environmental Sociology as a sub discipline within Sociology explores the various forms of interaction between human society and the environment. Catton and Dunlap A New Ecological Paradigm made them present Environmental Sociology as the study of interaction between society and its biophysical environment with a certain insistence given to the idea that every human society is dependent on the ecosystems in which it exists.

The environmental sociology of the 70's centers its attention on the study of green movement, energy issues, risks of catastrophes, public attitudes towards environmental questions, environmental policies and the quality of environment as a social problem.

Environmental sociology is also interested in a more general manner in human causes and social factors of environmental pollution, as well as in the social impacts of this pollution and of diminishing natural resources that is in the reciprocal relations between human societies and their biophysical environment.

Environmental sociology has different dimensions to it that their own research foci, environmental attitudes and the environmental movement, social impact analysis, risk assessment, responses to toxic sitting and discovery natural hazards, research and so forth. The inequitable social distribution of environmental hazards is another central area of Environmental Sociological research, with scholars examining the processes by which socially disadvantaged populations come to experience greater exposures to myriad environmental hazards including natural disasters and unequal distribution of natural resources..It also helps to formulate equitable strategies to drive environmental degradation and also to build sustainable relationship between humans and the environment. Public opinion about environmental issues and environmental policies and the influence of the Green movement on these policies.

Environmental Sociologists seek to understand a variety of topics, including agrifood systems, the origins of human-induced environmental decline, the relationship between population dynamics, health, and the environment, and

the role that elites play in harming the environment, environmental regulatory agency dynamics.

Today in sociology, two approaches to sociology of the environment battle it out in Contemporary academic writing: the realist approach and the constructionist approach. These are different approaches to what sociology does. Does sociology talk about how humans relate to the environment and the social factors that influence that? Or is it mainly about how humans perceive their relationship to the environment—a sociology of perspectives on the environment?

1.3 Sociological Perspectives on Environment

1.3.1. The realist approach

In the realist approach, the problems of the environment are quite real. Inevitably, **social scientists** will follow the lead of the **natural sciences** in identifying the problems. The task of sociology is to explain the social causes of environmental problems. Also, what social alternatives could produce a better environmental outcome? In this approach, sociologists are in the same boat as most other commentators on environmental problems. Academics in many disciplines—for example environmental scientists, economists, and psychologists—argue about what the problems are and what can be done. If sociology has anything special to offer, it is a deeper and more systematic understanding of the social roots of environmental problems and the processes of social change.

1.3.2. The constructionist approach

A second approach attacks realism and argues that there is no one 'reality' of environmental problems. Different people have their own differently constructed and equally valid interpretations of the environment. This second perspective comes from a sociological tradition which says that society is not a real thing—it is socially constructed. In this view social and other realities do not exist independently of the meanings people create about them. Applied to environmental issues, this approach maintains that 'there is no singular "nature" as such, only a diversity of contested natures; and that each such nature is constituted through a variety of socio-cultural processes from which such natures cannot be plausibly separated'. So sociologists should investigate how the

environment is understood by different sections of the population, how environmental issues are constituted as social Problems and how people respond to these discourses of environmental trouble. It is hard to deny the force of the constructivist claim that our understanding of environmental problems is constructed in specific social contexts. Realists cope with this awkward truth by saying that 'the objective world is real and independent of our categorizations but filtered through subjective conceptual systems and scientific methods that are socially conditioned'. So they admit that society influences the way we look at the natural world but they insist that there is a reality out there.

1.3.3 The reformist approach

The reformist approach aims to make small reforms to the economic and political structures of current society to deal with environmental problems. A much-read book with this approach is *Natural Capitalism*.

Within this approach markets are the main means to distribute products— products are bought and sold for money. According to Hawken and colleagues, 'natural capitalism does not aim to discard market economics'. Instead what is necessary is the steering of markets 'in more creative and constructive directions'. Other aspects of the capitalist economy such as money, private ownership of the means of production (factories and farms, and so on) and wage labour are also retained.

In the reformist model economic growth continues. It is argued that this can take Place at the same time as environmental damage is cut back. For example, according to Hawken et al., 'even if the global economy expanded by 6- to 8-fold, the rate of releasing carbon by burning fossil fuel could simultaneously decrease'. In fact, new environmental technology is a growth industry in this account and stimulates growth— 'reducing the economy's dependence on fossil fuels can be seen as an investment and job creation *opportunity*'. Environmental reforms come about because people lobby politicians for change— with the threat of voters turning away from parties that do not enact environmental reforms. Markets 'demand . . . responsible citizenship to keep them functioning properly'. This is what is expected to take place in rich countries; proponents of the reformist model never consider how the model could possibly work in poor and undemocratic countries.

Environmental reforms also come about partly through lifestyle changes by ordinary citizens who make different market decisions. But a central aspect of change is various kinds of government intervention—for example, regulations to prevent environmentally damaging practices, taxes such as a carbon tax on the use of fossil fuels, incentives and subsidies for new technologies such as solar hot water services or wind power, and international agreements like the Kyoto Protocol designed to get countries to agree to environmental reforms. One idea is to replace all taxation based on income with environmental taxes—governments would be totally funded by taxes on harmful environmental activities. According to the reformist account, all these environmental reforms benefit the economy, first, because energy efficiency is cheaper; you are not wasting money on energy you don't need. Second, environmental reforms create new industries and new jobs— for example new energy infrastructure such as wind energy plants or energy-efficient double-glazed windows.

1.4 The Emergence of Environmental Sociology

The contemporary environmental sociology is embedded historically and introduces the sociology of the environmental issues and nature. There is a vast discussion led within the field of environmental sociology about the significance of the environment for classical sociologists. Dunlap and Catton [1978] claim that sociology largely ignored the natural environment Their belief stands on the assumption that all social sciences are based on the separation of the natural world Dunlop and Cotton called this "Human exemptionalism Paradigm" and with this theory they laid the foundations for the formulation of the environmental sociology Alexandrescu 2009:48. The view that sociology was oblivious to environmental topics throughout its history is being disproved by several authors and it is possible to find that also sociological classics had an insight into the relationship between the society and the environment and the dynamics of this relationship.

Before the 1970s, Western sociology had not paid a lot of attention to the biophysical environment. Yet, with the rise of concern about the environment, the sociological community recognized this area as worthy of sociological attention but still, the environment did not have an enduring position within this social science. This antipathy towards the natural environment might originate from the classical theorists' desire to distinguish sociology from natural sciences by focusing on the social causes of social phenomena as per Dunlap and Murdoch

Nevertheless, classical theories are very important for the formulation of environmental sociology. That is because environmental sociology either builds upon them some of its arguments or because it creates its own discourse by expressing the differences between their bases.

For instance, what environmental sociology shares with Marxism is an activist approach and perception of environmental degradation as a discrepancy with modern development. Contrarily, environmental sociology takes a step aside from Marxism because of the consequences for nature of the trust in Marxism among soviet countries in the second half of twentieth century. Weber's sociology and especially neo-Weberian scholars played an important part in the development of environmental sociology. Weber's contribution is seen mainly in his focus on the link between subjective meaning and social action and in his formulation of alienation from nature Dunlap 2002 Moreover, Beck sees an ecological subtext in Weber's writings claiming that "in Weber's view industrial capitalism generates an insatiable appetite for natural resources which undermines its own material prerequisites." Beck on 2010 say However, there are several areas to which environmental sociology has a different stand, such as technology and the effects of rationalization. Even though Durkheim's main concepts are social facts

explained by other social facts (so there is no concern in nature per se), we can discover certain contribution to environmental sociology also in Durkheim's sociology. Durkheim's division of labor created a basis for demographic human ecology from which latter environmental sociologists' proceeds.

The younger sociology of the (mid-) twentieth century could be seen as more distant to the environment than classical sociological theories since the society of the twentieth century with the technical developments is the industrial society par excellence. But various points are seen as conducive to the articulation of environmental sociology.

For instance, the followers of Parsons' theories, especially Luhmann and his thesis that subsystems in modern society fail to communicate are resonating in the incompetence of political systems to accomplish the demands for natural protection, economic development and justice in society. Another example might be observed in the Critical Theories. Habermas' emphasis on communication and meaning might be important. Also Benjamin's work referring to the master of nature might be significant for environmental sociology. World-system theory is attractive for environmental sociologists because of its global-scale point of view. That is why it could address issues such as global warming, resource depletion, ozone holeetc

Therefore the claim that sociology had been totally oblivious to the nature and environment would be wrong. Alexandrescu [2009] disproved it by an analysis of American sociological text books from the late nineteenth century till the late twentieth century. And according to Beck, classical sociologists "… did have an

idea of an unintended dynamics of capitalist modernization…" which influences the attitude towards the nature and the use of natural resources.

Although we may find traces of environmental sociology in the whole history of sociology itself; the main development of the specific subject on its own started in the second part of the twentieth century. In the 1960s and 1970s a number of sociologists began to recognize the importance of environmental questions and started a research related to this area so that the subject of environmental sociology began to be more and more complex According to Alexandrescu, it was Dunlap and Catton's article "Environmental Sociology: a New Paradigm" published in 1978 that created the environmental sociology as such.

In the period of the late twentieth century, this rise of environmental concern was typical among the general public as well. Hannigan presents four main reasons for this growth of environmental consciousness among both experts and public (represented by New Social Movements). The first explanation is the Reflection.

hypothesis, which says that the rise of the concern about the environment started after the second world war as a reaction to worsening situation secondly the post materialist thesis explains the rise of the environmental concern as a broader shift in values. This thesis is linked to Inglehart's scale of Postmaterialism. The next explanation strongly focuses on the social location of those people who are more concerned with nature. This New Middle-class thesis calls these people "social and cultural specialists". The last, fourth, explanation is the Regulationist/Political closure approach. According to this approach, the reason for the rise of the environmental concern is the defensive reaction to the tension in the political system in Western Europe. All four explanations have both their advocates and

critics Nevertheless, all of them bring us a new point of view of the public participation in the environmental issues.

The theory that bridges both classical concerns about the environment and the early twentieth century concerns and also the theories of environmental sociology itself is "New Environmental Paradigm". As was already mentioned at the beginning of this section, this theory stands at the initiation of the existence of environmental sociology. The "New Environmental Paradigm" was developed as the opposite to, and a new tendency for, the presumed heritage of classical sociology – the set of traditions and assumptions that lead to the lack of concern for nature and biophysical environment("Human Exemptionalist Paradigm"). This distinction between "Human Exemptionalist Paradigm" and "New Environmental Paradigm" provoked many questions and misunderstandings. Afterwards, it leads to a deep polemic between various academics and sociologists. What Dunlap and Catton wanted to propose with the "New Environmental Paradigm" is a "…new way of looking at modern, industrialized societies by calling attention to their ecosystem dependence"

Ulrich Beck is a great contributor to the later environmental sociology. He is not included in the debate over the appropriate paradigm for the (environmental) sociology but he brings about a full integration of the theory of risks into a contemporary society and he broadens the environmental point of view.

1.5 Environmental sociology as a field of inquiry

'Earth Day 1970' is often said to represent the debut of the modern environmental movement. Starting as a modest proposal for a national teach-in on the environment, it grew into a multi-faceted event with millions of

participants. What most distinguished Earth Day, however, was its symbolic claim to be 'Day 1' of the new environmentalism, an interpretation which was widely embraced by the American mass media, thus affording the environmental issue instant and widespread recognition.

When Earth Day inaugurated the 'Environmental Decade' of the 1970s, sociologists found themselves without any prior body of theory or research to guide them towards a distinctive understanding of the relationship between society and the environment. While each of the three major classical sociological pioneers – Émile Durkheim, Karl Marx and Max Weber – arguably had an implicit environmental dimension to their work, this had never been brought to the fore, largely because their American translators and interpreters favoured social structural explanations over physical or environmental ones. From time to time, isolated works pertaining to natural resources and the environment had appeared, mostly within the area of rural sociology, but these had never coalesced into a cumulative body of work. In a similar fashion, social movement theorists gave short shrift to conservation groups, leaving historians to explore their roots and significance.

To comprehend why this situation arose, it is necessary to consider how both geographical and biological theories of social development and social change lost their predominance when sociology emerged as a distinctive discipline in the early twentieth century.

1.5 The Rise of 'Environment' in Sociological Theory

It has been observed that 'contemporary forms of environmental degradation present one of the most, if not the most, complex and catastrophic dilemmas of modernity'. There is a general agreement that the economic expansion of a century and half has had alarming consequences for the global environment. Depletion of the ozone layer, air pollution, loss of forests and bio-diversity, extinction of plants and animal species, loss of marine life, soil and water pollution have occurred at an alarming rate. Especially in post war years, release of toxic matters into the environment, worldwide expansion of nuclear energy, acid rains, new chemical pesticides, non biodegradable plastics and other harmful

chemicals have come to pose a threat to life itself. In the recent decades, however we have witnessed the growth of environmental movements/conflicts, of environmental politics which may play an important role in checking the deterioration of our environment at the local and global levels.

The seriousness of the situation has led the scholars to predict that the 21st century will be characterized by a massively endangered natural environment if the present trends of ecological devastation continue. Further it is predicted that this aspect will become increasingly dominant in all fields- politics, foreign affairs, development policy, education, technology and research.

In this context two important issues emerge: the causes and consequences of environmental degradation in modern societies, and the role environmental politics can play to curb environmental degradation. Scholars have pointed to the limitations of the theoretical legacy of classical theory of Marx, Weber and Durkheim for examining the issues.

Weber's work shows the least engagement with the natural world. Even Marx and Durkheim, Goldblatt argues, who saw the relation between human societies and the natural world as central to historical change, did not pay much attention to the impact of economic and demographic processes on ecosystems. In fact, classical social theory was concerned more with how pre-modern societies had been constrained by their natural environments than with how industry in modern society led to environmental degradation.

In recent times, however, environmental concerns, both the origins and nature of environmental deterioration and the emergence of environment centered politics have been articulated in sociological writings.

1.6 Towards the emergence of an environmental sociology: 1970–2005

There are various reasons why a new scholarly field appears on the academic horizon. Sometimes this reflects the expanding possibilities bursting forth from a cutting edge methodology or theoretical breakthrough. For example, Crick and Watson's unravelling of the double helix structure of DNA was the catalyst that sparked the growth of cell biology. At other times, a new specialisation represents the merger of two previously existing scientific specialities. Finally, a new field can

arise out of the intellectual and political ferment generated by movements for social reform and change. This probably best describes the case of environmental sociology.

As we have seen, each of the three widely acknowledged 'founders' of the discipline of sociology – Durkheim, Weber and Marx – addressed some aspect of nature and society, but this was not really definitive to their work. If environmental interest was to be found anywhere in North America, it was within the area of rural sociology, where there was a body of empirical research on natural resources. These enquiries took two forms: the study of natural resource dependent communities and research on the burgeoning use of public parkland for recreational purposes. Alas, by the late 1960s, many of these contributions had been overlooked or totally forgotten.

There is general agreement that the first explicit use of 'environmental sociology' was by Samuel Klausner in his 1971 book *On Man in His Environment* (page 4). Dunlap (2002b: 11– 12) remembers that he first came across the term in Klausner's book several years later 'when the term was just starting to be used'. Throughout the 1960s, Klausner, a sociologist and clinical psychologist, was engaged in a series of studies of human behaviour under stress. In 1967, he received a small grant ($7,000) from a think tank, Resources for the Future, to study 'social–psychological aspects of environmental research'. Three years later, he edited a special issue of the *Annals of the American Academy of Political and Social Science* on 'Society and Its Physical Environment'.

By this time, sociological interest in environmental matters had been re-ignited, primarily by the rising popularity of environmentalism and the environmental movement. A major catalyst for this had been the publication a decade before of *Silent Spring* (1962), Rachel Carson's bestselling expose of ecosystem damage due to agricultural pesticide use. Then in the early 1970s, the widespread attention accorded the apocalyptic predictions contained in *The Limits of Growth* (Meadows *et al*. 1972), combined with the 'energy crisis' in the United States, deepened this environmental concern among academics. In addition, it broadened the scope of sociological interest in environmental matters to include issues related to resource scarcities and energy use. One sociologist who was particularly swayed by this was William Catton. Upon his return from New Zealand to the University of Washington in 1972, Catton expanded his earlier research interest in national

parks and wilderness visitors to a more theoretical concern with overpopulation and declining fossil fuels. This coalesced with the publication in 1980 of the influential book *Overshoot: The Ecological Basis of Revolutionary Social Change*.

Environmental sociology has also been established since the early 1990s in Japan and Korea. One of the first environmental researchers in Japan was Nobuko Iijima who wrote her Master's thesis on the impact of Minimata disease on the local community. In 1992, she helped found the Japanese Association for Environmental Sociology (JAES) and served as its first president. By 1999, the JAES had over 450 members and its own publication, the *Journal of Environmental Sociology* (*Kankyo Shakaigaku Kenkyu*). In Korea, environmental sociology began to be taught from the early 1990s. Following a 1993 international conference held under the title 'Environment and Development', the Research Group for Environmental Sociology was established in 1995. This led to the founding of the Korean Association for Environmental Sociology in June 2000. In October 2001, at the Kyoto Environmental Sociology Conference, a research network, the Asian Pacific Environmental Connection was founded with the brief of solving societal and environmental problems in the Asia–Pacific region.

1.7 Resurgence of Environmental Sociology

In contrast to the larger society, mainstream sociology in the 1970s was almost oblivious to the significance of environmental problems. This blindness stemmed from a long period of neglect of environmental matters, stimulated by the societal context in which sociology developed as well as its unique disciplinary traditions. The Durkheimian emphasis on explaining social phenomena only in terms of other "social facts," plus an aversion to earlier excesses of biological and geographical "determinisms," had led sociologists to ignore the biophysical world. To legitimize sociology as a discipline, it was important to move away from explanations of, for example, racial and cultural differences in terms of biological and geographical factors, respectively. Yet in the process of developing distinctively social explanations for societal phenomena, our discipline replaced older determinisms with sociocultural determinism. For example, as recently as the late 1970s, sociologists of agriculture argued that it was inappropriate to include factors such as soil type and rainfall in explanations of soil conservation adoption or farm energy use because they were not *social* variables. These disciplinary traditions were strengthened by sociology's emergence during an era of unprecedented

growth and prosperity, which made limits to resource abundance and technological progress unimaginable, and increased urbanization, which reduced direct contact with the natural environment. With modern, industrialized societies appearing to be increasingly disembedded from the biophysical world, sociology came to assume that the exceptional features of *Homo sapiens*—language, technology, science, and culture more generally—made these societies "exempt" from the constraints of nature and thus reluctant to acknowledge the societal relevance of ecological limits. Given sociology's neglect of the biophysical environment—and tendency to equate "the environment" with the social context of the phenomenon being studied— it is not surprising that efforts to establish environmental sociology as an area of inquiry included a critique of the larger discipline's blindness to environmental matters. Dunlap and Catton's (1979a) effort to define and codify the field of environmental sociology was accompanied by an explication and critique of the "human exemptionalism paradigm" (HEP) on which contemporary sociology was premised. While not denying that human beings are obviously an exceptional species, these analysts argued that humans' special skills and capabilities nonetheless fail to exempt the human species from the constraints of the biophysical environment. Consequently, Catton and Dunlap (1978, 1980) suggested that the HEP should be replaced by a more ecologically sound perspective, a "new ecological paradigm" (NEP), that acknowledges the ecosystem dependence of human societies.

The call for mainstream sociology's dominant paradigm to be replaced with a more ecologically sound one proved to be a rather controversial feature of environmental sociology. While the exemption list underpinning of mainstream sociology has been increasingly recognized (Dunlap 2002b), the call for adoption of an ecological paradigm has been criticized for allegedly deflecting efforts to apply classical and mainstream theoretical perspectives in environmental sociology. Nonetheless, environmental sociologists are producing rapidly expanding bodies of both empirical literature on the relationships between societal and environmental variables that clearly violates Durkheim's antireductionism taboo and theoretical literature representing efforts to develop more ecologically sound theories that are not premised on the assumption of human exemptionalism. Both of these trends reflect the declining credibility of exemptionalist thinking within sociology (Dunlap 2002b).

Sociological interest in the impacts of energy and other resource scarcities accelerated the emergence of environmental sociology as a distinct area of inquiry by heightening awareness that "the environment" was more than just another social problem, and that environmental change can indeed have societal consequences as well as the obvious fact that human activities can affect the environment. Studies of the impacts of energy shortages on society facilitated a transition from the early "sociology of environmental issues"—involving the application of standard sociological perspectives for analyzing societal responses to environmental issues—to a distinctive "environmental sociology" focused explicitly on societal-environmental relations.

1.8 Environmental Concerns and Social Sciences in India

Among the pioneers who showed great sensitivity to the relationship between humans and their environment was Patrick Geddes, the founder of the department of Civics and Sociology in Mumbai. Technological advances and urbanization had profoundly altered that relationship. He devoted much of his time to the task of planning the urban environment with the clear purpose of ' preservation of the best historical traditions of the past, the involvement of the people in their own betterment and rediscovery of past traditions of city building which deliberately expressed the aesthete ideal of the community'.

More recently since the seventies, a large number of information on the nature and the extent of environmental degradation has become available. The publication of the State of India's Environment Reports in 1982 and 1985 by Delhi based centre for Science and Environment marked an important beginning. A large number of journalists have been reporting on a variety of issues related to environmental degradation, peoples protest and mass controversies regarding the development projects of the Government. Several studies have focused on the social and environmental consequences of colonial state intervention, its effect on the indigenous social, cultural institutions and practices of resource management and social protest against control of resources.

The depletion of natural resources in the contemporary context, the changed used and management of these resources and their effect on local communities and the need for an alternative resource management have been the subjects of many studies conducted by social scientists in general. Although it is recognized

that environmental degradation threaten all, irrespective of people's wealth, priviliege, status or class, the fact remains, especially in developing countries like India, that the weak, the poor and the underprivileged are the worst victims of it. Displacement, marginalization and deterioration of the quality of life of large sections of population, the tribals, nomadic communities, craftsmen, the urban and the rural poor and women, as a result of the economic policies of the Government have concerned both social scientists and activists alike. The aim is to work out an alternative framework of development which would combine sustainability with equity and social justice

1.9 Conclusion

More recently, a course on environment and society should form a part of sociology curriculum at the post graduate and under graduate levels. It could include the following themes among others: the changing human nature relationship in history and the role of science and technology, perspectives on environment/ ecology and society in sociology and anthropology including the recent contributions of social science theorists on the nature and causes of environmental degradation in modern society, environmental critique of development, gender and environment and environmental politics/ movements. With specific reference to India, emphasis could be laid on the nature and impact of environmental degradation in colonial and post-colonial contexts, traditional system of resource management, depletion of resources and its effects on local communities, environmental struggles/ conflicts, recent experiments at resource management by the local communities/groups, and social and environmental impact of development projects.

1.10 **Model Questions:**

1. Discuss the concept of environmental sociology. What does it mean and what are its attributes?
2. Describe the emergence of environmental sociology.
3. Write a short note on the relations of man and environment.
4. Classify and describe in brief the rise of environmental sociology.
5. What are the theories of environmental sociology?
6. Give an account of resurgence of environmental sociology.
7. What are the major environmental concerns in India?

Unit-II

2.0. The Concept of Environment

2.1. Environmental Issues

2.2. Environmental issues of urban areas

2.3. Environmental problems of rural areas

2.4. Population growth and environment

2.5. Impact of population on environment

2.6. Environmental pollution

2.7. What is pollution?

2.8. Factors of environmental pollution

2.9. Factors of environmental pollution

2.10 Types of pollution

2.11. Energy resources

2.12. Urban development and its impact

2.13. Model questions

UNIT-II

The Environmental Issues

2.0.The Concept:

The environment, we understand all those conditions that surround us and influence every activity of life in some or other ways.

As per the Oxford Dictionary, 'Environment' literally means surroundings/ surrounding objects/ conditions/ circumstances of life of person or society.

The word 'environment' may be defined to include everything external to man/ organism. It covers the region, surroundings or circumstances in which anything exists.

The 'environment' is considered as a composite term for the conditions in which an organism lives, and therefore, consists of air, water, soil, sunlight, food, etc. which are the basic needs of all organisms to survive.

Definitions:

C.C. Park (1980) has defined the 'environment' as "the sum total of conditions which surrounds a man at a given point in space and time."

A. Goudie (1984) has defined "the environment" as "the representative of physical components of the earth where in man is the important factor influencing his environment."

2.1. Environmental Issues:

There are many **environmental issues in India**. Air pollution, water pollution, garbage, and pollution of the natural environment are all challenges for India. The situation was worse between 1947 through 1995. According to data collection and environment assessment studies of World Bank experts, between 1995 through 2010, India has made one of the fastest progress in the world, in addressing its environmental issues and improving its environmental quality. Still,

India has a long way to go to reach environmental quality similar to those enjoyed in developed economies. Pollution remains a major challenge and opportunity for India. Environmental issues are one of the primary causes of disease, health issues and long term livelihood impact for India.

2.2. Environmental Issues of Urban Areas:

A municipality or N.A.C. (notified area council or corporation or metropolitan city whose population is more than 400 people/sq.km. is called an urban area. Thus, urban areas are the places of high population density. The problems of these densely populated urban areas are:

i.   Development of slum
ii.   High production of solid wastes
iii. Increased consumption of natural resources
iv.   Want of open space
v.   Violation of Floor Space Index (FSI)
vi.   Noise pollution
vii. Air pollution
viii. Water scarcity
ix.   Traffic and floating population
x.   Scarcity of fresh vegetables and fish
xi.   Water-logging and drainage of liquid waste and sewage.

i.   Development of Slum:

Poor people from rural areas migrate in large numbers to urban areas in search of some kind of employment. They occupy any open space or vacant land on the outskirts of the city or town. They construct their dwellings in such places making use of any material like rusted tins, empty tar barrels, cardboards, polythene, tarpaulin, jute sacks etc. these areas are overcrowded and are without any civic amenities like light, water supply, drainage, roads, transport facilities, toilets and medical facilities. All such areas with no civic and basic amenities in cities and towns are called slums. Over 25 million

people live in slums of urban areas of India. About 40% of slum dwellers are living in big cities.

ii.   Production of solid waste and its management:

As urban areas are densely populated and as urban lifestyle requires use and consumption of large quantities of materials, production of solid waste is very high in urban areas. The solid wastes (garbage, animal wastes, rubbish, ashes, glasses, polythenes, plastics, papers, construction wastes etc.), industrial wastes (rubbish, ashes, heavy metals, toxic wastes etc.) and hazardous wastes (radio isotopes, biological wastes, nuclear wastes, pesticides etc.). With the increase of population, solid waste production increases. This creates a lot of problems so far as its disposal is concerned. In the long-run these wastes produce foul smell and poisonous gases and become breeding grounds of vectors of different diseases (e.g., flies, mosquitoes etc.).

iii.   Increased consumption of natural resources:

Natural resources include energy, water, fossil fuels, forest products etc. As more industrialized and urban people have expensive lifestyle. Rate of consumption of natural resources is very high in urban areas. For example, though U.S.A has 5% of world's population, 74% of its total population lives in urban areas who consume 25% of the total energy consumed by the entire world population. One of the most acute problems of urban areas of India is scarcity of potable water especially the groundwater.

iv.   Open Space:

Most of the urban areas of the world are overpopulated or overcrowded or highly congested areas without open spaces for parks, playgrounds and social gatherings. This results in non-availability of free and clean air and space for playing and recreation.

v.   Violation of urban planning rules:

Craze for urban life leads to violation of rules laid down for establishing ideal urban settlements where one can lead healthy and comfortable life. Most often building codes are violated. In other words, prescribed Floor Space Index (FSI) or Floor Area Ratio is violated.

vi.   Noise pollution:

More people means more business and more vehicles leading to production of more noise or sound. Sound pollution in urban areas causes psychological and physical ailments.

vii.   Air pollution:

High population density, continuous human activities, large number of plying automobiles, industries etc. make the air of urban areas highly polluted. The polluted air contains carbon monoxide, carbon dioxide, oxides of nitrogen, hydrocarbons, sulphur dioxide, organic vapours, particulate lead, dust, ashes, chlorine, fluorine, metallic traces, pesticide granules, pollen and spores of plants etc. which are detrimental to human health.

viii.   Water Scarcity:

Since a large number of people live in a particular urban area, a large quantity of potable water is required to meet their daily demands. The groundwater of urban areas has been depleting, the causes being construction of concrete structures and the pressure of large populations. Metropolitan cities like Chennai and Mumbai face acute shortage of potable water.

ix.   Traffic and floating population:

Heavy traffic and floating population create a lot of environmental problems in urban areas. They not only cause all kinds of pollution but also contribute in the rise of heat of urban environment.

x.   Water-logging and Drainage:

Because of unplanned settlements, large amount of solid wastes, violation of building codes, influx of poor and uneducated people without any civic sense,

etc., many parts of urban areas become highly congested, drains are blocked, unauthorized structures are raised on public places, roads and drains. These activities block all outlets for drainage of rainwater and domestic sewage in cities and towns.

2.3. Environmental Problems of Rural Areas:

Rural areas are comparatively less polluted than the urban areas. But due to ignorance, illiteracy, superstitions and poverty of rural people, rural areas suffer from many environmental problems of their own. These are as follows:

i.   Salination, desertification and degradation of lands.
ii.   Utilization of agricultural lands for housing purposes.
iii.   Indiscriminate use of pesticides and agrochemicals.
iv.   Lack of roads and drainage facilities.
v.   Poor sanitation and hygiene.

i.   Sanlination, desertification and degradation of lands:

Because of ignorance and illiteracy the crop fields of rural areas are over-cultivated and water meant for irrigation is misused. These unplanned activities of rural people lead to salination, desertification and land degradation.

ii.   Utilization of agricultural land for housing:

With steady growth of rural population, more and more agricultural lands are being utilized for housing purposes both by government and private agencies. This results in decreased per capita availability of cultivated land. Recent estimation reveals that there is only less than one acre of cultivable land per every Indian. This is the cause of over-cultivation in the remaining cultivable land.

iii.   Indiscriminate use of pesticides and other agrochemicals:

Pesticides and fertilizers are the products of green revolution. To feed the mouths of growing population, there has been a continuous effort to increase crop production. Pesticides have been developed to kill all kinds pests infesting crop and vegetable plants and fertilizers for providing extra nutrients to the plants to increase production. But all such agrochemicals like bacteriocides, fungicides, nematocides, weedicides, insecticides, fertilizers etc. are also proved to be hazardous for human health. While many of the pesticides are non-biodegradable and hence accumulate in the bodies of organisms, many constituents of fertilizers cause health problems in humans and other animals.

iv.   Roads and drainage facilities:

Villages or rural areas lack good roads and drainage systems. In the absence of transport facilities rural people fail to have access to better healthcare, education, market and interaction with other people. Lack of drainage makes the rural areas filthy and unhygienic which help in spreading of diseases.

v.   Poor sanitation and hygiene:

Poverty, illiteracy and callous attitude of the administration make the people of rural areas unaware of the importance of cleanliness, sanitation and hygiene. As a result, rural areas become polluted and epidemics break out.

2.4. Population Growth and Environment

Many people (including national leaders) worry that population growth depletes resources and can trigger social or economic catastrophe if it is not contained. The developing countries have faced many challenges in recent decades, including low levels of education, poor health standards, poverty, scarce housing, natural resource depletion, wars, and economic and political domination by other countries.

The impact of population growth on economic development is a complex issue. As might be imagined population growth has positive and negative effects on development. The rapid population growth and economic development in

country are degrading the environment through the uncontrolled growth of urbanization and industrialization, expansion and intensification of agriculture, and the destruction of natural habitats. One of the major causes of environmental degradation in India could be attributed to rapid growth of population, which is adversely affecting the natural resources and environment. The growing population and the environmental deterioration face the challenge of sustained development without environmental damage. The existence or the absence of favorable natural resources can facilitate or retard the process of economic development. The three fundamental demographic factors of births, deaths and migration produce changes in population size; composition, distribution and these changes raise a number of important questions of cause and effect. Population Reference Bureau estimated the 6.14 billion world's population in mid 2001. Contribution of India alone to this population was estimated to be 1033 millions. It is estimated that the country's population will increase to 1.26 billion by the year 2016. The projected population indicates that India will be a first most populous country in the world and China will be second in 2050 (Population Reference Bureau, 2001). The increase of population has been tending towards alarming situation. India is having 18 percent of the world's population on 2.4 percent of its land area has great deal of pressure on its all natural resources. Water shortages, soil exhaustion, deforestation, air and water pollution afflicts many areas. If the world population continues to multiply, the impact on environment could be devastating.

As the 21st century begins, growing number of people and rising levels of consumption per capita are depleting natural resources and degrading the environment. The poverty-environmental damage nexus in India must be seen in the context of population growth as well. The pressures on the environment intensify every day as the population grows. The rapid increase of human numbers combines with desperate poverty and rising levels of consumption are depleting natural resources on which the livelihood of present and future generations depends. Poverty is amongst the consequences of population growth and its life style play major role in depleting the environment either its fuel demands for cooking or for earning livelihood for their survival. The unequal distribution of resources and limited opportunities cause push and pull factor for people living below poverty line that in turn overburdened the population density in urban areas and environment get manipulated by manifolds, consequently, urban slums are developed in urban areas.

The growing trends of population and consequent demand for food, energy, and housing have considerably altered land-use practices and severely degraded India's forest vis-à-vis environment also. The growing population put immense pressure on land extensification at cost of forests and grazing lands because the demand of food could not increase substantially to population. Thus, horizontal extension of land has fewer scopes and relies mostly on vertical improvement that is supported by technical development in the field of agriculture i.e. HYV seeds, Fertilizers, Pesticides, Herbicides, and agricultural implements. All these practices causing degradation and depletion of environment with multiplying ratio.

The relationship between population growth, resource depletion and environmental degradation has been a matter of debate for decades. The argument has been between those who view population numbers per se as the main culprit in increasing pressure on the environment and those who place more blame on economic development, non sustainable agricultural and industrial practices, and excessive and wasteful consumption. In fact, both population growth and no sustainable development are cause for concern in India. Though the relationship is complex, population size and growth tend to expand and accelerate these human impacts on the environment.

What is more concern, the number of population rise will increase to such an extent in future that it will cause overall scarcity for resources. Decades of economic expansion and population growth have degraded its land, air and water.

2.5. Impact of Population on Environment

The human population has been increasing at an extremely high rate in the last century and unfortunately, not much has been done to slow down this process. Undoubtedly, overpopulation is a global issue. It is global because it pertains to all of humanity, but global also means that it affects the whole world, i.e. the environment. Almost all human activities impact negatively the environment in one form or another, and as human population expands, the damaging effects on the environment multiply. Here are some of the most imminent environmental problems that results from human population growth:

1. Water supply. Water is one of the basic elements of live, and it is needed to preserve the balance of every ecosystem. It cools down and cleanses the environment and is used by plants and animals to carry out vital functions. As human population increases, so does the consumption of water. In the past fifty years, the per capita availability of fresh water has decreased by one third. Fresh water supply is a problem in most of the developing countries, especially those located in arid climates such as in Africa, South America and Asia. In some African countries, fresh water needs to be carried daily from sources more than two hours walking distance. Water supply is an issue in urban areas as well. In Beijing, the water table falls down with as much as two meters annually.

2. Water pollution. The problem with water is not only overconsumption, but also pollution. "More than 95% of urban sewage in developing countries is discharged untreated into the nearest waterway or field." The main contributors to water pollution are factories and open mines, discarding waste water with heavy metals, toxic substances and solid waste, which are virtually impossible to purify. The situation is even worse when it comes to ocean exploitation and pollution. Overfishing changes the balance in coastal ecosystems and decreases fish populations. Sometimes it might even lead to extinction of certain marine species. Overfishing also damages coral reefs, because it allows algae to overgrow them. It turns out that the ocean is "the ultimate garbage dump " because eventually all of the sewage, sediment from forest clearing, fertilizer and pesticide run-off flow into it. It is important to preserve the ocean, not only because it is an important source of food, but also because it plays a major role in climate regulation. The circulation of cold and warm water protects the earth from extreme temperature fluctuations. In addition, oceans absorbs between 30 and 40% of the CO_2 given off as a result of human activity, thus keeping global warming at stake.

3. Soil Degradation. Population growth results increases the demand for food production. Since the arable land in many of the overpopulated regions is limited, farmers begin to cultivate dry, hilly, nutrient-poor areas that are not very suitable for farming. Exploiting such lands makes them easily susceptible to erosion and loss of nutrients. For example, in search for farmland in Indonesia, peasants have been planting their crops on steep slopes. As a result, almost one half of Java's land is now in danger of erosion. Globally, the statistics are even more frightening. It is estimated that 1.2 billion hectares of land, approximately the size

of Europe, U.S. and Mexico combined, have lost much of their agricultural output capability in the last 50 years.

4. Deforestation. The search for more farmland causes other damaging agricultural practices such as slash-and-burn cultivation. Basically, a forest area is burned and converted into pasture, but due to poor soils, it looses its productivity in about three years. This initiates a vicious circle which results in the deforestation of large areas, mostly in tropical regions. Deforestation is also caused by the use of wood as fuel, since 9 out of 10 African households use wood for cooking and heating. This is the reason why Ghana lost almost a third of its dense forest from 1938 to 1980. In addition, the building of roads and the expansion of residential areas have contributed to the loss of primary forest.

5. Loss of biodiversity. All of the previously described effects of overpopulation on the environment lead to the destruction of the natural habitat of many wildlife species. The natural flora and fauna have been under constant pressure to adapt to a quickly changing environment. Since they have been unable to do so, they have been displaced from their natural ecological niche. The constant clearing of the Amazon forest has had devastating effect on many rare tropical species. It has been estimated that 10% of the species in the region have become extinct.

All of the above environmental issues clearly indicate that the natural assets that humans take for granted are in grave danger. Most of the damage on the environment caused by human expansion is long-lasting and in some cases permanent. There is no doubt that the human population will continue increasing and the condition of the environment will exacerbate. Therefore, only a sustainable approach toward conserving what currently exists as natural resources could counteract the detrimental effects of overpopulation on the natural world.

2.6. Environmental Pollution

Pollution is one of the most important problems of the 21st century. We all depend on our environment. Earth provides oxygen for breathing, clean water for

drinking and many raw materials, mankind needs to survive. Environment protection means trying to save these basic principles of life for all creatures.

The mad race among nations over the globe for development has jeopardized the health of man. Progress in agriculture and industry is taken a general criterion of development. This craze has resulted into unlimited exploitation of every bit of natural resources available. The splendid plenty fullness of nature is a heritage that should be conserved for future generation and not be spoiled.

Such activities of man had adverse effect on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man has disturbed the delicate ecological balance between living and non-living components of biosphere. The unfavourable condition created by man himself has threatened the survival of not only of man himself but also the other living organisms. A number of species likely to become rare, threatened, endangered or near extinction.

2.7. What is Pollution?

Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and soil that may harmfully affect the life or create a potential health hazard of any living organism. Pollution is thus direct or indirect change in any component of the biosphere that is harmful to the living components and in particular undesirable for man, affecting adversely the industrial progress, culture and natural assets or general environment.

Definition of Pollution:

We use the word "pollution" all the time, and the word carries certain connotations, but most of us would have difficulty in defining the term specifically. Pollution is the introduction by man, directly of indirectly, of substances or energy into the environment to such a degree that environmental conditions change.

Some definitions of pollution include the extraction of energy or substances from the environment, if it is done to such a degree that environmental conditions

change. The point is that man causes it, and it results in a change in the environment.

2.8. The Pollutants:

A pollutant is any solid, liquid, or gaseous substance present in such a concentration as may be or tend to be injurious to the environment. The pollutants are of two types: Non degradable and bio-degradable.

a. Non-degradable pollutants:

These includes poisonous compounds such as aluminium cans, mercuric salts, phenolic compounds, plastics and DDT, which do not easily degrade into simpler forms. Occasionally, they may combine with other compounds in the nature to produce additional toxins.

b. Bio-degradable pollutants:

They include very common unstable substances of domestic sewage, which can be easily decomposed by natural processes. Thus, these toxins can be removed by natural waste treatment mechanisms. Degradable pollutants appear to be more problematic, when the input into the environment exceeds the decomposition capacity.

The degradable pollutants provide energy (in the form of organic matter) and nutrients (as carbonates, phosphates etc) which increase the productivity of ecosystem, if rate of input is moderate. When input is increased, a critical range is reached, characterized by severe oscillations as algal blooms. Additional input brings out the poisoning of the system. In other words, if input is moderate, it will be useful by increasing productivity; otherwise high rate of input spoils the system. In case of non-degradable pollutants, toxic substances are harmful from the very beginning and as they increase, the productivity decreases.

There has grown up serious concern all over the world about the rivers turning murky, fish rotting on sea shores, tree withering, cities choking with foul air, toxic chemicals being cycled into food stuffs, disease epidemics appearing so frequently, acid rain, global warming, ozone layer depleting.

Environment pollution has become an international problem with environmental protection being a global pursuit of every government, receiving urgent attention by planners and legislators. Thus, control of pollution through enactment of laws was deemed necessary and is one of the concrete steps towards achieving a clean environment.

2.9. Factors of environmental pollution:

There are people who believe that environmental pollution is primarily a problem of the rich and the more affluent countries. The same kind of argument was advanced in the Stockholm Conference. If we accept this argument then the problem of environmental pollution should not be a matter of concern for the developing countries. But the fact is that the developing countries are also suffering from environmental deterioration and probably heading towards more pollution with their higher rate of population growth and efforts for industrialization. At present, the problem of environmental deterioration in the developing countries is not due to industrialization but to their poverty and lack of development.

Three factors are responsible for environmental pollution: population growth, increase in affluence and industrialization.

1. Population growth:
   More people lead to more demands on food, energy housing, clothing, transportation, all of which cause the environmental pollution. Problems of domestic sewage and solid waste disposal are directly related to the number of people. To meet the growing needs, fertilizers, pesticides, factories, fuel, nuclear energy etc. are required. These in turn lead to water pollution, air pollution, thermal pollution and radioactive wastes which, together with the sewage and solid wastes of people result in environmental pollution. Apparently more people mean more environmental pollution.
2. Affluence:
   The race among the countries to achieve a higher rate of growth is a significant dimension of the environmental pollution problem. Economic

growth means more consumption of resources. Rapid consumption of natural resources and waste disposal by increasing number of people put a great stress on environment. At the present rate of consumption, it has been estimated that many vital natural resources will be exhausted by the end of another two decades.

3. Industrialization:

It is not difficult to see how advances in technology and industrialization have accelerated the destruction of the environments. Mountains were detonated and leveled, and sea bottoms scraped and drilled to yield minerals and fossil fuels. Agricultural lands were tilled faster by tractors and fertilizer to yield several times the old harvest. More efficient fishing gear caught shiploads of fish only to deplete the sources. In using the new technology, we have exploited more than rehabilitated the natural environment. We forgot that our rate of developing and using of resources is destroying the nature faster than it could recover. We are overlooking the rights of future generations to the non-renewable resources that we are using up. We failed to see that the waste materials released by technological processing could build up to toxic levels.

2.10. Types of Pollution:

Water pollution:

Water pollution means contamination of streams, lakes, seas, underground waters or oceans by substances which are harmful to living things. Water is necessary for life on earth. Some organisms need water to live in; others to drink, but all contain water. For example in our body there is about 80% of water. Plants and animals require water that is moderately pure, and they cannot survive if their water is loaded with toxic chemicals or harmful micro-organisms. Water pollution can kill large numbers of fish, birds, and other animals, in some cases killing all members of a species in an affected area. Pollution makes streams, lakes, and coastal waters unpleasant to look at, to smell, and to swim in. fish and shellfish harvested from polluted waters may be unsafe to eat. People who ingest polluted water can

become ill, and with prolonged exposure may develop cancers or bear children with birth defects. In some cases it can cause death.

Major types of water pollutants:

The major water pollutants are chemical, biological, or physical materials that degrade water quality. Pollutants can be classed into eight categories, each of which presents set of hazards.

Petroleum products:

Oil and chemicals derived from oil are used for fuel, lubrication, plastics manufacturing, and many other purposes. These petroleum products get into water mainly by means of accidental spills from ships, tanker trucks, pipelines, and leaky underground storage tanks. Many petroleum products are poisonous if ingested by animals, often causing death. In addition, spilled oil may be contaminated with other harmful substances, such as polychlorinated biphenyls (PCBs).

Heavy metals:

Heavy metals, such as copper, lead, mercury, and selenium get into water from many sources, including industries, automobile exhaust, mines, and even natural soil. Like pesticides, heavy metals become more concentrated as animals feed on plants and are consumed in turn by other animals. When they reach poisonous, or can result in long-term health problems similar to those caused by pesticides and herbicides.

Hazardous wastes:

Hazardous wastes are chemical wastes that are either (poisonous), reactive (capable of explosive or toxic gases), corrosive (capable of corroding steel), or ignitable (flammable). If improperly treated or stored, hazardous wastes can pollute water supplies. PCBs, a class of chemicals once widely used in electrical equipment such as transformers, can get into the environment through oil spills and can reach toxic levels as organisms eat one another.

Pesticides and herbicides:

Chemicals used to kill unwanted animals and plants, for instance on farms or in suburban yards, may be collected by rainwater runoff and carried into streams, especially if these substances are applied too lavishly. Some of these chemicals are biodegradable and quickly decay into harmless or less harmful forms, while others are non biodegradable and remain dangerous for a long time.

Excess organic matter:

Fertilizers and other nutrients used to promote plant growth on farms and in gardens may find their way into water. At first, these nutrients encourage the growth of plants and algae in water. However, when the plant matter and algae die and settle underwater, micro-organisms consume oxygen that is dissolved in the water. Oxygen levels in the water may drop to such dangerously low levels that oxygen- dependent animals in the water, such as fish, die. This process of depleting oxygen to deadly levels is called eutrophication.

Sediment:

Sediment, soil particles carried to a streambed, lake or ocean, can also be a pollutant if it is present in large enough amount. Soil erosion produced by the removal of soil trapping trees near waterways, or carried by rainwater and floodwater from croplands, strip mines and roads can damage a stream or lake by introducing too much nutrient matter. This leads to eutrophication. Sedimentation can also cover streambed gravel in which many fish, such as salmon trout, lay their eggs. Many disease- causing organisms that are present is small numbers in most natural waters are considered pollutants when found in drinking water. Such parasites as Giardia lambila and Cryptosporidium parvum occasionally turn up in urban water supplies. These parasites can cause illness, especially in people who are very young and in people who are already suffering from other diseases.

Thermal pollution:

Water is often drawn from rivers, lakes or the ocean for use as a coolant in factrories and power plants. The water is usually returned to the source warmer than when it was taken. Even small temperature changes in a body

of water can drive away the fish and other species that were originally present and attract other species in place of them. Thermal pollution can accelerate biological processes in plants and animals or deplete oxygen levels in water. The result may be fish and other wildlife deaths near the discharge source.

Health effects of water pollution:

Health effects of chemicals commonly found in drinking water are:

1. Damage of lever, kidney and nervous system.
2. Sterility in males.
3. Genetic mutations.
4. Cancer
5. Fetal damage
6. Infant deaths

Biological (water borne- diseases)

1. These caused by the presence of an infective agent.
a. Viral: viral hepatitis A, hepatitis E, polio myelitis, rotavirus diarrhoea in infants.
b. Bacterial: typhoid and paratyphoid fever, bacillary dysentery, coil diarrhoea, cholera.
c. Protozoal: amoebiasis, giardiasis.
d. Helminthic: round worm, thread worm, hydatid disease.
e. Lepotospiral: weils disease.
2. Those due to the presence of an aquatic host:
a. Snail: schistosomiasis.
b. Cyclops: guinea worm, fish tape worm.

Prevention and control of water pollution:

The various ways/techniques suggested to control the water pollution are as follows:

1. Stabilization of the ecosystem:

This is the most scientific way to control water pollution. The principles involved are the reduction in waste input, harvesting and removal of biomass, trapping of nutrients, fish management and aeration. Various methods may be used to restore species diversity and ecological balance in the water body to prevent pollution.

2. Reutilization and recycling of wastes:

Various kinds of wastes include industrial effluents, sewage of municipal and other system and thermal pollutants may be recycled to beneficial use. For instance urban waste may be recycled to generate cheaper fuel gas and electricity.

3. Removal of pollutants:

Various pollutants (radioactive, chemical, biological) present in water body can be removed by appropriate methods such as absorption, electodialysis, ionexchange, reverseosmosis etc. Reverse-osmosis is based on the removal of salts and other substances by forcing the water through a semipermeable memberance under a pressure exceeding the osmotic pressure. Due to this, flow occurs in reverse direction. Reverse- osmosis is commonly used to and can also be used to desalinate the brackish water and also for purifying water from sewage.

Future outlook:

Though water (prevention and Control of Pollution) Act was promulgated in 1974 (and amended in 1988), a serious cconcern about water quality control could be generated only recently. The CPCB in collaboration with SPCBs is tackling this problem at war footing.

The water (Prevention and Control of Pollution) Cess Act, 1977 could recognize the value of this resource. Every drop of water used in the industry levied. There should be less waste of water.

Chronic power crisis is a limited factor on pollution control. Waste treatment needs power. We must evolve low power requiring technology. Sewage pollution from large human settlements is the major cause of water pollution in our country.

To avoid establishment of new industries without pollution control at source, we must revise the policy of licensing and subsequent follow-up-action. While setting up a new industry, environment impact assessment is necessary for making correct decisions about possible negative impacts, in urban sector, a proper land use plan is to be evolved to contain the stress of environmental pollution on residents.

Air Pollution

Air pollution can cause health problems and it can also damage the environment. It has caused thinning of the protective ozone layer of the atmosphere, which is leading to climate change. Modernization and progress have led to air getting more and more polluted over the years. Industries, vehicles, increase in the population and urbanization are some of the major factors responsible for air pollution. The following industries are among those that emit a great deal of pollutants into the air: thermal power plants, cement, steel, refineries, petro chemicals and mines. Air pollution results from a variety of causes, not all of which are within human control. The source of pollution may be in one country but the impact of pollution may be felt elsewhere.

Health impacts of air pollution:

Since the onset of the industrial revolution, there has been a steady change in the composition of the atmosphere mainly due to the combustion of fossil fuels used for the generation of energy and transportation. Air pollution is a major environmental health problem affecting the developing and the developed countries alike. The effects of air pollution on health are very complex as there are many different sources and their individual effects vary from one to another. It is not only the ambient air quality in the cities but also the indoor air quality in the rural and the urban areas that are causing concern. In fact in the developing world, the highest air pollution exposures occur in the indoor environment. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system; they are also taken up by the blood and

pumped all round the body. These pollutants are also deposited on soil, plants, and in water further contribution to human exposure.

Sources of Air pollution:

1. Automobiles: the air is mostly polluted by the exhaust gases of automobiles which constitute 60% of the air pollution. The automobiles exhausts contain compounds like carbon monoxide, oxides of nitrogen, hydrocarbons, sulphur dioxide, aldehydes, organic vapours and particulate lead. A hydrocarbon, 3-4 benzopyrene is released to the air when fuels burn incompletely.

2. Industries: pollutants like flyash, soot and sulphur dioxide are released from thermal power plants using coal. The sulphuric and phosphoric acid units of fertilizer plants produce oxides of sulphur, particulate matter and fluorine. Plants utilizing nitrogen produces ammonia, nitrogen oxides and hydrocarbons. The major pollutants produced by the textile industry are cotton dust, nitrogen oxide, chlorine, naphtha vapour and sulphur dioxide. Chemical plants and pesticide plants release chlorine gas. Steel plants generate carbon monoxide, carbon dioxide, sulphur dioxide, fluorine and dust.

3. Burning of wood and fossil fuels: smoke and carbon dioxide are produced during burning of wood for cooking in homes, hotels and other public places. Burning of fossil fuels like coal, kerosene, petrol etc. produce carbon dioxide, carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, particulate matter and metallic traces.

4. Ionic radiation: air and water are contaminated by radioactive dusts generated from nuclear tests which find their way into the food chain. Ionizing radiations emanated from radioactive wastes of nuclear reactors ionize protoplasm in the living organisms.

5. Agriculture: air pollution is also caused by pesticides and fertilizers used indiscriminately in the agricultural fields. A majority of the pesticides do not degrade into simple forms. As they remain stable in the environment, they enter the food chain. Air is also polluted by spray dusts and granules of pesticides produced during spraying of pesticides over infected plants.

6. Natural pollutants: pollens and spores produced by the seasonal plants cause allergic reactions when reach us carried by air. Breakdown of photosynthesis pigments in algae produce carbon dioxide. Volcanic eruption, forest fires, decomposition of natural organic and inorganic materials produces harmful particles and gases which also pollute air.

Effects of Air Pollution:

1. Global Warming (Greenhouse effect)
The heat balance of the earth gets affected with the increase in the concentration of CO_2 in the troposphere. Usually when solar radiation enters atmosphere, most of it passes down and reaches earth. When heat from the earth is reflected back, the thick layer of CO_2 in the atmosphere does not allow it to radiate out. Most of the heat reflected from the earth is absorbed by CO_2 layer and the water vapours present in the atmosphere. Thus while the thick CO_2 layer allows the solar radiation to pass through it to reach earth's surface, it prevents the heat from the earth's surface to radiate back to the outer space. As a result, atmosphere gets heated up. There is an increase of the temperature of atmosphere with the increase of CO_2 concentration in the troposphere. In this process the earth becomes warmed. This is called 'Greenhouse Effect'.
Plants are grown in a greenhouse in cold weather. The roof and side walls of a greenhouse are made up of glass. Solar radiation easily enters into a greenhouse through the glass roof and side walls but the glass prevents the heat from within the greenhouse to radiate out to the atmosphere. As a result, the inside of a greenhouse remains warmer in the cold weather facilitating better growth of plants.

2. Ozone layer depletion:
Ozone gas is mostly present in the stratosphere layer of atmosphere. In addition to stratosphere, low concentration of ozone is also found in troposphere. The ultraviolet (UV) radiations coming from the sun is mostly absorbed by the ozone in the stratosphere. Thus it acts as a shield protecting the living organisms from the harmful effects of ultraviolet radiation. The concentration of ozone in the stratosphere is approximately

10 mg/kg of air. But when air becomes polluted, the ozone layer in the stratosphere becomes depleted. At present the depletion of ozone layer due to air pollution led to the formation of a big hole, the size of a big continent, in the ozone layer above Antarctica. As a result of this, the UV radiation from the sun can reach the earth directly and can cause many health hazards. The pollutant that chiefly causes the depletion of ozone layer is chlorofluorocarbon used as refrigerant and propellant. Nitrogen-oxide and hydrocarbons are the other agents of ozone layer depletion.

3. Acid Rain:

   Combustion of fossil fuels like coal, mobil and petrol produce sulphur dioxide which is oxidized to sulphuric acid in humid conditions. Nitrogen oxides are a group of primary pollutants which are produced by automobile exhausts. Both sulphur dioxide and nitrogen oxides react with moisture in the air to produce sulphuric acid and nitric acid. These two acids come down to earth along with rain affecting the lives of plants and animals.

   Effects of Acid Rain:

   i.   Turns leaves of plants yellow and brown.

   ii.   Accelerates senescence in plants.

   iii.   Lowers productivity of forests, grasslands and crops.

   iv.   Changes soil quality and soil fertility.

   v.   Kills aquatic animals and plants and thus lowers productivity of aquatic ecosystems.

   vi.   Causes skin and respiratory diseases in man.

   vii.   Causes damage to the lime stone and marble monuments

   viii. Increases dissolved metals in soil and water which get into food chain.

4. Photochemical Smog:

   When the air pollutants like hydrocarbons and nitrogen oxides react with one another in the presence of sunlight, they produce nitrogen dioxide, ozone and a compound called peroxylacetyl nitrate

Control of Air Pollution:

i.   Industries can use smokeless fuels

ii.   Precipitators, scrubbers and filters can be used by industries to check the production of particulate matter

iii.   By using smokeless chullahs, solar cookers, and biogas, production of smoke can be controlled.

iv.   Industries can use large chimneys

v.   Positive crank case ventilation and catalytic converter can be used to reduce automobile emissions.

vi.   To control sulphur dioxide concentration in air, the recommended methods are (a) use of low sulphur fuels, (b) removal of sulphur from the fuel before use and (c) use of scrubbers

vii.   Antipollution devices can be fitted to automobiles to filter the emissions.

viii. Alternate fuels can be developed for automobiles that can reduce the pollutants in their exhausts.

ix.   Public awareness regarding hazards of air pollution, deforestation and importance of plantation should be created.

Soil Pollution:

Soil, is the upper layer of earth's crust. Plants grow on soil. Hence the growth of the plants is directly affected by the texture, composition and water content of the soil. Like air and water soil is also polluted by human activities.

Chief pollutants of the soil are the solid wastes like metals, plastics, polythene, human and animal excreta, glass, paper, rubber, building materials like sand,cement, bricks etc. many of these solid pollutants are not biodegradable. They not only pollute the surrounding environment by generating foul smell and poisonous gases but also change the texture and composition of soil affecting the animals and plants inhabiting on it.

Sources of soil pollution:

1. Domestic wastes
2. Industrial wastes
3. Agricultural wastes

4. Animal wastes
5. Community wastes

Effects of soil pollution:

In towns and cities, a large amount of solid wastes is dumped on the adjoining soil daily, where soil pollution has become a major problem. As the solid wastes in such thickly populated areas are not collected, disposed or dumped properly, the soil of those human habitats becomes highly polluted and causes a lot of problems as follows:

i. Breeding of disease carriers like flies and mosquitoes can take place on the decomposed organic solid wastes.
ii. Organic matters may breed microbes.
iii. Decomposed organic matters produce foul smell.
iv. Solid wastes can be washed away by run-off water during rainy season and pollute other water bodies.
v. They can block drains and cause water-logging, thus helping in breeding of mosquitoes.
vi. Non-biodegradable solid wastes like polythene, plastic, glass metals, etc. when dumped on soil, create problems for plants.

Control of soil pollution:

Soil pollution can be controlled by the following three ways:

1. Throw-away output approach
   Dumping of solid wastes on land or water bodies or burning is known as throw-away output approach of solid waste disposal. But instead of protecting the environment, this approach pollutes the place of dumping or burning.
2. In-put approach
   By reducing the production of solid wastes, we can prevent soil pollution caused by their harmful effects.
3. Resource recovery output approach

Recycling of solid wastes can be undertaken to convert them into many useful products. Thus, they can be a resource rather than a liability. The following are some of the examples of this resource output approach.

a. Packing card boards, hand-made drawing sheets, newsprint, unbreakable dolls and many other durable items can be produced from recycled waste papers.

b. Many reusable items can also be produced from recycled solid wastes like glasses, plastics, polythene etc.

c. Compost can be prepared from organic wastes by dumping them under soil. This compost is a rich source of nutrients for plants when used as manure.

d. Biogas can be produced from excreta of man and other animals for use as fuel and for lighting houses.

e. Ash is a solid waste produced from thermal power plants run on coal. This hazardous environmental pollutant can be used to make bricks and concrete and as manure in agricultural fields.

Noise Pollution

Noise can be defined as any sound that is unwanted and unpleasant and causes discomfort and annoyance. Both health and mind of an individual get affected by noise. Sound is measured by a unit called decibel. Sound becomes injurious to our ear when it is of more than 130 decibels. Again sound is unwanted when it crosses 100 decibel mark.

Sources of sound

a. Industries:
Machineries of industries run in compact spaces produce unpleasant sound of higher decibels. Such sounds are injurious to the health and mind of workers.

b. Traffic:

Number of automobiles on the roads has been increasing day by day. The vehicles like motor cycles, scooters, cars, buses, trucks, autorickshaws, areoplanes etc. not only pollute air by producing harmful gases in their exhausts but also produce irritating, unpleasant and unbearable sound. These sounds can cause physical and psychological illness, especially in people of urban areas adjacent to major roads.

c. Communities and gatherings:

Gatherings of people in festivals, processions, marriages, meetings, rallies etc. is another major source of noise. The sounds produced from chanting, slogans, high pitched music, speeches, songs, use of microphones etc. associated with such gatherings are also injurious to our health.

d. Electrical and electronic gadgets:

Frequent use of electrical and electronic gadgets like radio, TV, telephone, grinder mixture, washing machine, cookers and many such applicances also becomes a major source of unpleasant sound.

Effects of Noise Pollution

Noise is always irritating, annoying, unpleasant, unbearable and injurious to our health. It affects the work of people of places like hospitals, schools, offices, libraries etc. which require a calm, peaceful and serene atmosphere. The followings are some of the important effects of sound or noise pollution:

i.   Irritation, annoyance
ii.   Reduction of work efficiency
iii.   Impairment of loss of hearing
iv.   Insomnia or sleeplessness
v.   Hypertension(or increase in blood pressure)
vi.   Nervous disorders and brain damages
vii.   Sweating, nausea and fatigue
viii. Aliments of stomach and brain
ix.   Increase in cholesterol level in blood leading to hypertension, heart ailments and strokes.

Control of Noise Pollution:

1. Control of noise production at the source
   i. By locating the chief sources of sound production i.e. industries, aerodromes, highways etc. away from human settlements.
   ii. By discouraging or preventing or banning establishment of human habitations close to industries, aerodromes, highways etc.
   iii. By making the use of silencing devices in automobiles, aeroplanes, industries and other such sound producing machines or electronic and electrical gadgets mandatory.
   iv. By planting trees on both sides of highways, streets, factory premises and near airports and at different places of towns and cities since plants can absorb noise efficiently.
2. Control of transmission of noise
   If the sound production areas are covered and enclosed by sound-proof tiles and high rise walls respectively, the transmission of irritable sound can be prevented or reduced. This purpose can also be served if thick plantation can be undertaken around the factories or industries.
3. Control by protecting the victims of sound pollution
   Devices like earplugs and earmuffs should be provided to people who have constant and continuous exposure to harmful irritable proof and all such places of work sound-proof.
4. Control by enacting laws
   Laws should be enacted to ban or control production of irritable sound from loud speakers, crackers, processions, transportations, machines etc. during sleeping hours especially in the places where hospitals, schools, colleges, libraries etc. are located. Adequate laws should also be enacted for banning high pitch horns in the vehicles without silencers and for limiting volume of radios, music systems, TVs while listening.
5. Control of noise pollution by creating public awareness and education
   Awareness with regard to harmful effects of sound pollution should be created through print and electronic media, pamphlets, posters, roadside shows, seminars, symposia, hoardings and education.

2.11. **Energy Resources**

The sun sends out energy as solar radiation. Solar radiation can pass through space and the gases in the atmosphere. Solar energy heats anything that it hits. Plants use solar energy in the chemical reaction called photosynthesis, to live and grow.

Over many millions of years, chemical and physical processes can change substances from dead animals and plants to coal, oil and natural gas, or fossil fuels. These processes are still not fully understood but we know the energy stored in these fossil fuels come originally from the sun. When we burn these fuels, they form carbon dioxide gas and water, and release heat energy. We use the heat energy to drive machines that are essential for our modern way of life.

In the past few hundred years, we have burned fossil fuels that took millions of years to form. They would take million years to form again. We call these sources of energy non-renewable. However, if we can use solar energy directly, or use plant or animal products for fuel, then we have a renewable source of energy as renewable as the sun that shines every day. Energy is the ability to do work. When we move something by pushing of pulling, we are doing work. When we move something by pushing of pulling, we are doing work. Energy is necessary for anything to move or change.

Energy cannot be made or destroyed, but it can change from one form to another. Energy is either potential energy (stored energy) or kinetic energy (movement energy). The water at the top of waterfalls has potential energy. This potential energy changes to kinetic energy as the water falls.

We can also describe energy as having different forms, for example atomic energy (nuclear energy), chemical energy, electrical energy, heat energy, light energy, mechanical energy, and radiation energy (including solar radiation).

The increase in use of non-renewable fossil fuels may have increased the amount of carbon dioxide and other gases in the atmosphere to produce what is called

the global greenhouse effects. The temperature of the earth is believed to have increased and some scientists think this may lead to climate changes and widespread flooding of low-lying areas as the increased temperature causes the sea to expand because of the melting of ice. It makes sense then to be cautious and conserve non-renewable fuels for use by future generations and to control the global greenhouse effect. So, we should judicious as regards to energy use, and to change to renewable sources of energy.

Types of Energy Resources

1. Renewable or Non-conventional sources of Energy

These sources are being continuously consumed by man but renewed by nature. Such resources are inexhaustible. These energy sources are solar energy, wind energy, tidal energy, wood, biomass energy, bio-fuels, geothermal energy etc.

i. Solar energy:

Solar energy is the biggest source of non-conventional source of energy. The simple and commonest mode of solar energy utilization is solar thermal conversion. Efforts are being made for solar refrigeration, air-conditioning. Solar photovoltaic panels, cookers, heaters and solar battery driven cars are being found cost effective and technically better adopted, since we get effective sunshine for 250-300 useful days in a year.

ii. Wind energy:

The wind energy can be used for water pumping and power generation. The wind power is converted into mechanical and electrical energy. Areas like Kutch and Okha (Gujarat), Puri (odisha), Tuticorin (Tamilnadu) have wind turbines used for electricity generation.

iii. Tidal energy:

The possibility of generating tidal energy is being studied in the Rann of Kutch in Gujarat and Sundarbans in West Bengal. The world's only major tidal power station settled in France.

iv. Hydropower:

The water flow of the rivers is being collected in rivers with the heep of a dam. The potential energy of stored water in a dam is converted into kinetic energy of water by allowing it to fall through pipes from top of the dam to its bottom. This flowing water rotates the turbines as a consequence of which, the armature coil of the generator rotates so that electricity is generated.

v. Ocean Thermal Energy:

The energy produced due to difference in temperature of water at surface of ocean and at deeper levels is called ocean thermal energy. For efficient operation of Ocean Thermal Energy Conversion (OTEC), a difference of 20 degree Celsius or more is needed between surface water and deeper water.

vi. Geothermal energy:

The energy harnessed from hot rocks present inside earth is called geothermal energy. In places like Manikaran, Kulu and Sohma (Haryana), Taptapani (Odisha), hot water comes out from soil. Hot water coming out with pressure can be used to run the turbine of a generator to produce electricity.

vii. Bio-mass energy:

Organic matter like wood, cattle dung, sewage, agricultural wastes produced by plants is called biomass. The energy produced from these organic matters is known as biomass energy.

viii. Bio-gas:

Biogas is an important solution to present day energy crisis, especially in rural areas. The gas produced by action of bacteria on biomass is called biogas. Cow-dung is being used as a raw material to produce biogas in rural areas.

ix. Bio-fuels:

Alcohols like ethanol and methanol can be produced through fermentation of biomass. Sugar cane can be used for the production of ethanol. Methanol, like ethanol is clean, non-polluting fuel and can be obtained from woody plants. It burns at lower temperature than gasoline or diesel.

x. Hydrogen:

When hydrogen burns in air, large quantities of energy is released.

Non-Renewable Resources of Energy:

i. Coal: About 6,000 billion tonnes of coal lies under the earth. Till 2004 over 200 billion tonnes have been used. Major coal fields in India are: Raniganj, Jharia, East Bokaro and West Bokaro, Panch Konkam, Singnoulli, Talcher, Canada. The major states best known for coal deposits are Jharkhand, Odisha, West Bengal, M.P. A.P. and Maharashtra. India has about 5% of total world's coal deposits. Coal is the major source of power source of power and is of great importance as industrial fuel.

ii. Petroleum: World's crude oil deposits are diminishing at a greater rate and can be available only up to next 40 years. OPEC (Organization of Petroleum Exporting Countries) consisting of 13 countries have 67% petroleum deposits. These crude oils are being refined and purified by distillation. Major products are available namely petrol, diesel, kerosene, lubricating oil, plastic during the distillation process.

iii. Liquefied Petroleum Gas (LPG): The petroleum gases are being converted into liquid under pressure to form LPG- the cooking gas. The LPG is being marketed as household gas for kitchens.

iv. Natural Gas: The natural gas is composed of chiefly methane with small quantity of propane and ethane. In our country natural gas (fossil fuel)is a gift of nature. The natural gases are being used as energy sources and raw materials in petrochemical industry.

v. Compressed Natural Gas (CNG): in present days the CNG is being used in all major cosmopolitan cities to run vehicles. The CNG use has greately reduced the vehicular pollutions.

vi. Synthetic Natural Gas (SNG): the low quality coals are being converted to SNG in combination with carbon monoxide and hydrogen.

vii. Nuclear energy: A very small amount of radioactive substance can produce sufficient quantity of energy. Nuclear reactors are required to produce atomic energy. In India we have four nuclear power stations.

The nuclear energy is being used for production of electricity, as fuel for marine vessels, and spacecrafts and for heat generation in chemical processing plants.

Conservation of Energy Sources

At present we are adopting the following methods for conservation of energy sources being recommended by the experts.

1. Efficiency in production of energy.
2. Conservation of energy in transportation sector.
3. Conservation in utilization of energy.

Government of India has given high priority for conservation of petroleum products. Following methods are being undertaken for conservation in utilization of energy:

a. Adoption of measures and practices conducive to increased fuel efficiency and training programmes in transport sector.
b. Development and promotion of use of fuel efficient equipments like LPG and kerosene stoves in domestic sector.
c. Standardization of fuel efficient irrigation pumps for making them more energy efficient in agricultural sector.
d. To create massive awareness amongst people about the uses of energy efficient appliances for saving energy and money.
e. Awareness generation amongst people is also necessary to use natural resources like sun, wind, geothermal energy and trees for heat and cooling.

2.12. URBAN DEVELOPMENT AND ITS IMPACT:

When considering the future development of the urban sphere, especially in its European and EU context, one very important key strategic aspect has to do with sustainability considerations, i.e. the systemic interplay between environmental/ecological, economic and socio-cultural (sometimes here together referred to as "green") factors (in the sustainability context). Within this realm, you find challenges dealing with climate change, water availability and natural resource flows, including waste streams and their uses. When discussing "green" issues in connection with urban challenges, a starting point is the sustainability challenges connected with the urban space itself. However, you also find highly relevant considerations dealing with what the urban development implies for other activities distributed in geographical space as mirrored e.g. by the urban-rural connections in the form of the connection between urban space and its natural resources supporting "hinterland". Thus the impacts of the urban activities on the surrounding world is here at heart - in all its different ecological dimensions, such as water quality and quantity, biodiversity erosion, implications of the chemical impact on the ecological systems of the hinterland - and in terms of the competition over land use among different functions.

The urban-rural connection is not always to be considered "negative" in character and the urban space as "intruder", "eroder" and sometimes "destroyer". Instead there is often an intricate interplay between functions in the urban space and those connected directly to the rural space that carries mutual benefits, e.g. in terms of distribution of functional responsibilities of implementation. The two different spaces may thus manifest themselves as symbiotically linked and mutually reinforcing not least the vitality for survival of both. This does not mean that there does not exist an ecological footprint from the urban space on the global "hinterland". In addition, the social aspects of urban life (e.g. demographic, value orientation, preferences and issues around well being and human satisfaction) often have "green" connotations, e.g. how a climate change induced new water availability situation can strongly impinge on social life, and thus point at the issue of how societal priorities are allocated in such a situation. In earlier historical cases, desert towns provide vivid examples of such types of phenomena.

Many of the "green" types of challenges, e.g. climate change, are general phenomena (often planetary in scope) and not necessarily specifically connected to urban space. Their global and general features do not say anything about their specific impacts on urban phenomena. A scrutiny over a number of such general "grand challenges" thus has to indicate more precisely how such causal links to urban situations may be perceived in terms of what has already happened, but also exploring what could happen in the future. In order to do so, there is a need to first outline the general landscape of various "grand challenges" which also emerge as "drivers" of change in various systems, including the urban ones. Such a two-step outline of those relationships will be attempted in this text, in a form that will highlight a number of such phenomena and their potential nature. All this serves the increased capacity to explore various future options, including how to design criteria for the types of possible actions that may be entailed, and to make suggestions for incorporation in various policy packages at local, regional, national and EU levels respectively.

The current EU political context has several facets – some of very recent and some of older origin. The knowledge production side for sure has its roots in the Lisbon agreements. The urban aspects of EU "green" considerations have several threads, most of them over and above those that are directly oriented towards urban issues.

The economic crisis of 2008-10 has demonstrated the need for many fresh approaches to the economic problems at hand and those perceived at deeper level for the future. The 'smart, sustainable and inclusive growth' slogan at the centre of the Europe 2020 agenda, points at possible lines of action for socio-economic development over the next decade. Also, longer-term approaches to deeper transformations will have to be designed and implemented. This holds true not least for the urban challenges in their connections to green challenges for European policy, such as the need to shift to a low carbon paradigm. This is only one example of the frame of drivers of a global kind that Europe is facing, and which sometimes are called the 'grand challenges'. Specifically, the 'smart' component of the solution package is highlighted in the Europe 2020 agenda, with its connotation of 'knowledge and innovation as drivers of future growth'. The urban area exemplifies this to a large extent. The need to confront all these challenges will also draw into the picture the coherence of policy approaches and avoidance of unnecessary overlaps.

Impact of Urbanisation on Environment:

1. High rate of population growth due to migration.
2. Rich people, traders, industrialists and politicians grab all the prime land, develop pooh colonies and lead luxurious life whereas poor and deprived class are pushed to unhealthy slums.
3. Prices of land go up beyond the reach of common people. Streets become congested and due to lack of open space, free clean air becomes scarce.
4. Depletion of vegetation and greenery.
5. Industries, factories, automobiles and sewage pollute the environment significantly.
6. Because of increasing urban population more and more vacant lands are used for housing purposes by real estate dealers, builders and other people. As a result, crop fields, orchards, gardens, forests, playgrounds, grazing fields and even graveyards adjoining the urban areas are converted into housing plots.
7. Number of dwellings in an urban area is far less than the number of people inhabiting it. As a result, a small dwelling is occupied by many people, streets become congested and poor people are compelled to live in unhygienic makeshift shelters built on unauthorized land of slums. These slums are not only illegal but also lack all basic and civic amenities and thus the slum-dwellers lead very miserable lives.
8. Migrations from rural areas create great problems for the city planners, local administrators and civic authorities. As there is always a large floating population of unknown number in a city, a lot of stress develops on basic civil amenities like water, electricity, transport health services etc. Due to a large floating population urban environment deteriorates as it causes traffic jam, pollution, solid wastes, heat, dust, diseases and above all law and order problems.

2.13. Model Questions:
1. Discuss major environmental issues.
2. What are the impacts of population on Environment?
3. Define Pollution and discuss its types.
4. Explain the major sources of energy.
5. Discuss urban development and discuss its impact on environment.

Unit-III

3.0.   Development

3.1. Different approaches to development

3.2. Development and forced displacement

3.3.   Inclusive development
3.4.   Rural infrastructure and inclusive development
3.5.   Non-inclusive development
3.6.   Displacement
3.7.   Development induced displacement
3.8.   Causes of displacement
3.9.   Forced displacement
3.10. Rehabilitation
3.11. Environmental problem
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3.18. EIA in India
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3.20. Model questions

3.0. <u>Development</u>

We all have ideas for ways we can improve living conditions in our communities. For example, maybe in your community, people would like to build a new school or a better health clinic. Maybe there are some roads that need to be repaired or wells and pipes that need to be built to improve access to clean drinking water. Maybe members of your community are interested in a new job training program or developing irrigation systems to provide water for crops and animals during the dry season.

These are all examples of ideas for development of your community—ways to improve quality of life, opportunity and well-being. Different communities and individuals will have many different ideas about what good development means to them.

Government officials, companies, and other groups may have different ideas for development. For example, sometimes governments and companies declare that big projects—such as roads, mines, hydropower dams, or modern buildings—are necessary for the development of the whole country.

Sometimes these big projects can have negative impacts on local communities. If local people say they do not want these projects, they are often told that they are opposed to the development of their country.

But are these projects always really development? What happens if you disagree with a proposed development project because of the harm it will cause? Who should decide what kinds of projects and policies will be best for the future of your communities and country?

There are many different ideas and models for development, so there is no single definition or type of project that is development. The decisions that are made about the development of one area will have a big impact on the lives of all people in that area.

For this reason, everyone should have a voice in defining what kind of development happens in their community and their country.

3.1. DIFFERENT APPROACHES TO DEVELOPMENT

When most people think about plans for development, they think about projects which focus on improving people's quality of life. This may include projects that help to support families, build homes, protect the environment, improve access to food, Preserve culture and increase opportunities to learn and work. This might involve small projects within a community or it might involve big projects carried out by the government or companies. Sometimes development projects and policies can benefit some people but harm others. Good development projects include the ideas of all people who will be affected by the project and find ways to avoid causing harm when they are implemented. For example, a company might decide to build a factory in a rural village to create jobs and make the country richer. However, the factory might also pollute a river that a neighboring community relies on for fishing. This project may benefit the people who get jobs in the factory but harm the fishing families from the nearby village. For the factory to be a good development project, the company will need to find a way to avoid polluting the river and causing harm to the nearby communities. Those responsible for the development will also need to talk to people in the fishing village and ask for their ideas about how to avoid harming their livelihoods and the environment. This approach to development is called inclusive development, because it includes local people in planning and decision-making and focuses on directly improving the lives and opportunities of local people.

Sometimes development projects and policies can benefit some people but harm others. Good development projects include the ideas of all people who will be affected by the project and find ways to avoid causing harm when they are implemented. For example, a company might decide to build a factory in a rural

village to create jobs and make the country richer. However, the factory might also pollute a river that a neighboring community relies on for fishing. This project may benefit the people who get jobs in the factory but harm the fishing families from the nearby village.

Unfortunately, around the world, there are many development projects that are Non-Inclusive because they have not taken local communities' ideas and problems into account. These projects can involve taking natural resources away from local communities, or forcing people to move from their homes so that more modern buildings can be built. These are often projects that local communities have no involvement in, and instead of solving their problems they often create new ones. These projects sometimes do not have much benefit for poor people, but mainly benefit people who are already rich and powerful.

3.2. DEVELOPMENT AND FORCED DISPLACEMENT

One of the worst impacts of non-inclusive development is forced displacement. In the name of development people are sometimes evicted from their homes and forced to move out of the way. Many people around the world have become poorer due to forced displacement. This is because in addition to losing their homes, they lose access to the land or resources they depend on for many aspects of their lives, including their food and livelihoods. When people are displaced, in addition to losing their homes, they often lose access to local resources and services. Lost resources might include forests, rivers and farmland. Lost services might include community centers, schools or health clinics. Displacement often leads to the breakdown of communities and social and support networks. When inclusive development processes are used by communities, governments and companies, there is less risk of forced displacement and these negative impacts happening. This is because local communities who are affected by development projects are asked for their opinions and ideas about the project and how they would like to see their problems being solved. If people are required to move because of a project, inclusive development ensures that they are included in the discussions and

decisions about moving. Consultations should happen and action should be taken so that the living conditions of affected people are not negatively affected, or there could even be discussion on how they can be made better. With this approach to development, people's human rights are respected. In the next sections of the Guide, you will learn about human rights and how respect for human rights can improve the way development occurs.

1. DEVELOPMENT: Improvement of the quality of life, opportunity and well being. Development can happen at the community level or at the country level. It can be anything from building schools and improving access to health care to building the economy and improving trade with other countries.

2. INCLUSIVE DEVELOPMENT: An approach to development which includes local people in planning and decision-making and focuses on improving the lives and opportunities of affected people. Inclusive development also respects people's rights. Many people are excluded from development because of their gender, ethnicity, age, sexual orientation, disability or poverty. The effects of such exclusion are staggering, deepening inequality across the world. The richest ten percent of people in the world own 85 percent of all assets, while the poorest 50 percent own only one percent. Development can be inclusive - and reduce poverty - only if all groups of people contribute to creating opportunities, share the benefits of development and participate in decision-making. Inclusive development follows UNDP's human development approach and integrates the standards and principles of human rights: participation, non-discrimination and accountability. There are many elements for a nation to consider in pursuing inclusive development. A vital one is how to create productive and gainful employment. This should be paired with effective and efficient social safety nets to protect those who cannot work or who earn too little. To reach the Millennium Development Goals (MDGs), many developing countries will also need to enhance public services by building schools and hospitals, training teachers and doctors, and providing access to water, sanitation and transportation, all of which requires public spending. Well-designed fiscal policies - the way a government collects and spends public resources - can play a major role in stimulating growth and reducing poverty. UNDP works with developing countries to improve how inclusive

development policies and programmes like those mentioned are designed and implemented. It provides policy advice in areas such as employment strategies, job creation and social safety nets. We help develop the capacity of governments to formulate strategies and fiscal policies that stimulate pro-poor growth, reduce poverty and achieve the MDGs. At the same time, UNDP advocates for a stronger role for the state, enhanced public investment and economic governance to ensure that everyone has access to vital public services.

3.3. WHAT IS INCLUSIVE DEVELOPMENT?

In addressing the question of what is meant by inclusive development, two issues arise. First, the distinction between growth and development, and second, the import of the term "inclusive." "Development" brings into play dimensions of well being beyond simply income, while "inclusive" focuses attention on the distribution of wellbeing in society. Further intricacies arise, as will be seen, because the answers to these two questions are in fact interrelated. In principle the distinction between growth and development should be clear at a general, abstract level. Growth refers to economic growth, in other words, increase in per capita income. This is a narrowly defined technical concept that is measurable and is indeed measured by statistical agencies the world over. Development, on the other hand, is not at all well defined, at least not as precisely defined, as growth. At different times the term has been used to refer to (i) just economic growth, (ii) changes in economic structure of production (rising share of industry and then services from an agricultural base), (iii) spatial distribution of population (increasing urbanization), (iv) improvements in "social indicators" of education and health, etc. The "modernization" debate in the social sciences has partly been about the normative significance of the trajectory of a country which might go through the above changes—is it a good thing and should countries aim to go through this trajectory? Perhaps the best known exemplar of the distinction between growth and development, certainly the best known in terms of indicators that are on par quantitatively with economic growth as an indicator, is the Human Development Index (HDI). As is well known, this index combines per capita income of a country with two other indicators two arrive at a single index of "development". The two other indicators relate to education (measured by

literacy rate) and health (measured by life expectancy). The objectives of those who formulated and developed the HDI included the explicit broadening of the evaluation of country performance from sole reliance on per capita income to other dimensions of human well being. I will return to the distinction between solely incomes based versus more broadly constructed measures of well being. Let us now turn, however, to a discussion of what is meant by "inclusive." Fairly clearly, it refers in some sense to the distribution of well being, however measured. A given average for a population can be distributed in an infinite number of ways, ranging from perfect equality to extreme equality. And we can evaluate this distribution in a number of different ways, depending on what specific social welfare function is used in evaluating individual well being and then aggregating the evaluation to a social level. One specific form of a social welfare function defined on income, for example, would lead to the well known Foster-Greer-Thorbecke (FGT) class of poverty indices, which have now become the workhorse of empirical income poverty analysis among researchers and in international agencies. This class of indices includes the standard "head count ratio measure" (the fraction of population below the poverty line), "the income gap measure" (the shortfall of poor incomes from the poverty line normalized by the poverty line and total population) and "the squared income gap measure" (using the square of the shortfall, to emphasize the wellbeing of the poorest of the poor). Thus this class of indices can capture values judgments by varying the degree of "poverty aversion". Another member of this family, as the "poverty aversion" becomes infinitely large, coincides with the Rawlsian maxi min measure—evaluation is determined solely by the lowest level of well being, in this case the lowest level of income. Let us then pursue the notion of inclusiveness as being captured in some sense by poverty.

For a given level of average income, inclusiveness can be measured simply by the degree of poverty. As for changes in average income, growth, its inclusiveness can thus be measured by the change in poverty. Specifically, we can calculate poverty change per unit of increase in per capita income, convert this into elasticity, and use this as a measure of the inclusiveness of growth. Such exercises are now common, and yield useful insights into the nature of growth. Fairly clearly, a given

increase in per capita income—a given growth rate—is consistent with a range of changes to poverty (including, even, an increase in poverty). This leads then to the idea of "pro-poor growth" which at this level is indistinguishable from "inclusive growth." Both could be measured by the "growth elasticity" of poverty reduction." But consider now the behavior of the income distribution above the poverty line, and more generally the inequality in the overall distribution, as growth takes place. For example, if inequality in the overall distribution falls with growth, this would have some claim to be labeled "inclusive growth". If there is growth, and a fall in overall inequality, poverty will fall so on this case growth will be "pro-poor" as well. But if there is growth and an increase in inequality, then we could have the case that poverty falls because the growth effect dominates the inequality effect. In this case growth is "pro-poor", in the sense that poverty has fallen; but it is not "inclusive", in the sense that inequality has risen. These are not just definitional games. The recent experience of most fast growing economies, in Asia and elsewhere, precisely matches this stylized pattern. Using these definitions, we might say that inclusive growth is necessarily pro-poor, but non inclusive growth (in the sense of inequality increasing with growth) is not necessarily anti poor, provided it is not "too" non-inclusive (i.e. the inequality rising effect does not dominate the growth effect on poverty). However, making the same rate of growth more inclusive (inequality falling more or not raising so much) must make that growth more pro-poor. And, since there is a range of possibilities for distributional change associated with any given growth rate, inclusiveness itself can be more or less pro-poor—certain types of inequality decrease (for example those that increase middle level incomes) reduce poverty by less than other types of inequality decrease (for example, those that increase the lowest incomes). To summarize on income, therefore, the focus of policy for poverty reduction must be growth with as much inclusiveness as possible, and with as much inclusiveness of the poorest as possible. Clearly, the same framework above that is now widely applied to income could in principle be applied to non-income dimensions of well-being. For example, if literacy were conceptualized as a continuous variable, then the literacy rate used in the HDI would be seen as the analog of the "head count ratio", where the "poverty line" is a minimum level of reading and writing ability. The same issues would arise along

this dimension of inclusiveness. There could be an improvement in the average level of literacy, with little or no improvement in literacy below the minimum cut off. On health, average life expectancy across all individuals could improve, but with little or no improvement below some acceptable minimum. Inequalities in health outcomes have become a matter of growing interest in developing and developed countries alike, and some conceptual energy has been devoted to measuring health inequality. Then if development, beyond growth, is to do with improvements in average levels of attainment along dimensions other than income, inclusive development is to do with the distribution of these improvements. Inclusive development occurs when average achievements improve and inequalities in these achievements fall. By analogy with the income case, we can define pro-poor development as occurring when improvements in average attainments are accompanied by improvements of achievements below a critical threshold. Thus when development is inclusive it is also pro-poor. But development can be pro-poor even though it is not inclusive, inequality in this non-income dimension increases, provided that this increase in inequality is not large enough to offset the impact on "non-income poverty" of the average improvement along this dimension. Thus a move from just growth to inclusive development involves two steps— a move to evaluate the distribution as well as the average level of well being along any dimension considered, and a move to include dimensions other than income in the assessment of performance. The move from, growth to inclusive growth takes only the first step, staying focused on the income dimension. The move from growth to development takes only the second step, by bringing in non-income dimensions but staying focused on average achievements. Inclusive development as a concept invites and requires both steps to be taken. Is the Human Development Index (HDI) a measure of inclusive development? It certainly satisfies the second requirement, because it brings in education and health alongside income in constructing an overall measure of well being or performance for a country. However, it shows a concern for distribution only along one of these dimensions. This dimension is education because, as argued earlier, literacy, measured as the achievement of minimum levels of reading and writing, can be seen as being analogous to income poverty— it focuses attention on the lowest levels of educational achievement. But along

the income dimension the HDI uses only per capita income, not its distribution and not income poverty measures. Similarly, along the health dimension the measure is average life expectancy, which can in principle improve while its distribution worsens. Thus the HDI is not a measure of inclusive development. It should be noted, however, that there have been several attempts to modify the HDI to make it distribution ally sensitive, for example by introducing income poverty rather than average income, or gender sensitive, but taking into account the distribution of education and health across the genders. But the core HDI, the "headline" HDI, does not have these features. What of the Millennium Development Goals (MDGs)? How close do they come to capturing inclusive development? The answer is that in their totality they do represent a decisive shift away from the pure economic growth assessment of country performance, both because they bring in more dimensions than income, and because they bring in distributional considerations along the dimensions. Thus the two key indicators of the first goal (end poverty and hunger), to halve between 1990 and 2015 the proportion of people whose income is less than $1 per day and to halve the proportion of people who suffer from hunger, focus on distribution as well as going beyond just income (to bring in nutrition). The second goal, to achieve universal primary education, obviously goes beyond income but focuses attention on the lowest rung of educational achievement. The third, fourth and fifth goals (on gender equality, child health and maternal health) also emphasize distributional improvements of non-income dimensions. The sixth goal, combating HIV/AIDS, malaria and other diseases, has as a target, for example, the achievement of universal access to treatment for HIV/AIDS to all those who need it. This is certainly a non-income goal, but what of its distributional characteristic? If we conceptualize HIV/AIDS on a continuum from worst to less bad, then universal access to treatment is like equalizing the shortfall of "good health" from the critical minimum. In this sense it can be viewed as analogous to an income poverty target. But suppose HIV/AIDS afflicts primarily those who have higher incomes. Then in addressing distribution along one dimension we might give additional resources to those who are better off along another dimension. This raises the question of aggregation along different dimensions, which I will take up presently. The seventh MDG goal, of environmental sustainability, has several

components, some of which are distribution ally sensitive, but others of which are not. Thus the sub-goal of halving the proportion of population without sustainable access to safe drinking water and basic sanitation is analogous to halving income poverty. But the distributional aspects of another sub-goal, that of reducing biodiversity loss, are not self-evident since biodiversity cannot be ranked across individuals in the same way that income, or education, can. It is not clear who will benefit from reducing biodiversity loss at the national or global level. Once again, it leads us into following through the impact of acting on one dimension on the distributional characteristics of other dimensions—for example, will reducing biodiversity loss benefit the income poor or the income rich? Growth is a unidimensional measure of performance. As discussed above, pro-poor growth or inclusive growth, while still focused on income, face issues of aggregation across individuals—poverty indices are one way of effecting this aggregation, and more general social welfare functions are essentially methods of aggregating the myriad changes in income across individuals into a single national level index for evaluation. The concept of development introduces dimensions of well being beyond income, but this raises the question of aggregating across these dimensions to arrive at a single measure of performance. What if income rises but health or education worsens? Even if all dimensions move in the same direction, if changes are at different rates in different countries for different dimensions, the evaluation question remains. The HDI resolves this in a particular way—it takes an equal weighted average of the indicators along the three dimensions of income, education and health. But it is not clear on what basis these weights, or indeed any other set of weights can be chosen. The extensive debate on the question has not resolved the issue. We should consider four things in assessment and evaluation: (i) economic growth, (ii) measures of income distribution, including income poverty, (ii) measures of average performance along dimensions other than income, in particular education and health, (iv) measures of distribution along non-income dimensions of wellbeing, including distribution not only across individuals but across salient groups such as gender or ethnicity. In many ways, the MDG approach does this. There is an inevitable untidiness about the MDG approach since it has many dimensions and many indicators, but this is inevitable if we want to move from growth to inclusive

development as the objective of policy. Finally, I want to clarify that the focus of discussion here has been on assessment and evaluation of the outcomes of policy and the development process. These outcomes are multidimensional, and assessment is correspondingly complex. But this does not say anything about how these outcomes arise, or how they can be improved. That is a separate question, and will be taken up in the next section, focusing in particular on infrastructure interventions. But it is as well to address a tendency in some parts of the literature, that one set of outcomes are essentially all that we need to focus on, because the other dimensions track these outcomes very closely, statistically, and causally. This argument is indeed made for income—traditionally for economic growth, but more recently for income poverty. Thus, it used to be argued, and is still argued, that education and health, for example, track income fairly closely, so we might as well focus policy on the income dimension. There are two problems with this argument. First, there is the straightforward statistical argument that education and health do not in fact track income perfectly. Even when there is a significant statistical relationship on average, there is considerable variation around the average, and countries at the same level of per capita income can have widely different achievements in non-income dimensions. This holds also at the relationship across individuals. Second, and more importantly, even the significant statistical relationship does not establish causality, at least not uni-directional causality from income to the other dimensions. There is significant evidence that education and health feedback positively on income. There is thus no substitute for careful analysis of each intervention and its impact on multidimensional outcomes taking into account feedback effects from each dimension on to the others. And, as a practical matter, the MDGs provide a useful way of structuring the outcomes to focus on.

3.4. Rural Infrastructure and Inclusive Development-: Investing in infrastructure, rural infrastructure in particular, is a policy instrument available to governments to advance their objectives. What light does the objective of inclusive development, as characterized in the previous section, throw on the instrument, and what guidance does it provide for the deployment of the instrument? We focus on the differences with the objective of growth, which means paying

attention to two issues—outcomes beyond income, and distribution of these outcomes. As argued above, the MDGs provide a good way of implementing these concerns. Infrastructure is a broad term. The standard usage is of course in terms of roads. But electricity, telephone connections, water supply, buildings to house markets, all fall into this category. In what follows I will use roads as the leading example, and will mostly have roads in mind when I use the term infrastructure, with qualifications noted as they arise. The relationship between infrastructure and the levels and growth of income at the country level is much discussed in the literature. There could in principle be excessive investment in infrastructure with the growth objective, in the sense that the economic rate of return from the investment is below the opportunity cost of funds, but a significant body of literature argues that the issue in most developing countries is too little infrastructure to support rapid growth. The most obvious case is road connections between production centers (whether manufacturing or natural resource extraction) and points of export. Thus, for example, it is argued that one of the reasons why "structural adjustment" did not have as much success as expected in Africa was because of the poor state of infrastructure. "Getting the prices right" to incentivize agricultural production for export was not of much use if the produce could not be got to the port in time and in good condition. But cuts in public expenditure and especially in public investment, worsened an already bad situation and negated the pricing reforms. Coming right up to date, recent discussions on infrastructure constraints to India's growth prospects have led to an agreement on the need for massive investment if Indian growth is to be sustained. However, while it is the assessment of this author that infrastructure dose play a central role in economic growth, it should be made clear that the literature is not united in ascribing causality from infrastructure to economic growth. At least, cross-country regression analysis that tries to establish this link has been questioned by some authors. The relationship between infrastructure and economic growth is perhaps best seen as being positive but nuanced. Equally, there is a lively debate on how exactly infrastructure can play this role, and whether such a role should even be envisaged for it, or whether the government should simply stick to deploying infrastructure in supporting a growth strategy. The issue is important, because different types of infrastructure investment have

different outcomes, and real choices have to be made. Let us start then with roads and their role in inclusive growth. Spatial disparities in income and income growth have long been remarked upon in developing countries. It is well documented that these disparities have been growing in the last two decades, accompanying globalization and high national level growth rates. Internal divergence between rural and urban areas, between coastal and inland areas, and between sub national regions more generally, which tracks unequal development of infrastructure across these divides has become a worrying aspect of recent growth experience. What should be the policy response to this? The consensus view is that a reversal of the opening up of economies to global integration, which has created opportunities but also inequalities, is not really an option. No country has attained sustained growth without access to global markets, global investment and global know how. Rather, the question is how the growing inequalities can be managed. Since the evidence and analysis identifies some of the cause of regional divergence, in the face of growth opportunities, as lying in divergence in the level and quality of infrastructure, the policy response is seen to lie in addressing infrastructure deficits in lagging regions. This applies both to infrastructure within these regions, as well as infrastructure that links lagging regions to advancing regions and to the global economy. Thus the perspective of inclusive growth leads to a natural focus on rural roads. Rural areas contain the bulk of national poor, globally in aggregate but particularly in Asia, and it is these are among the areas that have been lagging in terms of income growth. This is apparent both in terms of direct comparison of income growth in rural and urban areas, but also in the observations that lagging regions are more rural in their composition than advancing regions in nearly all countries. Putting together the evidence on the causal connection between road connections and income growth, and the evidence on relatively low levels and growth of

3.5. NON-INCLUSIVE DEVELOPMENT: Development that does not take affected communities' ideas and problems into account. Non-inclusive development projects can involve taking natural resources away from local communities, or forcing people to move from their homes so that more modern buildings can be built.

3.6. __DISPLACEMENT__

Displacement can be defined as the forcing of communities and individuals out of their homes, often also their homelands, for the purposes of economic development. - Coercion and violation of Human Right

1. Displacement is defined as the act of moving someone or something from one position to another or the measurement of the volume replaced by something else.
   a. *An example of displacement is when war requires people to move from their homes due to the danger.*
   b. *An example of displacement is the weight of the water that is replaced by an ocean liner.*

__Displacement__

• Displacement is seen as the result of a model of development that enforces certain technical and economic choices without giving any serious consideration to those options that would involve the least social and environmental costs.

• Most displacement has been involuntary. There has been very little meaningful participation of affected people in the planning and implementation of the dam project, including the resettlement and rehabilitation aspects. The displaced and other affected people have often been the last to receive any meaningful information on the dam project. What information they have received has typically been limited and provided very late in the planning and implementation of mitigation measures. There have been instances of the submergence of land and other property, and of displacement without prior and sufficient warning of the impending filling of the reservoir. The displacement literature bears testimony to traumatic forced and delayed relocation, and to the denial of development opportunity for years and often decades due to a long and uncoordinated displacement and resettlement process. The numbers of both directly and indirectly affected people have frequently been underestimated, and there has been an inadequate understanding of the exact nature and extent of the negative effects involved. The State and other project proponents, largely viewing

displacement from the standpoint of its causes, consistently maintain that displacement is justified in the larger national interest. It is argued that while some displacement may be inevitable in large development projects, the long term good these projects will bring merits the sacrifice of a few in favour of the larger good. This notion of displacement as sacrifice has influenced thinking on displacement considerably. It has stripped displacement of its political content, the fact that displacement involves the loss of people's rights to land and resources. This has also led to a perception of resettlement and rehabilitation as are ward for the sacrifice rather than as a basic right or entitlement.

Those who view displacement from the point of view of its outcomes would in effect say that though some level of displacement may be inevitable its negative consequences are not. It is acknowledged that displacement causes severe social, economic, and environmental stresses that translate themselves into physiological, psychological, socio-cultural, economic, and ecological damage. At the same time it is maintained that by expanding resettlement objectives beyond merely aiming to improve the standards of living of the people, it would be possible to offset these disabilities. Thus moving towards such a just resettlement and rehabilitation is the focus of this school of thought. As a result displacement is large viewed from the perspective of resettlement and rehabilitation and its attendant complexities. The concern of this school of thought is with effective rehabilitation, which it maintains can manage displacement. So much so that very often displacement and resettlement are used interchangeably in this context, typically as involuntary resettlement in the case of the World Bank, for example. The meaning of displacement has come to be more or less taken for granted, particularly in most academic literature. It is very important to understand that displacement is a multidimensional phenomenon of which physical relocation is only one of the most significant outcomes. The displaced peoples movements have challenged this view of displacement with physical relocation at its centre and instead has as its core the historical experience of millions of displaced people.

This understanding of displacement highlights (i) the alienation of the individual and community legal and customary rights and dislocation of the social and economic organization, and (ii) the politics of legal and policy instruments that sanctions such disenfranchisement. The focus is thus on the experience as well as the structures of displacement. In this context displacement refers not only to those who are forced to physically relocate in order to make way for the project and its related aspects but also includes those who are displaced from their resource base and livelihoods. It is commonly experienced through the loss of land and the disruption of social and economic relationships.

3.7. **DEVLOPMENT INDUCED DISPLACEMENT-: Development-induced displacement** and resettlement (DIDR) is the forcing of communities and individuals out of their homes, often also their homelands, for the purposes of economic development. It is a subset of forced migration. It has been historically associated with the construction of dams for hydroelectric power and irrigation purposes but also appears due to many other activities, such as mining and the creation of military installations, airports, industrial plants, weapon testing grounds, railways, road developments, urbanization, conservation projects, forestry, etc. Development-induced displacement is a social problem affecting multiple levels of human organization, from tribal and village communities to well-developed urban areas.

According to Bogumil Terminski (2012) approximately fifteen million people each year are forced to leave their homes following big development projects (dams, irrigation projects, highways, urbanization, mining, conservation of nature, etc.). Anthony Oliver-Smith (2009) and Michael M. Cernea (2006) are also estimating that current scale of DIDR amounts to 15 million people per year.

Development-induced displacement or the forced migration in the name of development is affecting more and more people as countries move from developing to developed nations. The people that face such migration are often helpless, suppressed by the power and laws of nations.

The lack of rehabilitation policies for migrants means that they are often compensated only monetarily - without proper mechanisms for addressing their grievances or political support to improve their livelihoods.

Displaced people often internalize a sense of helplessness and powerlessness because of their encounter with the powerful external world, although there are also several examples of active resistance movements against development-induced displacement. In every category, particularly among marginalized groups, women are the worst hit and pay the highest price of development. A study carried out by the National Commission for Women in India (NCW) on the impact of displacement on women reveals that violence against women is increased. An increase in alcoholism due to displacement has led to a marked rise in domestic violence in India. In the Lincoln Park Community of Chicago, Illinois, where Jose (Cha-Cha) Jimenez founded the human rights Latino organization: Young Lords, Mayor Richard J. Daley displaced tens of thousands Puerto Ricans and the poor. This displacement helped to prolife rate growing street gangs. Today these gangs' enterprises with murder for hire arson for profit and drug sales as its prime motivation. Displacement has made men feel helpless or insecure and turned women and children into scapegoats. Displacement also leads to deterioration in health and high mortality rates as services in those selected areas are the first to be cut. The nutrition and health of women, which is worse than that of men even under normal circumstances, is bound to go down in the event of an overall worsening in health caused by displacement.

Humanitarian aid agencies and government programs should target their efforts when intervening to assist victims of forced economic displacement, to ensure their work does not run counter to processes aimed at addressing the fundamental roots of the conflict. The Overseas Development Institute advocates the search for durable solutions to the recovery of displaced persons which go beyond short-term return, relocation and local integration processes.

The Norwegian Refugee Council, Internal Displacement Monitoring Center, has an online review: Development-Induced Displacement.

3.8.CAUSES OF DISPLACEMENT-: According to Michael M. Cernea the main causes of development-induced displacement include: water supply (construction of dams, artificial reservoirs, irrigation projects), urban infrastructure, transportation (roads, highways, canals); energy (mining, power plants, oil exploration and extraction, pipelines), expansion of agriculture, parks and forest reserves and population redistribution schemes

SOME EXAMPLE OF DISPLACEMENT-:

- [Three Gorges Dam](#) in [China](#) - about 1.13 million displaced (recently increased to 4 million, but many could return).
- [Tokuyama Dam](#) in [Japan](#) - some 600 displaced.
- [Donji Milanovac](#) for Đerdap hydroelectric power plant
- [Sardar Sarovar Dam](#) in [India](#) - between 1 and 2 million displaced

3.9. FORCED DISPLACEMENT: When people or communities are made to leave their homes and lands. Forced displacement often happens because of non-inclusive development.

3.10. Rehabilitation

Rehabilitation programmes have predominantly focused on the process of physical relocation rather than on the economic and social development of the displaced and other negatively affected people. This has severely eroded the development effectiveness of rehabilitation programmes and heightened the impoverishment risk of the rehabilitator. According to Cernea (1998) risks to adversely affected people are not a component of conventional project analysis. The key economic risks to affected people are from the loss of livelihood and income sources such as arable land, common property resources such as forests, grazing land, ground and surface water, fisheries, etc and changed access to and control of productive resources. The loss of economic power with the breakdown of complex livelihood systems results in temporary or permanent, often decline in living standards leading to marginalisation. Higher risks and uncertainties are

introduced when diversified livelihood sources are lost. Loss of livelihood and disruption of agricultural activity can adversely affect household food security, leading to under- nourishment. Higher incidence of diseases associated with deteriorating water quality can result in increased morbidity and mortality. High mortality rates, immediately after involuntary resettlement in Kariba and High Aswan dams, are cases in point. As Cernea notes (1998), forced displacement tears apart the existing social fabric, leading to socio-cultural disarticulation.

• Most projects have long planning horizons and the actual physical relocation comes a long time after the initial notifications. The interim period is one full of uncertainties and enormous psycho-social anxieties for the to-be-relocated communities. Numerous examples exist of communities being subjected to multiple displacements by successive development projects.

• The costs of the rehabilitation programme have invariably been underestimated and under-financed. It is often the case that it is always the resettlement and rehabilitation budget that is reduced whenever the project runs into financial problems.

• Institutional weaknesses, marked by confusions between various departments and the lack of capacity as well as continuity, have been major problems in ensuring effective resettlement.

• In the absence of policy and legal instruments and an effective mechanism to monitor compliance, even well-structured institutions with trained staff have failed in consistent implementation of effective rehabilitation programme.

• Generally, participation of the affected people has been superficial or treated as unimportant by those responsible for the project. More often they have been manipulated, co-opted, or directly excluded.

• Evidence suggests that for a vast majority of the indigenous/tribal peoples displaced by big projects the experience has been extremely negative in cultural, economic, and health terms. The outcomes have included assetlessness, unemployment, debt-bondage, hunger, and cultural disintegration. For both

indigenous and non-indigenous communities studies, show that displacement has disproportionately impacted on women and children.

• Rehabilitation sites are invariably selected without reference to availability of livelihood opportunities, or the preferences of displaced persons themselves. Sometimes even temporary shelters are unavailable, and the first few months in the new site are spent in the monsoon rains under the open sky. House-sites are often much smaller than those in which the resettled people lived in the village, and temporary structures where they exist are made of tin or other inappropriate material and design.

• The question of livelihoods is a major issue in rehabilitation policy. There is reluctance on the part of governments and lending agencies to adopt and make operational policies requiring that the loss of agricultural land be compensated with alternative land, especially in the face of increasing pressure on land and the limited availability of arable land as well as its high price. This is despite the fact that most non- land-for-land programmes have failed to foster successful self-employment and other non-land-based livelihood strategies, especially in the critical areas of employment, skills, and capacity building.

• Forced relocation usually results in people being transplanted from a social ecology in which they were primary actors to one in which they are aliens; they are not only very vulnerable but also end up in most cases as an underclass in their new socio-cultural milieu.

• Communities of displaced people are invariably fragmented and randomly atomized, tearing asunder kinship and social networks and traditional support systems. Communities and often even large families are broken up and resettled over a wide area. The outcomes are psychological pathologies and alcoholism etc, common among displaced populations. It has been documented that this greatly enhanced psychological and psycho-social stress caused by involuntary rehabilitation heightens morbidity and immorality.

• The special vulnerabilities and specific needs of indigenous and tribal peoples have been inadequately addressed.

• Rehabilitation sites have been under-prepared in terms of basic amenities and essential infrastructure such as health, schooling, and credit.

•Generally, displacement as result of acquisition is legally sanctioned while, with few exceptions, there is no legal framework that governs the process of displacement itself.

• The existence of nation-wide norms and legally approved rehabilitation policy has played a role in improving outcomes for affected people. However, in the absence of these, the role of multilateral development institutions has assumed significance. In the 1980s, the World Bank played a significant role in influencing the development of rehabilitation policies or institutional framework to manage displacement and rehabilitation.

• Both in the case of national laws and international agency policies, there has been a wide gap between the laws and policies and their actual implementation. Cases include the Sardar Sarovar Project where apparently progressive state government and World Bank policies have failed to prevent widespread impoverishment and suffering among displaced people, and the Three Gorges Project in China where a national rehabilitation and resettlement law has not prevented numerous problems from emerging.

In many cases the focus of resettlement programmes is simply to get people to move out of the way to the rehabilitation sites as quickly and smoothly as possible. A number of submissions and cases in the WCD ís review highlighted the exercise of intimidation, violence, and even murder to compel communities to move (see the discussion under Human Rights). Once people are relocated or even shifted out the rehabilitation programme usually fizzles out or loses momentum, with the displaced people now at their most vulnerable. The resettled people are most vulnerable to be forgotten once the physical relocation is complete, a waning of interest sometimes referred to as developer's fatigue (Argentina Report 1999).

Forced relocation disrupts, or even destroys, social organization of production, networks of relationships, allocation of resources, and an entire complex of rights,

individual and communal. These cannot be restored by the mere provision of alternative land and housing.

Once it becomes known that people are to be relocated, a process of deferred investment sets in on the part of those to be rehabilitated, as well as of outside sources, such as government and entrepreneurs. People in areas from which rehabilitation is to take place thus become poorer, even before they are moved. Rehabilitation in the absence of active development initiatives is thus likely to become impoverishment - the opposite of what it is intended to be.

Rehabilitation of displaced people is thus a process that is acknowledged as entailing several risks. As discussed above, Cernea identifies the risks as landlessness, joblessness, homelessness, marginalization, increased morbidity and mortality, food insecurity, loss of access to common property and services, and social disarticulation (1998: 43-44). These risks render rehabilitation inherently problematic, and indeed impoverishment and disempowerment have been the rule than the exception with respect to rehabilitated people around the world.

Simply restoring the status quo ante in terms of material assets will thus leave people worse off than before. Therefore the main objective of a rehabilitation programme must be to improve the standard of living and not just restoration of pre-relocation standards of living. While the restoration of prerelocation standards is still echoed in several rehabilitation programmes there is enough evidence to indicate that this goal is limited and inadequate (Scudder, T. 1997).

Rehabilitation and Development-;

Rehabilitation can be envisioned as a process that would reverse the risks of resettlement. Cernea suggests a risk and reconstruction model of rehabilitation that would be marked by a series of transitions from:

• landlessness to land-based resettlement;

• joblessness to re-employment;

• food insecurity to safe nutrition;

• Homelessness to house reconstruction;

• increased morbidity and mortality to improved health and well being, and

•social disarticulation and deprivation of common property resources to community reconstruction and social inclusion (Cernea M.M. 1998:47).

Rehabilitation is only possible where development takes place. Thus resettlement must be planned as an integral part of the comprehensive development project (Jain, L.C. 2000). In this sense rehabilitation is really an outcome of resettlement that is conceived not as physical relocation or mere restoration of incomes but as development. This brings us to the question of development in the context of resettlement and rehabilitation.

One useful way of understanding development in the context of resettlement and rehabilitation of negatively affected people is, in terms of the real freedoms that the citizens enjoy, to pursue the objectives they have reason to value, and in this sense the expansion of human capability can be, broadly, seen as the central feature of the process of development (Dreze J. & Sen A. 1996:10).

A resettlement programme in order to qualify as development must therefore centre around: (i) enhancement of capabilities; and (ii) the expansion of social opportunities by addressing the social and personal constraints that restrict peoples choices. This would mean that resettlement with development entails questions of resources and rights that would affect the quality of life of the people.

The success of development programmes cannot be judged merely in terms of their effects on incomes and outputs, and must, at a basic level, focus on the lives that people can lead. This would mean (i) tangible benefits like lower morbidity and mortality, an increasing level of education, increasing incomes through opportunities for employment and livelihood; and (ii) empowering the displaced people through building capacities by their participation in the entire decision-making process of the development project and resettlement.

We will once again return to the issue when we discuss the question of what constitutes the fundamentals of a successful developmental resettlement programme. One overarching issue is the need to move from a context where forced evictions or involuntary resettlement is assumed to be the norm, to one where displacement becomes voluntary and takes place on the basis of negotiated agreements between developers and affected people.

3.11. ENVIRONMENTAL PROBLEM

Our environment is constantly changing. There is no denying that. However, as our environment changes, so does the need to become increasingly aware of the problems that surround it. With a massive influx of natural disasters, warming and cooling periods, different types of weather patterns and much more, people need to be aware of what types of environmental problems our planet is facing.

Global warming has become an undisputed fact about our current livelihoods; our planet is warming up and we are definitely part of the problem. However, this isn't the only environmental problem that we should be concerned about. All across the world, people are facing a wealth of new and challenging environmental problems every day. Some of them are small and only affect a few ecosystems, but others are drastically changing the landscape of what we already know.

Our planet is poised at the brink of a severe environmental crisis. Current environmental problems make us vulnerable to disasters and tragedies, now and in the future. We are in a state of planetary emergency, with environmental problems piling up high around us. Unless we address the various issues prudently and seriously we are surely doomed for disaster. Current environmental problems require urgent attention.

1. Pollution: Pollution of air, water and soil require millions of years to recoup. Industry and motor vehicle exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution. While water pollution is caused by oil spill, acid rain, urban runoff; air pollution is caused by various gases and toxins released by industries and factories and combustion of fossil fuels; soil

pollution is majorly caused by industrial waste that deprives soil from essential nutrients.

i. Air Pollution: Pollution of air, water and soil take a huge number of years to recover. Industry and engine vehicle fumes are the most obvious toxins. Substantial metals, nitrates and plastic are poisons in charge of pollution. While water contamination is brought about by oil slicks, acid rain, and urban sprawl; air contamination is created by different gasses and poisons discharged by businesses and manufacturing plants and burning of fossil fills; soil contamination is majorly created by mechanical waste that takes supplements out of the soil.

ii: Soil and Land Pollution: Land pollution simply means degradation of earth's surface as a result of human activities like mining, littering, deforestation, industrial, construction and agricultural activities. Land pollution can have huge environmental impact in the form of air pollution and soil pollution which in turn can have adverse effect on human health.

2. Global Warming: Climate changes like global warming is the result of human practices like emission of Greenhouse gases. Global warming leads to rising temperatures of the oceans and the earth' surface causing melting of polar ice caps, rise in sea levels and also unnatural patterns of precipitation such as flash floods, excessive snow or desertification.

3. Overpopulation: The population of the planet is reaching unsustainable levels as it faces shortage of resources like water, fuel and food. Population explosion in less developed and developing countries is straining the already scarce resources. Intensive agriculture practiced to produce food damages the environment through use of chemical fertilizer, pesticides and insecticides. Overpopulation is one of the crucial current environmental problem**.**

4. Natural Resource Depletion: Natural resource depletion is another crucial current environmental problems. Fossil fuel consumption results in emission of Greenhouse gases, which is responsible for global warming and climate change. Globally, people are taking efforts to shift to renewable sources of energy like

solar, wind, biogas and geothermal energy. The cost of installing the infrastructure and maintaining these sources has plummeted in the recent years.

5. Waste Disposal: The over consumption of resources and creation of plastics are creating a global crisis of waste disposal. Developed countries are notorious for producing an excessive amount of waste or garbage and dumping their waste in the oceans and, less developed countries. Nuclear waste disposal has tremendous health hazards associated with it. Plastic, fast food, packaging and cheap electronic wastes threaten the well being of humans. Waste disposal is one of urgent current environmental problem**.**

6. Climate Change: Climate change is yet another environmental problem that has surfaced in last couple of decades. It occurs due to rise in global warming which occurs due to increase in temperature of atmosphere by burning of fossil fuels and release of harmful gases by industries. Climate change has various harmful effects but not limited to melting of polar ice, change in seasons, occurrence of new diseases, frequent occurrence of floods and change in overall weather scenario.

7. Loss of Biodiversity: Human activity is leading to the extinction of species and habitats and and loss of bio-diversity. Eco systems, which took millions of years to perfect, are in danger when any species population is decimating. Balance of natural processes like pollination is crucial to the survival of the eco-system and human activity threatens the same. Another example is the destruction of coral reefs in the various oceans, which support the rich marine life.

8. Deforestation: Our forests are natural sinks of carbon dioxide and produce fresh oxygen as well as helps in regulating temperature and rainfall. At present forests cover 30% of the land but every year tree cover is lost amounting to the country of Panama due to growing population demand for more food, shelter and cloth. Deforestation simply means clearing of green cover and make that land available for residential, industrial or commercial purpose.

9. Ocean Acidification: It is a direct impact of excessive production of CO2. 25% of CO2 produced by humans. The ocean acidity has increased by the last 250 years

but by 2100, it may shoot up by 150%. The main impact is on shellfish and plankton in the same way as human osteoporosis.

10. Ozone Layer Depletion: The ozone layer is an invisible layer of protection around the planet that protects us from the sun's harmful rays. Depletion of the crucial Ozone layer of the atmosphere is attributed to pollution caused by Chlorine and Bromide found in Chloro-floro carbons (CFC's). Once these toxic gases reach the upper atmosphere, they cause a hole in the ozone layer, the biggest of which is above the Antarctic. The CFC's are banned in many industries and consumer products. Ozone layer is valuable because it prevents harmful UV radiation from reaching the earth. This is one of the most important current environmental problems.

11. Acid Rain: Acid rain occurs due to the presence of certain pollutants in the atmosphere. Acid rain can be caused due to combustion of fossil fuels or erupting volcanoes or rotting vegetation which release sulfur dioxide and nitrogen oxides into the atmosphere. Acid rain is a known environmental problem that can have serious effect on human health, wildlife and aquatic species.

12. Water Pollution: Clean drinking water is becoming a rare commodity. Water is becoming an economic and political issue as the human population fights for this resource. One of the options suggested is using the process of desalinization. Industrial development is filling our rivers seas and oceans with toxic pollutants which are a major threat to human health.

13. Urban Sprawl: Urban sprawl refers to migration of population from high density urban areas to low density rural areas which results in spreading of city over more and more rural land. Urban sprawl results in land degradation, increased traffic, environmental issues and health issues. The ever growing demand of land displaces natural environment consisting of flora and fauna instead of being replaced.

14: Public Health Issues: The current environmental problems pose a lot of risk to health of humans, and animals. Dirty water is the biggest health risk of the world and poses threat to the quality of life and public health. Run-off to rivers carries

along toxins, chemicals and disease carrying organisms. Pollutants cause respiratory disease like Asthma and cardiac-vascular problems. High temperatures encourage the spread of infectious diseases like Dengue.

15. Genetic Engineering: Genetic modification of food using biotechnology is called genetic engineering. Genetic modification of food results in increased toxins and diseases as genes from an allergic plant can transfer to target plant. Genetically modified crops can cause serious environmental problems as an engineered gene may prove toxic to wildlife. Another drawback is that increased use of toxins to make insect resistant plant can cause resultant organisms to become resistant to antibiotics.

The need for change in our daily lives and the movements of our government is growing. Because so many different factors come into play; voting, governmental issues, the desire to stick to routine, many people don't consider that what they do will affect future generations. If humans continue moving forward in such a harmful way towards the future, then there will be no future to consider. Although it's true that we cannot physically stop our ozone layer from thinning (and scientists are still having trouble figuring out what is causing it exactly,) there are still so many things we can do to try and put a dent in what we already know. By raising awareness in your local community and within your families about these issues, you can help contribute to a more environmentally conscious and friendly place for you to live.

16. Increased Carbon Footprint: Temperature increases, like climate change, are the consequence of human practices, including the use of greenhouse gasses. When the atmosphere changes and the heat increases, it can cause a number of problems and start to destroy the world we live in.

17. Genetic Modification: Genetic modification utilizing biotechnology is called genetic engineering. Genetic engineering of food brings about expanded poisons and sicknesses as qualities from a hypersensitive plant can exchange to target plant. Some of these crops can even be a threat to the world around us, as animals start to ingest the unnatural chemicals and such.

18. Effect on Marine Life: The amount of carbon in the water and the atmosphere is continuing to be a problem in the world around us. The primary effect is on shellfish and microscopic fish, and it has similar effects to osteoporosis in humans.

19. Mining: Mining results in extraction of minerals from earth's core. These minerals also bring out harmful chemicals from deep inside the earth to the earth's surface. The toxic emissions from mining can cause air, water and soil pollution.

20: Natural Disasters: Natural disasters like earthquakes, floods, tsunamis, cyclones, volcanic eruption can be unpredictable, devastating and can cause irreparable damage. They can cause huge loss of life and property ……….

21: Nuclear Issues: Radioactive waste is a nuclear fuel that contains radioactive substance and is a by-product of nuclear power generation. The radioactive waste is an environmental concern that is extremely toxic and can have devastating effect on the lives of the people living nearby, if not disposed properly. Radioactive waste is considered to be harmful for humans, plants, animals and surrounding environment.

22. Loss of Endangered Species: Human overpopulation is prompting the elimination of species and environmental surroundings and the loss of various biomes. Environmental frameworks, which took a huge number of years to come into being, are in risk when any species populace is huge.

23: Agricultural Pollution: Modern day agriculture practices make use of chemical products like pesticides and fertilizers to deal with local pests. Some of the chemicals when sprayed do not disappear and infact seeps into the ground and thereby harms plants and crops. Also, contaminated water is used for irrigation by farmers due to disposal of industrial and agricultural waste in local water bodies.

24: Light and Noise Pollution: Noise pollution is another common form of pollution that causes temporary disruption when there is excessive amount of unpleasant noise. Construction activities, industrialization, increase in vehicular traffic, lack of urban planning are few of the causes of noise pollution.

25: Medical Waste: Medical waste is any kind of waste that is produced in large quantity by healthcare centers like hospitals, nursing homes, dental clinics and is considered to be of a bio-hazardous nature. The waste can include needles, syringes, gloves, tubes, blades, blood, body parts and many more.

26: Littering and Landfills: Littering simply means disposal of piece of garbage or debris improperly or at wrong location usually on the ground instead of disposing them at trash container or recycling bin. Littering can cause huge environmental and economic impact in the form of spending millions of dollars to clean the garbage of road that pollute the clean air.

Landfills on the other hand are nothing but huge garbage dumps that make the city look ugly and produce toxic gases that could prove fatal for humans and animals. Landfills are generated due to large amount of waste that is generated by households, industries and healthcare centers every day.

There is little doubt that environmental problems will be one of humanity's major concerns in the twenty-first century, and it is becoming apparent that sociologists can play an important role in shedding light on these problems and the steps that need to be taken to cope with them. While the study of environmental issues is an inherently interdisciplinary project, spanning the natural and social sciences as well as humanities, the crucial role of the social sciences in general and sociology in particular are increasingly recognized (e.g., Brewer and Stern 2005). This stems from growing awareness of the fact that environmental problems are fundamentally social problems: They result from human social behavior, they are viewed as problematic because of their impact on humans (as well as other species), and their solution requires societal effort. It is, therefore, not surprising that sociologists have shown growing interest in environmental issues in recent decades and that environmental sociology has become a recognized field. Yet sustained sociological investigation of environmental problems did not come easily, and is a relatively recent development in the field

Although there was scattered sociological attention to both urban problems and natural resource issues prior to the 1970s, environmental sociology developed in that decade as sociology's own response to the emergence of environmental

problems on the public agenda. At first, sociologists tended to limit their attention to analyzing societal response to environmental problems, rather than examining the problems themselves. But as sociologists gradually paid more attention to environmental issues, some began to look beyond societal awareness of environmental problems to examine the underlying relationships between modern, industrial societies and the biophysical environments they inhabit. The result was the emergence of environmental sociology as a field of inquiry (Buttel 1987; Dunlap and Catton 1979a). We briefly discuss how and why environmental sociology represents a major departure from sociology's traditional neglect of environmental phenomena, describe the field's institutionalization, examine the key environmental foci of research in the field, and review both early and more recent research emphases in the field. Early emphases mainly involved analyses of societal awareness of environmental issues, whereas recent emphases continue this line of research but also include considerable work on the causes, impacts, and solutions of environmental problem.

ENVIRONMENTAL SOCIOLOGY,PROBLEM AND THE DISCIPLINE

In contrast to the larger society, mainstream sociology in the 1970s was almost oblivious to the significance of environmental problems. This blindness stemmed from a long period of neglect of environmental matters, stimulated by the societal context in which sociology developed as well as its unique disciplinary traditions. The Durkheimian emphasis on explaining social phenomena only in terms of other "social facts," plus an aversion to earlier excesses of biological and geographical "determinisms," had led sociologists to ignore the biophysical world (Benton 1991; Dunlap and Catton 1979a). To legitimize sociology as a discipline, it was important to move away from explanations of, for example, racial and cultural differences in terms of biological and geographical factors, respectively. Yet in the process of developing distinctively social explanations for societal phenomena, our discipline replaced older determinisms with sociocultural determinism (Carolan 2005a, 2005b). For example, as recently as the late 1970s, sociologists of agriculture argued that it was inappropriate to include factors such as soil type and rainfall in explanations of soil conservation adoption or farm energy use because they were not social variables (Dunlap and Martin 1983).

These disciplinary traditions were strengthened by sociology's emergence during an era of unprecedented growth and prosperity, which made limits to resource abundance and technological progress unimaginable, and increased urbanization, which reduced direct contact with the natural environment. With modern, industrialized societies appearing to be increasingly disembedded from the biophysical world, sociology came to assume that the exceptional features of Homo sapiens—language, technology, science, and culture more generally—made these societies "exempt" from the constraints of nature (Catton and Dunlap 1980) and thus reluctant to acknowledge the societal relevance of ecological limits (Dunlap 2002b).

Given sociology's neglect of the biophysical environment—and tendency to equate "the environment" with the social context of the phenomenon being studied— it is not surprising that efforts to establish environmental sociology as an area of inquiry included a critique of the larger discipline's blindness to environmental matters. Dunlap and Catton's (1979a) effort to define and codify the field of environmental sociology was accompanied by an explication and critique of the "human exemptionalism paradigm" (HEP) on which contemporary sociology was premised. While not denying that human beings are obviously an exceptional species, these analysts argued that humans' special skills and capabilities nonetheless fail to exempt the human species from the constraints of the biophysical environment. Consequently, Catton and Dunlap (1978, 1980) suggested that the HEP should be replaced by a more ecologically sound perspective, a "new ecological paradigm" (NEP), that acknowledges the ecosystem dependence of human societies. The call for mainstream sociology's dominant paradigm to be replaced with a more ecologically sound one proved to be a rather controversial feature of environmental sociology. While the exemptionalist underpinning of mainstream sociology has been increasingly recognized (Dunlap 2002b), the call for adoption of an ecological paradigm has been criticized for allegedly deflecting efforts to apply classical and mainstream theoretical perspectives in environmental sociology (Buttel 1987, 1997). Nonetheless, environmental sociologists are producing rapidly expanding bodies of both empirical literature on the relationships between societal and

environmental variables that clearly violates Durkheim's antireductionism taboo and theoretical literature representing efforts to develop more ecologically sound theories that are not premised on the assumption of human exemptionalism. Both of these trends reflect the declining credibility of exemptionalist thinking within sociology (Dunlap 2002b).

THE ENVIRONMENTAL FOCI OF THE FIELD-:

Whether defined narrowly as the study of societal environmental relations (Dunlap and Catton 1979a, 1979b) or more broadly as covering all sociological work on environmental issues (Buttel 1987), what makes environmental sociology a distinct field is its focus on the biophysical environment. However, the environment is an enormously complex phenomenon, open to various conceptualizations and operationalizations, and this leads to diverse foci in the work of environmental sociologists (Dunlap and Michelson 2002; Redclift and Woodgate 1997). One way of making sense of this diversity draws on ecologists' insight that the biophysical environment performs many services for human beings (Daily 1997). At the risk of oversimplification, we can sort these numerous services into three general types of functions that the environment or, more accurately, ecosystems serve for human societies (and all living species). Adopting this ecological perspective enables us to highlight the various aspects of the environment that environmental sociologists examine as well as to note some general trends in how these foci have changed over time (Dunlap 1994; Dunlap and Catton 2002).

To begin with, the environment provides us with the resources necessary for life, most critically, clean air and water, food, and shelter. Ecologists thus view the environment as providing the "sustenance base" for human societies, and we can also think of it as a "supply depot" of natural resources. Many environmental sociologists focus on issues surrounding the extraction, transport, use, and conservation of resources such as fossil fuels, forests, and fisheries. Second, in the process of consuming resources humans, like all species, produce "waste" products; indeed, humans produce a far greater quantity and variety of waste products than do any other species. The environment must serve as a "sink" or

"waste repository" for these wastes, either absorbing or recycling them into useful or at least harmless substances. When the waste products exceed an environment's ability to absorb them, the result is pollution. A growing number of environmental sociologists examine social processes related to pollution problems, ranging from the generation of pollution to its social impacts. Finally, like all other species, humans must also have a place to live, and the environment provides our home—where we live, work, play, and travel. In the most general sense, the planet Earth provides the home for our species. Thus, the third function of the environment is to provide a "living space" or habitat for human populations and other species. Environmental sociologists have focused on a variety of living space issues, traditionally ranging from housing to urban design but more recently encompassing macrolevel issues such as the impacts of deforestation, desertification, and climate change on human settlements and habitats.

When humans overuse an environment's ability to fulfill these three functions, "environmental problems" in the form of pollution, resource scarcities, and overcrowding and/or overpopulation are the result. Furthermore, not only must the environment serve all three functions for humans but when a given environment is used for one function its ability to fulfill the other two can be impaired. Impairment of ecosystem functions may yield more complex environmental problems. Functional incompatibilities between the living space and waste-repository functions are apparent, for example, when the use of an area for a waste site makes it unsuitable for living space. Similarly, if hazardous materials escape from a waste repository and contaminate the soil or water, the area can no longer serve as a supply depot for drinking water or for growing agricultural products. Finally, converting farmland or forests into housing subdivisions creates more living space for people, but means that the land can no longer function as a supply depot for food timber or habitat for wildlife.

Analytically separating these three functions provides insight into the evolution of environmental problems as well as the expanding foci of environmental sociology. In the 1960s and early 1970s, when awareness of environmental problems was growing rapidly in the United States, primary attention was given to air and water

pollution and the importance of protecting areas of natural beauty and recreational value. Early sociological work focused on these topics (e.g., Catton 1971; Molotch and Follett 1971). The "energy crisis" of 1973–1974 highlighted the dependence of modern industrialized nations on fossil fuels, added credibility to those espousing "limits to growth" (Meadows et al. 1972), and generated sociological interest in the impacts of energy shortages and scarcity more generally (e.g., Catton 1976; Schnaiberg 1975). The living space function came to the fore in the late 1970s when it was discovered that the Love Canal neighborhood in upstate New York was built on an abandoned chemical waste site that was leaking toxic materials, and this generated sociological attention to local environmental hazards (e.g., Levine 1982). More recently, problems stemming from functional incompatibilities at larger geographical scales, ranging from deforestation and loss of biodiversity to the truly global-level phenomena of ozone depletion and global warming, have attracted attention from sociologists (e.g., Canan and Reichman 2001; Dietz and Rosa 1997; Rudel and Roper 1997).

The above examples of how human activities are affecting the ability of the environment to serve as our supply depot, living space, and waste repository involve focusing on specific aspects of particular environments such as a given river's ability to absorb wastes without becoming polluted. It is more accurate, however, to note that it is not "the environment" but "ecosystems" and ecological processes that provide these three functions for humans—and for all other living species. Furthermore, it is increasingly recognized that the health of entire ecosystems, including the Earth's global ecosystem, is being jeopardized as a result of growing human demands being placed on them. Exceeding the capacity of a given ecosystem to fulfill one of the three functions may disrupt not only its ability to fulfill the other two but also its ability to continue to function at all. Whereas historically the notion that human societies face "limits to growth" was based on the assumption that we would run out of food supplies or natural resources such as oil (Meadows et al. 1972), contemporary "ecological limits" refer to the finite ability of the global ecosystem to serve all three functions simultaneously without having its own functioning impaired (see, e.g., Vitousek et al. 1997; Wackernagel et al. 2004).

The late Frederick Buttel noted on a number of occasions (Buttel 2004:333; Buttel and Gijswijt 2001:46) that researchers in the field employ overly simplistic conceptualizations of the environment, often limiting their attention to "ecological withdrawals and additions" or the supply depot and waste repository functions. Despite its simplicity, the three-function model offers major advances. First, as illustrated above, the model clarifies the characteristics and sources of environmental problems, how they change over time, and thus the expanding foci of environmental sociological research. Second, the model acknowledges the function of living space (and spatial phenomena in general), which is essential for examining the flows of resources and pollution across political boundaries in the modern world that are receiving increasing attention from environmental sociologists (Bunker 2005; Mol and Spaargaren 2005). Third, the model is consistent with conceptualizations of the biophysical environment employed in sophisticated measures of "ecological footprints" and "human appropriation of net primary production" that are increasingly used in empirical research by environmental sociologists and environmental scientists (Haberl et al. 2004).

INSTITUTIONALIZATION OF ENVIRONMENTAL SOCIOLOGY-

Sociological interest in the impacts of energy and other resource scarcities accelerated the emergence of environmental sociology as a distinct area of inquiry by heightening awareness that "the environment" was more than just another social problem, and that environmental change can indeed have societal consequences as well as the obvious fact that human activities can affect the environment. Studies of the impacts of energy shortages on society facilitated a transition from the early "sociology of environmental issues"—involving the application of standard sociological perspectives for analyzing societal responses to environmental issues—to a distinctive "environmental sociology" focused explicitly on societal-environmental relations. The nascent environmental sociology of the 1970s was quickly institutionalized via the formation of organizations within U.S. national sociological associations. These groups provided an organizational base for the emergence of environmental sociology as a thriving area of specialization, and attracted scholars interested in all aspects of the environment, from built to natural (Dunlap and Catton 1979b, 1983). The late

1970s was a vibrant era of growth for American environmental sociology, but momentum proved difficult to sustain during the 1980s because this decade was a troublesome period for the field and social science more generally. Ironically, however, stimulated by major accidents such as those at Chernobyl in the then USSR and Bhopal in India and growing evidence of global environmental problems, interest in environmental issues from a sociological perspective was taking root internationally. By the late 1980s and early 1990s, environmental sociology was not only reinvigorated in the United States but also was being institutionalized in countries around the world and within the International Sociological Association (ISA) (Dunlap and Catton 1994; Redclift and Woodgate 1997). ISA's Research Committee on Environment and Society, RC 24, has become an especially important vehicle for facilitating the global spread of environmental sociology (Mol 2006).

SOCIETAL AWARENESS OF ENVIRONMENTAL PROBLEMS-:

The emergence of "the environment" on the U.S. national agenda in the late 1960s and early 1970s led sociologists to study factors that contributed to societal awareness of environmental degradation. While there were a few early efforts to analyze the overall processes involved (e.g., Albrecht 1975), most studies focused on specific factors such as environmentalism. The environmental movement played the major role in placing environmental issues on the nation's agenda, and studies of environmentalism were a primary emphasis of early sociological work not only inNorth America but also subsequently in Europe, South America, and Asia. The growth of public awareness and concern stimulated by environmental activists and personal experience with degradation also received a good deal of attention. These two emphases have continued over time, while in recent decades attention to the roles played by the media and especially science in generating societal attention to environmental problems has increased. These strands of research have contributed to a broader concern with understanding how environmental problems are "socially constructed."

Environmentalism-:

In the United States, the modern environmental movement evolved out of the older conservation movement and the social activism of the 1960s, and sociologists helped document this evolution. Early studies focused heavily on the characteristics of people who joined national environmental organizations, finding that organizations such as the Sierra Club drew members who were above average in socioeconomic status, predominately white, and primarily urban. While this pattern led to charges of "elitism," it was noted that most voluntary and political organizations have similar membership profiles and that environmental activists were hardly economic "elites" (Morrison and Dunlap 1986).

Sociologists also studied the organizational characteristics of large national organizations such as the Sierra Club and Natural Resources Defense Council. Attention was given to their strategies and tactics, especially their efforts to influence national policy making via lobbying and litigation and their successful use of direct mail advertising to recruit a large but only nominally involved membership base (Mitchell 1979). These organizations grew rapidly in the late 1960s and early 1970s and ended up following a typical pattern observed for social movement organizations: As they became larger and more successful in the political arena, they also became more bureaucratic, professionalized, unresponsive to their memberships, willing to compromise, and conservative in their tactics (Mertig, Dunlap, and Morrison 2002).

One result is that by the 1980s, as more people discovered environmental hazards in their communities, a large number of local, grassroots organizations formed independently of the mainstream national organizations (Szasz 1994). The discovery that a disproportionate share of environmental hazards were located in minority and low income communities led to charges of environmental racism and injustice (Bullard 1990), the development of an "environmental justice frame" (Capek 1993) and the emergence of an "environmental justice" movement that gradually merged grassroots environmentalism centered in both minority and white, blue-collar communities (Pellow and Brulle 2005). Environmental justice organizations have been joined by a vast array of other local environmental groups with a range of foci, including land and wildlife protection,

that display diverse organizational forms and are sometimes linked to national organizations or belong to loose coalitions and networks (Andrews and Edwards 2005).

Besides describing and analyzing the organizational complexity and dynamics of contemporary environmentalism, sociologists have conducted long-term historical analyses of the growth of conservation/environmental organizations, both nationally (McLaughlin and Khawaja 2000) and locally (Andrews and Edwards 2005), and of the increasingly diverse set of environmentally relevant discourses to document the evolution of modern environmentalism out of traditional conservation concerns (Brulle 2000).

Also receiving a good deal of attention has been the emergence of environmental movements and Green parties in Europe (Rootes 2003) and, more recently, in Asia and Latin America (see Redclift and Woodgate 1997:pt. III). Transnational environmental activism is receiving increasing attention, including studies on topics such as how environmentalism in less-developed nations is influenced by international pressures (Barbosa 2000), how relations between transnational environmental organizations are influenced by ties to international governmental organizations such UN agencies (Caniglia 2001), and the factors that affect transnational environmental organizations' decisions to fund debt-for-nature "swaps" in less-developed nations (Lewis 2000). Some studies suggest that environmentalism is becoming a potent political force within many nations as well as at the international level (Shandra et al. 2004), whereas others are more cautious in their assessment of the potential influence of environmentalism at the global level (Frickel and Davidson 2004).

Within the United States, the increasing mobilization of the conservative movement as an antienvironmental countermovement has begun to receive some attention (Austin 2002), particularly the degree to which conservative think tanks have been successful in influencing U.S. environmental policy making (McCright and Dunlap 2003). The effectiveness of conservatives in opposing American environmentalism was signaled by the recent release of a controversial report by two self-avowed environmentalists titled The Death of

Environmentalism (Schellenberger and Nordhaus 2004). The authors argue that mainstream environmental organizations focus too narrowly on solutions for specific problems such as global warming while failing to link their goals to widely held values, and thus fail to counter conservatives' success in tying their antienvironmental agenda to traditional American values (see the symposium on the controversy edited by Cohen 2006b).

The inability of environmentalists to halt the weakening of federal environmental regulations by the current administration (Kennedy 2005) has highlighted the ill health, if not moribund state, of environmentalism in a post-9/11 era, and it is unclear if the movement will be able to regain the momentum of earlier decades. Sociologists are actively involved in analyzing the state of environmentalism and offering prescriptions for its resurgence, including issuing calls for more active support for technological innovations to ameliorate environmental problems by major organizations (Cohen 2006a), for a stronger coalition between labor unions and environmentalists (Gould, Lewis, and Roberts 2004), and for a fundamental restructuring of environmental organizations and their funding (Brulle, forthcoming).

Environmental Awareness and Concern-:

As environmental problems gained a foothold on the public agenda, both public opinion pollsters and social scientists began conducting surveys to examine levels of public awareness of environmental problems and support for environmental protection efforts. Initial efforts were confined to documenting growing levels of public awareness and concern for the environment among residents of the United States and other wealthy nations and to examining variation in "environmental concern" across differing sectors of society—by levels of education, age, and residence, for example (Albrecht 1975). Syntheses of available findings indicated that age, education, and political ideology were the best predictors, with young adults, the well-educated and political liberals being more concerned about the environment than their counterparts. Urban residents and women were also sometimes found to be more environmentally concerned than were rural

residents and men, although these relationships often varied with the measure of environmental concern employed (Jones and Dunlap 1992).

Longitudinal studies have also been conducted, tracking trends in public opinion on environmental issues over extended time periods (Dunlap 2002a). A few studies examined correlates of environmental concern with longitudinal data, finding them to be relatively stable over long periods of time (Jones and Dunlap 1992). However, the lack of a public backlash against what is widely seen as the anti environmental orientation of the Bush administration (Kennedy 2005), comparable with that which occurred during the first term of the Reagan administration, has led to speculation that concerns over national security in a post-9/11 era may have fundamentally altered Americans' concern with environmental quality (Brechin and Freeman 2004).

A more recent contribution of sociologists has been to extend work on environmental attitudes to the international level. A key finding is that citizen concern for the environment is not limited to wealthy nations as often assumed but rather has diffused throughout most of the world (Dunlap and Mertig 1995; Brechin 1999). These studies challenge the notion that concern for environmental protection is a "postmaterialist" value that emerges only when nations become relatively affluent and citizens' basic needs are reasonably well met.

Although the above studies have provided useful information on the distribution and evolution of environmental concern, they often employ single-item indicators or other simple measures and shed little light on the complexity of such concern. Gradually, more attention has been paid to the conceptualization and measurement of environmental concern, and sociologists and other scholars have developed a wide range of measures of this concept (Dunlap and Jones 2002). In particular, the "new ecological paradigm (NEP) scale," which measures basic beliefs such as the existence of ecological limits and the importance of maintaining a balance of nature, has become the most widely used measure of environmental concern, employed in scores of studies worldwide (see Dunlap et al. 2000 for a revised NEP scale).

Other sociological contributions have been the development of a norm-activation model of environmental concern and behavior, clarification of the attitude-behavior relationship in the environmental domain, and the creation of a comprehensive value-belief-norm theory of environmental attitudes and activism (Stern et al. 1999). The latter has become an influential theoretical framework for helping guide the current emphasis on understanding the value basis of environmental concern (Dietz, Fitzgerald, and Shwom 2005).

In short, sociological studies of environmental concern have documented high levels of public awareness and concern over environmental quality, a crucial aspect of the emergence of environment as a social problem. These studies have shown that, unlike most social problems, environmental problems have had considerable staying power (Dunlap 2002a). It remains to be seen if this longterm trend will be fundamentally altered by 9/11 (Brechin and Freeman 2004).

Media and Science-:

It is widely assumed that the media play a vital role in setting the policy agenda, and sociologists among others have examined the role of media coverage in generating societal attention to environmental problems. In general, it has been found that newspaper coverage of environmental issues increased dramatically throughout the late 1960s and reached an early peak at the time of the first Earth Day in 1970, presumably contributing to the concomitant rise in public concern during the same period (Schoenfeld et al. 1979). More recently, Mazur (1998) has shown how changing patterns of media coverage of global environmental problems such as ozone depletion and global warming appear to have influenced the waxing and waning of attention given to such problems by the public and policymakers. Also, Dispensa and Brulle (2003) have documented how U.S. media coverage conveys more scientific uncertainty regarding anthropogenic climate change than does that of other advanced nations—presumably due to the greater influence of the petroleum industry in the United States.

It was common for sociologists to credit Rachel Carson's Silent Spring and other scientific contributions in accounting for the rapid emergence of societal attention to environmental problems in the 1960s. Mitchell (1979) highlighted the

dual emphasis on science and litigation in newer environmental organizations such as the Environmental Defense Fund and the Natural Resources Defense Council. However, a detailed analysis of the significant role played by science in environmental issues has emerged as a major emphasis in environmental sociology only in the past decade or so. Analysts such as Yearley (2005), for example, have emphasized that the environmental movement's heavy reliance on science is a mixed blessing for several reasons: (1) demands for scientific proof can be used to stall action, particularly by unsympathetic politicians; (2) the probabilistic and tentative nature of scientific evidence falls short of the definitive answers lay people and policymakers seek; and (3) reliance on scientific claims makes environmentalists vulnerable to counterclaims issued by "skeptic scientists" supported by industry. Such insights have led environmental sociologists to focus more broadly on the role of environmental science in generating societal interest in environmental issues, ranging from analyses of how lay persons work to document the deleterious health impacts of local pollution (Brown 1997) to the role of experts in generating consensus on the need to take action to ameliorate the thinning of the ozone layer (Canan and Reichman 2001).

Social Construction of Environmental Problems and the Constructivist--:

Sociologists have long argued that conditions do not become social "problems" unless they are defined as such by claims makers, who are then successful in having their definitions publicized by the media, legitimized by policymakers and thus placed onto the public agenda. Environmental sociologists have applied this "social constructivist" perspective to a wide range of environmental problems and to "environmental quality" more generally,highlighting the crucial roles played by environmental activists, scientists, and policy entrepreneurs (Yearley 1991). Some have synthesized relevant work on environmentalism, environmental science, media attention, and public opinion into detailed models of the social construction of environmental problems and, in the process, helped explain how environmental quality has remained a significant social issue for over three decades (Hannigan 1995). Constructivist work demonstrates that environmental problems do not simply emerge from changes in objective conditions, scientific evidence is seldom sufficient for establishing conditions as problematic, and the

framing of problems (e.g., as local or global) is often consequential (Yearley 2005)—representing a vital sociological contribution. However, in the 1990s some constructivists followed postmodern fads and "deconstructed" not only environmental problems and controversies but also "the environment" (or, more typically, "nature") itself. Proclamations that "there is no singular 'nature' as such, only a diversity of contested natures" (Macnaghten and Urry 1998:1) were not uncommon (e.g., Greider and Garkovich 1994). This provoked a reaction from environmental sociologists in the "realist camp," who argued that while one can deconstruct the concept of nature, an obvious human (and culturally bound) construction, this hardly challenges the existence of the global ecosystem and by implication various manifestations of ecosystem change construed as "problems" (Dunlap and Catton 1994). Realist critics further argued that a "strong constructivist" approach that ignores the likely validity of competing environmental claims slips into relativism, undermines environmental science and plays into the hands of its critics, precludes meaningful examination of societal-environmental relations seen as fundamental to environmental sociology, and at least implicitly resurrects the disciplinary tradition of treating the biophysical environment as insignificant (Benton 2001; Dickens 1996; Murphy 2002).

In response, defenders of social constructivism replied that they were not denying the reality of environmental problems, as their postmodern rhetoric sometimes suggested, but were simply problematizing environmental claims and knowledge (Burningham and Cooper 1999; Yearley 2002). In eschewing relativism in favor of "mild" or "contextual" constructivism (e.g., Hannigan 1995), most constructivists have moved toward common ground with their realist colleagues. The latter, in turn, have moved toward a "critical realist" perspective that, although firmly grounded on acceptance of a reality independent of human understanding, recognizes that scientific (and other) knowledge is imperfect and evolving (Carolan 2005a, 2005b). The result is that the "realist-constructivist battles" of the 1990s are subsiding, and environmental sociologists continue to make use of constructivist concepts such as framing to shed light on environmental controversies without slipping into relativism (e.g., Capek 1993; Shriver and Kennedy 2005).

CURRENT RESEARCH EMPHASES-:

The foregoing work on societal awareness of environmental problems can be technically considered as the sociology of environmental issues, but in recent decades it has become common to find research that clearly involves investigations of societal-environmental interactions or relations (Gramling and Freudenburg 1996). While sometimes involving examinations of perceptions and definitions of environmental conditions held by differing interests, such work is at least implicitly and more often explicitly "realist" in orientation—and clearly ignores the Durkheimian dictum that social facts be explained only by other social facts that hampered early environmental sociology (Dunlap and Martin 1983). Rather than problematizing environmental claims, this work typically investigates how changing environmental conditions (often in interaction with social factors) produce societal impacts or, more commonly, how social factors affect environmental conditions. Although space constraints prevent us from providing a comprehensive review of such work, we highlight environmental sociologists' contributions to three particularly important topics: the sources of environmental problems, the impacts of such problems, and the solutions to these problems.

3.12 Sources of Environmental Problems-:

Given that environmental sociology emerged in response to increased recognition of environmental problems, it is not surprising that a central concern of the field has been to explain the sources of environmental degradation and why such degradation appears endemic to modern industrial societies. Early work often involved analyses and critiques of the rather simplistic views of the causes of environmental degradation that predominated in the popular literature, particularly monocausal explanations highlighting population growth emphasized by Paul Ehrlich or technological development stressed by Barry Commoner. The ecological complex or POET model (highlighting relations among population, technology, social organization and the environment) was used to explicate the competing explanations and point out the limitations of their narrow foci (Dunlap and Catton 1979b, 1983).

The most influential analysis was offered by Schnaiberg (1980), who provided a cogent critique of the emphases on population growth, technological developments, and materialistic consumers as the key sources of environmental degradation. Schnaiberg's alternative "treadmill of production" model drew on a range of neoMarxist and other political-economy perspectives to offer a sophisticated alternative that stresses the inherent need of market-based firms to grow, to replace costly labor with advanced technologies, and the inevitable increase in resources used as inputs in expanding production processes. He further clarified how a powerful coalition of capital, state, and labor develops in support of continued growth, making it difficult if not impossible for environmental advocates to halt the resulting "treadmill."

Because the treadmill presents a compelling analysis of how and why increasing levels of environmental degradation inevitably accompany the expansion of capitalism, it has an inherent "face validity" that makes it appealing to environmental sociologists (Gould, Pellow, and Schnaiberg 2004). Yet despite this appeal, it has proven difficult to test empirically, particularly on a macrolevel, and has been used primarily to analyze localized opposition to treadmill processes (Buttel 2004). It has been used, for example, to explain the lack of success of local recycling programs and environmental campaigns (Gould, Schnaiberg, and Weinberg 1996; Pellow 2002; Weinberg, Pellow, and Schnaiberg 2000), and evoked a rebuttal in the case of recycling (Scheinberg 2003). At this point, the appeal of the treadmill model rests heavily on the fact that the growth of capitalism has been accompanied, particularly at the national and global levels, by increasing levels of environmental degradation (York 2004).

Finer-grained analyses of the linkages between economic activity and environmental degradation are needed to examine the validity of the treadmill model's assumption of an inevitable relationship between the two. Two examples of such analyses include Freudenburg's (2005) work suggesting that tiny fractions of the American industrial economy, often single plants within an industry, account for an enormously disproportionate share of pollution, and work by Grant and his colleagues (Grant and Jones 2003; Grant, Jones, and Bergesen 2002) showing that large chemical plants and those that are subsidiaries of other

companies account for a disproportionate share of toxic releases. In addition, growing recognition of the importance of consumption in contemporary societies (Carolan 2004; Shove and Warde 2002; Spaargaren 2003; Yearley 2005) raises questions about the treadmill model's dismissal of consumer behavior.

The integration of the treadmill model with another political economy perspective, world systems theory (WST), is needed to advance our understanding of the relationship between economic globalization and environmental degradation. According to Wallerstein (1974), the modern world system emerged in the early 1500s and is comprised of three structural positions: core, semiperiphery, and periphery. While the structure of the system has been stable since its genesis, which nations occupy each of the three positions can change somewhat over time. Core nations tend to specialize in profitable manufacturing, whereas peripheral nations tend to provide raw materials and cheap labor for both core and, increasingly, semiperipheral nations (Burns, Kick, and Davis 2003). Although ignored in the original formulation of the theory, environmental issues have attracted increasing attention from WST researchers (Roberts and Grimes 2002). The late Stephen Bunker, who pioneered the application of WST to environmental questions in his pathbreaking work on resource extraction in the Amazon (Bunker 1985), has noted the difficulties as well as benefits of merging the insights of the treadmill model with those of WST (Bunker 2005). While the time is ripe for following Bunker's lead, WST theorists largely ignore the insights offered by the treadmill model (Roberts and Grimes 2002) and treadmill proponents continue to ignore the insights of WST (Gould, Pellow, and Schnaiberg 2004).

The rapid growth of work on environmental issues by WST proponents in the past decade has included both longterm historical analyses of environmental degradation (Chew 2001) and the role of ecological factors in capitalist development (Moore 2003), and a spate of cross-national empirical studies investigating the relationship between countries' positions in the world system and, for example, national levels of deforestation (Burns et al. 2003), CO_2 emissions (Roberts and Grimes 1997), and ecological footprints (Jorgenson 2003). These large-scale, cross-national studies—typically finding that core nations

contribute disproportionately to global levels of environmental degradation—complement more narrowly focused analyses of the export of both hazardous wastes (Frey 2001) and polluting industries (Frey 2003) from core to peripheral nations, as well as the export of natural resources from the peripheral to core nations (Bunker 1985; 2005).2 Finally, Barbosa's work (2000) sheds light on how the world system not only encourages the exploitation of the Brazilian Amazon but also weakens efforts to protect it.

Adherents of WST have offered vital insights into the sources of environmental degradation. However, they must do more than demonstrate that world system position has a significant effect in regression equations predicting various forms of environmental degradation. Studies that examine patterns of environmental degradation within differing sectors of the world system (Burns et al. 2003) offer an advance, but more work on less-developed nations that clarify how involvement in the world capitalist system stimulates treadmill processes (e.g., privatization of natural resources) is needed—including attention to the role of international institutions such as the World Bank in expanding global capitalism, even under the guise of sustainable development (Goldman 2005).

Ironically, given the dismissal by Schnaiberg and many other sociologists of the perspectives of Ehrlich and Commoner, a recent alternative to the treadmill and WST models draws explicitly from the "IPAT equation" (holding that environmental impact is a function of population, technology, and affluence) that evolved from debates between the two ecologists. IPAT is isomorphic with the POET model developed by sociological human ecologists and used by early environmental sociologists (Dunlap 1994; Dunlap, Lutzenhiser, and Rosa 1994). Thus, the derivative "STIRPAT" (or "stochastic impacts by regression on population, affluence, and technology") model developed by Dietz and Rosa (1994) is rooted in what Buttel (1987) termed the "new human ecology" perspective in environmental sociology (see Benton 2001 for an updated overview of work representing this perspective).

The STIRPAT model provides a statistically rigorous technique for empirically examining the relative contributions of potential sources of environmental

degradation, including the economic variables central to political economy models, and thus offers an improvement over IPAT (York, Rosa, and Dietz 2003b). An early STIRPAT analysis of national-level CO_2 emissions found that population and affluence explained cross-national variation extremely well (Dietz and Rosa 1997), giving some credibility to the neo-Malthusian perspective (e.g., Catton 1980, 1987) that has generally been disregarded in the field. A recent and more sophisticated STIRPAT analysis of cross-national variation in ecological footprints (a comprehensive measure of ecological load encompassing the three functions of the environment noted earlier) again found population (size and age distribution) to be the most important contributor to national-level footprints, although environmental conditions such as land mass and latitude (reflecting climate variation) and economic variables such as affluence also have an effect (York, Rosa, and Dietz 2003a).

While the STIRPAT model helps provide great insight into the sources of environmental degradation, it will likely be subjected to criticism (in part because its emphasis on the importance of population may prove unpalatable to some environmental sociologists) and refinement. The "human ecology" perspective on which it builds is a broad orienting framework—calling attention to the ecological embeddedness of human societies—rather than a coherent theoretical perspective (Dietz and Rosa 1994),[3] and the degree to which "ecological theory" can be directly applied to Homo sapiens remains a problematic and contentious issue (e.g., Freese 1997). While a strength of the STIRPAT model is that it can incorporate an endless range of variables, including those suggested by alternative theoretical perspectives, the selection of predictor variables beyond indicators of population and affluence thus far appears to be rather ad hoc (compare, e.g., Dietz and Rosa 1997 with York et al. 2003a, 2003b). This is important because we can expect to see varying conclusions drawn from studies that incorporate differing variables into the model, as suggested by Shandra et al. (2004). Future work with STIRPAT might benefit from the concepts of "societal metabolism" and "colonization of nature" employed by Fischer-Kowalski and colleagues (arguably the leading exponents of a human ecological perspective in Europe), as well as from the examples of in-depth longitudinal studies of the

environmental impacts of specific nations guided by those concepts (e.g., Fischer-Kowalski and Amann 2001; Fischer-Kowalski and Haberl 1997; Haberl and Krausmann 2001).

The recent rapid development of theoretically and empirically sophisticated analyses of the sources of environmental degradation, particularly quantitative, crossnational studies, means that knowledge is evolving rapidly. It is not surprising that studies differ in findings and conclusions when they use differing samples of nations as well as varying indicators of an array of predictor variables, to say nothing of focusing on differing forms of environmental degradation. Also, there is a fundamental difference in logic between, for example, Jorgenson's (2003) effort to demonstrate that world system position is the key factor influencing nations' ecological footprints and York et al.'s (2003a) effort to explain variation in national footprints as fully as possible by employing a wide range of variables. We can expect considerable debate as well as eventual progress, especially if proponents of differing theoretical perspectives begin to focus on the same topics, in developing improved understanding of the sources of environmental degradation. Clearly, the field has come a long way since the early efforts to clarify debates over the key sources of such degradation (Dunlap and Catton 1979b, 1983; Schnaiberg 1980).

3.13 Impacts of Environmental Problems-:

As noted earlier, environmental sociology was just emerging at the time of the 1973–1974 energy crisis, so it is not surprising that identifying real as well as potential social impacts of energy and other natural resources was emphasized in this early period. While diverse impacts— from regional migration to consumer lifestyles—were investigated, heavy emphasis was placed on investigating the "equity" impacts of both energy shortages and the policies designed to ameliorate them (Rosa, Machlis, and Keating 1988). A general finding was that both the problems and policies often had regressive impacts, with the lower socioeconomic strata bearing a disproportionate cost due to rising energy costs (Schnaiberg 1975).

Equity has been a persistent concern in environmental sociology, and researchers gradually shifted their attention to the distribution of exposure to environmental hazards (ranging from air and water pollution to hazardous wastes). Numerous studies have generally found that both lower socioeconomic strata and minority populations are disproportionately exposed to environmental hazards (Brulle and Pellow 2006), and clarifying the relative importance of income and race-ethnicity has begun to receive attention (Szasz and Meuser 2000). While these findings have played a key role in generating attention to "environmental racism" and stimulating efforts to achieve "environmental justice" (Pellow and Brulle 2005), there are many methodological challenges to be overcome if researchers are to provide stronger documentation of environmental injustice (Saha and Mohai 2005; Bevc, Marshall, and Picou 2006).

At a broader level, international equity is attracting the attention of environmental sociologists such as WST researchers investigating the export of hazardous wastes and polluting industries from wealthy to poor nations, the exploitation of Third World resources by multinational corporations, and the disproportionate contribution of wealthy nations to many global-level problems—while the consequent hurdles these phenomena pose for international cooperation has also received attention (Redclift and Sage 1998). Mounting evidence of the disproportionate impact of environmental problems on peripheral nations and the lower strata within most nations calls into question Beck's (1992) "Risk Society" thesis that modern environmental risks transcend class boundaries (Marshall 1999).

Sociologists have not limited themselves to investigating the distributional impacts of environmental problems, and studies of communities exposed to technological or human-made hazards offer particularly rich portrayals of the diverse impacts caused by environmental and technological hazards. Whereas natural disasters—such as floods, hurricanes, and earthquakes—have been found to produce a therapeutic response in which communities unite in efforts to help victims, repair damage, and reestablish life as it was before the disaster struck, technologically induced disasters (particularly toxic releases) have a corrosive effect on community life (Freudenburg 1997; KrollSmith, Couch, and Levine 2002).

Although a putative hazard may appear obvious to some residents, the ambiguities involved in detecting and assessing such hazards often generate a pattern of intense conflict among different community groups (Shriver and Kennedy 2005). In many cases, such conflicts have resulted in a long-term erosion of community life as well as exacerbation of the victims' personal traumas stemming from their exposure to the hazards (Kroll-Smith et al. 2002).

Even when there is general agreement among residents concerning the impact of a disaster, there can be long-term socioeconomic damage to the community and psychological stress to its residents, as illustrated by longitudinal work on the impact of the 1989 Exxon Valdez oil spill in Alaska (Picou et al. 2004). In the aftermath of such disasters, three factors tend to impede recovery and contribute to long-term psychological stress and community damage: (1) perceptions of governmental failure; (2) uncertainty regarding the mental and physical health of victims; and (3) protracted litigation (Marshall, Picou, and Schlichtmann 2004). For the plaintiffs of Cordova, Alaska, the litigation process following the Exxon Valdez Oil Spill served as the strongest source of psychological stress and community damage (Picou et al. 2004).

It has been argued recently that the social-psychological distinction between natural and technological disasters is losing its empirical import, especially with the recent emergence of a third type of disaster—terrorism (Marshall, Picou, and Gill 2003; Webb 2002). Indeed, the blurring of the distinction is suggested by anecdotal evidence indicating that Hurricane Katrina is perceived as a natural disaster (storm surge damage along the Gulf Coast), technological disaster (breached levee system causing flooding in New Orleans), and a case of environmental injustice (low income people disproportionately trapped by rising flood waters in New Orleans). Such ambiguities indicate the need for fresh perspectives in sociological work on hazards and disasters. More generally, the rising incidences of human exposure to environmental hazards and technological disasters, particularly as less-developed (semi-peripheral and peripheral) nations experience more industrial growth and/or resource exploitation, suggests that environmental sociologists will pay increasing attention to the impacts (as well as the sources) of environmental degradation.

3.14Solutions to Environmental Problems-:

Environmental sociologists have typically focused more attention on the causes and impacts of environmental problems than on their solutions, although the situation has changed in the past decade. Akin to their analyses of causes, early work by environmental sociologists often involved explications and critiques of predominant approaches to solving environmental problems. Heberlein (1974) noted the predilection of the United States for solving environmental problems via a "technological fix," and then analyzed the relative strengths and weaknesses of voluntary and regulatory approaches. Other sociologists (e.g., Dunlap et al. 1994) subsequently identified three broad types of "social fixes" implicit in policy approaches: (1) the cognitive (or knowledge) fix relying on information and persuasion to stimulate behavioral change; (2) a structural fix employing laws and regulations to mandate behavioral change; and (3) a behavioral fix using incentives and disincentives to encourage behavioral change.

In the 1970s and 1980s environmental sociologists, along with other behavioral scientists, conducted a variety of studies evaluating the efficacy of these differing strategies, particularly for energy conservation (Rosa et al. 1988). Sociological analyses emphasized the degree to which energy (and other resource) consumption is affected by factors such as building construction and transportation systems, and thus the limitations of educational and information programs for achieving conservation (Lutzenhiser 1993; Shove and Warde 2002). Nonetheless, the changing regulatory climate of recent decades has generated renewed interest in voluntaristic approaches to environmental policy, and Tom Dietz and Paul Stern have recently led a comprehensive examination of environmental policy approaches via the U.S. National Academy of Sciences and the resulting volume (Dietz and Stern 2002) provides an excellent update of relevant work by environmental sociologists and other social scientists.

By the 1990s sociological interest in environmental policy took a quantum leap forward as environmental sociologists in Northern Europe began to analyze what appeared to be significant environmental amelioration within their nations. Originally building on models of industrial ecology, which suggest that the

modernization of industry can permit expanding production with decreasing levels of material input and pollution output, proponents of "ecological modernization" gradually moved beyond technologically driven explanations of environmental progress. New forms of collaboration between government, industry, and civil society were seen as institutionalizing an "ecological rationality" that not only tempers the excesses of traditional economic decision making but also stimulates the development of a "green capitalism" that purportedly marries the pursuit of environmental protection with the power of the market (e.g., Mol and Sonnenfeld 2000; Mol and Spaargaren 2000). In part because its acceptance of the presumed inevitability of capitalist expansion makes it compatible with currently hegemonic neoliberal economic ideology, ecological modernization theory (EMT) has become a leading perspective within environmental sociology— particularly in Europe.

Not only do proponents of EMT view the relationship between capitalism and environmental quality quite differently than do adherents of political economy perspectives but also their efforts to theorize processes of environmental improvement have led to a major revision in environmental sociology's traditional preoccupation with explaining environmental degradation (Buttel 2003). It is therefore not surprising that major debates have ensued over the validity of ecological modernization theory. American scholars from various theoretical perspectives have issued critiques, particularly dealing with the methodological inadequacies and resulting limitations of empirical research purportedly documenting cases of ecological modernization. These include EMT's emphasis on institutional change rather than actual environmental improvements; its focus on atypical plants, corporations, and industries selected to illustrate environmental improvements; its lack of generalizability beyond a small number of European nations; and its failure to recognize that environmental improvements in these nations result from increased use of poorer nations as supply depots and waste repositories (Bunker 1996; Goldman 2002; Schnaiberg, Pellow, and Weinberg 2002; York 2004; York and Rosa 2003).

Although it initially appeared that such critiques would foster serious debate over the validity of EMT and especially its applicability outside of Northern Europe

(Mol and Spaargaren 2002), most recently the leading proponents of EMT have retreated into a postmodernish stance emphasizing "the limitations of empirical studies in closing theoretical debates" (Mol and Spaargaren 2005:94). However, given the recent growth of cross-national empirical studies in environmental sociology, surely the best way to resolve theoretical debates and establish the generalizability of theoretical claims is for the contestants to reach agreement concerning key variables, appropriate measures, and reasonable samples and then to empirically test theoretically derived hypotheses—as suggested by Fisher and Freudenburg (2001). Thus far it has fallen primarily to American scholars to provide empirical, crossnational tests of EMT, and preliminary results are at best mixed. Fisher and Freudenburg's (2004) claim of some support for expectations partially derived from EMT has generated an exchange over the adequacy of their methodological analysis (Fisher and Freudenburg 2006; York and Rosa 2006). Likewise, investigations of the existence of an environmental Kuznets curve (an inverted U-shaped relationship between affluence and environmental degradation, indicating that degradation increases as nations develop economically but then declines once a reasonable level of affluence is reached), a central expectation from EMT, has generated conflicting evidence (Burns et al. 2003; Ehrhardt-Martinez, Crenshaw, and Jenkins 2002; Fisher-Kowalski and Amann 2001; Roberts and Grimes 1997; Rudel 1998; York et al. 2003a, 2003b).

Despite the dubious evidence for ecological modernization, we believe it deserves continued testing, particularly in the United States. While contemporary U.S. environmental policy, which might be construed as ecological demodernization, represents a major anomaly for EMT, the theory may offer insights into why and how some local governments and a few corporations in the United States appear to be taking steps in accordance with EMT expectations despite a federal government that is widely seen as antienvironmental (Kennedy 2005). More generally, EMT has become just one strand of a larger recent effort within environmental sociology to contribute to an understanding of processes of "environmental reform" (Buttel 2003) and "environmental governance" (Davidson and Frickel 2004), topics once ceded to political science and economics.

Perhaps the most significant sociological contribution in this vein outside of EMT has been research conducted by proponents of the world civil society (WCS) perspective, research employing sophisticated quantitative techniques such as event history analysis to demonstrate the global spread of norms concerning appropriate governmental responsibilities—including environmental protection. Emphasizing the role of intergovernmental organizations, transnational nongovernmental organizations, international treaties, and other vehicles of diffusion, WCS researchers have documented the global spread of governmental laws and agencies designed to protect environmental quality or "environmental regimes" (e.g., Meyer et al. 1997; Frank, Hironaka, and Schofer 2000).

In response to criticism that WCS research documents institutional and policy changes but not changes in environmental conditions (Buttel 2000), a recent study reports that institutionalization of a global environmental regime is related to declining rates of CO2 and chlorofluorocarbon (CFC) emissions (Schofer and Hironaka 2005). However, while there has been an absolute decrease in global CFC emissions, reflecting the fact that there were economically attractive technological alternatives to CFCs, the study finds only a slowing in the rate of growth of CO2 emissions. Given that data on global ecological footprints suggest the need for declines in overall levels of environmental degradation (Wackernagel et al. 2004), a mere slowing in the rate of increase of degradation may be inadequate for avoiding the possibility of "overshoot" raised by Catton (1980) a quarter century ago. Thus, it is unclear whether the global diffusion of an environmental regime touted by WCS proponents, a process compatible with EMT's claim of a global trend toward ecological modernization (Mol 2001), will prove adequate for halting continued degradation (Goldman 2002). This is particularly the case now that the United States, once a pioneer in terms of environmental protection, has arguably become the major obstacle to the effective implementation of a global environmental regime (Kennedy 2005), at the very time rapid industrialization of nations such as China and India makes the need for such a regime more crucial than ever.

3.15 Environmental Impact Assessment

An **environmental impact assessment** is a formal process used to predict the environmental consequences (positive or negative) of a plan, policy, program, or project prior the implementation decision, it proposes measures to adjust impacts to acceptable levels or to investigate new technological solution. Although an assessment may lead to difficult economic decisions and political and social concerns, environmental impact assessments protect the environment by providing a sound basis for effective and sustainable development.

The purpose of the assessment is to ensure that decision makers consider the environmental impacts when deciding whether or not to proceed with a project. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made." EIAs are unique in that they do not require adherence to a predetermined environmental outcome, but rather they require decision makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts.

3.16 Origin of Environment Impact Assessment

Before the First World War, rapid industrialization and urbanization in western countries was causing rapid loss of natural resources. This continued to the period after the Second World War giving rise to concerns for pollution, quality of life and environmental stress. In early 60s, investors and people realized that the projects they were under taking were affecting the environment, resources, raw materials and people. As a result of this, pressure groups formed with the aim of getting a tool that can be used to safeguard the environment in any development. The USA decided to respond to these issues and established a National Environmental Policy Act in 1970 to consider its goal in terms of environmental protection. The USA became the first country to enact legislation on EIA. This was the first time that EIA became the official tool to be used to protect the

environment. The United Nations Conference on the Environment in Stockholm in 1972 and subsequent conventions formalized EIA. At present, all developed countries have environmental laws whereas most of the developing countries are still adopting it (Lee, 1995). Multilateral and bilateral lenders included EIA requirements in their project eligibility criteria (OECD, 1996).

Environmental impact assessment is the formal process used to predict the environmental consequences (positive or negative) of a plan, policy, program, or project prior to the decision to move forward with the proposed action. Formal impact assessments may be governed by rules of administrative procedure regarding public participation and documentation of decision making, and may be subject to judicial review. An impact assessment may propose measures to adjust impacts to acceptable levels or to investigate new technological solutions.

The purpose of the assessment is to ensure that decision makers consider the environmental impacts when deciding whether or not to proceed with a project. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made." EIAs are unique in that they do not require adherence to a predetermined environmental outcome, but rather they require decision makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts

3.17 HISTORY of EIA

Environmental Impact Assessments commenced in the 1960s, as part of increasing environmental awareness. EIAs involved a technical evaluation intended to contribute to more objective decision making. In the United States, environmental impact assessments obtained formal status in 1969, with enactment of the National Environmental Policy Act. EIAs have been used increasingly around the world. The number of "Environmental Assessments" filed

every year "has vastly overtaken the number of more rigorous Environmental Impact Statements (EIS). An Environmental Assessment is a "mini-EIS designed to provide sufficient information to allow the agency to decide whether the preparation of a full-blown Environmental Impact Statement (EIS) is necessary. Eia is an activity that is done to find out the impact that would be done before development will occur.

3.18 EIA in India

The Ministry of Environment and Forests (MoEF) of India has been in a great effort in Environmental Impact Assessment in India. The main laws in action are the Water Act (1974), the Indian Wildlife (Protection) Act (1972), the Air (Prevention and Control of Pollution) Act (1981) and the Environment (Protection) Act (1986), Biological Diversity Act (2002). The responsible body for this is the Central Pollution Control Board. Environmental Impact Assessment (EIA) studies need a significant amount of primary and secondary environmental data. Primary data are those collected in the field to define the status of the environment (like air quality data, water quality data etc.). Secondary data are those collected over the years that can be used to understand the existing environmental scenario of the study area. The environmental impact assessment (EIA) studies are conducted over a short period of time and therefore the understanding of the environmental trends, based on a few months of primary data, has limitations. Ideally, the primary data must be considered along with the secondary data for complete understanding of the existing environmental status of the area. In many EIA studies, the secondary data needs could be as high as 80% of the total data requirement. EIC is the repository of one stop secondary data source for environmental impact assessment in India.

The Environmental Impact Assessment (EIA) experience in India indicates that the lack of timely availability of reliable and authentic environmental data has been a major bottle neck in achieving the full benefits of EIA. The environment being a multi-disciplinary subject, a multitude of agencies are involved in collection of environmental data. However, no single organization in India tracks available data from these agencies and makes it available in one place in a form required by environmental impact assessment practitioners. Further, environmental data is

not available in enhanced forms that improve the quality of the EIA. This makes it harder and more time-consuming to generate environmental impact assessments and receive timely environmental clearances from regulators. With this background, the Environmental Information Centre (EIC) has been set up to serve as a professionally managed clearing house of environmental information that can be used by MoEF, project proponents, consultants, NGOs and other stakeholders involved in the process of environmental impact assessment in India. EIC caters to the need of creating and disseminating of organized environmental data for various developmental initiatives all over the country.

EIC stores data in GIS format and makes it available to all environmental impact assessment studies and to EIA stakeholders in a cost effective and timely manner. So that we can manage that in different proportions such as remedy measures etc.,

3.19. **ENVIRONMENTAL ASSESSMENT**

An **environmental assessment** (EA) is an environmental analysis prepared pursuant to the National Environmental Policy Act to determine whether a federal action would significantly affect the environment and thus require a more detailed *Environmental Impact Statement (EIS)*. The certified release of an Environmental Assessment results in either a *Finding of No Significant Impact (FONSI)* or an EIS.

The Council on Environmental Quality (CEQ), which oversees the administration of NEPA, issued regulations for implementing the NEPA in 1979. Eccleston reports that the NEPA regulations barely mention preparation of EAs. This is because the EA was originally intended to be a simple document used in relatively rare instances where an agency was not sure if the potential significance of an action would be sufficient to trigger preparation of an EIS. But today, because EISs are so much longer and complicated to prepare, federal agencies are going to great effort to avoid preparing EISs by using EAs, even in cases where the use of EAs

may be inappropriate. The ratio of EAs that are being issued compared to EISs is about 100 to 1.

Likewise, even the preparation of an accurate EA is viewed today as an onerous burden by many entities responsible for the environmental review of a proposal. Federal agencies have responded by streamlining their regulations that implement NEPA environmental review, by defining categories of projects that by their well understood nature may be safely excluded from review under NEPA, and by drawing up lists of project types that have negligible material impact upon the environment and can thus be exempted.

CONTENT

The Environmental Assessment is a concise public document prepared by the federal action agency that serves to:

1. briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a Finding of No Significant Impact (FONSI)
2. Demonstrate compliance with the act when no EIS is required
3. facilitate the preparation of an EIS when a FONSI cannot be demonstrated

The Environmental Assessment includes a brief discussion of the purpose and need of the proposal and of its alternatives as required by NEPA 102(2)(E), and of the human environmental impacts resulting from and occurring to the proposed actions and alternatives considered practicable, plus a listing of studies conducted and agencies and stakeholders consulted to reach these conclusions. The action agency must approve an EA before it is made available to the public. The EA is made public through notices of availability by local, state, or regional clearing houses, often triggered by the purchase of a public notice advertisement in a newspaper of general circulation in the proposed activity area.

PROCEDURE
The EA becomes a draft public document when notice of it is published, usually in a newspaper of general circulation in the area affected by the proposal. There is a 15 day review period required for an Environmental Assessment (30 days if exceptional circumstances) while the document is made available for public

commentary, and a similar time for any objection to improper process. Commenting on the Draft EA is typically done in writing or email, submitted to the lead action agency as published in the notice of availability. An EA does not require a public hearing for verbal comments. Following the mandated public comment period, the lead action agency responds to any comments, and certifies either a FONSI or a Notice of Intent (NOI) to prepare an EIS in its public environmental review record. The preparation of an EIS then generates a similar but more lengthy, involved and expensive process.

3.20. **Model Questions:**

1. What are the different approaches to development?
2. Discuss different types of development.
3. Discuss the causes of displacement.
4. Explain the history of Environmental Impact Assessment in India.
5. Critically examine the major environmental problems.

Unit-IV

4.0.   Global Challenges
4.1.   Environmental justice
4.2.   Environment
4.3.   Environmental discrimination
4.4.   Litigation
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UNIT- IV

GLOBAL CHALLENGES

4.0. What are global challenges?

For the purposes of this paper, 'global challenges' will be defined as any major trend, shock, or development that has the potential for serious global impacts and thus to create humanitarian needs and change the environments in which humanitarian actors will operate in coming years. Below is a non-exhaustive list of global challenges we have identified:

• **Climate change:** With a predicted increase in temperature that will indirectly lead to the disappearance of territory, spark widespread (and, in many cases, permanent) displacement (already 20 million people are estimated to have been temporarily displaced by climate related disasters in 2008, a comparable number to the 26 million conflict-related IDPs in the same period), change morbidity disease patterns, and promote a monumental shift in global policies, climate change will fundamentally transform the way humanity approaches global security and livelihood sustainability.

• **Extreme poverty and inequality:** With a marked increase in extreme poverty and profound inequalities of income and wealth plaguing most nations (as approximately half the world's population lives on less than 1% of its wealth), extreme poverty and inequality continue to leave whole communities and households in an almost irreversibly devastating state of vulnerability and need.

• **Financial and economic crisis:** With the world economy now predicted to contract by 1.7%, remittances which accounted for some 2% of the major developing countries' GDP in 2007 having decreased to 1.8% in 2008 and falling by an additional 0.9% this year, private capital flows dropping by some $700 million compared to previous years, and an additional 90 million people being pushed into poverty, the financial and economic crisis is leading to unemployment, an increase in poverty, and the curtailment of critical safety-nets, thereby threatening an even larger caseload in need of humanitarian assistance.

• **Food crisis:** With over 1 billion people worldwide (one-sixth of the world population) suffering from hunger, over 30 cases of food-related unrest having

erupted around the world since 2008, 25,000 children dying daily from malnutrition, 2 billion people currently suffering from micro-nutrient deficiencies, local food prices in most developing countries being too expensive for hundreds of millions of people, disputes over depleting land resources, and projections that by 2025 food production will not be able to increase by the necessary 50% over current levels to keep up with population growth, the food crisis will continue to threaten lives and livelihoods worldwide.

Water scarcity: With the number of people who do not have access to safe water rising just over 1 billion to 2 billion by 2025 (roughly one third of the world population), water scarcity represents a major political, economic and human rights issue driving vulnerability and conflict.

• **Energy security:** With the projected one and a half times increase in energy demand by 2030, energy security could cause supply-side gluts stoking fears of scarcity and reigniting geopolitical rivalries, whilst also providing the impetus to invest in renewable energies.

• **Migration**: With the potential for hundreds of millions of people forced to uproot their lives and rebuild them across borders, continents and oceans, migration will be one of the biggest challenges both within and across borders.

• **Population growth and demographic shift**: With a population that will grow from 6.7 billion today to over 8 billion by 2025, and the number of people aged over 65 rising from 390 million now to 800 million in the same time frame, population growth and demographic shifts will put massive strains on global resources and institutions. Localized demographic trends will also be a source of challenges: the number of 15 – 24 year olds in the Middle East and North Africa region is unprecedented and set to rise as a proportion of population. (In an extreme case, the Palestinian Territories are set to see an 84% increase in youth population between 2005 and 2025.) This trend, combined with the MENA region claiming the highest youth unemployment rates in the world, may be a source of further regional insecurities.

• **Urbanization**: With an urban population that will double in Asia and increase by 150% in Africa between now and 2050, urbanization will create massive social inequities and risks as well as tangible health problems, malnutrition rates,

unemployment, and income deficits, which represent an almost permanent threat to the security of billions.

• **Health pandemics and infectious diseases**: With projections that any large-scale influenza pandemic could result in from 2 up to 60 million potential deaths, and the discovery that infectious diseases that have been controlled historically are now demonstrating increased virulence, changing incidence, and shifting vectors of transmission, health pandemics and infectious diseases threaten to further degrade the lives of many, potentially increasing feelings of injustice and amplifying the pressures on weak and fragile states.

Ozone Layer Depletion

Earth's atmosphere is divided into three regions, namely troposphere, stratosphere and mesosphere The stratosphere extends from 10 to 50 kms from the Earth's surface. This region is concentrated with slightly pungent smelling, light bluish ozone gas. The ozone as is made up of molecules each containing three atoms of oxygen; its chemical formula is 03. The ozone layer, in the stratosphere acts as an efficient filter for harmful solar Ultraviolet B (UV-B) rays Ozone is produced and destroyed naturally in the atmosphere and until recently, this resulted in a well- balanced equilibrium .Ozone is formed when oxygen molecules absorb ultraviolet radiation with wavelengths less than 240 nanometres and is destroyed when it absorbs ultraviolet radiation with wavelengths greater than 290 nanometres. In recent years, scientists have measured a seasonal thinning of the ozone layer primarily at the South Pole. This phenomenon is being called the ozone hole.

Ozone Depletion Process-:

Ozone is highly reactive and easily broken down by man-made chlorine and bromine compounds. These compounds are found to be most responsible for most of ozone layer depletion. The ozone depletion process begins when CFCs (used in refrigerator and air conditioners) and other ozone-depleting substances (ODS) are emitted into the atmosphere. Winds efficiently mix and evenly distribute the ODS in the troposphere. These ODS compounds do not dissolve in rain, are extremely stable, and have a long life span. After several years, they reach the stratosphere by diffusion Strong UV light breaks apart the ODS molecules. CFCs, HCFCs, carbon tetrachloride, methyl chloroform release chlorine atoms, and halons and methyl bromide release bromine atoms. It is the chlorine and bromine atom that actually destroys ozone, not the intact ODS molecule. It is estimated that one chlorine atom can destroy from **10,000 to 100,000** ozone molecules before it is finally removed from the stratosphere.

Effects of Ozone Layer Depletion:

Effects on Human and Animal Health: Increased penetration of solar UV-B radiation is likely to have high impact on human health with potential risks of eye diseases, skin cancer and infectious diseases. Effects on Terrestrial Plants: In forests and grasslands, increased radiation is likely to change species composition thus altering the bio-diversity in different ecosystems. It could also affect the plant community indirectly resulting in changes in plant form, secondary metabolism, etc.

Effects on Aquatic Ecosystems: High levels of radiation exposure in tropics and subtropics may affect the distribution of phytoplanktons, which form the foundation of aquatic food webs. It can also cause damage to early development stages of fish, shrimp, crab, amphibians and other animals, the most severe effects being decreased reproductive capacity and impaired larval development.

Effects on Bio-geo-chemical Cycles: Increased solar UV radiation could affect terrestrial and aquatic bio-geo-chemical cycles thus altering both sources and sinks of greenhouse and important trace gases, e.g. carbon dioxide (CO_2), carbon monoxide (CO), carbonyl sulfide (COS), etc. These changes would contribute to biosphere-atmosphere feedbacks responsible for the atmosphere build-up of these greenhouse gases.

Effects on Air Quality: Reduction of stratospheric ozone and increased penetration of UV- B radiation result in higher photo dissociation rates of key trace gases that control the chemical reactivity of the troposphere. This can increase both production and destruction of ozone and related oxidants such as hydrogen peroxide, which are known to have adverse effects on human health, terrestrial plants and outdoor materials. The ozone layer, therefore, is highly beneficial to plant and animal life on earth filtering out the dangerous part of sun's radiation and allowing only the beneficial part to reach earth. Any disturbance or depletion of this layer would result in an increase of harmful radiation reaching the earth surface leading to dangerous consequences.

Ozone Depletion Counter Measures
-International cooperation, agreement (Montreal Protocol) to phase out ozone depleting chemicals since 1974 -Tax imposed for ozone depleting substances - Ozone friendly substitutes- HCFC (less ozone depleting potential and shorter life) -Recycle of CFCs and Halons.

Global Warming
Before the Industrial Revolution, human activities released very few gases into the atmosphere and all climate changes happened naturally. After the Industrial Revolution, through fossil fuel combustion, changing agricultural practices and deforestation, the natural composition of gases in the

atmosphere is getting affected and climate and environment began to alter significantly.

Over the last 100 years, it was found out that the earth is getting warmer and warmer, unlike previous 8000 years when temperatures have been relatively constant. The present temperature is 0. 3 - 0.6 oC warmer than it was 1 00 years ago. The key greenhouse gases (GHG) causing global warming is carbon dioxide. CFC's, even though they exist in very small quantities, are significant contributors to global warming. Carbon dioxide, one of the most prevalent greenhouse gases in the atmosphere, has two major anthropogenic (human-caused) sources: the combustion of fossil fuels and changes in land use. Net releases of carbon dioxide from these two sources are believed to be contributing to the rapid rise in atmospheric concentrations since Industrial Revolution. Because estimates indicate that approximately 80 percent of all anthropogenic carbon dioxide emissions currently come from fossil fuel combustion, world energy use has emerged at the sources of green house gases.

Sources of Greenhouse Gases

Some greenhouses gases occur naturally in the atmosphere while other result from human activities. Naturally occurring greenhouse gases **Methane** include water vapor, carbon dioxide, methane, **12%** nitrous oxide, and ozone certain human activities, however, add to the levels of most of those naturally occurring gases. Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned. Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from the decomposition of organic wastes in municipal solid waste landfills, and the raising of livestock. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels. Very powerful greenhouse gases that are not naturally occurring include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6), which are generated in a variety of industrial processes. Often, estimates of greenhouse gas emissions are presented in units of millions of metric tons of carbon equivalents (MMTCE), which weights each gas by its Global Warming Potential or GWP value.

Global Warming Potentials

Although there are a number of ways of measuring the strength of different greenhouse gases in the atmosphere, the Global Warming Potential (GWP) is perhaps the most useful. GWPs measure the influence greenhouse gases have on the natural greenhouse effect, including the ability of greenhouse gas molecules to absorb or trap heat and the length of time, greenhouse gas molecules remain in the atmosphere before being removed or broken down. In this way, the contribution that each greenhouse gas has towards global warming can be assessed. Each greenhouse gas differs in its ability to absorb heat in the atmosphere. HFCs and PFCs are the most heat-absorbent. Methane traps

over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 270 times more heat per molecule than carbon dioxide. Conventionally, the GWP of carbon dioxide, measured across all time horizons, is 1. The GWPs of other greenhouse gases are then measured relative to the GWP of carbon dioxide. Thus GWP of methane is 21 while GWP of nitrous oxide is 270.

Other greenhouse gases have much higher GWPs than carbon dioxide, but because their concentration in the atmosphere is much lower, carbon dioxide is still the most important greenhouse gas, contributing about 60% to the enhancement of the greenhouse effect.

Global Warming (Climate Change) Implications

Rise in global temperature
Observations show that global temperatures have risen by about 0.6 °C over the 20th century. There is strong evidence now that most of the observed warming over the last 50 years is caused by human activities. Climate models predict that the global temperature will rise by about 6 °C by the year 2100.

Rise in sea level
In general, the faster the climate change, the greater will be the risk of damage. The mean sea level is expected to rise 9 - 88 cm by the year 2100, causing flooding of low lying areas and Food shortages and hunger. Water resources will be affected as precipitation and evaporation patterns change around the world. This will affect agricultural output. Food security is likely to be threatened and some regions are likely to experience food shortages and hunger.

India could be more at risks than many other countries
Models predict an average increase in temperature in India of 2.3 to 4.8oC for the benchmark doubling of Carbon-dioxide scenario. Temperature would rise more in Northern India than in Southern India. It is estimated that 7 million people would be displaced, 5700 km2 of land and 4200 km of road would be lost, and wheat yields could decrease significantly.

Loss of Biodiversity
Biodiversity refers to the variety of life on earth, and its biological diversity. The number of species of plants, animals, micro organisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all a part of a biologically diverse earth. Biodiversity actually boosts ecosystem productivity where each species, no matter how small, all have an important role to play and that it is in this combination that enables the ecosystem to possess the ability to prevent and recover It is now believed that human activity is changing biodiversity and causing massive extinctions. The World *Resource Institute* reports that *there is a link*

between biodiversity and *climate change.* Rapid global warming can affect ecosystems chances to adapt naturally. Over the past 150 years, deforestation has contributed an estimated 30 percent of the atmospheric build-up of CO2. It is also a significant driving force behind the loss of genes, species, and critical ecosystem services.

Link between Biodiversity and Climate change

Climate change is affecting species already threatened by multiple threats across the globe. Habitat fragmentation due to colonization, logging, agriculture and mining etc. are all contributing to further destruction of terrestrial habitats. Individual species may not be able to adapt. Species most threatened by climate change have small ranges, low population densities, restricted habitat requirements and patchy distribution. Ecosystems will generally shift northward or upward in altitude, but in some cases they will run out of space – as 10C change in temperature correspond to a 100 Km change in latitude, hence, average shift in habitat conditions by the year 2100 will be on the order of 140 to 580 Km. Coral reef mortality may increase and erosion may be accelerated. Increase level of carbon dioxide adversely impact the coral building process (calcification). Sea level may rise, engulfing low-lying areas causing disappearance of many islands, and extinctions of endemic island species. Invasive species may be aided by climate change. Exotic species can out-compete native wildlife for space, food, water and other resources, and may also prey on native wildlife. Droughts and wildfires may increase. An increased risk of wildfires due to warming and drying out of vegetation is likely. Sustained climate change may change the competitive balance among species and might lead to forests destruction.

Climatic Change Problem and Response

In June 1992, the "United Nations Framework Convention on Climate Change" (UNFCCC) was signed in Rio de Janeiro by over 150 nations. The climate convention is the base for international co-operation within the climate change area. In the convention the climate problem's seriousness is stressed. There is a concern that human activities are enhancing the natural greenhouse effect, which can have serious consequences on human settlements and ecosystems. The convention's overall objective is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The principle commitment applying to parties of the convention is the adoption of policies and measures on the mitigation of climate change, by limiting anthropogenic

emissions. greenhouse gases and protecting and enhancing greenhouse gas sinks and reservoirs. The commitment includes the preparation and communication of national inventories of greenhouse gases. The Climate convention does not have any quantitative targets or timetables for individual nations. However, the overall objective can be interpreted as stabilization of emissions of greenhouse gases by year 2000 at 1990 levels.
The deciding body of the climate convention is the Conference of Parties (COP).

At the COP meetings, obligations made by the parties are examined and the objectives and implementation of the climate convention are further defined and developed. The first COP was held in Berlin, Germany in 1995 and the latest (COP 10) was held in December 2004, Buenos Aires, Argentina.

The Kyoto Protocol

There is a scientific consensus that human activities are causing global warming that could result in significant impacts such as sea level rise, changes in weather patterns and adverse health effects. As it became apparent that major nations such as the United States and Japan would not meet the voluntary stabilization target by 2000, Parties to the Convention decided in 1995 to enter into negotiations on a protocol to establish legally binding limitations or reductions in greenhouse gas emissions. It was decided by the Parties that this round of negotiations would establish limitations only for the developed countries, including the former Communist countries.

Negotiations on the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) were completed December 11, 1997, committing the industrialized nations to specify, legally binding reductions in emissions of six greenhouse gases. The 6 major greenhouse gases covered by the protocol are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur xafluoridehe (SF_6).

Emissions Reductions

The United States would be obligated under the Protocol to a cumulative reduction in its greenhouse gas emissions of 7% below 1990 levels for three greenhouse gases (including carbon dioxide), and below 1995 levels for the three man-made gases, averaged over the commitment period 2008 to 2012.

The Protocol states that developed countries are committed, individually or jointly, to ensuring that their aggregate anthropogenic carbon dioxide equivalent emissions of greenhouse gases do not exceed amounts assigned

to each country with a view to reducing their overall emissions of such gases by at least 5% below 1990 levels in the commitment period 2008 to 2012.

Developing Country Responsibilities

Another problematic area is that the treaty is ambiguous regarding the extent to which developing nations will participate in the effort to limit global emissions. The original 1992 climate treaty made it clear that, while the developed nations most responsible for the current buildup of greenhouse gases in the atmosphere should take the lead in combating climate change, developing nations also have a role to play in protecting the global climate. Per Capita CO_2 emissions are small in developing countries and developed nations have altered Developing countries, including India and China, do not have to commit to reductions in this first time period because their per-capita emissions are much lower than those of developed countries, and their economies are less able to absorb the initial costs of changing to cleaner fuels. They have not contributed significantly to today's levels of pollution that has been the product of the developed world's Industrial Revolution. The idea is that developing countries will be brought more actively into the agreement as new energy technologies develop.

Actions required from developed and developing Nations

The Kyoto Protocol does call on all Parties (developed and developing) to take a number of steps to formulate national and regional programs to improve "local emission factors," activity data, models, and national inventories of greenhouse gas emissions and sinks that remove these gases from the atmosphere. All Parties are also committed to formulate, publish, and update climate change mitigation and adaptation measures, and to cooperate in promotion and transfer of environmentally sound technologies and in scientific and technical

Who is bound by the Kyoto Protocol?

The Kyoto Protocol has to be signed and ratified by 55 countries (including those responsible for at least 55% of the developed world's 1990 carbon dioxide emissions) before it can enter into force. Now that Russia has ratified, this been achieved and the Protocol will enter into force on 16 February 2005.

National environmental Action Plan-

India is faced with the challenge of sustaining its rapid economic growth while dealing with the glob- al threat of climate change. This threat emanates from accumulated greenhouse gas emissions in the atmosphere, anthropogenically generated through long-term and intensive industrial growth and high consumption

lifestyles in developed countries. While engaged with the international community to collectively and cooperatively deal with this threat, India needs a national strategy to firstly, adapt to climate change and secondly, to further enhance the ecological sustainability of India's development path.

Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. With an economy closely tied to its natural resource base and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected changes in climate.

Recognizing that climate change is a global challenge, India will engage actively in multilateral negotiations in the LIN Framework Convention on Climate Change, in a positive, constructive and forward-looking manner. Our objective will be to establish an effective, cooperative and equitable global approach based on the principle of common but differentiated responsibilites and respective capabilities, enshrined in the United Nations Framework Convention on Climate Change (UNFCCC). Such an approach must be based on a global vision inspired by Mahatma Gandhi's wise dictum-The earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed. Thus we must not only promote sustainable production processes, but equally, sustainable lifestyles across the globe.

Finally, our approach must also be compatible with our role as a responsible and enlightened member of the international community, ready to make our contribution to the solution of a global challenge, which impacts on humanity as a whole. The success of our national efforts would be significantly enhanced provided the developed countries affirm their responsibility for accumulated greenhouse gas emissions and fulfill their commitments under the UNFCCC, to transfer new and additional financial resources and climate friendly technologies to support both adaptation and mitigation in developing countries.

We are convinced that the principle of equity that must underlie the global approach must allow each inhabitant of the earth an equal entitlement to the global atmospheric resource. in this connection, India is determined that its per capita greenhouse gas emissions will at no point exceed that of developed countries even as we pursue our development objectives.

Principles-:

Maintaining a high growth rate is essential for increasing living standards of the vast majority of our people and reducing their vulnerability to the impacts of climate change. In order to achieve a sustainable development path that simultaneously advances economic and environmental objectives, the National Action Plan for Climate Change (NAPCC) will be guided by the following principles:

Protecting the poor and vulnerable sections of society through an inclusive and sustainable development strategy, sensitive to climate change.

Achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions.

Devising efficient and cost-effective strategies for end use Demand Side Management.

Deploying appropriate technologies for both adaptation and mitigation of greenhouse gases emissions extensively as well as at an accelerated pace.

Engineering new and innovative forms of market, regulatory and voluntary mechanisms to promote sustainable development.

Effecting implementation of programmes through unique linkages, including with civil society and Local government institutions and through public private-partnership.

Welcoming international cooperation for research, development, sharing and transfer of technologies enabled by additional funding and a global IPR regime that facilitates technology transfer to developing countries under the UNFCCC.

APPROACH
The NAPCC addresses the urgent and critical concerns of the country through a directional shift in the development pathway, including through the enhancement of the current and planned programmes presented in the Technical Document.

The National Action Plan on Climate Change identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively. It outlines a number of steps to simultaneously advance India's development and climate change-related objectives of adaptation and mitigation.

THE WAY FORWARD-:

NATIONAL MISSION PLAN-:

In dealing with the challenge of climate change we must act on several fronts in a focused manner simultaneously. The National Action Plan hinges on the development and use of new technologies. The implementation of the Plan would be through appropriate institutional mechanisms suited for effective delivery of each individual Mission's objectives and include public private partnerships and civil society action. The focus will be on promoting understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation.

There are Eight National Missions which form the core of the National Action Plan, representing multi-pronged, long-term and integrated strategies for achieving key goals in the context of climate change. While several of these programmes are already part of our current actions, they may need a change in direction, enhancement of scope and effectiveness and accelerated implementation of time bound plans.

National Solar Mission

A National Solar Mission will be launched to significantly increase the share of solar energy in the total energy mix while recognizing the need to expand the scope of other renewable and non-fossil options such as nuclear energy, wind energy and biomass India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as

future energy source. It also has the advantage of permitting a decentralized distribution of energy, thereby empowering people at the grassroots level.

Photovoltaic cells are becoming cheaper with new technology There are newer, reflector-based technologies that could enable setting up megawatt scale solar power plants across the country. Another aspect of the Solar Mission would be to launch a major R&D programme, which could draw upon international cooperation as well, to enable the creation of more affordable, more convenient solar power systems, and to promote innovations that enable the storage of solar power for sustained,long-term use.

National Mission for Enhanced Energy Efficiency

The Energy Conservation Act of 2001 provides a legal mandate for the implementation of the energy efficiency measures through the institutional mechanism of the Bureau of Energy Efficiency (BEE) in the Central Government and designated agencies in each state. A number of schemes and programmes would result in a saving of 1 0,000 MW by the end of 11th Five Year Plan in 2012. To enhance energy efficiency, four new initiatives will be put in place. These are:

• A market based mechanism to enhance cost effectiveness; of improvements in energy efficiency in Energy intensive large industries and facilities, through certification of energy savings that could be traded.

• Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable.

• Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.

• Developing fiscal instruments to promote energy efficiency

National Mission on Sustainable Habitat

A National Mission on Sustainable Habitat will be launched to make habitat sustainable through improvements in energy efficiency in

buildings, management of solid waste and modal shift to public transport. The Mission will promote energy efficiency as an integral component of urban planning and The Energy Conservation Building Code, which addresses the design of new and large commercial buildings to optimize their energy demand, will be extended in its application and incentives provided for retooling existing building.

Recycling of material and Urban Waste Management will be a major component of ecologically sustainable economic development. India already has a significantly higher rate of recycling of waste compared to developed countries. A special area of focus will be the development of technology for producing power from waste. The National Mission will include a major R&D programme, focusing on bio chemical conversion, waste water use, sewage utilization and recycling options wherever Better urban planning and modal shift to public transport. Making long term transport plans will facilitate the growth of medium and small cities in ways that ensure efficient and convenient public transport. In addition, the Mission will address the need to adapt to future climate change by improving the resilience of infrastructure, community based disaster management, and measures for improving the warning system for extreme weather events. Capacity building would be an important component of this Mission.

National Water Mission

A National Water Mission will be mounted to ensure integrated water resource management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within states. The Mission will take into account the provisions of the National Water Policy and develop a framework to optimize water use by increasing water use efficiency by 20% through regulatory mechanisms with differential entitlements and pricing. It will seek to ensure that a considerable share of the water needs of urban areas are met through recycling of waste water, and ensuring that the water requirements of coastal cities with inadequate alternative sources of water are met through adoption of new and appropriate technologies such as low temperature clesalk

nation technologies that allow for the use of ocean water. The National Water Policy would be revisited in consultation with states to ensure basin level management strategies to deal with variability in rainfall and river flows due to climate change. This will include enhanced storage both above and below ground, rainwater harvesting, coupled with equitable and efficient management structures The Mission will seek to develop new regulatory structures, combined with appropriate entitlements and pricing. It will seek to optimize the efficiency of existing irrigation systems, including rehabilitation of systems that have been run down and also expand irrigation, where feasible, with a special effort to increase storage capacity. Incentive structures will be designed to promote water-neutral or water-positive technologies, recharging of underground water sources and adoption of large scale irrigation programmes which rely on sprinklers, dripirrigation and ridge and furrow irrigation

National Mission for Sustaining the Himalayan Ecosystem

A Mission for sustaining the Himalayan Ecosystem will be launched to evolve management measures for sustaining and safeguarding the Himalayan glacier and mountain eco-system. Himalayas, being the source of key perennial rivers, the Mission would,inter-alia, seek to understand, whether and the extent to which, the Himalayan glaciers are in recession and how the problem could be addressed. This will require the joint effort of climatologists, glaciologists and other experts.

The Himalayan ecosystem has 51 million people who practice hill agriculture and whose vulnerability is expected to increase on account of climate change. Community-based management of these ecosystems will be promoted with incentives to community organizations and panchayats for protection and enhancement of forested lands. In mountainous regions, the aim will be to maintain two thirds of the area under forest cover in order to prevent erosion and land degradation and ensure the stability of the

National Mission for a Green India

A National Mission will be launched to enhance ecosystem services including carbon sinks to be called Green India. Forests play an indispensable role in the preservation of ecological balance and maintenance of bio-diversity. Forests also constitute one of the most effective carbon-sinks.

The Prime Minister has already announced a Green India campaign for the afforestation of 6 million hectares. The national target of area under forest and tree cover is 33% while the current area under forests is 23%.

The Mission on Green India will be taken up on degraded forest land through direct action by communities, organized through Joint Forest Management Committees and guided by the Departments of Forest in state governments. An initial corpus of over Rs 6000 crore has been earmarked for the programme through the Compensatory Afforestaion Management and Planning Authority (CAMPA) to commence work. The programme will be scaled up to cover all remaining degraded forest land. The institutional arrangement provides for using the corpus to leverage more funds to scale up activity.

National Mission *for* Sustainable Agriculture

The Mission would devise strategies to make Indian agriculture more resilient to climate change. It would identify and develop new varieties of crops and especially thermal resistant crops and alternative cropping patterns, capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability. Agriculture will need to be progressively adapted to projected climate change and our agricultural research systems must be oriented to monitor and evaluate climate change and recommend changes in agricultural practices accordingly. This will be supported by the convergence and integration of traditional knowledge and practice systems, information technology, geospatial technologies and biotechnology. New credit and insurance mechanisms will be devised to facilitate adoption of desired practices. Focus would be on improving productivity of rainfed agriculture.

India will spearhead efforts at the international level to work towards an ecologically sustainable green revolution.

National Mission on Strategic Knowledge for Climate Change

To enlist the global community in research and technology development and collaboration through mechanisms including open source platforms, a Strategic Knowledge Mission will be set up to identify the challenges of, and the responses to, climate change. It would ensure funding of high quality and focused research into various aspects of climate change. The Mission will also have, on its research agenda, socio-economic impacts of climate change including impact on health, clemography, migration patterns and livelihoods of coastal communities. It would also support the establishment of dedicated climate change related academic units in Universities and other academic and scientific research institutions in the country which would be networked. A Climate Science Research Fund would be created under the Mission to support research. Private sector initiatives for development of innovative technologies for adaptation and mitigation would be encouraged through venture capital funds. Research to support policy and implementation would be undertaken through identified centres. The Mission will also focus on dissemination of new knowledge based on research findings.

India's Greenhouse Gas Emissions
India has experienced a dramatic growth in fossil fuel CO2 emissions, and as per study it shows an increase of nearly 5.9 % since 1950. At present India is rated as the 6th largest contributor of CO2 emissions behind China, the largest contributor However, our per capita CO2 of 0.93 tons per annum is well below the world average of 3.87 tons per annum. Fossil fuel emissions in India continue to result largely from coal burning. India is highly vulnerable to climate change as its economy is heavily reliant on climate sensitive sectors like agriculture and forestry. The vast low-lying and densely populated coastline is susceptible to rise in sea level.
The energy sector is the largest contributor of carbon dioxide emissions in India. The national inventory of greenhouse gases indicates that 55% of the total national emissions come from energy sector. These include emissions from road transport, burning of traditional. Agriculture sector constitutes the next major contributor, accounting for nearly 34%. The emissions under this

sector include those from enteric fermentation in domestic animals, manure management, rice cultivation, and burning of agriculture residues. Emissions from Industrial sector mainly came from cement production.

Indian Response to Climatic Change

Under the UNFCCC, developing countries such as India do not have binding GHG mitigation commitments in recognition of their small contribution to the greenhouse problem as well as low financial and technical capacities. The Ministry of environment and Forests is the nodal agency for climate change issues in India. It has constituted Working.

4.1. ENVIRONMENTAL JUSTICE

Environmental justice is a movement that grew from the recognition of a disproportionate number of environmental burdens in certain communities. It works to ensure a healthy environment for all regardless of race, nationality, income, gender or age.

The term **environmental justice** emerged as a concept in the United States in the early 1980s. The term has two distinct uses. The first and more common usage describes a social movement in the United States whose focus is on the fair distribution of environmental benefits and burdens. Second, it is an interdisciplinary body of social science literature that includes (but is not limited to) theories of the environment, theories of justice, environmental law and governance, environmental policy and planning, development, sustainability, and political ecology.

The United States Environmental Protection Agency defines **environmental justice** as "the fair treatment and meaningful involvement of all people regardless of race, color, sex, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies

Proponents of environmental justice generally view the environment as encompassing "where we live, work, and play" (some definitions also include 'pray' and 'learn') and seek to redress inequitable distributions of environmental burdens (such as pollution, industrial facilities, and crime).

4.2. **ENVIRONMENT**

When you think about the environment, your mind might conjure up images of rambling rivers, peaceful woodlands or scenic mountains. However, a broader definition of environment is the surroundings or conditions in which a person lives. By this definition, the environment would include your home, place of work, schools, and community parks. These are the places you spend your time, and they play a big role in your overall health, happiness and well-being.

Those involved in the movement called environmental justice feel that a healthy environment is a necessary component of a healthy life. In this lesson, we will learn about environmental justice and its efforts to make everyone's environment clean, safe and healthy.

DEFINITION
The United States Environmental Protection Agency defines Environmental Justice as follows:
"The fair treatment and meaningful involvement of people of all races, cultures, incomes and educational levels with respect to the development and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that: (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) their concerns will be considered in the decision making process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected".

The EPA definition can be analyzed from the taxonomy of distributive, procedural, corrective, and social justice. Distributive justice in practice has not meant a redistribution of pollutants equally to all communities, but the enforcement of the equal protection of the law or pollution preventions strategies so that pollutions will not be distributive to any community. The Agency places considerable emphasis upon procedural justice to make rules and regulations transparent in order for communities to access the decision-making process. We can also see that corrective justice is one of the main thrusts of the Agency where it uses legislation, rules and regulations, or lawsuits to reward, compensate, or punish guilty parties for damages done. Social justice attempts to bring about a more just and humane society as a whole, which would put this beyond the scope

of EPA policy. Although EPA policy seems to be strongest in support of procedural and corrective justice, it is weakest in support of distributive and social justice. The EPA definition and the taxonomy of definitions, except perhaps for social justice, take a short-term approach to environmental justice.

Policies to address short-term problems are not the solution. To implement such policies is like fighting a rear guard action. Therefore, we must be visionary and be willing to plan for the future or we will blunder into it with all the alphabet soup of social and environmental problems that have been intensified over the years. The following definition of environmental justice is more visionary and broader in scope:

"Environmental justice is those cultural norms and values, rules, regulations, behaviors policies, and decisions that support sustainable development, so that people can interact with confidence that their environment is safe, nurturing, and productive. Environmental justice is served when people can realize their highest potential, without experiencing the "isms". Environmental justice is supported by decent-paying and safe jobs; quality schools and recreation; decent housing and adequate health care; democratic decision-making and personal empowerment; and communities free of violence, drugs, and poverty. Environmental justice communities are where both cultural and biological diversity are respected and highly revered and where distributive justice prevails".

This definition makes environmental justice much boarder than the EPA definition. It is not only concerned about short-term policies, but long-term policies that will affect people and the communities they live in. It gives a vision of what an environmentally just community would look like; it reads like a community of the future. To realize this vision of the future will require us to develop cities and systems that mimic nature. In nature there is virtually no waste in that the waste for one life-form becomes the food for another one. Therefore we must build cities and production systems where the waste from one system becomes the raw materials for the other. We must build cities that mimic nature where there will no longer be a need to drill for oil or to mine for coal. Although systems that mimic nature will go a long way to eliminate sickness, death, and environmental degradation, such systems fail to address the issue of equity, justice, and fairness, which are critical to an environmentally just society. Without equity and fairness there can be no justice.

4.3. <u>ENVIRONMENTAL DISCRIMINATION-:</u>

Environmental discrimination poses several questions: Are minority communities and individuals burdened with more than their share of environmental risks in this country, while enjoying fewer of the benefits of environmental regulation than others? Is environmental justice policy no different from education, criminal and civil justice, and a host of other socioeconomic institutions in this country in being tainted by the broad brush of race and class discrimination? If not, what besides race and class discrimination could possibly explain these differences in environmental burdens and benefits? What explains the apparent lack of concern for the uneven impact of environmental policies and activities in most of the original federal environmental legislation?

Environmental justice advocates frequently make the argument that minority populations disproportionally undertake or are subjected to environmentally hazardous activities because they have few economic alternatives and/or are not fully aware of the risks involved. A combination of this lack of awareness coupled with their relative lack of political and economic power makes poor minority communities a frequent target for environmentally hazardous activities. Those who question the validity of the impact of environmental racism argue that environmental issues historically have been less important to minority groups than more pressing socioeconomic issues such as of lack of education, drug abuse, crime, unemployment, etc.

Minority under-representation in environmental groups can be viewed as an extension of these groups' placing environmental injustices low on their list of priorities. One issue that environmental justice seeks to address is that of environmental   discrimination. Racism and discrimination against   minorities center on a socially-dominant group's belief in its superiority, often resulting in a) privilege for the dominant group and b) the mistreatment of non-dominant minorities. The combined impact of these privileges and prejudices are just one of the potential reasons that waste management and highly-pollutive sites tend to be located in minority-dominated areas. A disproportionate quantity of minority

communities (for example in Warren County, North Carolina) play host to landfills, incinerators, and other potentially toxic facilities.

Environmental discrimination has historically been evident in the process of selecting and building environmentally hazardous sites, including waste disposal, manufacturing, and energy production facilities. The location of transportation infrastructures, including highways, ports, and airports, has also been viewed as a source of environmental injustice. Among the earliest documentation of environmental racism was a study of the distribution of toxic waste sites across the United States. Due to the results of that study, waste dumps and waste incinerators have been the target of environmental justice lawsuits and protests. Energy production has also been a significant source of environmental discrimination complaints, with minority, poor, and rural communities arguably most affected both by energy extraction (such as coal mining (including mountaintop removal),uranium mining and enrichment, oil drilling and refining, unconventional oil and gas extraction; and by electricity production in coal- and gas-fired power plants and nuclear reactors. Alternative energy sources, including solar, wind, bio-mass, natural gas, and "clean coal", promise to reduce greenhouse gas emissions, reducing the disproportionate burdens that global climate change will place on poor communities in the U.S. and the global South. However, they may bring new environmental risks.

One way to grasp the enormity of the issue of environmental injustice is through studying 'Treatment, Storage and Disposal Facilities', or TSDFs. Before the passage of the Resource Conservation and Recovery Act in the United States, there were no checks and balances on toxic waste. This legislation, passed in 1976, authorized the EPA to monitor TSDFs in accordance with new, more environmentally-friendly standards. Based on information from the EPA's website, inspectors examine the "use and management of containers, tank systems, surface impoundments, waste piles, land treatment, landfills, incinerators, drip pads,[and] miscellaneous other units", as well as making sure that companies are "complying with air emission standards for process vents, equipment leaks, tanks, surface impoundments, and containers, in addition to requirements for containing buildings"

Environmental justice advocates frequently encounter the question, "If I'm not a minority, why should I care about this?" A common response is that environmental inequality is bad for the environment, which in turn, is bad for everyone. James Boyce sums it up this issue in his 2007 report for PERI, of the University of Massachusetts Amherst:

"By respecting nature's limits and investing in nature's wealth, we can protect and enhance the environment's ability to sustain human well-being. But how humans interact with nature is intimately tied to how we interact with each other. Those who are relatively powerful and wealthy typically gain disproportionate benefits from the economic activities that degrade the environment, while those who are relatively powerless and poor typically bear disproportionate costs. All else equal, wider political and economic inequalities tend to result in higher levels of environmental harm. For this reason, efforts to safeguard the natural environment must go hand-in-hand with efforts to achieve more equitable distributions of power and wealth in human societies. Globalization – the growing integration of markets and governance worldwide – today poses new challenges and new opportunities for both of these goals"

4.4. **LITIGATION-:**

Some of the most successful environmental justice lawsuits are based on violations of civil rights laws. The first case to use civil rights as a means to legally challenge the sitting of a waste facility was in 1979, in Bean vs. Southwestern Waste Management. Attorney Linda McKeever Bullard, the wife of "father of environmental justice" Robert D. Bullard, represented residents of Houston's Northwood Manor and successfully opposed the decision of the city and Browning Ferris Industries to construct a solid waste facility near their mostly African-American neighborhood.

Title VI of the Civil Rights Act of 1964 is often used in lawsuits that claim environmental inequality. Section 601 prohibits discrimination based on race, color, or national origin by any government agency receiving federal assistance. To win an environmental justice case that claims an agency violated this statute, the plaintiff must prove the agency intended to discriminate. Section 602 requires agencies to create rules and regulations that uphold section 601. This section is useful because the plaintiff must only prove that the rule or regulation in question had a discriminatory impact. There is no need to prove discriminatory intent. *Seif*

v. Chester Residents Concerned for Quality Living set the precedent that citizens can sue under section 601. There has not yet been a case in which a citizen has sued under section 602, which calls into question whether this right of action exists.

The Equal Protection Clause of the Fourteenth Amendment, which was used many times to defend minority rights during the 1960s, has also been used in numerous environmental justice cases.

4.5.   <u>EFFECTED GROUP OF ENVIRONMENTAL JUSTICE-:</u>

Among the affected groups of Environmental Justice, those in high-poverty and racial minority groups have the most propensies to receive the harm of environmental injustice. Poor people account for more than 20% of the human health impacts from industrial toxic air releases, compared to 12.9% of the population nationwide. This does not account for the inequity found among individual minority groups. Some studies that test statistically for effects of race and ethnicity, while controlling for income and other factors, suggest racial gaps in exposure that persist across all bands of income

African-Americans are affected by a variety of Environmental Justice issues. One notorious example is the "Cancer Alley" region of Louisiana. This 85-mile stretch of the Mississippi River between Baton Rouge and New Orleans is home to 125 companies that produce one quarter of the petrochemical products manufactured in the United States. The United States Commission on Civil Rights has concluded that the African-American community has been disproportionately affected by Cancer Alley as a result of Louisiana's current state and local permit system for hazardous facilities, as well as their low socio-economic status and limited political influence

Indigenous groups are often the victims of environmental injustices. Native Americans have suffered abuses related to uranium mining in the American West. Churchrock, New Mexico, in Navajo territory was home to the longest continuous uranium mining in any Navajo land. From 1954 until 1968, the tribe leased land to mining companies who did not obtain consent from Navajo families or report any consequences of their activities. Not only did the miners significantly deplete the limited water supply, but they also contaminated what was left of the Navajo water supply with uranium. Kerr-McGee and United Nuclear Corporation, the two largest mining companies, argued that the Federal Water Pollution Control Act did not apply to them, and maintained that Native American land is not subject to

environmental protections. The courts did not force them to comply with US clean water regulations until 1980.

The most common example of environmental injustice among Latinos is the exposure to pesticides faced by farm workers. After DDT and other chlorinated hydrocarbon pesticides were banned in the United States in 1972, farmers began using more acutely toxic organophosphate pesticides such as parathion. A large portion of farm workers in the US are working illegally, and as a result of their political disadvantage, are not able to protest against regular exposure to pesticides. Exposure to chemical pesticides in the cotton industry also affects farmers in India and Uzbekistan. Banned throughout much of the rest of the world because of the potential threat to human health and the natural environment, Endosulfan is a highly toxic chemical, the safe use of which cannot be guaranteed in the many developing countries it is used in. Endosulfan, like DDT, is an organ chlorine and persists in the environment long after it has killed the target pests, leaving a deadly legacy for people and wildlife.

Residents of cities along the US-Mexico border are also affected. Maquiladoras are assembly plants operated by American, Japanese, and other foreign countries, located along the US-Mexico border. The maquiladoras use cheap Mexican labor to assemble imported components and raw material, and then transport finished products back to the United States. Much of the waste ends up being illegally dumped in sewers, ditches, or in the desert. Along the Lower Rio Grande Valley, maquiladoras dump their toxic wastes into the river from which 95 percent of residents obtain their drinking water. In the border cities of Brownsville, Texas and Matamoros, Mexico, the rate of anencephaly (babies born without brains) is four times the national average

One reason for toxic industries to concentrate in minority neighborhoods or poor neighborhoods is because of their lack of political power. Whether it be lack of homeownership or just because of a general inability to participate politically, these groups are treated unfairly. This lack of political participation could indicate why latinos are the most affected by environmental injustice in the US, since many latinos are illegal immigrants and thus cannot participate in the political system

States may also see placing toxic facilities near poor neighborhoods as beneficial from a Cost Benefit Analysis (CBA) perspective. Viewing a state's wealth through the lens of CBA's, it would be more favorable to place a toxic facility near a city

of 20,000 poor people than it would be to place it by a city of 5,000 wealthy people.

Steel works, blast furnaces, rolling and finishing mills, along with iron and steel foundries, are responsible for more than 57% of the total human health risks from industrial pollution this means that if the government wanted to make major reformative legislation for Environmental Justice, they could easily do so by targeting these industries

4.6.   ENVIRONMENTAL JUSTICE STRATEGY-:

Pursuant to the President's Executive Order, the EPA developed an environmental justice strategy aimed at integrating environmental justice into the Agency's programs and policies. The stated goal is to ensure that "[n]o segment of the population, regardless of race, color, national origin, or income, as a result of the EPA's policies, programs, and activities, suffers disproportionately from adverse human health or environmental effects, and all people live in clean, healthy, and sustainable communities

In accordance with the Executive Order's emphasis on grassroots community involvement, the EPA based its strategy on three guiding principles: (1) environmental justice begins and ends in communities; (2) helping affected communities gain access to information will enable them to participate meaningfully in activities; and (3) effective leadership will advance environmental justice. Following these principles, the EPA developed an approach focused on establishing common sense standards and procedures for conducting the Agency's programs. This "Common Sense" Initiative attempts to bring together communities, environmentalists, industry, states, tribes, and others to develop cleaner, cheaper, and smarter solutions to environmental problems. Along with four other mission topics, the Common Sense Initiative focuses on "public participation, accountability, partnerships, and communication with stakeholders."78 Based on the realization that effective environmental justice strategies require early involvement by affected communities and other stakeholders, the Agency will actively seek to incorporate the expertise of local, affected community members throughout this process. Foremost among the EPA's projects to address and remedy environmental injustice is its Brownfields program. The program is designed to address the problems associated with abandoned commercial and industrial

properties (known as "brownfields"), which are located overwhelmingly in minority and poor communities. The EPA hopes this program will: stem the environmentally damaging and racially divisive phenomenon of urban sprawl and Greenfields development; focus on problems that are inextricably linked with environmental justice; allow communities to offer their vision for redevelopment; apply environmental justice principles to the development of a new environmental policy; and provide greater awareness of and opportunities for partnership building between the EPA and affected communities and other stakeholders. The Brownfields program clearly embodies the Executive Order's emphasis on grassroots community involvement.83 By making a concerted effort to work with community groups, investors, lenders, developers, and other affected parties, the Brownfields program recognizes that communities directly affected by a problem or project are imminently qualified to participate in the decision-making process. By providing services such as training and support for community groups and technical assistance grants, the Brownfields program seeks to establish mechanisms to ensure the full and meaningful participation of all affected parties. By actively seeking community input and involvement, the Brownfields program, in theory, enables poor and minority communities to influence the decision-making process; thus, addressing the problem of powerlessness by providing these disadvantaged communities with a modicum of political empowerment.

4.7. Environmental Justice Issues

Examples of environmental burdens that may be considered under the umbrella of environmental justice cover many aspects of community life. These burdens can include any environmental pollutant, hazard or disadvantage that compromises the health of a community or its residents. For instance, one of the environmental justice issues and examples is inadequate access to healthy food. Certain communities, particularly lower-income or minority communities, often lack supermarkets or other sources of healthy and affordable foods.

Another issue is inadequate transportation. While public transportation may be available in urban areas, policies must be monitored to avoid cuts in service and fare hikes that make it difficult for community residents to pursue employment or an adequate living standard.

Air and water pollution are major environmental justice issues. Because many lower-income or minority communities are located near industrial plants or waste disposal sites, air and water quality can suffer if not properly monitored.

These communities may also contain older and unsafe homes. Older homes are more likely to have lead-based paint that can chip and finds its way into the dust and soil surrounding the home, leading to illness. These houses may also be prone to structural problems, mold or other hazards that put residents at higher risk of health problems.

4.8. The Future of Environmental Justice

Over the years environmental justice has evolved and gone from resisting and changing discriminatory practices of sitting polluting facilities in communities of color and communities of low-income to addressing the impact of global climate change. Lessons to date from the signs of global warming suggest that we must divorce ourselves from the fossil fuel economy. People of color and low-income are disproportionately impacted by the toxins from fossil fuel industries that poison ambient air quality that lead to toxic-induced and aggravated disease and general health disparities. People of color and low-income groups are not only disproportionately impacted by pollutants in the short-term, but will be least able to protect themselves in a warming climate caused by fossil fuel-induced greenhouse gases. As global warming takes place, resulting in flooding in some areas and droughts in others, structural inequalities will become more visible as millions of people migrate across geo-political boundaries in search of dry land, food, jobs, and shelter causing regional conflicts and even wars. Tropical diseases will move north making more people vulnerable to a variety of illnesses. Hurricane Katrina and its aftermath may be a harbinger of the future, particularly if we continue along this perilous trend of warming the planet. Global climate change may be the largest environmental justice crisis of all. To build an environmentally just society not only calls for a cleaner environment, but it calls

for the eradication of structural inequality which contributes to world terrorism and world disequilibrium.

4.9. <u>ENVIRONMENTAL POLICY-:</u>

Communities of all sizes, from townships to the national government, establish laws that govern how individuals acting within the community are to conduct themselves. The environment is arguably one of the newest considerations to be decided by and incorporated into the body of the law. The body of law relevant to the environment includes full dedicated statutes, smaller pieces of larger legislation, international treaty agreements, and the immense body of regulatory law, which is promulgated by federal, state, and local agencies. In the 21st Century, the environment has also become a consideration in all types of laws from building codes, customs and shipping laws, finance law, and even space law. This section examines the law (both current laws and the evolving process of legislation), the agencies that administer and develop the law, and the policies that influence developing and current law.

Environmental policy refers to the commitment of an organization to the laws, regulations, and other policy mechanisms concerning environmental issues and sustainability. These issues generally include air and water pollution, solid waste management, biodiversity, ecosystem management, maintenance of biodiversity, the protection of natural resources, wildlife and endangered species. Policies concerning energy or regulation of toxic substances including pesticides and many types of industrial waste are part of the topic of environmental policy. This policy can be deliberately taken to direct and oversee human activities and thereby prevent harmful effects on the biophysical environment and natural resources, as well as to make sure that changes in the environment do not have harmful effects on humans.

It is useful to consider that environmental policy comprises two major terms: environment and policy. Environment refers to the physical ecosystems,

but can also take into consideration the social dimension (quality of life, health) and an economic dimension (resource management, biodiversity) Policy can be defined as a "course of action or principle adopted or proposed by a government, party, business or individual". Thus, environmental policy focuses on problems arising from human impact on the environment, which retroacts onto human society by having a (negative) impact on human values such as good health or the 'clean and green' environment.

Environmental issues generally addressed by environmental policy, management, ecosystem management, biodiversity protection, the protection of natural resources, wildlife and endangered species, and the preservation of these natural resources for future generations. Relatively recently, environmental policy has also attended to the communication of environmental issues

4.10. INSTRUMENT OF ENVIRONMENTAL POLICY-:

Environmental policy instruments are tools used by governments to implement their environmental policies. Governments may use a number of different types of instruments. For example, economic incentives and market-based instruments such as taxes and tax exemptions, tradable permits, and fees can be very effective to encourage compliance with environmental policy. Bilateral agreements between the government and private firms and commitments made by firms independent of government requirement are examples of voluntary environmental measures. Another instrument is the implementation of greener public purchasing programs. Several instruments are sometimes combined in a policy mix to address a certain environmental problem. Since environmental issues have many aspects, several policy instruments may be needed to adequately address each one. Furthermore, a combination of different policies may give firms greater flexibility in policy compliance and reduce uncertainty as to the cost of such compliance.

Government policies must be carefully formulated so that the individual measures do not undermine one another, or create a rigid and cost-ineffective framework. Overlapping policies result in unnecessary administrative costs, increasing the

cost of implementation. To help governments realize their policy goals, the OECD Environment Directorate collects data on the efficiency and consequences of environmental policies implemented by the national governments. The website, www.economicinstruments.com, provides database detailing countries' experiences with their environmental policies.

The current reliance on a market-based framework is controversial, however, and many environmentalists contend that a more radical, overarching approach is needed than a set of specific initiatives, to deal with the climate change. For example, energy efficiency measures may actually increase energy consumption in the absence of a cap on fossil fuel use, as people might drive more fuel-efficient cars. Thus, Aubrey Meyer calls for a 'framework-based market' of contraction and convergence. The Cap and Share and the Sky Trust are proposals based on the idea.

Environmental impact assessments (EIA) are conducted to compare impacts of various policy alternatives. Moreover, it is assumed that policymakers make rational decisions based on the merits of the project. Eccleston and March argue that although policymakers normally have access to reasonably accurate information, political and economic factors often lead to environmentally destructive decisions in the long run. The decision-making theory casts doubt on this premise. Irrational decisions are reached based on unconscious biases, illogical assumptions, and the desire to avoid ambiguity and uncertainty. Eccleston identifies and describes five of the most critical environmental policy issues facing humanity: water scarcity, food scarcity, climate change, the peak oil, and the population paradox.

4.11. HISTORY OF ENVIRONMENTAL POLICY-:

The 1960s marked the beginning of modern environmental policy making. Although mainstream America remained oblivious to environmental concerns, the stage had been set for change by the publication of Rachel Carson's New York Times bestseller Silent Spring in 1962. Earth Day founder Gaylord Nelson, then a U.S. Senator from Wisconsin, after witnessing the ravages of the 1969 massive oil

spill in Santa Barbara, California. Administrator Ruckelshaus was confirmed by the Senate on December 2, 1970, which is the traditional date we use as the birth of the agency. Five months earlier, in July 1970, President Nixon had signed Reorganization Plan calling for the establishment of EPA in July 1970. At the time, Environmental Policy was a bipartisan issue and the efforts of the United States of America helped spark countries around the world to create environmental policies. During this period, legislation was passed to regulate pollutants that go into the air, water tables, and solid waste disposal. President Nixon signed the in 1970 which set the USA as one of the world leaders in environmental conservation.

In the European Union, the very first Environmental Action Programmed was adopted by national government representatives in July 1973 during the first meeting of the Council of Environmental Ministers. Since then an increasingly dense network of legislation has developed, which now extends to all areas of environmental protection including air pollution control, water protection and waste policy but also nature conservation and the control of chemicals, biotechnology and other industrial risks. EU environmental policy has thus become a core area of European politics.

Overall organizations are becoming more aware of their environmental risks and performance requirements. In line with the ISO 14001 standard they are developing environmental policies suitable for their organization. This statement outlines environmental performance of the organization as well as its environmental objectives. Written by top management of the organization they document a commitment to continuous improvement and complying with legal and other requirements, such as the environmental policy objectives set by their governments.

4.12.ENVIRONMENTAL POLICY STUDIES-:

Given the growing need for trained environmental practitioners, graduate schools throughout the world offer specialized professional degrees in environmental policy studies. Due to the lack of standard nomenclature, institutions use varying designations to refer to academic degrees they award.

However, the degrees typically fall in one of four broad categories: master of arts, master of science, master of public administration, and PhD in environmental policy. Sometimes, more specific names are used to reflect the focus of the academic program. For example, the Monterey Institute of International Studies awards Master of Arts in International Environmental Policy (MAIEP) to emphasize the international orientation of the curriculum.

4.13.ENVIRONMENTAL ACTION-:

Environmental Action is a practice of protecting the natural environment on individual, organizational or governmental levels, for the benefit of both the natural environment and humans. Due to the pressures of population and technology, the biophysical environment is being degraded, sometimes permanently. This has been recognized, and governments have begun placing restraints on activities that cause environmental degradation. Since the 1960s, activity of environmental movements has created awareness of the various environmental issues. There is no agreement on the extent of the environmental impact of human activity, and protection measures are occasionally criticized.

4.14.APPROACHES TO ENVIRONMENTAL ACTION-:

Voluntary environmental agreements

In industrial countries, voluntary environmental agreements often provide a platform for companies to be recognized for moving beyond the minimum regulatory standards and thus support the development of best environmental practice. In developing countries, such as throughout Latin America, these agreements are more commonly used to remedy significant levels of non-compliance with mandatory regulation. The challenges that exist with these agreements lie in establishing baseline data, targets, monitoring and reporting. Due to the difficulties inherent in evaluating effectiveness, their use is often questioned and, indeed, the environment may well be adversely affected as a result. The key advantage of their use in developing countries is that their use helps to build environmental management capacity.

Ecosystems approach

An ecosystems approach to resource management and environmental protection aims to consider the complex interrelationships of an entire ecosystem in decision making rather than simply responding to specific issues and challenges. Ideally the decision-making processes under such an approach would be a collaborative approach to planning and decision making that involves a broad range of stakeholders across all relevant governmental departments, as well as representatives of industry, environmental groups and community. This approach ideally supports a better exchange of information, development of conflict-resolution strategies and improved regional conservation.

International environmental agreements

Many of the earth's resources are especially vulnerable because they are influenced by human impacts across many countries. As a result of this, many attempts are made by countries to develop agreements that are signed by multiple governments to prevent damage or manage the impacts of human activity on natural resources. This can include agreements that impact factors such as climate, oceans, rivers and air pollution. These international environmental agreements are sometimes legally binding documents that have legal implications when they are not followed and, at other times, are more agreements in principle or are for use as codes of conduct. These agreements have a long history with some multinational agreements being in place from as early as 1910 in Europe, America and Africa. Some of the most well-known multinational agreements include: the Kyoto Protocol, Vienna Convention on the Protection of the Ozone Layer and Rio Declaration on Environment and Development.

4.15. GOVERNMENT-:

Discussion concerning environmental action often focuses on the role of government, legislation, and law enforcement. However, in its broadest sense, environmental protection may be seen to be the responsibility of all the people and not simply that of government. Decisions that impact the environment will ideally involve a broad range of stakeholders including industry, indigenous

groups, and environmental group and community representatives. Gradually, environmental decision-making processes are evolving to reflect this broad base of stakeholders and are becoming more collaborative in many countries.

Many constitutions acknowledge the fundamental right to environmental action and many international treaties acknowledge the right to live in a healthy environment. Also, many countries have organizations and agencies devoted to environmental action. There are international environmental action organizations, as the United Nations Environment Programme.

Although environmental action is not simply the responsibility of government agencies, most people view these agencies as being of prime importance in establishing and maintaining basic standards that protect both the environment and the people interacting with it.

4.16.ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY. Following a decade of growing concern about pollution, and less than two months after the first Earth Day celebration in 1970, President Richard M. Nixon proposed creating the Environmental Protection Agency (EPA). Nixon presented the EPA proposal to Congress as a reorganization plan to consolidate the Federal Water Quality Administration, the National Air Pollution Control Administration, the Bureau of Solid Waste Management, and the Bureau of Water Hygiene, along with certain functions of the Council on Environmental Quality, the Atomic Energy Commission, and various other agencies into one agency. The primary mission of the new agency was to research the adverse effects of pollution and to establish and enforce standards to protect human health and the environment. Congress approved, and on 2 December 1970, the EPA opened its doors.
Nixon chose thirty-eight-year-old Assistant Attorney General William D. Ruckelshaus as EPA's first administrator. Dubbed Mr. Clean, Ruckelshaus wasted no time explaining that the EPA's primary obligation was the protection of the environment, not the promotion of commerce or agriculture. Under Ruckelshaus, the EPA first attempted to establish and enforce air quality standards. It also went

after water polluters. Immediately, EPA threatened Cleveland—whose Cuyahoga River was so polluted that it had recently caught fire—Detroit, and Atlanta with lawsuits if they did not clean up their waterways. The EPA warned business and local governments that it would use the power of the courts to enforce the nation's environmental laws. Initially, however, the agency's authority was limited because few strong federal environmental laws existed.

4.17. Major Environmental Legislation

The Clean Air Act of 1970 (CAA), signed into law only a month before the EPA began operations, gave the EPA significant new powers to establish and enforce national air quality standards and to regulate air pollution emitters from smokestacks to automobiles. To take just one of many examples, under the CAA, the EPA began phasing out leaded gasoline to reduce the amount of poisonous lead in the air. The Clean Water Act of 1972 (CWA) did for water what the CAA had done for air—it gave the agency dramatic new authority to establish and enforce national clean water standards. Under these laws, the EPA began an elaborate permitting and monitoring system that propelled the federal government—welcome or not—into almost every industry in America. The EPA promised industry a chance to make good faith efforts to implement the new standards, but warned that federal enforcement actions against violators would be swift and sure.

The EPA also took quick action under other new environmental laws. The Federal Insecticide, Fungicide, and Rodenticide Act of 1972 (FIFRA) authorized the agency to regulate a variety of chemicals found in pesticides. Under its authority, the EPA banned the use of DDT, once viewed as a miracle chemical and sprayed in neighborhoods across America to stop the spread of malaria by killing mosquitoes, but later discovered to cause cancer and kill birds. The use of DDT had driven many avian species, including the bald eagle, to the brink of extinction and had inspired Rachel Carson to write *Silent Spring* (1962), which many credit as the clarion call for the modern environmental movement. In 1974, the passage of the Safe Drinking Water Act (SDWA) supplemented the CWA by granting the EPA power to regulate the quality of public drinking water.

The EPA's regulatory powers, however, did not stop with air, water, and pesticides. In 1976, Congress passed the Resource, Conservation, and Recovery Act (RCRA), which authorized the agency to regulate the production, transportation, storage, and disposal of hazardous wastes. That same year,

Congress passed the Toxic Substance Control Act (TSCA), authorizing the EPA to regulate the use of toxic substances. Under TSCA, the EPA, for example, began the phase out of cancer-causing PCB production and use. The leaking of chemical containers discovered at Love Canal, New York, in 1978 drew the nation's attention to the problem of hazardous and toxic wastes already disposed of unsafely in sites across the country. To address this problem, Congress in 1980 enacted the Comprehensive Environmental Response, Compensation, and Recovery Act (CERCLA), which provided a federal Superfund for hazardous waste cleanup and authorized the EPA to identify contaminated sites and go after those responsible for the contamination.

4.18.The EPA's Tasks

The Superfund measure was the last major environmental law passed by Congress during the twentieth century. Although Congress passed other important environmental legislation after 1980 and added important amendments to existing laws, CAA, CWA, SDWA, FIFRA, RCRA, TSCA, and CERCLA defined the basic parameters of EPA's regulatory powers. And the agency has since had its hands full. For example, each law required the EPA to identify any substance found in air, water, drinking water, pesticides, buildings, and waste—almost any substance found in the environment—that might be harmful to human health or the environment. The EPA then has had to identify how these substances do harm and at what doses. This has involved scientific investigation of gargantuan proportions, and the EPA is far from finished with the process.

The environmental laws have also required the EPA to determine threshold levels of regulation, another colossal task, and one that has involved more than just science. Often without much guidance from Congress, the agency has had to make difficult decisions about acceptable risks. Is a single death in one million acceptable? One in 100,000? One in 10,000? Despite its mission, politics and reality have dictated that economics play an important part in the EPA's regulatory scheme. Some substances are harmful at any level, but banning them entirely would cause catastrophic economic disaster, and in some cases would require devolutionary, and generally unacceptable, changes in the structure of modern society. The EPA's science, therefore, has always been tempered by economic and political reality.

4.19.Expanding Authority

That said, the EPA's regulatory role continued to grow during the 1980s, despite the conservative administrations of Ronald Reagan and George H. W. Bush. Following a nuclear accident at Three Mile Island in 1979, the EPA began to monitor nuclear waste and fallout (though other agencies have the primary power to regulate nuclear waste). Hazardous waste leaks at Times Beach, Missouri, in 1982 accelerated the EPA's regulation of dioxins. A year later, cleanup action of the Chesapeake Bay prompted the agency to begin regulating pollution from so-called "non-point" sources, primarily urban and agricultural runoff. In 1985, scientists discovered a hole in the earth's ozone layer, and after the signing of the Montreal Protocol two years later, the EPA began regulating the phase out of ozone-depleting chlorofluorocarbons. In 1989, the*Exxon Valdez* spilled eleven million gallons of crude oil in Alaska's Prince William Sound. The EPA fined the Exxon Corporation $1 billion, the largest criminal environmental damage settlement in history.

During the 1990s, the EPA continued its attempt to fulfill its obligations under existing laws, and responded to the requirements of new laws and to the exigencies of environmental disaster and scientific discovery. The Pollution Prevention Act of 1990 forced the EPA to focus on the prevention—not just the correction—of environmental damage. In 1991, the agency created a voluntary industry partnership for energy efficient lighting and for reducing toxic chemical emissions, and a year later the agency began the Energy Star program to help consumers identify energy efficient products. In 1994, President William Clinton ordered the EPA to make environmental justice part of its mission, meaning that it would have to be certain that its regulations did not have a disparate impact on minority and low-income groups. On an old front, the EPA launched new initiatives, battling secondhand smoke in the name of indoor air pollution and creating a market-based permit trading program to reduce the sulfur dioxide emissions that cause acid rain. By the end of the decade, it faced many new challenges, including a rapidly depleting ozone layer and global warming.

By the year 2000, the EPA had become the federal government's largest regulatory agency. It wielded a budget of nearly $8 billion and employed more than eighteen thousand people. Its ever-growing number of rules had cost the regulated community $180 billion at the twentieth century's end. The EPA's growth earned the agency many enemies in industry and among conservative politicians. It has even clashed with traditionally liberal political interests, like labor unions that fear environmental regulations will cost jobs and minority

groups who resent the fact that too often environmental regulation has meant locating polluting industries and hazardous waste sites in low-income, predominantly minority communities, which have little political clout. The EPA has also received almost unending criticism from environmental groups, which believe that it has not done enough.

4.20.Model Questions:
1. What are the global challenges related to environment?
2. What is Environmental Justice?
3. Discuss Environmental Discrimination.
4. What are the major issues of environmental justice?
5. Discuss the major instruments of environmental policy.
6. Explain the history of environmental policy.
7. Discuss the major environmental legislation.
8. Explain the different approaches to environmental action.