

**Working Paper**

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**Sustainable  
Environment &  
Development :  
Some Reflections**

**Tattwamasi Paltasingh**

July 2011



**Sardar Patel Institute  
of Economic &  
Social Research**  
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## **List of Abbreviations**

AM	Ahmedabad Mirror
CBO	Community Based Organization
CELP	Centre for Environmental Law and Policy
CFC	Chlorofluorocarbon
CRED	Centre for Research on the Epidemiology of Disasters
CSO	Central Statistics Office
EDP	Environmentally Adjusted Net Domestic Products
EESS	Environment Education in School System
ESI	Environment Sustainability Index
GDP	Gross Domestic Product
GHGs	Green House Gases
GLOBE	Global Learning and Observation to Benefit the Environment
GoI	Government of India
HDI	Human Development Index
IFA	Indian Forest Act
IPCC	Inter-governmental Panel on Climate Change
MIC	Methyl Isocyanate
MNP	Milieu en Natuur Planbureau (Environmental Assessment Agency)
MoEF	Ministry of Environment and Forest
NCEPC	National Committee on Environmental Planning and Coordination
NGO	Non-Government Organisation
NRC	National Research Council
OECD	Organisation for Economic Cooperation and Development
PTWC	Pacific Tsunami Warning Centre
SNA	System of National Accounts
SPM	Suspended Particulate Matter
USAID	United States Agency for International Development
UV-B	Ultra Violet B radiations
WHO	World Health Organisation

# Sustainable Environment & Development: Some Reflections

Tattwamasi Paltasingh\*

## ***Abstract:***

There is constant dilemma on fulfilling the developmental goals and maintaining the balance in ecological system. There is conflict between the supporter of development and supporter of environment. Degradation in environment is also dependent upon economic factors. Sustainable environment is a complex interaction of economic development and protection of environment. Increasing environmental pollution and continuously increasing population are imposing dual pressure on our ecological system. Socio-economic and technological advancement pose threat to the basic elements of the environment i.e. air, land and water in terms of polluting them. As a result the biodiversity and global climate has been drastically affected. Frequency of natural disaster due to adverse climate change poses limitations to the sustainable development. However, more encouragement of renewable energy sources, afforestation, alternative fuel, strict measures for control of air pollution and economic reform are needed to protect our environment. There has to be consistent emphasis on the promotion of policies and programmes for social welfare and socio-economic growth that can further translate to the sustainable benefits of the people through protection of environment.

*Key words: Environment, ESI, Pollution, Climate Change, Natural Calamity, Pollution Control, Environmental Legislation, Environment Education*

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**Acknowledgment :** *The paper is published on the occasion of World Environment Day, celebrated at Sardar Patel Institute of Economic & Social Research campus. The author is thankful to Prof. Y.K. Alagh for his initiative and encouragement.*

## **Introduction:**

Degradation of natural resources can be a major obstacle for economic development. Environment is a basic source of raw materials that further facilitates the range of economic activities. Basic requirement of human life or any living being is fulfilled through the eco-system. Environment provide many essential lifesaving means including the vital protective ozone layer, which block the harmful ultra violet (UV) rays of sun reaching to earth surface which protects us and our surroundings from the effects of the harmful UV-B radiations with wavelength ranging between 290-320 nanometre is responsible for sun tanning and different types of skin cancer. Ozone layer is continuously depleted due to comfort seeking modern devices like air-conditioner, refrigerator etc. Atmospheric concentration of carbon dioxide and ozone depleting chemicals are projected to increase to a level which could affect world climate and upper atmosphere significantly by 2050. Advancement in scientific and technical knowledge has made it possible to overuse the natural resources. An increase in population puts up an additional pressure on the environment. Many forests and the natural surrounding have been gradually disappearing because of development projects and industries. Some of the useful plants having medicinal values and some of the animals are either extinct or on the verge of extinction. The water in lakes, rivers and oceans are contaminated to a large extent which can cause threat to the lives. The forests all over the world are disappearing at an accelerating rate, with most of the loss taking place in humid tropical forest of Africa, Asia and South America. Destruction of forest & agricultural land has left poor people with no other option rather than shifting to industrial area that generates new urban slums.



Economic growth has accelerated to new invention in science and technology that has created more dependency among people. With the development of science and technology, there has been considerable change in the living style. At the same time people are not free from stress, anxiety, violence, and diseases because of mental and physical problems. Transport and communication has been made easy with introduction of new vehicles with new design and machineries. Automobiles are mushrooming and available in the market to cater to the need of individuals inclined towards consumerist culture. Huge amount of natural resources are already destroyed & the process is still continued. The world is at risk that might affect the next generation too. Protection of environment versus economic growth has been a topic of discussion for quite some time now. Developed countries used to be blamed for establishing more number of polluting industries for higher economic returns and are considered to be the initiators of environmental damage. However, now developing countries are also targeting towards uncontrolled economic development at the cost of environmental degradation. Massive clearing of tropical rainforest is no more confined to farming only, as people have moved on in practicing different livelihood pattern that has gone beyond agricultural sector. Deforestation has given more scope & space for establishing big industries. The industries have multidimensional impact causing pollution to all the basic life supporting components i.e. air, water, soil & other sources. At the present scenario, it is difficult to stop the growth of developing nations taking into consideration the future environmental concern.

Present paper is an attempt to address some of the major areas concerning environment. In addition, there has been attempt to discuss global warming & climate change, environmental issues in India as well as in other countries with some evidences, various initiatives for controlling pollution. In the concluding section there has been discussion on policy implications that can contribute in tackling the challenges with reference to environmental issues.

### **Environmental Sustainability VS Development:**

Environmental degradation could not be fully explained by the Environmental Kuznet hypothesis alone which explain a U shaped curvilinear relationship between economic inequality and economic development of a nation. However, some indices like Environment Sustainability Index (ESI) and Human Development Index (HDI) along with population changes should be considered. ESI estimation is prepared on the basis of 76 variables including air, water, land and biodiversity quality degradation along with various policy measures to control environmental pollution (Yale, CELP; 2005). The HDI is based on 3 indices namely GDP per capita, life expectancy at birth and education assessed by adult literacy rate and gross enrolment ratio. Highest ESI score is evidenced by Finland (ESI=75.1) and lowest being North Korea (29.2). India ranks 101 with ESI score of 45.2 (Yale, 2005). Most of the Asian countries score better in ESI as compared to India. The China scores better Human Development Index in comparison to India which could be due to better population control measures in the former. However, China's score is poor in ESI index as compared to India which shows that ESI and HDI need not be related indices (Table 1).



**Table 1: Development Indices for Selected Asian Countries**

Country	ESI (2005)	ESI ranking on a Global Scale	HDI (2004)	HDI ranks (2004)	HDI ranks (2009)
Indonesia	48.8	75	0.692	111	111
India	45.2	101	0.595	127	134
Bangladesh	44.1	114	0.509	138	146
Pakistan	39.9	131	0.497	142	141
China	38.6	133	0.745	94	92

Source: Yale Centre for Environmental Law and Policy (2005) & USAID, 2009, HDR, 2009

The Human Development Index for India was 0.595 and India ranked 134 out of 182 countries in the world. The HDI rank of India has declined from 127 to 134 from 2004 to 2009 whereas China has marginal improvement from (94 to 92) in HDI ranking during 2004-2009(USAID, 2009; HDR, 2009). ESI & HDI can be improved in both developed & developing countries by controlling pollution & implementing innovative policy measures.

There is no universally accepted appropriate approach to sustainable development. In the present technology oriented world; participation from grass root level cannot be ignored, that can help to design a more effective framework for sustainable development. A holistic environmental analysis can help in understanding the ecological system in its totality. In today's contexts, policies and activities can be redesigned to reduce environmental degradation. System of National Accounts (SNA) can deal with EDP and environmentally adjusted net income. In most of the instances for national level decision making conventional SNA approach is adopted. Hence, there is need for supplementary environment friendly SNA approach that can save the corresponding performance indicators. The macro economic situation can

trace the links between economic based policies and natural resource management. For instance, if agricultural productivity can increase through substitution of crops, then the issue does not end there. The specialists in agriculture must also look into the matter whether the crop that has been substituted is environment friendly or it can damage the environment. For example cultivating tobacco, sugarcane etc. can provide good economic return and at the same time this is not considered to be eco-friendly.

### **Pollution: Sources & Implications:**

Pollution can be defined as an undesirable change in the physical, chemical or biological characteristics of air, land and water that can adversely affect human life or any living beings & hence broadly the ecosystem (Odum, 1971). Principal sources of pollutions can be broadly categorised as agricultural, industrial, extraterrestrial, bio-genic, natural and human-generated. Environmental pollution can be mainly categorised as air pollution, water pollution, land pollution, noise pollution and radioactive pollution etc. The classification however does not restrict the interconnection in the categories of pollution.

Industrialization is one of the major reasons for water pollution and according to a recent Government of India survey the number of manufacturing industries and other industrial units are continuously increasing in India (CSO, 2010). Manufacturing units can not sustain without the support of raw materials generated from the ecosystem. In addition recycle used material as well as waste products of human society are absorbed by the environment. The chemical industry generates an increasing amount of chemical every year which adversely affect the atmosphere soil and water. With restrictions on release of such chemicals to air and water, hazardous chemical waste is getting shifted to land for their disposal.



Use of water is inevitable for the survival of all the living being on earth. Water resources are very important natural resource for sustaining development of the society. But in the present day scenario all sources of water is found to be polluted. The pollutant are found in every source of water whether it is lake, stream, ocean, river, pond or even the well. For survival purpose this water is used by human beings, animals or even for the purpose of plant protection. Water is polluted by traditional organic waste, waste released by industries, fertilisers and pesticides for crop protection, the waste caused by human beings and animals and other harmful substances. These wastes are normally dumped into water sources like sea and river hence pollute water. Discharge of untreated domestic sewage, polluted water from commercial and industrial waste leaching to the ground further pollute the natural water resources. The water shortages constrain economic output, cause decline in fisheries and high cost to provide safe water. Rise at sea level due to global warming is one of the main reasons for intrusion of seawater in the ground water. This phenomenon can affect the income generated through agriculture and fishery. The developing countries are largely dependent on coastal fishery and because of the rise in sea level they are more adversely affected. Rise in sea level has displaced a large number of populations. Those who are more dependent on water and literally live inside the water like fish and other water animals are badly affected by the contaminated water. Consumption of fish surviving in poisonous water can be very harmful for anybody. Water pollution and water scarcity contribute to millions of deaths and illnesses annually all over the world.

Air pollution is connected with our atmosphere to the extent that can harm all kinds of living beings like human beings, animals, plants and also it can harm indirectly the other objects related with life. In today's context fossil fuels are used for multiple purposes like electricity production in power plants that can be used for running machineries in different industrial plants. This is also used for running automobiles

as well as aeroplanes. The everyday use of it includes cooking, heating, cooling etc. The release of different gases like carbon dioxide, carbon monoxides, sulphur dioxide, nitrogen oxides, methane and chlorofluorocarbons into air due to different human activities results in imbalances of natural cycles leading to global warming, desertification, natural disasters like floods, earthquakes etc. The combination of sulphur oxide and nitrogen oxide in the atmosphere can be the reason for acid rain. Lakes, soil and crops are threatened to be damaged due to acid rain from increased combustion of fossil fuels. Carbon monoxide is very harmful to human beings and survival of animals.

Besides these the industrial accidents further add to the air pollution e.g. Meuse valley incidence in Belgium in 1930 followed by Pennsylvania smog incident in 1948 and London smog disaster in 1952. The Bhopal gas tragedy in MP, India could be sited as the worst industrial disaster releasing 40 tonnes of poisonous gas, methyl isocyanate (MIC), into the air, killing about 15000 people and affecting lakhs of people of Bhopal (Sengar, 2007). Accident of lesser impact also keeps occurring further adding to the increasing air pollution. Though such pollution accidents are not every day's event, but the number of such problems is bound to increase due to increasing environmental pollution (Sengar, 2007). Major air pollutants are coal fired power plants, chemical plants, oil refineries, nuclear waste disposal activity, petrochemical plants, incinerators, metal production factories, plastic factories, and other heavy industries. Agricultural air pollution comes from contemporary practices which include burning of natural vegetation as well as spraying of pesticides and herbicides. In urban areas, increasing pollution of vehicles is leading to poor air quality. Air quality in major cities of India indicate higher level of Suspended Particulate Matter (SPM) which includes dust, mist, fumes and smoke, than



prescribed limits. Indoor air pollution can be particularly hazardous to health as it is released in close proximity to people. In India, air pollution is believed to cause 527,700 fatalities every year (WHO, 2003). Older people, children, infants and expecting mothers are quite vulnerable to diseases induced by air pollution. Depletion of Ozone layer due to increasing air pollution can cause cardio-respiratory health problems, chest pain, congestion, allergy and asthma etc. North America is a leading producer of air pollutants like sulphur dioxide, nitrogen oxide, carbon monoxide and hydrocarbons followed by USA and then OECD-Europe. The United States alone contributes more than half of it. Americans constitute less than 5% of the world population, but produce roughly about one fourth of the world's Carbon Dioxide.

The major sources of noise pollution are roadway noise, industrial noise & aircraft noise as well as high-intensity sonar. Most of us contribute to noise pollution as majority of our day-to-day activities generate some or the other noise. Growing urbanization has resulted in use of increasing number and types of vehicles that creates undesirable noise pollution. Rise of aviation industry has multiplied the number of aeroplanes that create disturbing and noisy environment. Noise pollution affects all human beings i.e. industry workers in particular and public in general. Noise pollution adversely affects the human being leading to irritation, loss of concentration, loss of hearing (Goines and Hagler, 2007). It produces many other ill effects on health like changes in psychological and physiological functions of the human beings including the sleep disturbances, anxiety, high blood pressure and stress (Mishra, 2000).



The land is one of the important aspects for life support system but it has been overused and abused. There is an increasing demand on the land for the purpose of agriculture, forestry, grassland, urban and industrial development. Loss of top soil is maximum in India, being 18.5% of the total soil loss at the global level. The effective forest cover is about 14% but the requirement is about 33% in plains and 60% in hills (MoEF, 2007). The forest depletion in India is accompanied by increasing amount of pollution affecting atmosphere, soil, and water. Many of these damages are irreversible. Each year new desert is created due to loss of productive land. Therefore forest protection and encouragement for efforts to create new forest areas is urgently required. A deterioration of agricultural soil will take place globally due to soil erosion, loss of organic matter, desertification, salinization and water logging to a significant level. Activities related to agriculture involving non judicious use of chemicals, fertilizers, insecticides, pesticides, herbicides and fumigants pollute the soil to a great extent. This affects the soil, land crops and aquatic life. The toxic chemicals used in modern agriculture as pesticides is silently killing many useful microbes responsible for bio-geo-chemical cycles, useful insects, birds, butterflies of the forest and fish in the lakes. Soil pollution can result in loss of crop productivity, loss of forest products. The crops and plants grown on polluted soil can be the reason for contaminated vegetables, fruits, and other edible items. It has been estimated that waste from the industries contribute over one half of the total pollutant load and majority of these come from large and medium industries in India. Due to increasing number of factories and industries hazardous chemicals are dumped in the soil causing soil pollution. Spilling of oil and chemicals affects the quality of soil. Land around smelting and mining complex are usually spoiled by metals like cadmium, zinc, lead, arsenic etc. which contaminates soil and makes plants in surrounding areas unsafe for human and animal consumption. Industries like pulp and paper

mills, oil refineries, power plants, chemical and fertilizer units, iron and steel plants. rubber and plastic industries are major soil pollutants.

Since the development of the atomic bomb and improving techniques for harnessing nuclear energy, possibilities of radioactive material being released into the atmosphere has increased tremendously. Main sources of radioactive pollution in water are the radioactive elements in the earth's crust and artificial radionuclide appeared due to human activities like nuclear power plants, nuclear weapons testing, manufacture and use of radioactive resources (Lucia et al, 2009). Radioactive pollution can endanger the public health to a great extent, if not managed to a safer limit in the atmosphere. Nuclear wastes from laboratories, hospitals using radioactive material pollute the environment to a great extent. Birth deformity recently found among the living organisms is one of the dangerous after effects of radioactive leakage from Fukushima nuclear power plant of tsunami affected Japan (AM, 2011). Radioactive and other hazardous material put health and safety problems in increasing number of countries. Increasing pollution level on the earth surface and atmosphere has been responsible for significant climate changes and global warming.

### **Climate Change & Consequences:**

Human generated pollution of air, water and land has increased the emission of the greenhouse gases in the atmosphere resulting in global warming. There is an increasing concentration of Green House Gases (GHGs) like carbon dioxide, methane, nitrogen oxide, Chloro-Fluoro Carbons (CFCs) etc, due to various human activities like burning more coal, oil and natural gas. Similarly deforestation and land cleaning also release GHGs amounting 1000-2000 million tonnes per year. The GHGs are added to the environment much faster as compared to the natural process



which can remove them. Consequently earth surface gets heated up resulting in Green House Gas effect. In several large developing countries and fast growing economies (China, India, Thailand, Indonesia, Egypt, and Iran) GHG emissions have increased rapidly. India ranks fifth among the leading GHGs emitters countries and produce 2.1 tonnes of GHG per capita. Emissions in China have escalated strongly over the 1990-2005 period. As per the assessment made by the Netherland Environment Assessment Agency (MNP, 2007), the largest GHGs emitter is China followed by United States. However, per capita emission of the green house gases is found to be highest in USA followed by Canada (Table 2). Most of the largest GHG emitters have either large economies or large populations, or both.

**Table 2: World Leading GHGs Emitter Countries in 2005**

S.No	Country	Emissions as a percentage of the global total	per-capita emissions, (Tons of GHG per-capita)
1.	China	17%,	5.8
2.	USA	16%	24.1
3.	European Union	11%	10.6
4.	Indonesia	6%	12.9
5.	<b>India</b>	<b>5%</b>	<b>2.1</b>
6.	Russia	5%	14.9
7.	Brazil	4%	10.0
8.	Japan	3%	10.6
9.	Canada	2%	23.2
10.	Mexico	2%	6.4

(Source:MNP, 2007)

Strong correlation between Greenhouse Gases (GHGs) emissions, population, and GDP reflects the importance of population and economic growth as GHGs emission drivers. Economic growth (measured as an increase in GDP per capita) has been found to be the strongest factor influencing GHGs emissions level, generally putting upward pressure on emissions. This is the case in countries as diverse as the United States, India, Indonesia, Australia, and Iran. In Russia and Ukraine, as noted above,

economic contraction contributed to a decline in emissions. By 2050, the temperature of earth is projected to rise about 3 degree Celsius as concentration of carbon dioxide will be doubled by that time. It is estimated that an increase in 1 degree Celsius can adversely effect the world food production of oceans and can result in rise in sea level which could further threaten many coastal countries and many island areas like Goa, Madras to face extinction. A deliberate production of dangerously powerful disease producing bacteria, virus or fungi for biological warfare is another environmental threat to mankind. The plant and animal species are more likely to extinct dramatically. More than 20 percent of all species on the earth will be lost from their habitat especially in tropical forest.

The Inter-governmental Panel on Climate Change (IPCC) in its 4<sup>th</sup> assessment report indicated that the impacts of global warming on human society are widespread as well as profound. Impacts such as frequent abnormal climatic conditions and disastrous weather, expansion of drought affected areas, increased drought and storm frequency, and more frequent tropical cyclones in some regions, will cause huge risk to the sustainable development of human society and economy, even the very existence of life on earth (WMO, 2007) is under threat. Climate change has been a matter of deep concern in contemporary period. There is no unanimous agreement on how to deal with the problem of climate change. The rich industrialized countries are largely blamed to create problems related to climate change because of their consumption pattern adding threat to the environment (Jha, 2004). The population of the developed countries are much less than rest of the world but they emit and consume about 75 - 80 % of resources of the world. There are environmentalists who have argued that the emission of the poor people who are most deprived and under privileged need not be blamed for climate change. Rather it should be treated



as their basic human rights as they do not have any other survival strategies (Agrawal and Naraian, 1991). There are different consequences of climate change. An adverse impact of climate change on agricultural crop yields, GDP and welfare issues were explained by Kumar and Parikh (2001a, 2001b).

Agriculture is one of the sectors adversely affected by changing climate. In such situation, farmers are the worst sufferers because of their loss in crop cultivation. There is evidence of crop failures because of climate change. The quality of fertile land is getting worse gradually. Some of the areas in coastal belt remain submerged because of the rise in sea level causing threat to the lives. Natural calamities are the consequences of climate change, so it is important to identify various ways and means on how to reduce the future environmental threat. The climate changes are affecting the environment across the globe. It is time for both developed & developing countries to adopt ways & means that can help in sustaining the environment. The impacts of climate change at national and international level have been discussed in next section of the paper.

### **Environmental Disasters:**

More than four billion people in developing countries were affected by different kinds of natural disasters during 1984 to 2003. Economic losses between 1990 and 1999 due to natural disasters are found to be exceeded those between 1950 and 1959 for about fifteen times (World Bank, 2004). Center for Research on the Epidemiology of Disasters (CRED), Belgium, and the data of disasters from Swiss Re and Munich Re, have shown an increasing trend in frequency of disasters over the last two decades (Scheuren et al. 2008). According to them the total number of flood and windstorm events increased about 7 % annually during 1988-2006, and 8 percent between 2000 and 2007. These natural disaster associated economic losses and



causalities are also rising globally. According to the United States, National Research Council (NRC, 2006), there was a rapid increase of these losses from the 1960s to the 1990s. The disaster losses have been greater than 3 percent of GDP in many developing nations. According to Perrow (2007) mortality due to natural disasters has been concentrated in developing countries.

India and China hold more than one-third of the world population and three-quarters of all people affected by disasters over the period 1980 to 2004 (Stromberg, 2007). Disaster related loss is even more intensified in many developed and developing nations. Flood followed by the wind storm are leading forms of the natural disaster all over the world since 1980 to 2004. However, the greatest human lives loss are due to the drought followed by wind storm and maximum number of affected human lives are due to the floods followed by the droughts during the same period. The numbers of disasters are found to be more in low income countries in comparison to the high income countries of the Europe and this could be due to more populous status of the earlier group of countries. The number of people affected and died due to natural disasters is also higher in the low income countries as compared to the high population countries (Stromberg, 2007).

### ***Disaster: An International perspective***

Global environmental change and natural disasters are interconnected. The Killer heat waves in Europe in 2003, Hurricane Katrina in USA in 2005, Typhoon, Sidr in Bangladesh in 2007, China earthquake in 2008, freezing rain and snowstorm in China in 2008, Earthquake in Haiti, USA in 2010, Killer heat wave in Russia in 2010 and earthquake followed by Tsunami in Japan in 2011 are the major global natural disasters destroying human lives and creating huge loss to living beings. Recent Japan 2011 earthquake with 9.0 magnitudes on Richter scale occurred on 11<sup>th</sup> March

2011 at the Western Pacific Ocean in Japan, lasting approximately six minutes can be considered as most shocking to the series of natural disasters. Sendai was the worst affected city in Japan. The earthquake is followed by a major tsunami which brought massive destruction along with the Pacific coastline of Japan's northern islands. Consequently there was a loss of thousands of lives and devastated many habitations (PTWC, 2011). The aftermath of the earthquake and tsunami included both a humanitarian crisis and a major economic loss. The survivors were deprived of all basic amenities of life. The economic impact included both immediate problems, with industrial production suspended in many factories, and the long term issue of the cost of rebuilding estimated to be more than hundred billions.

### ***Disasters in India:***

In India, there are extreme evidences that have taken place because of climate change. Last one and half decade has witnessed many natural disasters because of climate change. Cyclone in Andhra Pradesh during 1996, super cyclone in Orissa during 1999, Earthquake in Gujarat, in 2001, Killer heat waves in South India in 2003 and Indonesia earthquake followed by Indian Ocean Tsunami in 2004, Kashmir earthquake in 2005 has shaken the whole world (Somayajulu, 2007). These major instances of calamities can affect not just one generation but many future generations. Frequently occurring disaster in India are found to be the earthquake followed by floods, cyclones and landslide. In India 56% of the total area of the country is susceptible to seismic disturbances. About 400 million people are affected by 2001 due to earthquake in India alone. Flood occurrence in 8 major river valleys spread over 40 million hectares of area in the entire country has affected 260 million people by 2001. Episodes of cyclones in 5700 km long coastline of southern



Peninsular India involving 9 states viz Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal and Union Territory of Pondicherry besides Island of Lakshadweep, Andaman and Nicobar has affected 10 million people. Frequent landslides in entire sub Himalaya region and Western Ghats have shattered 10 million peoples' lives by 2001 (MoEF, 2001).

## **Strengthening Environment:**

### **Global Initiatives:**

United Nations Conference on Human Environment held at Stockholm in June 1972 drew the attention of whole world towards a clean and healthy environment. An important aspect of the Stockholm Declaration was a strategy to draft an action plan for the development of human environment. Most revolutionary step towards the environment preservation and development was the Earth Summit convened by the UN General Assembly at Rio de Janeiro in 1992. Another major step in the direction was the World Summit on Sustainable Development, held at Johannesburg, in 2002. The Summit emphasized sustainable development and gave new impetus to fight poverty and protection of environment. Among all the initiatives, the major one i.e. Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and it came in force on 16th February 2005. The Kyoto Protocol sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. These amount to an average of 5% decline of GHGs emission against 1990 levels over the five-year period i.e. during 2008-2012. Recognizing the fact that developed nations are principal contributors to the current high levels of GHG emissions in the atmosphere with more than 150 years of industrial activity, the Protocol places more burden on developed nations.

### **National Initiatives:**

Environment movements are initiated in India due to its participation in UN conference on human environment held at Stockholm in June 1972. Thereafter, a provision was added to the Indian constitution by the 42<sup>nd</sup> Amendment in 1976 regarding preservation of the environment throughout the country. India had laid down the foundation in Directive Principles of State Policy and the citizens' duty towards environmental protection in India. The initiation of industry regulation has taken place during late 18th century, started in England later on spread to all over the world. Manual labor was substituted by machines and technology. Manufacturing industries started growing considerably. There was high growth of production. Production units used huge quantity of raw material that was generated through water, oil, natural gas, coal and cutting of trees. Deforestation is still taking place-causing harm to the environment. However there are certain legal guidelines to control the over use of natural resources and protect the environment.

### ***Environmental Laws in India:***

Environmental laws are legal guidelines indented to protect our environment. The Environment (Protection) Rules, The Urban Land (Ceiling and Regulation) Act, the Industries (Development and Regulation) Act, the Mines and Minerals (Regulation and Development) Act and Noise Pollution (Regulation and Control) Rules (Tiwari, 2007) are some of the legal initiatives taken by the government towards this direction. Soon after the independence there was no environment policy. Major initiative was witnessed during the 1970s to protect the environment. A National Committee on Environmental Planning and Coordination (NCEPC) was established in 1972 collaborating with the Department of Science and Technology. Despite these extensive measures, the rate of pollution and environment degradation has not been



minimized to a considerable extent. Very often the laws sound complex and remain ambiguous that makes it difficult for the environment professionals to deal with it. In such situation common people cannot understand the importance and implications of such legislative matters. For example, Indian Forest Act (IFA) 1927 has not clearly spelled out the definition of forest & it has been defined differently by the judicial system with various court orders (Lele, 2007). During late 1970s, there is an extension of constitutional provision. Again in late eighties, right to live in clean and healthy environment has been designated as the fundamental right. Most of the environmental laws are virtually unenforceable or implemented inadequately. A wide gap exists between enactment and enforcement of environmental laws. Despite these acts and rights, keeping the environment- pollution free is a task which is not to be assumed as an exclusive responsibility of the government. Citizens of the nation need to play the most important and more responsible role involving the other stakeholders to make and manage cleaner and healthier environment. Only the legislative provisions are not sufficient to protect our environment. There has to be awareness among the citizens to make the environment clean & green. Children have to be oriented from an early stage so that they can be sensitized to be environment friendly. Educational institutions play a major role to inculcate good practices so that they can play responsible role with an eco- friendly approach.

### ***Environment Education in India:***

The department of environment was established by government of India in 1980 followed by separate ministry for environment in 1985. Management, protection and conservation of forest are followed as per National Forest Policy, 1988. The government of India has initiated some schemes and programmes to generate awareness regarding the environmental issues especially among school children like environment education, awareness and training programme, formal environment



education programme, non-formal environment education and awareness programme: and grant- in aid to professional societies and institutions. Environment Education in School System (EESS) project was implemented in 8 states in phase I and in another 7 states in phase II of the project by Ministry of Environment and Forest (MoEF, 2007). World Environment day, Conservation day, World wetland day, Earth day, Science day celebrations are important events to earmark relevance of environment to human beings. Green teacher programme was initiated during 2004-2005 with an objective to develop necessary knowledge, skill and ideas regarding the environment among the school teachers (Daniel, 2007). Besides these the government has established major centres of excellence to generate awareness and strengthen research and training pertaining to environmental issues. The Environment and Forest unit of Planning Commission constituted a Working group on research, education, training, capacity building and information management for the environment and forest sector for eleventh five year plan (GoI, 2011).

Many eco-clubs were initiated by Ministry of Environment and Forestry to educate school children about their immediate environment and eco systems, their interdependence and their importance in survival, by involving the children in different environment related activities. These clubs mobilized the youngsters with spirit of scientific inquiry about environment and its protection. MHRD through Sarva Siksha Abhiyan (SSA) initiative has introduced eco-garden concept to make the school campus environment friendly (Paltasingh, 2008). GLOBE (Global Learning and Observation to Benefit the Environment) is another science and education programme pertaining to environment learning to the students at international level. India joined the GLOBE in August 2000 which aims to unite student, teachers and scientists all over the world and the target is school children.

## **Policy Issues & Concluding Remarks:**

Environmental degradation and natural calamity are intricately connected to each other. This is expected to be the priority areas of researches, planners and policy makers. Protection of environment is one of the major components of sustainable development and that can contribute preventing natural disasters. Both at macro & micro level policies can be framed in such a manner that the value of preventive measures can be understood properly. Development of local model is one of the significant components of assessing the impact of environmental degradation. In assessing such impact; disaster disaggregated data is required. This is because human vulnerability is unequal and varies across community, class & region. For instance poor people are more vulnerable to risk of the disaster. The community response to risk and disaster is also diverse. The impact of disaster and the process of recovery can have an impact at national & international level. There are mechanisms and different coping strategies to deal with disaster risk. Prevention and mitigation can be followed in different ways as per the situation. There are instances where there can be complete prevention of disaster for instance landslide, forest fire etc. At the same time there are disasters that cannot be eliminated completely. In such situation context specific initiatives can be taken to control the negative impact if not complete elimination. There should be clear cut rules & policies to protect the environment & it should be enforceable as well. It has been experienced that the loss from pollution is more than the gain from industrialization. Post industrialization period has paved the way of uncontrolled economic development causing threat to the environment. Pollution at different levels has been the reason for increased health related and other problems. The quality of the land has degraded to a large extent which has added on to the problems of the farmers. Hence the lopsided growth that is only oriented towards economic development, can finally end up in bringing more loss to the environment as well as to the socio-economic structure, i.e. dependent on natural resources.



Cultural practices are important part of Indian society across states & religion. For instance most of the commonly celebrated occasions like Holi, Diwali, Ganesh Chaturthi, Navratri , Kite Flying , Wedding, New Year, Christmas, Eid and many such celebrations directly and indirectly add to the environment pollution. Hence Pollution Department or the other concerned departments can look into the matter with some suggestive measures notwithstanding the religious & cultural sentiments to minimize the pollution. In addition to awareness generation among the public, various academic institutes should encourage students to use more bicycles than vehicles run by petrol or diesel. The institutes having more cyclists should be given some incentives that can help the students realising the importance of sustaining the environment at a young age. In the era of globalization luxurious items are easily available driven by the market forces. The lists of such products are endless, starting from modern household accessories, luxury cars, fancy cell phones, air conditioners and many more. Often people have the tendency of over using such products more than their requirement. Some form of environmental laws for instance could be in the form of carbon-tax can be enforced by the government on citizens who emit excess carbon from their luxurious lifestyle.

The contemporary disaster risks are diverse and may not be controlled by one agency. There can be collaborative efforts to control the situation. Different stake holders like government departments related to ministry of forest and environment, NGOs, CBOs, researchers, donor agencies & planners can join hands together to prevent negative impact of the disasters. At the same time there can be integration with multiple sectors like department of disaster management, forest & environment, health & agriculture etc. Such integrated approaches contribute in controlling the situation in a better manner. Integration with different stake holders and sectors can help in developing new knowledge base and mechanisms An integrated Natural



Resource Management policy with an objective of conservation and resource enhancement, with preservation and pollution abatement should be paid attention by policy makers (Bhat, 2010). Resources generated through over exploitation of environment are most likely to be unstable. Industrialisation & big projects are considered to be the main reason for economic progress. This assumption has created many consequences. Large scale migration is taking place across states and countries. The notion of private property and private enterprises are questioned by the environmental movement. The issues concerning large projects and economic are getting more complex. The environmental situation in India is getting affected by number of factors. At one point of time economic development can address the challenge of poverty by giving instant benefits to the people. Job opportunities and other issues related to it can be widened. There has been discussion whether the future development of developing countries can be reconciled notwithstanding the contradiction of environment debates.

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