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**ECOLOGICAL IMBALANCES CAUSES AND CONSEQUENCES****Dr. Ramamohana Reddy Appannagari****Environmental Ecologist, CHEMTEX Environmental & Industrial Hygiene Services,  
Laboratory, Port Arthur, Texas, USA.****ABSTRACT**

**N**atural and environmental resources are the basis of all economic activities. Soil, forests, mines, water, air and other natural resources are productive assets of an economy. In fact, productivity of an economic system depends to a large extent on the supply and quality of its natural resources. Poor quality of water and air adversely affects the health of population, causing reduced labour productivity and premature mortality. Similarly, soil degradation and erosion leads to reduced and inferior quality agricultural output. In this paper an attempt is made to understand the relationship between man-resource- environment, to study the particular causes and consequences of eco-imbalance and to analyze the knowledge and awareness of



respondents on various facets of eco-imbalance. For the purpose of the present study a sample has been drawn from the second year degree college students who are studying science and civilization as common paper in Ananthapuramu district of Andhra Pradesh. The sample size is 120 students. Care was taken to cover government as well as private college students and also both male and female students.

**KEYWORDS:** Natural and environmental resources , economic activities , health of population.

**INTRODUCTION :**  
In fact environment is an

inseparable whole and is constituted by the interacting systems of physical and biological elements which are interlinked individually as well as collectively in myriad ways. Physical elements (space, landforms, water bodies, climate, soils, rocks and minerals) determine the variable character of the human habitat, its opportunities as well as limitation. Biological elements (plants, animals, micro-organism and mass) constitute the biosphere. Since the environment is both physical and biological concept, it encompasses both the non-living (abiotic) and living (biotic)

components of the planet earth. Thus on the basis of basic structure the environment may be divided into two basic types e.g. physical or abiotic environment and biotic environment. On the basis of physical characteristics and state, abiotic or physical environment is subdivided into three broad categories viz. (i) solid, (ii) liquid and (iii) gas, which represents the lithosphere (solid earth), the hydrosphere (water component) and the atmosphere respectively. Thus the three basic divisions of physical environment may be termed as (i) lithospheric environment (ii) hydropheric environment and (iii) atmospheric environment. The biotic component of the environment consists of plants and animals including man as an important factor. Thus the biotic environment may be

divided into plants environment and animals environment. All the organisms work to form their social groups and organizations at several levels and thus is formed social environment wherein the organisms work to derive matter from the physical environment for their sustenance and development.

Environment consists of three basic components, viz., (i) abiotic or physical component (ii) biotic components and (iii) energy component. Physical or biotic component consists of lithospheric components, hydrospheric component and atmospheric component. While biotic component comprises plant component, animal (including man) component and micro organism component. Energy component includes solar energy and geothermal energy.

Ecological approach to the study of man-environment relationship is based on the basic principle of ecology which is the study of mutual interactions between organism and physical environment on the one hand and interactions among the organisms on the other hand in a given ecosystem. Thus, man is considered as an integral part of nature/environment and there should be harmony and not hostility between man and environment.

Ecology, in a very simple term, is a science that studies the interdependent, mutually reactive and interconnected relationships between the organisms and their physical environment on the one hand and among the organism on the other hand. Ecology is defined as the science of the correlation between all organism living together in one and the same locality and their adaptations to their surroundings. The scope of ecology and its aims have expanded enormously with development of ecological concepts and thoughts consequent upon growing interests in man-environment relationship due to increasing pressure on natural/ecological resources to sustain and enhance economic development in view of ever-increasing human population. Ecology lays more emphasis on the study of unity and balance of environment or biospheric ecosystem. Thus, the scope of ecology has been extended from the scientific study of mutual relationships of biotic and abiotic components of the whole biosphere or part thereof to the environment problem in terms of environmental degradation and ecological crisis arising out of increased human impacts on natural/ecological resources through advanced modern technologies aimed at accelerated rate of economic development to meet the demands of ever-increasing population at global and regional levels.

In a more simple term an ecosystem may be defined as a fundamental functional unit occupying special dimension of "earth-space ship" characterised by total assemblage of biotic community and biotic components and their mutual interactions within a given time unit. There are three major components of ecosystems-energy component. The functioning of an ecosystem depends on the pattern of energy flow because all aspects of living components of an ecosystem depend on energy flow which also helps in the distribution and circulation of organic and inorganic matter within the ecosystem.

The stability of ecosystem refers to balance between production and consumption of each element in the ecosystem. In other words, ecosystem stability means balance between input and output of energy and normal functioning of different bio-geo-chemical cycles and stable conditions of concentration of all elements. Ecosystem instability refers to that state when an ecosystem is unable to adjust with environmental changes. This so happens when the changes are conscious and enormous and these changes were exceeds the resilience or capacity of the ecosystem. For example rapid rate of mass felling of trees in a forest ecosystem seldom allows regeneration of forest community because exposed surface due to deforestation is subjected to intense weathering and erosion and nutrients are washed out by surface run-off.

### OBJECTIVES OF THE STUDY

- 1.To understand the relationship between man-resource- environment
- 2.To study the particular causes and consequences of eco-imbalance.
- 3.To analyze the knowledge and awareness of respondents on various facets of eco-imbalance.

### Sampling

For the purpose of the present study a sample has been drawn from the second year degree college students who are studying science and civilization as common paper in Ananthapuramu district of Andhra

Pradesh. The sample size is 120 students. Care was taken to cover government as well as private college students and also both male and female students.

### Causes for Eco-Imbalance

The main reason for imbalance in ecosystem of the world is man's dominance in the global ecosystem and his thoughtless alternation of it to satisfy his need and greed. Some specific causes for eco-imbalance are as follows:

#### Changing Hydrology

Irrigation is a major consumer of water in many countries. When river water is used for irrigation by constructing canals, the rate of water flow in the river is reduced and the quality of water down-stream may decline. Building large dams for irrigation and power generation changes the ecosystem of the area impounded for the reservoir. In the impoundment area, a large number of trees may be felled, fertile land may be submerged under water and a large human population may be displaced. In addition, irrigation increases the water vapour contents of the surrounding air, alters the surface run-off characteristics of the land and sometimes, increases the concentration of pesticides in the underlying ground water.

#### Large-Scale Use of Fertilizers

Plants rarely use more than 50-60 percent of the nitrogen chemical fertilizers. The residual nitrogen in the form of nitrate is likely to pollute ground and surface waters, causing over-enrichment of nutrients and algal blooms in rivers and lakes. Some of the extra nitrates may also be converted into nitrogen oxides by the action of certain soil bacteria. In order to reduce the adverse ecological impact of the large-scale use of fertilizers, researches are being conducted currently to determine the extent of fertilizer use and minimize environmental pollution, while maximizing food production.

#### Large-Scale Use of Pesticides

Pesticides are the chemicals used to eradicate pests. Pesticides are classified as insecticides, rodenticides, fungicides, nematicides, herbicides and so on. However, none of these chemicals are so specific as to kill only the target species. As a result, they pose hazards also to other organisms including man.

#### Changes in Earth's Surface

The atmosphere and the ecosystem can be affected both by human activities and natural changes in the physical and biological properties of the earth's surface. Modifications (including deforestations and swamp drainage) that reduce evaporation from an area and alter the amount of energy available for evaporation, thereby changing the energy balance at the earth's surface.

#### Acid Rain

In common language, "acid rain" means the presence of good amount of acids in rain water. Acid rain is one of the major effects of air pollution. Large amounts of sulphur dioxide and oxides of nitrogen are released into the atmosphere through the burning of fossil fuels (oil and coal) and fuel wood. These oxides (SO<sub>x</sub> and NO<sub>x</sub>) react with the atmospheric water vapour to produce sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) and nitric acid (HNO<sub>3</sub>), which then return to the earth's surface with rain water. Acid rain poses a major threat to ecological balance with potential for both macro and microbiological effects on plants and animals. Acid rain not only affects crops, forests and aquatic ecosystems adversely, but it also leches exposed rocks, there by damaging ancient monuments such as the Taj Mahal. Since many famous structures have been constructed from soft rocks, acid rain has already damaged many ancient monuments of great historical value.

#### Green-House Effect

The atmosphere of the earth is said to act like a "green-house" and carbon dioxide is one of the major

components of the atmosphere which stimulates the "green-house effect". The green-house becomes warm because glass is transparent to visible light but practically opaque to infrared radiation. As a result, the sunlight can pass through the glass walls of the green-house and can get absorbed by the soil inside it. It is then reemitted as heat rays (infrared radiation), which cannot pass through the glass walls. As a result, the temperature inside the green-house rises above the ambient temperature.

The rising proportion of carbon dioxide is causing great concern because the green-house effect will result in higher average temperature on the surface of the earth (the so-called "global warming"). If this happens, there will be wide-spread climatic change with possibly disastrous consequences. The rising temperature could melt the polar ice caps, submerging much of low-lying land mass and many coastal cities (like London, New York, Mumbai, Kolkata and Chennai) under sea water. Similarly, fertile land may be turned into desert and agricultural production may fall drastically due to global warming.

### **Forest Fires**

Fire is still employed to help man hunt wild animals, clear forests and obtain charcoal for fuel. Repeated forest fires, combined with overgrazing, can seriously degrade the environment and harm the ecosystem.

### **Overgrazing**

Environmental degradation and ecological damage arising from overgrazing are wide-spread in arid and semi-arid regions of the Near-Eastern countries, Central Asia and the Mediterranean basin for many years. One important consequence of overgrazing is desertification (i.e., a process of reduction or elimination of the productive capacity of land that leads ultimately to desert-like formation). About 95% of the land in the arid and semi-arid regions of the world is in the processes of desertification.

### **Clearance of Forests**

Forest represents at least 6 billion hectares for natural vegetation and several billion hectares more could easily support woody vegetation. It has been estimated that, by the mid-twentieth century, mankind reduced the world's original forest area by at least 33%. Man has converted forests to grasslands and croplands. In addition to the clearance of forests for agriculture and animal husbandry, the forests are being destroyed for timber and fuel-wood.

### **Plant and Animal Breeding**

Sometimes plants have been introduced in new habitats which have brought nutritional value to the diets of millions of people. Similarly, animals beneficial to mankind have been added. Unfortunately, many introductions of new plant and animal species have been without adequate forethought and without the collection of ecological data on the probable impact on native plants and animals. For example, the house sparrow, which was introduced in North America, soon became a serious crop pest. In Australia, the introduction of European carp now seriously threatens the environment of native fish species in island waters, mainly because it increases the turbidity of water, which reduces the productivity of aquatic plants. The best known case in Australia is the introduction of rabbits from Europe. The rabbits have multiplied rapidly since they have no natural enemies in Australia, and have caused extensive damage to the native flora and fauna.

### **Loss of Genetic Resources**

Since the 1970's, great concern has been expressed over the survival of thousands of plant and animal species. Hunting of animals for food or sport has taken its toll on a number of species, and so too the excessive plant collection for medicinal or other purposes. According to a study by the International Union for Conservation of Nature and Natural Resources, about 1,000 species of birds and mammals are currently threatened with extinction. Destruction of habitats is one of the major reasons for the loss of species. Such a loss causes eco-imbalance.

### **Mining Activities**

Mineral extraction and processing has a wide range of ecological impacts on land, atmosphere, water and socio-economic environment of local people. Direct effects of mining on the landscape such as surface disturbances and generation of wastes tend to be roughly proportional to the quantity of minerals extracted. Reclamation of land disturbed by mining activities is an important factor in reducing the environmental damage caused by mining wastes. If surface mining is extended more and more to areas with fragile ecosystems, the rehabilitation of land after mining becomes a severe problem. Progress in rehabilitation is expensive and slow in areas where soil cover is thin, the over-burden is high in acidity or salinity and rainfall is sparse. Air pollution generated from mining and ore processing activities creates serious environmental and health problems.

### **Industrialization**

Industrialization is necessary to provide the basic necessities and comforts of life to our growing population. However, improperly planned industrialization has created serious problems of environmental pollution and ecological imbalance all over the world.

### **Urbanization**

Unplanned urbanization gives rise to many socio-economic, environmental and health problems. For example, slum settlements arise as part and parcels of a city and are essentially the result of acute shortage of housing in cities and towns. People not able to find a dwelling tend to occupy any vacant land outside and inside the city, where they build a dwelling with any available material. This is done in a haphazard manner with no civic facilities of water supply, drainage, roads, transport and other amenities. A slum settlement becomes a burden not merely due to the poor quality of structures, but also on account of the environment of insanitation that leads to several social evils. Slum expansion leads to destruction of natural ecosystems surrounding the towns and cities.

### **Impact of Eco-imbalance**

Some important impacts of polluted environment and imbalanced ecosystems are as follows:

#### **Effects on Human Health**

Polluted air, water and land generate many harmful chemical and biological agents that have a negative impact on human health. A wide range of communicable diseases can be spread through the elements of environment polluted by human and animal waste products. This is clearly evidenced by the plagues of the Middle Ages, when the disease spread through rats that were fed on contaminated human waste. Although major diseases transmitted via the environment have been almost eliminated in developed countries through immunization and sanitation programmes, no country is totally immune from outbreaks of environmentally transmitted diseases, as the outbreak of SARS (Severe Acute Respiratory Syndrome) in 2003 in many countries clearly proved.

#### **Soil Degradation**

The protection of soil against the hazards of degradation is essential if the productivity of soil has to be sustained. Soil degradation has many causes, but the immediate concerns are improper land use, soil erosion, acidification, salinisation, water-logging and chemical degradation. Soil erosion is the washing or blowing away of the surface soil. Erosion may take place under natural conditions, but it is greatly increased when human activities cause disappearance of the protective cover of natural vegetation. Acidification and salinisation directly reduce soil fertility. They may be caused by acid rain and accumulation of water soluble salts in the soil. Chemical degradation of soil may occur if the nutrients in the soil are leached out or harmful chemicals like DDT and radioactive substances. Soil erosion is a global problem,

### Desertification

The term "desert" encompasses a wide range of environmental complexes:

- (1) Rainless deserts, where rainfall is not an annually recurring event.
- (2) Run-off deserts, where the annual rainfall is low (less than 100 mm) and variable.
- (3) Rainfall deserts, where the rainfall is insufficient for crop production (100-200 mm).
- (4) Man-made deserts, parts of the semi-arid areas (rainfall 200-350 mm) that have been transformed into deserts due to man's over-exploitation of the land.

Desertification results from the combined effect of two factors; severe recurrent droughts and human over-exploitation of drylands. The cures for desertification have been known for a long time. They consist of the reverse processes, i.e., biological recovery of environmental conditions, naturally or artificially induced. Considerable experience in combating desertification has been acquired by the US, Australia and Israel but corrective measures are expensive though net benefits would certainly exceed the costs.

### Genetic Resource Depletion

The genetic material contained in the domesticated varieties of crop plants, trees, livestock, aquatic animals and microorganisms is essential for the breeding programmes in which continued improvements in yields, nutritional quality, flavour, durability, pest and disease resistance, responsiveness to different soils and many other qualities are achieved. Because of intensive selection for high performance and uniformity, the genetic base of much food production in modern times has grown dangerously narrow.

### Contamination of Food

Chemical contaminants reach food and livestock feed from many sources. Pesticides used in farming often find their way into crops. In addition, veterinary drugs and animal growth promoting chemicals may pass into meat and dairy products like milk and butter. Some food preservatives like sodium nitrite, chemicals and materials contained in food packaging may also enter the packaged food. Crops may be chemically contaminated by the airborne deposition of industrial emissions or by industrial effluents. The current trend to centralize food processing, handling and distribution of food and the greater reliance on large storage facilities may aggravate some of the above problems.

### Depletion of the Stratospheric Ozone Layer

Following the predictions in 1974 that chlorofluorocarbons as well as some other gases (methane, ammonia and nitrous oxide), diffused to the stratosphere, would lead to the depletion of the protective ozone layer, a group of experts prepared a World Plan of Action on the Ozone Layer. Under this Plan, a Co-ordinating Committee on the Ozone Layer was established, which subsequently produced assessments of the ozone layer and its impacts.

### Global Warming

Although carbon dioxide is almost completely transparent to visible light, it strongly absorbs and reradiates the infrared radiation (heat rays). Thus carbon dioxide acts like the glass of a green-house and, on a global scale, tends to warm the air in the lower levels of the atmosphere. This phenomenon is known as the "green-house effect". In addition to carbon dioxide, water vapour and ozone also absorb the infrared radiation emitted by the surface of the earth and help keep the earth warm. There is enough evidence to show that the temperature of the entire earth has risen during the recent decades. For example, glaciers in both hemispheres are receding. There occurred an increase in the mean annual air temperature of about 0.5°C during 1885-1940. The highest increase in the annual mean temperature occurred in the Northern Hemisphere between 40°N and 70°N latitudes, where the average rise in temperature was 0.9°C and astonishing increase in the average winter temperature of 1.6°C.



**RESULTS AND DISCUSSION**

The major causes of environmental pollution are industrialization, urban-ization and motorization. In many countries a large number of industries have been set up inside or near large cities. The stack emissions from these industries pollute the air that man breathes. The industrial effluents pollute the streams, rivers and oceans.

A consequence of industrialization, especially in developing countries, is the large-scale migration of rural population to the industrial centres in large cities, leading to their overpopulation. This results in congestion within the city, creating slum conditions, infections and water and sewage problems. The neo-rich people leave the city and move to suburbs. In the process, they fell trees, drive away wild animals from their natural habitat or kill them, drain pond and other natural water reservoirs and clear forests for constructing residential complexes. The consequence of these is interference with the ecosystem and degradation of environmental quality. Table 1 presents the respondent’s knowledge on major agents of eco- imbalance.

**Table 1**  
**Respondent’s Knowledge on Major Agents of Eco- Imbalance**  
**(Multiple Responses)**

S. No	Agents of Pollution	No. of Respondents	Frequency
1	Industrialization	114	95.00
2	Urbanization	46	38.33
3	Motorization	69	57.50
4	Deforestation	71	59.17
5	Can’t Say	2	1.67
<b>Total</b>		<b>302</b>	<b>251.67</b>

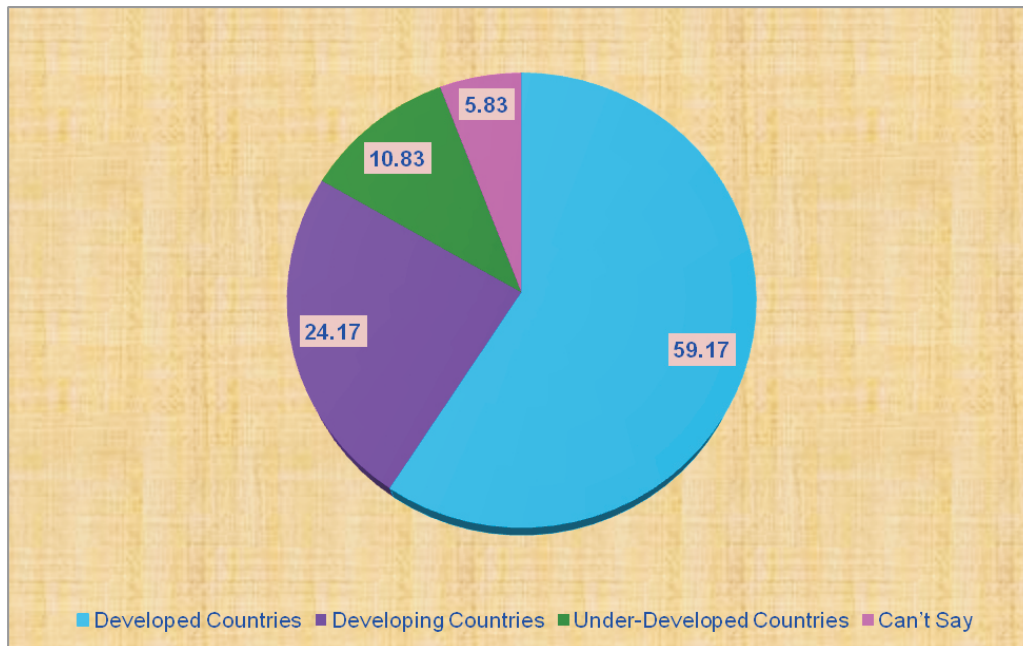
Source: Field Data

It is evident from table 1 that as per the knowledge of sample respondents’ industrialization (95 per cent) is the major cause of eco-imbalance. Around 59.17 per cent of respondents declared that deforestation is the second major cause for eco-imbalance. Motorization (57.50 per cent) is considered as the third cause for eco-imbalance in the world. Around 38.33 per cent sample stated that urbanization is also one of the cause for eco-imbalance. On the other hand 1.67 per cent of respondents have no idea.

**RESPONSIBLE COUNTRIES**

It is considered that the world is being polluted as the rich or developed countries emit 80 per cent of poisonous gases into the environment from their factories, cars etc., consume more resources than required and generate more waste. It is to be noted that it is not the poor who cause environment to suffer most but the rich and their affluence. Figure 1 shows the views of sample respondents on the major cause for pollution.

**Figure 1**  
**Respondent’s Views on Responsible Countries for Eco- Imbalance**



It is clear from figure 1 that a preponderant majority i.e. 59.17 per cent of sample students declared that the developed countries are responsible for ecological imbalance in the world. As per the opinion of 24.17 per cent of sample respondents developing countries with their endeavours for fast economic growth were resulting for ecological imbalance. The people with scarcity of livelihood resources in under-developed resources causing for deforestation and water contamination also responsible for ecological imbalances as reported by 10.83 per cent of sample. The remaining 5.83 per cent of respondents were unable to respond.

**Awareness on Green House Gases**

The most important greenhouse gases are Carbon Dioxide, Methane, Nitrous Oxide and Water Vapor. While all these gases occur naturally in the atmosphere, emissions from human sources have caused their levels to rise to a point that is no longer sustainable. Table 2 gives the details of awareness of sample students on green house gases.

**Table 2**  
**Respondents Awareness on Green House Gases**

S. No	Type of Countries	No. of Respondents	Frequency
1	Carbon Dioxide	27	22.50
2	Methane	3	2.50
3	Nitrous Oxide	2	1.67
4	Water Vapour	5	4.17
5	Sulphur dioxide	8	6.67
6	calcium carbonate	5	4.17
7	First four	65	54.17
8	All the above	5	4.17
<b>Total</b>		<b>120</b>	<b>100.00</b>

Source: Field Data

According to table 2 that only 54.17 per cent of sample respondents were aware of the four important green house gases. Around 22.50 per cent considered that only Carbon Dioxide is the important green house gas. Around 6.67 per cent of sample declares Sulphur dioxide is the only green house gas. Water vapour is the only green house as stated by 4.17 per cent of sample. Methane and Nitrous Oxide is the green house gases as per 2.50 per cent and 1.67 per cent of total sample.

## CONCLUSION

If action isn't taken immediately worldwide to reduce carbon emissions, the consequences could be catastrophic. It is about humanity. It's about the right to protection against deliberate and careless destruction of human homelands, property, and livelihoods. It's about the right to observe one's native culture. It's about the basic human right to physical integrity. All these rights will cease to exist once the human race becomes extinct due to a global cataclysm brought about by climate change. In other words, global warming is a human rights issue.

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