

## **Consequences of Environmental Pollution on Biodiversity**

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### **Abstract**

*Broadly, environment refers to all physical conditions that surround all living beings. At present our environment is so polluted that it leads to undesirable conditions for all life forms. Industrialization, urbanization, transport, synthetic fertilizers and many other factors are responsible for this condition. Biodiversity greatly affected by environmental pollution. Now, many species of animals, plants, and microorganisms are endangered due to deteriorated habitat. The present study is a brief overview about various forms of pollution and their consequences on biodiversity.*

**Keywords:** *environment, pollution, biodiversity, endangered species, climate change.*

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### **I. Introduction**

In past decades air, water and land were pure, undisturbed, uncontaminated and most hospitable for sustenance of life on earth. There was a perfect balance between living beings and their environment. But today, the situation has severely deteriorated. Industrialization, urbanization, technological advances, transportation etc. are the basic cause of such disturbances. All these practices are categorized as environmental pollution. All these contribute to depletion of valuable natural resources, degradation of forests, grasslands etc. and above all ecological crises. Polluted environment is the major cause for reduction in biodiversity<sup>1</sup>. To sustain life on earth and to preserve the species that are endangered, all the nations and different organizations must come forward and take strict measures.

### **II. Environmental pollution**

Whenever we encounter the term pollution, we mean environmental pollution, though it has many other meanings also. Environmental Pollution may be described as the unfavorable alteration of our surroundings or introduction of any undesirable material into natural surroundings. Pollution takes place through the changes in energy patterns, radiation level, chemical and physical constitutions and abundance of organisms. It includes the release of material into atmosphere which makes the air unsuitable for breathing harm the quality of water and soil and damage the health of human beings, plants, and animals  
The main components of the environment include the land, air and water. Many factors are responsible for their pollution.

#### **Land Pollution:**

Land pollution is caused due to industrial dumping, mining, construction, use of synthetic fertilizer, oil spills, paper and pulp industries, plastic etc.<sup>2</sup>

Modern agricultural practices have been heavily involved in polluting soil through the non-judicious use of chemical fertilizers, herbicides, insecticides and fumigants. Most of these are stable chemicals and remain in the soil for long periods without degradation and have cumulative effect<sup>3</sup>. Nitrogen fixation by microorganisms in soil is severely affected due to non-judicial use of these synthetic chemicals. Such practices reduce the fertility of soil and also affect the life of living beings who depend on it.

#### **Air Pollution:**

Our atmosphere has many layers. Troposphere is the lowest one. Air pollution mainly occurs in this layer<sup>4</sup>. Urban areas of many developed nations are drastically impacted by air pollution. The reason behind this is that pollutants can stay in the environment for decades<sup>5,6</sup>.

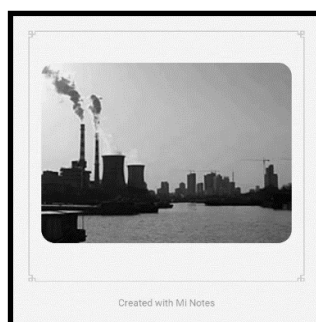
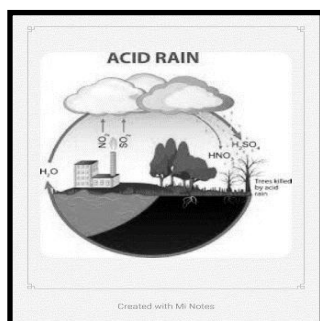
Main causes of air pollution are the discharge particles from vehicles, factories, thermal power stations and domestic fires etc. Major pollutants are Carbon dioxide, smoke, Sulphur dioxide, oxides of nitrogen, lead compounds etc.

*Carbon dioxide* does not harm in its natural ratio in the atmosphere, but it goes on increasing due to increased transportation that involve fossil fuel combustion, deforestation and biomass burning. Over the years, a large amount of gaseous and particulate matter has accumulated in the atmosphere of earth and these prevent the outgoing radiation from escaping. The blanket effect termed as "greenhouse effect" has resulted in an

increase in temperature throughout the world and is known as "global warming". That in turn results in the rise of sea level due to melting of ice caps. Floods near coastal areas and climate change are severe consequences of global warming.

"Smoke" is mainly a suspension of carbon particles in the air. Smog or fog is the result of the combination of smoke with water vapors which aggravate the problems of asthma and other lung diseases.

*Sulphur dioxide* percentage also increases in atmosphere which is the result of human combustion activities. It causes serious health issues as lung disease, cancer, heart problems in human being<sup>7,8</sup>. The gas reacts with water to form dilute solution of sulphuric acid, the main cause of "acid rain". Life of both terrestrial and aquatic animals affected by acid rain as it poisonous for them.



*Sources of environmental pollution (courtesy google pic.)*

"Oxides of Nitrogen" also go high as a result of all anthropogenic activities involving combustion from industrial and automobile engines. In damp conditions these gasses react with water to form a dilute solution of nitric acid which can also be a cause of "acid rain". They sometimes cause eye irritation in humans.

"Lead Compounds" are mainly released to air from motor vehicles. These are poisonous to plants and in higher concentration are also harmful to animals.

### **Water Pollution:**

Pollution of rivers, streams, ponds, lakes and groundwater mainly caused by the discharge of industrial waste material and untreated sewage<sup>9</sup>.

"Industrial Waste Material" comes mainly from factories. These are harmful to aquatic animals and plants. Example, Cyanide, compounds of Mercury, Copper and Lead<sup>10</sup>. These persistent poisons accumulate in the bodies of aquatic animals, such as fish and the animals which feed on them such as water birds.

"Untreated Sewage" is sometimes released directly to water bodies or soil. Such sewage may contain human pathogens, which ultimately affect aquatic plants and animals and cause eutrophication.

"Agricultural Waste" material may drain into water bodies if fertilizers, insecticides or pesticide are used in large amounts. They can kill aquatic animals.

"Sea Water Pollution" is a result of oil drilling at seabed and also due to dumping large amounts of industrial, electronic waste, toxic chemicals, sewage, plastic items etc. Oil causes death of sea birds, and plants on the seashore.

Another type of pollution is "radioactive pollution" which is due to the increase in natural background radiation emerging from activities of man involving the use of naturally occurring or artificially produced radioactive materials. This causes cancer to human beings.

Along with all of the above, other major sources of pollution are *noise* and *plastic pollution*, which create various problems.

### **III. Biodiversity And Pollution**

#### **Biodiversity**

Biodiversity or biological diversity is a term coined to describe the immense variations in the species, both plant and animals, that co-exist in nature and their living environment. It includes genetic, species and ecosystem diversity. Genetic diversity is genetic variation within species. Species diversity is represented by morphological, physiological and genetic features, whereas ecosystem diversity shows variation in the habitat where different species live<sup>10</sup>.

*Biological diversity plays a significant role in nature. An eco-rich biodiversity represents a healthy and sustainable habitat. In ecology, biodiversity plays a significant role as it enriches soil, maintains water and climate cycles, humidity and precipitation and helps in recycling and converting waste material into nutrients*<sup>12</sup>.

#### **Loss of biodiversity due to pollution**

During the past few centuries, with the increase in environmental pollution, biodiversity has come under tremendous pressure<sup>12</sup>. Biological extinction which led to the disappearance of one species in several hundred years has now been replaced by an accelerated rate of extinction-one species every year.

Contemporary losses of species are reorganized to result from physical stressors, i.e., habitat loss, harvesting etc. biological stressors i.e., exotic organism introductions, and chemical stressors i.e., change in biological cycles, pollution. The World Conservation Union, IUCN, maintains a Red List of endangered species of plants and animals around the world, where species are categorized as extinct, critically endangered, endangered, vulnerable or near threatened. As of 2007, 41415 species appear on the IUCN Red List and 16306 are threatened with extinction.

Presently humans are recognized to have the ability to alter global and regional environment and ecosystem via air, water and soil pollution. As a result, the impact of pollution on biological diversity is a contemporary concern of major dimension.

Air Pollution due to increase in CO<sub>2</sub> quantity in atmosphere may cause adverse effects on plant and animal populations. It also causes climate change which in turn reduces biological diversity. Warmer global climate as a result of air pollution, have a profound effect on ecosystems as they are very sensitive to climate change. Alteration of ecosystem could lead to a change in species diversity including a loss of species

Montane species, unless they can migrate to higher elevation, may face extinction. A study of 3°C warming in Great Basin National Park in Eastern Nevada concluded that it would cause 20%-50% species in individual mountain ranges to go extinct. Pounds et al (1999)<sup>13</sup> provided evidence that alteration in the highland forests at Monterda, Costa Rica, have occurred due to increase in air temperature.

Forest ecosystems are complex long-lived systems but that can suddenly be threatened by weather related stresses due to air pollution as flowering seed dispersal processes could be disrupted<sup>14</sup>.

Coastal zone ecosystems are very productive, very rich in species, but they are at high risk due to global warming, as due to this water column temp, and its quality changes. An increase of 1-2°C for the surface waters of tropical oceans could have important implications for coral reef ecosystems. Sea level rise as a result of global warming will increase salinity intrusion into coastal freshwater aquifers<sup>15</sup>.

Nitrogen Oxides are extremely important pollutants and have substantial potential significance for biological diversity. Nitrogen oxides present risk to biota directly in the form of acid rain and nitrogen saturation<sup>16</sup>. Aquatic resources acidified from the input of acid rain. The adverse response of aquatic biota to acidification is very well documented. Sensitive species may be stressed or lost at small increases in acidity.

Acid sensitive phytoplankton, Zooplankton and benthic macro-vertebrate species may also be lost.

The adverse impact of acid deposition on forest ecosystems is focused on the montane forests of North America also noticed.

Nitrogen Oxide increases the quantity of ozone in the atmosphere as in presence of sunlight nitrogen oxide is dissociated and forms an equal number of nitric oxide molecules and oxygen atoms which combine with oxygen gas to form ozone. High concentration of ozone is toxic to vegetation. California provides numerous examples of ozone stress on wildlife ecosystems.

Sulphur dioxide quantity is also raised in the environment causing pollution and reduced biodiversity in local surroundings. In North America, mining, and smelting operations release excessive Sulphur dioxide due to which all trees and shrubs were destroyed.

Organochlorine compounds such as polychlorinated biphenyls and organochlorine pesticides are important trace pollutants that persist in the environment. These pollutants bio magnify in food water and have resulted in acute ecotoxicological effects in aquatic and terrestrial organisms. These trace organic pollutants also penetrate soil particles.

Industrial discharge in water sources like rivers, ponds, and sea put a great threat to the ecosystem. Many hazardous heavy metals, phosphates, sulphates accumulate in animal tissue and cause many health effects and even threaten to become endangered.

#### **IV. Conclusions**

The atmosphere is highly structured and has no vertical partition. As a result, the injection of chemically persistent toxins anywhere in the world means they may begin a journey of global circulation and eventual deposition. Accumulation of these toxins via environmental media or food web exposure can place certain species at risk or loss from the receiving environment. Pollutants of global importance and ability of humans to alter fundamental biogeochemical cycles must be recognized as important mechanisms for the loss of biodiversity. Efforts to monitor the trends of both pollutants and major chemicals along with species risk must be made a high priority for environment management. So, the challenge for the world is to protect the natural biodiversity, exist from local to global level. This can be done by taking effective measures to reduce pollution, restoring and protecting our natural resources, conserving endangered species of both plants and animals and their ecosystem. All these actions should be taken at highest priority, otherwise future generations will live in a biologically improvised world.

#### **References**

- [1]. I.R.S.Ambasht,P.K.Ambasht(1992),Students & Friendss Co.,2<sup>nd</sup> Edition,Varanasi,Page-7.
- [2]. J.C.Mehta(1997), New Asion Publisher.pp158-160.
- [3]. S.L.Kayastha & V.K.Kumra,(1981) National Geographer Vol.XVI,No.1 pp.21-28.
- [4]. J.H.Seinfeld,(1986), New York, John Wiley.
- [5]. G.Mitchell et.al.(2000),Science Total Environ.,246,pp 153-163.
- [6]. E.Puliafito et.al.,(2003)Environ. Pollut.122, pp 105-117
- [7]. M.N. Rao & H.V.N. Rao (1989), Tata McGraw-Hill Publishing Co., New Delhi.
- [8]. J.B.Mudd & T.T.Kozlowski (1975), Academic Press, New York, pp13-22.
- [9]. P.K.Goel,(2006), books.google.com.
- [10]. A.Peters et.al.(2000),Epidemiology,11,pp 11-17.
- [11]. United Nations Environment Program, Global Biodiversity Assessment 3, Nairobi, UNEP, (2000).
- [12]. Hooper et.al. (2005), Ecological Monographs ,75(1),2-35.
- [13]. J.A.Pounds et.al.,(1999), Nature., nature.com.
- [14]. Walker et al., (1999), Ecosystems ,2,95-113.
- [15]. 15.J. A. Church and N.J. White, (2011), sea level rise from the late 19th to early 21st century, Surveys in Geophysics,32(4),585-602.
- [16]. Nirmal Kumar, Ecology and Pollution of Indian lakes and reservoirs, Ashish Pub. House New Delhi (1993) pp 207-224.