

Environment and Sustainable Development



**Paper: Human Rights, Gender And Environment**

**Lesson: Environment and Sustainable Development**

**Author Name: Dr. Govind Singh**

**College/ Department: Indraprastha College for Women/**

**Department of Environmental Studies**



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## 1.1 Introduction

The term *Environment* is thought to be derived from the French word *environ* which means surroundings. Everything around us constitutes our environment. The National Environmental Policy (NEP) of India provides a comprehensive and politically appropriate definition of the word *Environment*. According to the NEP, *Environment comprises all entities, natural or man-made, external to oneself, and their inter-relationships, which provide value, now or perhaps in the future, to humankind* (MoEF, 2006).

It is clear from the aforementioned definition that everything outside of each one of us is *our common environment*. Environment is made up of two prominent factors. These are living or **biotic factors** and non-living or **abiotic factors**. The biotic factors include plants, birds, animals, microbes etc. while the abiotic factors include air, water, metals, built environment, etc. There are constant interactions taking place between 1) the biotic and abiotic factors, 2) within the biotic factors and 3) within the abiotic factors at all times.

The study of interactions between the biotic and abiotic factors of the environment is termed as *Ecology*. At the same time, the study of interactions within the biotic and abiotic factors requires multidisciplinary inputs from almost every other subject. Consequently, the study of our Environment is interdisciplinary in nature and requires transdisciplinary contributions from all other academic disciplines.

Rapid industrialization and high rate of population growth in the last 200 years has led to large-scaled environmental degradation. As a result, natural resources are rapidly depleting and environmental pollution has become one of the most important challenges being faced by the world today. Ensuring *Environmental sustainability* was chosen as one of the eight Millennium Development Goals (MDGs) as part of the Declaration of the United Nations' Millennium Summit in 2000.

Prior to this, one of the first global meets that took place to address the concerns of environmental protection was the United Nations Conference on the Human Environment (UNCHE). The UNCHE took place in Stockholm (Sweden) in June, 1972 and the day on which it began (5<sup>th</sup> June) is now celebrated as the World Environment Day.

The World Environment Day is celebrated each year on 5<sup>th</sup> June and is one of the principal methods through which the United Nations generates environmental awareness in the people and governments across the world.

## 1.2 Contemporary Environmentalism

The response of environmentalists to the impacts of industrialisation and mechanisation on the environment is studied as contemporary environmentalism. In his book, *Environmentalism - A Global History*, author Ramachandra Guha notes that contemporary environmentalism is a child of the 1960s and perhaps a grandchild of the 1860s (Guha, 2000). Both these reference decades have played an equally important role in shaping the contemporary environmental wave.

**1860s** was the time when the environmental impacts of the industrial revolution had started becoming more visible. The large-scale desecration of nature in cities like London became an issue of concern and one of the first to protest were the poets and philosophers who inhabited these cities.

Indeed the environmental concerns were as important to the proponents of the Romantic period in Europe as was anything else. The poems of this era are literally a call to reconnecting with the glory of 'Mother Nature'.

**1960s** witnessed a shot in the arm of the contemporary environmental movement with the publishing of the landmark book *Silent Spring* by the United States based marine biologist Rachel Carson. *Silent Spring* (published in 1962) scientifically analysed the impacts of the use of pesticides on birds. The findings were not presented in technical language but articulated for popular reading which gave the book a mass appeal.

*Silent Spring* was translated in many European languages and resulted in the ban on the use of DDT, the most popular pesticide in those days. An even more significant contribution of this book was the spearheading of the global environmental movement and the role it played in the creation of the United States Environmental Protection Agency (USEPA) in 1970. In the next few decades following the creation of the UESPA, a similar agency was created by almost every other nation. This ushered in an era of state-supported environmental protection and strengthened the global environmental movement further.

## Indian scenario

Environmental consciousness was very much prevalent in the first civilizations that flourished in human history. Natural resources like water, forests etc. were considered sacred and were revered and protected. Such practices are common even today in countries like India, which are rooted in their ancient heritage. Worshipping of trees and rivers in a common practice in many parts of India and Indian culture and religion echoes the need to live in harmony with nature.

A popular milestone of the contemporary environmental movement in India is the *Chipko* movement. The Chipko movement took place in the Himalayas in Uttar Pradesh (now Uttarakhand) in the 1970s and was initiated by a women leader Gaura Devi. The movement started on 25 March, 1974 when over two dozen women (Fig. 1) managed to stop truckloads of labourers hired to fell over 2,500 trees. The women threatened that if the trees were axed, they would embrace the trees without fearing for their lives.



**Figure 1.** Surviving participants of the Chipko Movement reuniting on the 30<sup>th</sup> anniversary of the Movement in 2004.

**Source:** [http://en.wikipedia.org/wiki/Chipko\\_movement#/media/File:Chipko\\_2004.jpg](http://en.wikipedia.org/wiki/Chipko_movement#/media/File:Chipko_2004.jpg)  
(Accessed on 17/03/2015 at 09.00 am)

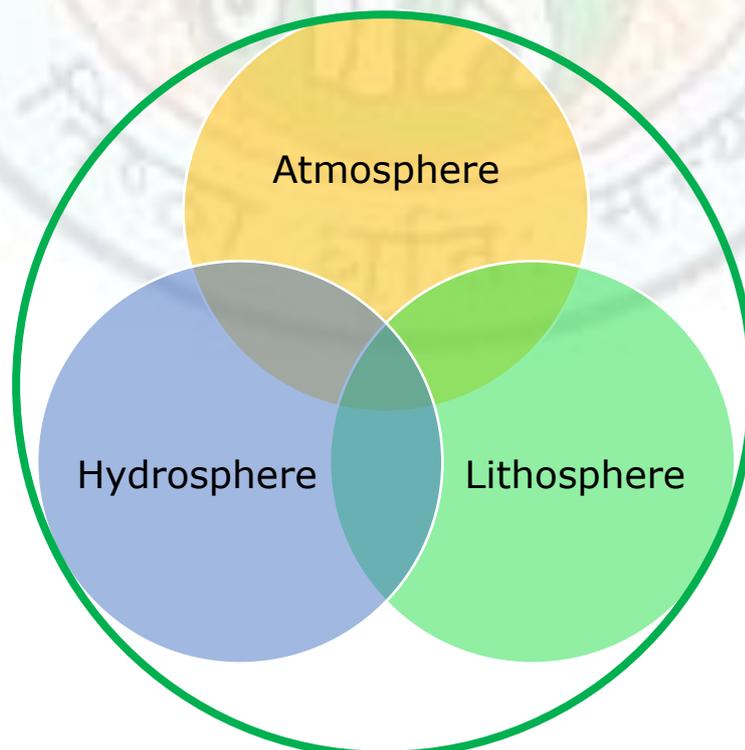
Chipko movement is a stark reminder of the otherwise unrelated bravery exhibited by the members of the *Bishnoi* community for protecting the trees. Members of the *Bishnoi* community inhabit parts of Western Rajasthan and the religious sect is around 500 to 600 years old. The religious philosophy of the *Bishnois* largely focuses on environmental harmony and protection. Members of the *Bishnoi* communities are known to have exhibited bravery and sacrificial spirit towards environment protection by saving trees from being felled even at the cost of their own lives.

A notable mention here needs to be made of Amrita Devi *Bishnoi*, who sacrificed her life while protecting trees from being felled in the year 1730. Tree felling had been ordered by the then Maharaja of Jodhpur without taking into consideration that it would hurt the *Bishnoi* sentiments. It is said that when all her attempts failed, she hugged the trees and received the blow of the axe on her own body. Her martyrdom inspired many other *Bishnois* to do the same and the Maharaja had to subsequently take back his order of tree felling.

Interestingly, environmental harmony and protection remained one of the focus areas of Mahatma Gandhi almost throughout his struggle for India's freedom. Many of Gandhi's quotations, like '*Earth provides enough to satisfy every man's need, but not every man's greed*', and '*Be the change you wish to see in the world*' have become punchlines for environmental campaigns across the world.

### 1.3 Components of the Environment

The environment around us is made up of four broad components. These are 1) atmosphere, 2) lithosphere, 3) hydrosphere and the 4) biosphere (Fig.2). Let us briefly discuss each of these components and try to understand their role in ensuring the balance of nature for a healthy environment.



**Figure 2.** Diagrammatic representation of the components of environment. The outer green circle represents the Biosphere.

## Atmosphere

The thick gaseous envelope that surrounds the Earth constitutes the atmospheric component of the environment. The atmosphere is present up to a height of approximately 300 km above the surface of the Earth. Interestingly, most of the gases (which together constitute air) are present up to a height of 20 km above the Earth's surface. Consequently, the atmospheric pressure on Earth decreases with increasing height.

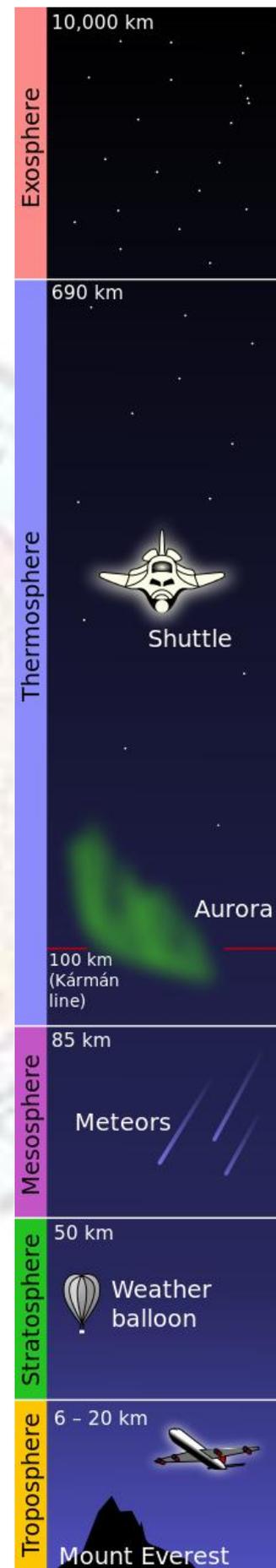
The atmosphere can be roughly divided into four zones. The zone which constitutes most of the gases (up to 20 km above the surface of the Earth, up to 6 km in case of the North and South poles) is called the **Troposphere**. All weather phenomena take place in this zone. Above the Troposphere lies the **Stratosphere** (which is approximately 30 km in height), followed by the **Mesosphere** (which is approximately 35 km height) and the **Thermosphere**. Everything outside and beyond the thermosphere is known as the **Exosphere** (Fig.3).

The Atmosphere of the Earth is made of different gases e.g. Nitrogen (78%), Oxygen (21%), Argon (0.9%), carbon dioxide (0.04%), etc. and the proportion of these gases in the atmosphere is relatively constant. Any change in the concentration of these gases in the atmosphere could lead to worrisome consequences.

For example, the concentration of carbon dioxide in the Earth's atmosphere is believed to have increased from 280 parts per million (ppm) in pre-industrial period (~1800) to 400 ppm in the present day. This is because the industrial revolution led to the large scale burning of coal and other fossil fuels for heating, power generation and related industrial processes. This sudden increase in the concentration of carbon dioxide in the Earth's atmosphere over a relatively short period of 200 years has resulted in **global warming**.

Similarly, a sudden decrease in Ozone concentration in the stratosphere was noted in late 1970s. The Ozone layer protects us from the harmful ultraviolet (UV) radiations of the Sun. The decrease in Ozone concentration resulted in the creation of an Ozone hole in the Earth's atmosphere. The cause of ozone depletion was later found to be the man-made emission of halocarbons. The highly concerning situation was well responded by the global community and resulted in the adoption of an international treaty – the Montreal Protocol.

The Montreal Protocol was agreed on 16 September, 1987 and called for the banning of the production of ozone depleting substances (ODS) and restricting the use of ODS world over. It



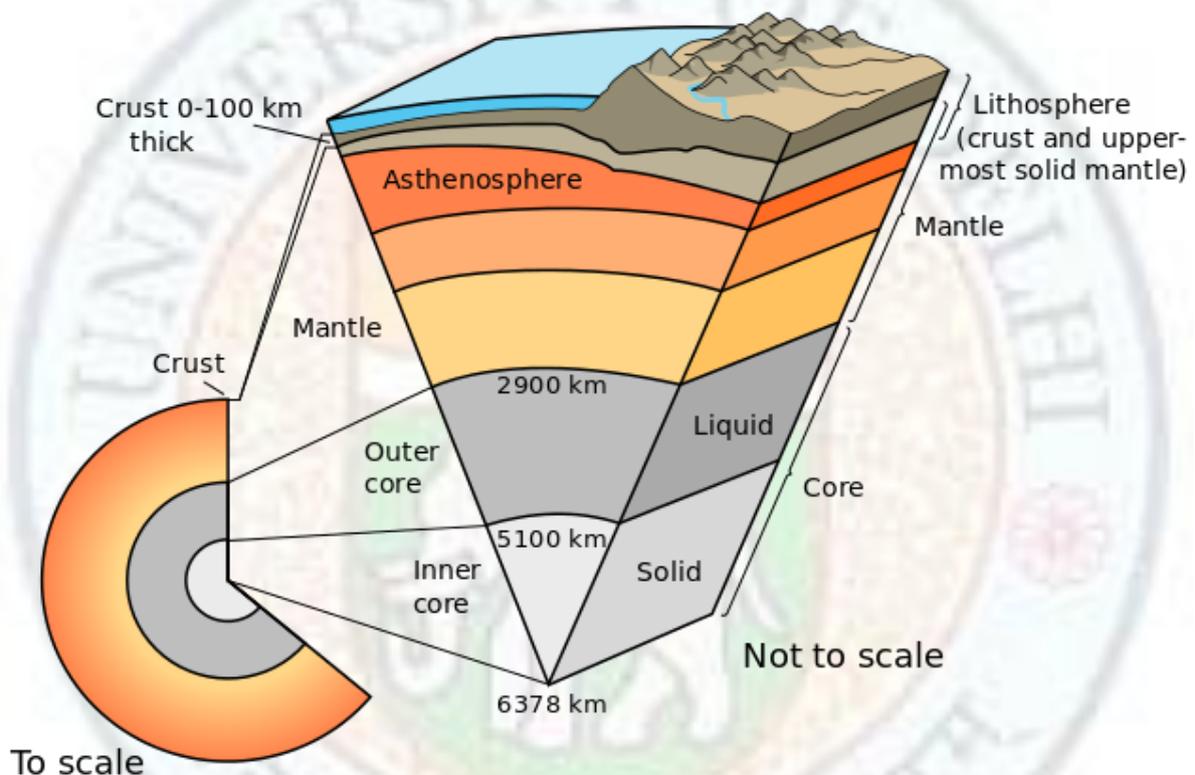
is one of the most successful international agreements in global politics till date. 16 September is now celebrated as the World Ozone Day.

**Figure 3 (right).** Structure of the Earth's atmosphere.

Image Source: <http://en.wikipedia.org/wiki/Atmosphere> (Accessed on 17/03/2015 at 09.05 am)

## Lithosphere

Lithosphere refers to the layers of rock material on the Earth's surface, in the continents and on the ocean floors. It includes rocks, various landforms such as mountains, valleys, plateaus and plains and soil. Soil is the medium of growth for plants and covers most of the Earth's surface. The lithosphere forms a relatively thin crust which is about 0-100 km thick and is thicker in the continents than in the ocean floors (Fig.4).



**Figure 4.** Diagram of Earth's internal structure.

Source: <http://commons.wikimedia.org/wiki/File:Earth-cutaway-schematic-english.svg> (Accessed on 17/03/2015 at 09.00 am)

The average composition of major components in the Earth's crust is as follows: Oxygen (46.6%), Silicon (27.7%), Aluminium (8.3%), Iron (5%), Calcium (3.63%), Magnesium (2.09%), Sodium (2.83%) and Potassium (2.59%). Some of the major and minor components constituting the lithosphere can interact with each other within the lithosphere or with hydrosphere and accumulate in concentration which are toxic for human beings. This condition is sometimes referred to as **natural pollution**.

An example of natural pollution can be witnessed in the Brahmaputra River Basin in North-east India. The ground water in this region is laden with high concentration of Arsenic thereby making it toxic and lethal for human consumption. The source of this Arsenic is believed to be natural, resulting from the interaction of the ground water aquifer with the adjoining lithosphere.

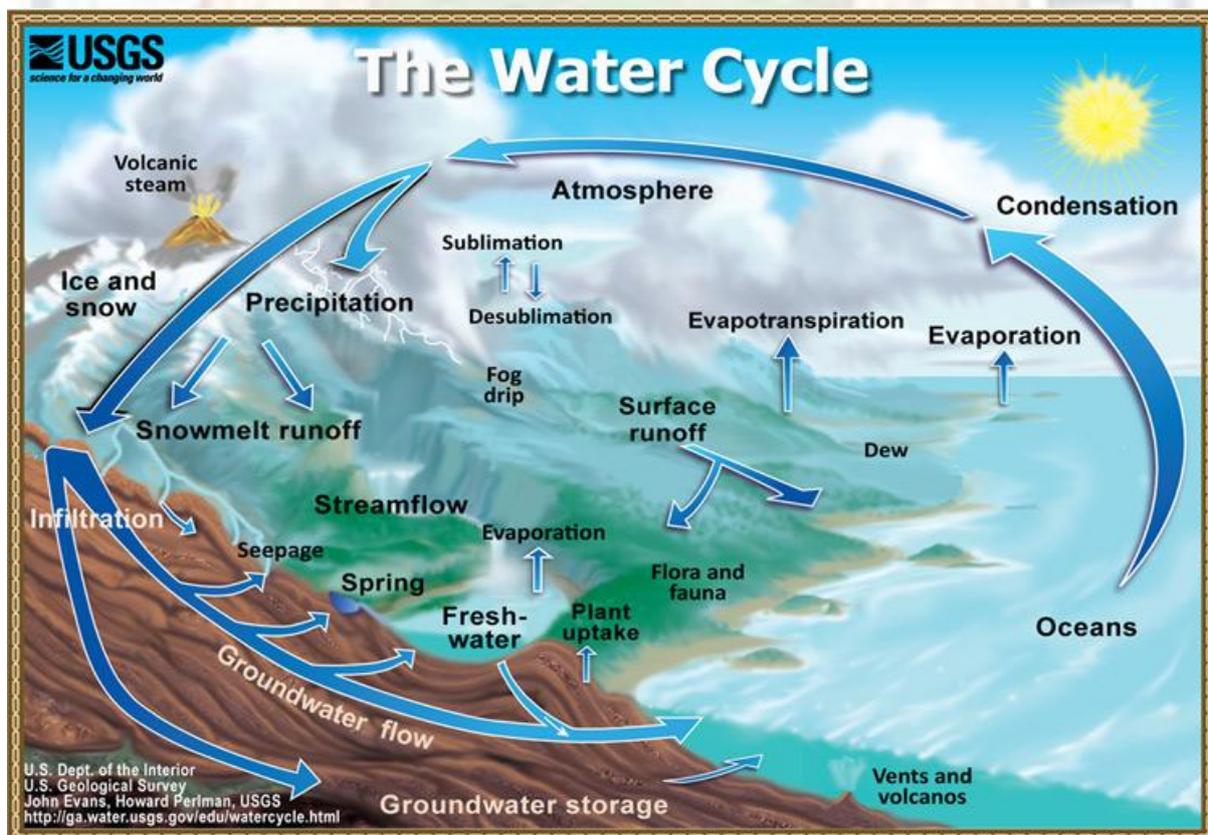
At the same time, human activities such as agricultural practices and mining also contribute to the contamination and pollution of lithosphere. Heavy metal contamination of soil in the agricultural states of Punjab and Haryana is largely due to the use of pesticides and fertilizers in these two agricultural states.

## Hydrosphere

Hydrosphere is the layer of water at or near the surface of the Earth. Water is the predominant substance in this sphere and it covers almost 70% of the Earth's surface. In its natural state, water is found:

- on continents as rivers and lakes,
- on the ocean floors,
- below the land as ground water,
- in the atmosphere as water vapour and
- embedded in the biomass as 'virtual water' (Remember water 70% of human beings, crops etc. is made up of water).

The movement of water within the hydrosphere and from one sphere to the other is known as the hydrological cycle or the Global Water Cycle (Fig.5). It involves the changing of water from one phase to the other through two prominent phenomena. The change in water from its liquid state to gaseous state is called **evaporation**. The change in water from the gaseous to liquid state is called **condensation**. When the evaporation of water takes place through the medium of plants, it is referred to as **evapotranspiration**.



**Figure 5.** Diagrammatic representation of the global water cycle.

Source: <http://commons.wikimedia.org/wiki/File:Watercyclesummary.jpg>

(Accessed on 17/03/2015 at 09.10 am)

In the global water cycle, water enters the hydrosphere as precipitation, in the form of rainfall or snowmelt. Water leaves the system as river flow or runoff, and as evapotranspiration, a combination of evaporation from open bodies of water, evaporation from soil surfaces, and transpiration from the soil by plants.

It is no wonder then that water is an abundant natural resource and constitutes approximately 70% of Earth's surface as well as the human body. The impact of global warming, climate change and more frequent droughts and floods--are all related in one way or the other to water.

However, despite this abundance of water on the Earth, only a small proportion of it is available as 'fresh water' for direct consumption. Fresh water can generally be described as water which has less than 1,000 mg/l of salts or total dissolved solids (TDS). The remaining proportion of total water is found in the oceans as 'salt water' as it contains salt and other minerals.

Approximately, 96.5% of total water on Planet Earth is found in oceans and seas and is in a saline and non-potable state. Another 1% of the total global water is also saline and can be found in lakes or deep in the ground.

Only about 2.5% of the total global water is fresh water, but not all of it is available for our use and consumption. The maximum proportion of total fresh water is stored in glaciers and ice caps or in the deeper aquifers as ground water. Only about 1.3% of the total fresh water available on the planet constitutes surface water and is available to the biosphere. Only a fraction of this water is available for human consumption.

It should be noted here that water is a pre-requisite for human survival and is critical to support population of the scale being witnessed in present day urban centres. You will also find it interesting that the words *aabadi* (Hindustani for population) and *aabad* (prosper) are both derived from the same Persian word *aab* meaning water (Kumar, 2002). Ancient civilizations flourished all along the banks of great rivers and may have fallen when the adjacent rivers dried up.

While it may seem that we have very little water for ourselves, theoretically, it is more than sufficient to sustain global ecology and human populations (UN Water, 2014). It therefore needs to be clarified here that the much talked about water scarcity is largely a result of mismanagement of water resources, unplanned urbanisation and economic factors governing water supply.

## **Biosphere**

The biosphere is that part of the Earth in which living organisms exist and thrive. The living organisms are usually found in the zone of confluence of the other three spheres, viz. lithosphere, atmosphere and hydrosphere. Some living organisms are exclusive found in only one of these spheres, e.g. deep sea animals and plants.

The biosphere of the Earth is inhabited by all the species of plants, animals and other life forms that are found on the planet. Human beings (*Homo sapiens*) are one such species which live in the biosphere and have inhabited it with all the other species on the planet. All the different living organisms supported by the biosphere are together known as the biological diversity (or **biodiversity**) of the planet.

## Value addition - know yourself

**Web Resource:** <http://assets.panda.org/custom/flash/daversitycode>

A video-parody of the Hollywood movie The Da Vinci Code, The Bio Diversity Code illustrates the meaning and implications of the Web-of-life.

It is very important here to understand that each species on the planet depends on many other species for its survival and prosperity. An intricate and metaphorical web of life exists in the biosphere which connects all the species together. Any ecological threat to one species will eventually threaten the existence of other species.

This also applies to the human species since we depend for our sustenance and survival on many other species. Loss of even a single species could prove fatal for our civilization. For example, if all the honey bees in the world were to suddenly disappear; a large number of plants will no longer be pollinated. We will thus neither get any honey nor fruits and vegetables thereby leading to a famine situation. It therefore becomes our ethical and logical responsibility to protect and safeguard the biodiversity on Planet Earth as a whole.

### Biogeochemical Cycle

The four components of environment that we have just discussed do not exist in isolation. There is constant exchange of matter and energy within these four components. The circulation of matter (usually a chemical substance like oxygen, nitrogen, sulphur etc.) through the biotic (biosphere) and abiotic (lithosphere, hydrosphere, atmosphere) components of the environment is known as **biogeochemical cycle**. The global water cycle that we have already discussed is an examples of a biogeochemical cycle.

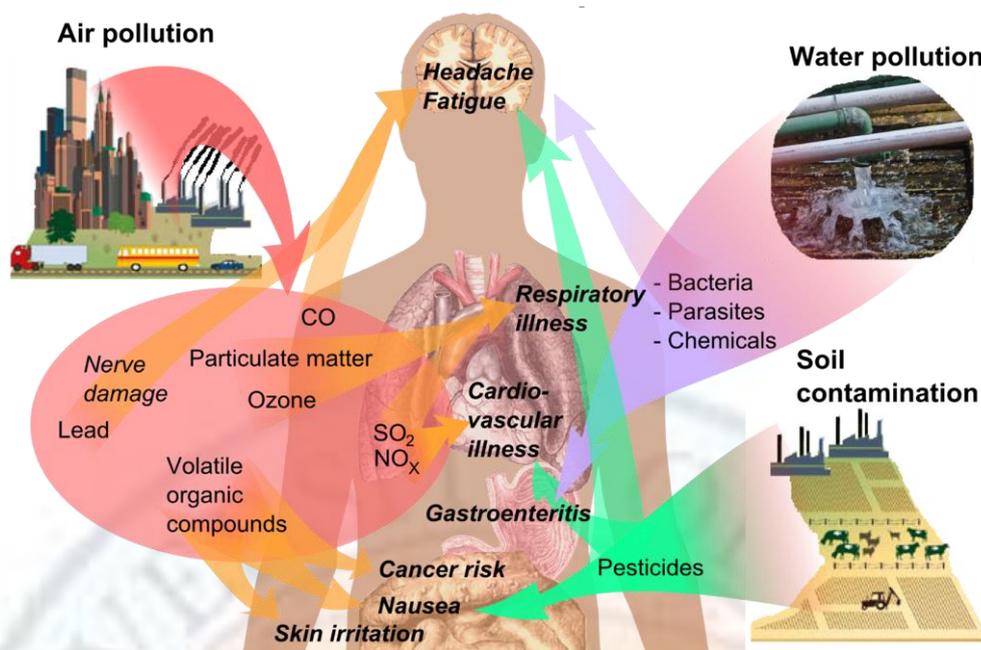
## 1.4 Environmental Pollution & Health

Human beings have, over a period of time, taken the reign of controlling the environment. We are constantly interacting with our environment and have consistently modified it to suit our needs. In our attempt to control the environment, we have added various substances to it thereby modifying it considerably.

Many of the substances that we have added to our environment (e.g. polythene, pesticides etc.) stay in it for long period of time. Some of these persistent substances often have deleterious impacts on us. This has resulted in the contamination of the pristine environment that was once favourable for flourishing of life on Planet Earth.

The contamination of the environment due to the addition of unwanted substance(s) is known as pollution. And the unwanted substance(s) is known as the pollutant. Pollution of the atmosphere is known as **air pollution**, pollution of the hydrosphere is known as **water pollution** and pollution of the lithosphere is known as **land or soil pollution**.

It needs to be noted here that environmental factors are the root cause of significant burden of death, disease and disability around the world. According to World Health Organisation (WHO), about a quarter of the diseases of mankind today occur due to prolonged exposure to environmental pollution.



**Figure 6.** Human health impacts of air, water and soil/land pollution.  
 Source: [http://en.wikipedia.org/wiki/File:Health\\_effects\\_of\\_pollution.png](http://en.wikipedia.org/wiki/File:Health_effects_of_pollution.png)  
 (Accessed on 17/03/2015 at 09.15 am)

Some common pollutants and major sources of these pollution are included in Table 1 below.

Table 1: Common pollutants and major sources of different types of pollution		
Type of Pollution	Common Pollutants	Major Sources
Air Pollution	<ul style="list-style-type: none"> <li>Smoke (which includes a mixture of gases like Sulphur dioxide or SO<sub>2</sub>, carbon monoxide or CO, etc.)</li> <li>Smog (Smoke + Fog)</li> <li>Respirable Suspended Particular Matter or RSPM (small microscopic particles in the air which can be inhaled by us)</li> <li>Dust or Pollen (some people are allergic to dust or pollen. Allergic reaction to pollen is known as hay fever)</li> </ul>	Vehicular exhaust, Thermal Power Plants (which burn large amounts of coal), Industrial processes.
Water Pollution	<ul style="list-style-type: none"> <li>Addition of microscopic or macroscopic particles which add colour, smell or taste to water cause <b>physical pollution</b> of water</li> <li>Addition of chemicals from fertilizers, pesticides or industrial effluents (e.g. phosphate, mercury, lead etc.) cause <b>chemical pollution</b> of water</li> <li>Addition of biological impurities (e.g. disease causing bacteria like <i>Salmonella typhi</i> which causes</li> </ul>	Industrial effluents, domestic sewage, agricultural run-off.

	typhoid or <i>Vibrio cholera</i> which causes cholera) causes <b>biological pollution</b> of water	
Land or Soil Pollution	<ul style="list-style-type: none"> <li>• Pesticides and chemical fertilizers</li> <li>• Industrial and household waste</li> <li>• High wind velocity and water flow just above the land surface devoid of grasses or trees leads to <b>soil erosion</b></li> </ul>	Agriculture, Industrial waste disposal, Landfills, Deforestation.

Data from various national and international environmental quality monitoring agencies suggests that Earth's environment has deteriorated considerably over the last few decades. There is a simultaneous deterioration of the quality of life, status of health and overall well-being of the human civilization. We can therefore deduce that there is a direct, positive correlation between environmental health and human health.

<b>Value addition- Did you know</b>
<b>Web Resource:</b> <a href="http://www.who.int/heli/en">http://www.who.int/heli/en</a>
Health and Environment Linkages Initiative (HELI) is a global effort by WHO and United Nations Environment Program (UNEP) to support action by developing country policymakers on environmental threats to health.

## 1.5 Environment versus Economic Development

In an ideal world, environmental protection and economic development should have been two sides of the same coin. Wikipedia defines **economic development** as the sustained, concerted actions of policy makers and communities for improving the standard of living and economic health of a specific area. We have already studied how environmental health is absolutely essential for securing human health and well-being. Consequently, improving the standard of living should necessarily also focus on environmental protection.

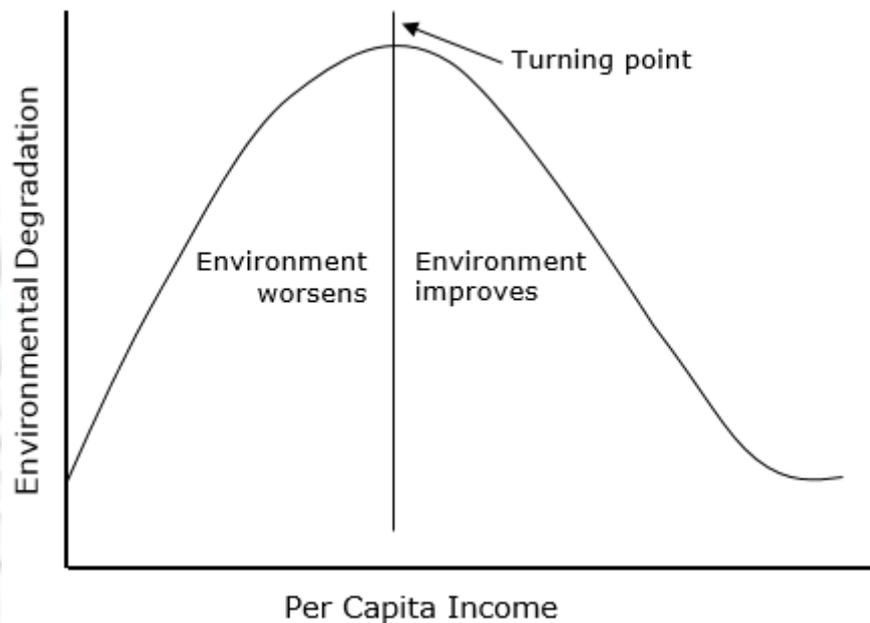
However, in reality, environmental concerns are often overlooked in the favour of economic development. An example here can be given from the National Capital Territory (NCT) of Delhi, India. Delhi is the second largest Urban Agglomeration in the world (after Tokyo, Japan) and is one of the most developed cities in the Indian sub-continent. Delhi can boast of state-of-the-art infrastructure including a glamorous Delhi Metro and is a hub of some of the best education and healthcare facilities.

Despite such a high rate of economic development, Delhi was declared the world's most polluted city in terms of air pollution in the year 2014 (ToI, 2014). Clearly, Delhi's economic development has taken place without considering the simultaneous need for environment protection. This has exposed over 20 million citizens of Delhi to the hazards of breathing polluted air every day.

An interesting hypothesis for understanding the actual relationship between economic growth and environmental protection is the **Environmental Kuznets curve** (Fig. 7). According to the Environmental Kuznets curve, economic development in any society leads to environmental degradation in the course of development. After the respective

society has developed to a certain point, environmental concerns then become a cause of concern and measures are taken to improve environmental quality.

Although the Environmental Kuznets curve hypothesis is much debated, it does get across the point that the process of economic development leads to environmental degradation, at least towards the beginning. Developing countries like India, which are on the left side of the turning point, are therefore more vulnerable to environmental degradation.



**Figure 7.** Environmental Kuznets curve showing the relationship between environment and economic development.

**Source : Self created (Author )**

We can deduce from the above discussion that development, in its present sense, has considerable impacts on the environment. A sector which is very important for development is the Energy sector. It is, in fact, the backbone of any nation's economic growth and development. At present, energy is mainly generated from fossil fuel based power plants or hydroelectric projects.

Burning of fossil fuel as well as construction of big dams both cause significant damage to the environment. Alternates energy sources (e.g. solar energy, wind energy etc.), which cause much less damage to the environment, are available but are presently more expensive. Consequently, due to lack of concern for the environment amidst the need for rapid economic development, the world's energy increasing energy demand continues to be met by burning coal and petroleum.

## 1.6 Sustainable Development

We have already understood that a large number of our activities cause pollution and lead to the degradation of our environment. The use of cars and other automobiles, the heavy dependence on electricity, construction of high rise buildings, our increasingly consumptive lifestyle are all examples of such activities. These activities are having an adverse impact on the quality of our environment in many ways. There is thus a need for balancing economic growth and environmental protection.

This was realized as early as in 1983 by the United Nations General Assembly and a **World Commission on Environment and Development** (WCED) was set up in that year. The objectives of the Commission were to address the issues of deteriorating human environment and the rapid depletion of natural resources. Developing long-term strategies for environmental protection and bringing nations together for meeting these objectives were some other objectives of the WCED.

The former Prime Minister of Norway Gro Harlem Brundtland was appointed as the Chairman of the WCED because of which the WCED is also known as the Brundtland Commission. The Brundtland Commission submitted its report in October, 1987 under the title, *Our Common Future*. The *Our Common Future* Report defined and called all nations to adopt the principles of **sustainable development**.

#### Value addition- for better understanding

**Web Resource:** <https://sustainabledevelopment.un.org>

The sustainable development agenda of the United Nations is promoted by the Division for Sustainable Development, which also maintains an easy-access archive of policy documents on this topic.

### Definition and Meaning

Sustainable development is that development which is inclusive and does not harm the environment or lead to rapid degradation of natural resources. Many definitions of sustainable development have been put forward since 1987. However, the definition put forward in the *Our Common Future* report continues to be the most widely used and accepted definition of sustainable development.

#### Value addition- Know it more

**Web Resource:** <http://delhigreens.com>

Delhi's first environmental blog sharing articles, news and information about environmental protection and sustainable development.

The 'Our Common Future' Report of the WCED defines sustainable development as '*development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs*' (WCED, 1987). It means that development can be called sustainable if it ensures that the same access to natural resources (like water, fossil fuel, minerals etc.) that we have is also granted to the future generations.

Sustainable development can be achieved by finding a balance between 1) economic growth, 2) social development and 3) environmental protection (Fig. 8). Indeed, these three pillars of sustainability need to work together for ensuring development which does not lead to environmental destruction. The needs of our future generations should also be kept in mind as we plan and implement development projects. Sustainable development is thus a sensible, just and equitable concept very much relevant in the present day.



**Figure 8.** Diagram depicting the three pillars of sustainable development.

**Value addition - Know it better**

**Web Resource:** <https://www.iisd.org/sd>

The website of the International Institute for Sustainable Development provides basic introduction to sustainable development.

The critical objectives for environment and development policies that follow from the concept of sustainable development, as outlined in the Our Common Future report (WCED, 1987) are:

- Reviving growth
- Changing the quality of growth
- Meeting essential needs for jobs, food, energy, water, and sanitation
- Ensuring a sustainable level of population
- Conserving and enhancing the resource base
- Reorienting technology and managing risk
- *Merging environment and economics in decision making*

**Value addition- For better understanding**

**Web Resource:** <http://www.un-documents.net/wced-ocf.htm>

To read more about *Our Common Future* Report (1987) you may read from the given link.

We can deduce from the above that sustainable development is a holistic concept. If adopted in totality, it can not only help in preventing the degradation of our environment

but also help eradicate poverty and improve human health and well-being. However, in the little over 25 years of the existence of the concept of sustainable development, environmental degradation may have slowed, but has definitely not stopped. This is largely because not all countries have adopted the concept of sustainable development in totality.

There is an urgent need today to sustain the growth, protect natural resources and meet the needs of an ever-increasing human population. The solution can be found in the successful adoption and implementation of the concept of sustainable development by every nation of the world. However, achieving the latter will not be possible by mere United Nations call to action but by citizens' involvement and public pressure.

The web of life connects every human being to one another and the human species to all the other species on the planet. It therefore becomes the responsibility of each one of us to ensure that the concept of sustainability is adopted and implemented by our respective governments. What needs to be remembered has been summed up in a quotation by an Anonymous author, "*We do not inherit the earth from our ancestors; we borrow it from our children.*"

## Glossary

Atmosphere:	The thick gaseous envelope surrounding the Earth and extending from the surface of the Earth to a height of approximately 300 km.
Biodiversity:	The sum total of all the different types of plants, animals, microbes and other living organisms found on Planet Earth.
Biogeochemical Cycle:	The continuous circulation of matter like water, oxygen, carbon etc. from one component of the environment to another.
Biosphere:	It is that component of the environment where life exists and flourishes and is usually found at the confluence of the other three components of the environment.
Bishnois:	A community of people living in parts of Western Rajasthan who believe in a religious sect which is deeply rooted in biodiversity conservation and environmental protection.
Chipko Movement:	An environmental movement initiated by women leader Gaura Devi in the present state of Uttarakhand for saving trees from being felled by embracing and hugging the trees.
Env. Kuznets Curve:	A relationship between environmental degradation and economic growth, which shows that economic growth initially results in environmental degradation. However, after a certain point, economic growth is accompanied with greater awareness and improvement of the environment.

Global Warming:	The gradual warming of the Earth's atmosphere due to the emission of carbon dioxide and other greenhouse gases during the burning of fossil fuel like coal and petroleum.
Global Water Cycle:	The movement and circulation of water from one component of the environment to another by using processes like evaporation and condensation.
Hydrosphere:	It is that component of the environment which is dominated by the presence of water and it covers almost 70% of the surface of Planet Earth.
Lithosphere:	It is that component of the environment which is covered by layers of rock materials and includes rocks, various landforms such as mountains, valleys, plateaus and plains and soil.
Pollutant:	An unwanted or undesirable substance that causes pollution.
Pollution:	The contamination of the environment due to the presence of unwanted or undesirable substances.
Sustainable Development:	Development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

## Short-answer Questions

- Q.1. Define environment in your own words. Why should we work to protect the environment?
- Q.2. Enlist the four sphere or components of the environment and briefly discuss any one of them.
- Q.3. What is air pollution? State some common pollutants of the air and their major sources.
- Q.4. Briefly discuss the Environment Kuznets curve and its role in studying the relationship between environment and development.
- Q.5. What is sustainable development? Define and enlist the three pillars of sustainability?

## Multiple-choice Questions

Question Number	Type of question
1	True or False

### Question

- a) World Environment Day is celebrated on the 5<sup>th</sup> of June.
- b) Ecology is the study of interactions within the abiotic factors of the environment.
- c) The zone of the atmosphere closest to the Earth's surface and which constitutes most of the gases is known as Thermosphere.
- d) Environmental Kuznets Curve depicts the relationship between environmental degradation and economic growth.
- e) The concentration of carbon dioxide in the Earth's atmosphere today is 280 ppm.

### Correct Answer / Option(s)

- a) True  
b) False  
c) False  
d) True  
e) False

### Justification/ Feedback for the correct answer

- a) World Environment Day is celebrated on 5th June to mark the beginning of the United Nations Conference on the Human Environment on 5<sup>th</sup> June, 1972.
- b) Ecology is the study of interactions between the biotic and abiotic factors of the environment.
- c) The zone of the atmosphere closest to the Earth is known as Troposphere.
- d) Environmental Kuznets curve depicts a positive correlation between environmental degradation and economic growth.
- e) The concentration of carbon dioxide in the Earth's atmosphere today has reached 400 ppb.

Question Number	Type of question
2	Expand the following

### Question

- a) WCED  
b) TDS  
c) ODS  
d) USEPA

### Correct Answer / Option(s)

- a) World Commission on Environment and Development  
b) Total Dissolved Solids  
c) Ozone Depleting Substances  
d) United States Environmental Protection Agency

Question Number	Type of question
3	Match the following

### Question

a) Silent Spring	i) Gaura Devi
b) Our Common Future	ii) Ramachandra Guha
c) Chipko Movement	iii) Gro Harlem Brundtland
d) Environmentalism – A global history	iv) Rachel Carson

<b>Correct Answer / Option(s)</b>	a) iv) b) iii) c) i) d) ii)
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Question Number	Type of question
4	Fill in the blanks

### Question

a) The United National Conference on the Human Environment in the year 1972 took place at_____.
b) Silent Spring book led to the ban on the use of _____.
c) Amrita Devi Bishnoi sacrificed her life while protecting _____in the year 1730.
d) Ozone Day is celebrated on_____.
e) The World Commission on Environment and Development (WCED) was set up by the United Nations in the year_____.

<b>Correct Answer / Option(s)</b>	a) Stockholm or Sweden b) DDT or pesticides c) trees d) 16 September e) 1983
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