

UNIT 5 – ENVIRONMENTAL PROTECTION

Global Warming

“Global warming is a gradual increase in the earth’s temperature generally due to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants. “

There are several causes of global warming, which have a negative effect on humans, plants and animals. These causes may be natural or might be the outcome of human activities. In order to curb the issues, it is very important to understand the negative impacts of global warming.

Causes of Global Warming

Following are the major causes of global warming:

Man-made Causes of Global Warming

Deforestation

Plants are the main source of oxygen. They take in carbon dioxide and release oxygen thereby maintaining environmental balance. Forests are being depleted for many domestic and commercial purposes. This has led to an environmental imbalance, thereby giving rise to global warming.

Use of Vehicles

The use of vehicles, even for a very short distance results in various gaseous emissions. Vehicles burn fossil fuels which emit a large amount of carbon dioxide and other toxins into the atmosphere resulting in a temperature increase.

Chlorofluorocarbon

With the excessive use of air conditioners and refrigerators, humans have been adding CFCs into the environment which affects the atmospheric ozone layer. The ozone layer protects the earth surface from the harmful ultraviolet rays emitted by the sun. The CFCs has led to ozone layer depletion making way for the ultraviolet rays, thereby increasing the temperature of the earth.

Industrial Development

With the advent of industrialization, the temperature of the earth has been increasing rapidly. The harmful emissions from the factories add to the increasing temperature of the earth.

In 2013, the Intergovernmental Panel for Climate Change reported that the increase in the global temperature between 1880 and 2012 has been 0.9 degrees Celsius. The increase is 1.1 degrees Celsius when compared to the pre-industrial mean temperature.

Agriculture

Various farming activities produce carbon dioxide and methane gas. These add to the greenhouse gases in the atmosphere and increase the temperature of the earth.

Overpopulation

Increase in population means more people breathing. This leads to an increase in the level of carbon dioxide, the primary gas causing global warming, in the atmosphere.

Natural Causes of Global Warming

Volcanoes

Volcanoes are one of the largest natural contributors to global warming. The ash and smoke emitted during volcanic eruptions goes out into the atmosphere and affects the climate.

Water Vapour

Water vapour is a kind of greenhouse gas. Due to the increase in the earth's temperature more water gets evaporated from the water bodies and stays in the atmosphere adding to global warming.

Melting Permafrost

Permafrost is there where glaciers are present. It is a frozen soil that has environmental gases trapped in it for several years. As the permafrost melts, it releases the gases back into the atmosphere increasing the earth's temperature.

Forest Blazes

Forest blazes or forest fires emit a large amount of carbon-containing smoke. These gases are released into the atmosphere and increase the earth's temperature resulting in global warming.

Effects of Global Warming

Following are the major effects of global warming:

Rise in Temperature

Global warming has led to an incredible increase in earth's temperature. Since 1880, the earth's temperature has increased by ~1 degrees. This has resulted in an increase in the melting of glaciers, which have led to an increase in the sea level. This could have devastating effects on coastal regions.

Threats to the Ecosystem

Global warming has affected the coral reefs that can lead to a loss of plant and animal lives. Increase in global temperatures has made the fragility of coral reefs even worse.

Climate Change

Global warming has led to a change in climatic conditions. There are droughts at some places and floods at some. This climatic imbalance is the result of global warming.

Spread of Diseases

Global warming leads to a change in the patterns of heat and humidity. This has led to the movement of mosquitoes that carry and spread diseases.

High Mortality Rates

Due to an increase in floods, tsunamis and other natural calamities, the average death toll usually increases. Also, such events can bring about the spread of diseases that can hamper human life.

Loss of Natural Habitat

A global shift in the climate leads to the loss of habitats of several plants and animals. In this case, the animals need to migrate from their natural habitat and many of them even become extinct. This is yet another major impact of global warming on biodiversity.

Preventive measures:

- Planting trees
- Creating more sustainable means of transportation, drive a fuel-efficient vehicle
- Judicious use of electricity, power your home with renewable energy
- Divest from the use of coal
- Advocate the importance of a healthy planet
- Reduce water waste
- Shrink the carbon profile

Climate Change

Climate is the average weather in a place over many years. The weather can change in just a few hours whereas climate takes millions of years to change. Planet earth has witnessed many variations in climate since the beginning.

What Are the Causes of Climate Change?

The American Association for the Advancement of Science has stated, “The scientific evidence is clear: global climate change caused by human activities is occurring now, and it is a growing threat to society.”

Below are a few of the ways humans are accelerating climate change.

Greenhouse Gases

Greenhouse gases play a vital role in the earth’s climate cycles. As the planet gets hit with the sun’s rays, some of the energy is absorbed, and the rest of that energy and heat gets reflected into space. Greenhouse gases in the atmosphere trap the reflected energy, redirecting it back down to the earth and eventually contributing to global warming. Various gases play this role, including:

- Water vapor
- Carbon dioxide (CO₂)
- Methane
- Nitrous oxide
- Chlorofluorocarbons (CFCs)

While some of these greenhouse gases, such as water vapor, are naturally occurring, others, such as CFCs, are synthetic. CO₂ is released into the atmosphere from both natural and human-made causes and is one of the leading contributors to climate change. CO₂ has been increasing at an alarming rate and has the potential to stay in the earth’s atmosphere for thousands of years unless it gets absorbed by the ocean, land, trees, and other sources. However, as CO₂ production has steadily risen, the earth’s natural resources to absorb it has also been diminished. This is already occurring in many ways as earth’s resources are disappearing from things like deforestation. Some studies even predict that plants and soil will be able to absorb less CO₂ as the earth continues to warm—possibly accelerating climate change even further.

Solar Activity

Solar activity, as mentioned above, does play a role in the earth’s climate. While the sun does go through natural cycles, increasing and decreasing the amount of energy that it emits to the earth, it is unlikely that solar activity is a major contributor to global warming or climate change. Since scientists began to measure the sun’s energy hitting our atmosphere, there has not been a measurable upward trend.

Agriculture

There are many significant ways in which agriculture impacts climate change. From deforestation in places like the Amazon to the transportation and livestock that it takes to support agricultural efforts around the world, agriculture is responsible for a significant portion of the world’s greenhouse gas emissions. However, agriculture is also an area that is making tremendous strides to become more sustainable. As productivity increases, less carbon is being

emitted to produce more food. Agriculture also has the potential to act as a carbon sink, and could eventually absorb nearly the same amount of CO₂ it emits.

Deforestation

Deforestation and climate change often go hand in hand. Not only does climate change increase deforestation by way of wildfires and other extreme weather, but deforestation is also a major contributor to global warming. According to the Earth Day Network, deforestation is the second leading contributor to global greenhouse gasses. Many people and organizations fighting against climate change point to reducing deforestation as one of, if not the most, important issues that must be addressed to slow or prevent climate change.

Human Activity

According to the Environmental Protection Agency, the most significant contributor to climate change in the United States is the burning of fossil fuels for electricity, heat, and transportation. Of these factors, transportation in the form of cars, trucks, ships, trains, and planes emits the largest percentage of CO₂—speeding up global warming and remaining a significant cause of climate change.

Livestock

While interconnected to many of the agricultural and deforestation issues we have already touched on, livestock in the form of cattle, sheep, pigs, and poultry play a significant role in climate change. According to one study, “Livestock and Climate Change,” livestock around the world is responsible for 51% of annual global greenhouse gas emissions.

Immediate Effects of Climate Change

From melting glaciers to more extreme weather patterns, people everywhere are beginning to take notice of the real impacts of climate change. While some nations around the world are taking action with initiatives such as the Paris Climate Agreement, others are continuing business as usual—pumping millions of tons of carbon into the atmosphere year after year. While the long-term consequences are still to be seen, for now, climate change continues to cause extreme weather as well as safety and economic challenges on a global scale.

Extreme Weather

Changes to weather are perhaps the most noticeable effect of climate change for the average person. One reason for this is the financial impact severe weather events can have. Extreme weather influenced by climate change includes:

- Stronger storms & hurricanes
- Heat waves
- Wildfires
- More flooding
- Heavier droughts

Safety & Economic Challenges

In 2014 the U.S. Department of Defense released a report that stated climate change posed a severe and immediate threat to national security. According to former Secretary of Defense,

Chuck Hagel, “Rising global temperatures, changing precipitation patterns, climbing sea levels, and more extreme weather events will intensify the challenges of global instability, hunger, poverty, and conflict.”

Long Term Impact of Climate Change

The long term impact of climate change could be absolutely devastating to the planet and everyone and everything living on it. If the world continues on its current trajectory, then we will likely continue to see increasing effects on everyday life.

Health

There are many ways in which climate change could impact people’s health. Depending on age, location, and economic status, climate change is already affecting the health of many and has the potential to impact millions more. According to the Center for Disease Control and Prevention, climate change-related health risks may include:

- Heat-related illness
- Injuries and fatalities from severe weather
- Asthma & cardiovascular disease from air pollution
- Respiratory problems from increased allergens
- Diseases from poor water quality
- Water & food supply insecurities

Negative Impact in Ecosystems

Ecosystems are interconnected webs of living organisms that help support all kinds of plant and biological life. Climate change is already changing seasonal weather patterns and disrupting food distribution for plants and animals throughout the world, potentially causing mass extinction events. Some studies estimate that nearly 30% of plant and animal species are at risk of extinction if global temperatures continue to rise.

Water & Food Resources

Climate change could have a significant impact on food and water supplies. Severe weather and increased temperatures will continue to limit crop productivity and increase the demand for water. With food demand expected to increase by nearly 70% by 2050, the problem will likely only get worse.

Sea Levels Rising

Rising sea levels could have far-reaching effects on coastal cities and habitats. Increasing ocean temperatures and melting ice sheets have steadily contributed to the rise of sea levels on a global scale. At current rates the National Oceanic and Atmospheric Administration estimate sea levels to rise by at least 8 inches by 2100, potentially causing increased flooding and decrease in ocean and wetland habitats.

Shrinking Ice Sheets

While contributing to rising sea levels, shrinking ice sheets present their own set of unique problems, including increased global temperatures and greenhouse gas emissions. Climate

change has driven summer melt of the ice sheets covering Greenland and Antarctica to increase by nearly 30% since 1979.

Ocean Acidification

The ocean is one of the main ways in which CO₂ gets absorbed. While at first glance that may sound like a net positive, the increasingly human-caused CO₂ is pushing the world's oceans to their limits and causing increased acidity. As pH levels in the ocean decrease, shellfish have difficulty reproducing, and much of the oceans' food cycle becomes disrupted.

Solutions for Climate Change

While the effects of climate change can seem bleak, there is still hope. By taking immediate action to curb climate change, we may never see the worst consequences. Likewise, as the world adopts cleaner, more sustainable energy solutions, there may be millions of new jobs created and billions of dollars of economic benefits. Below are some practical ways you can battle climate change, including:

- Purchase Renewable Energy Certificate for your home power needs
- Make your home energy efficient
- Buy carbon offsets
- Adopt a plant-based diet
- Reduce food waste
- Recycle
- Stop using fossil fuels
- Stop deforestation

Acid Rain

Acid Rain as the name suggests can be said to be the precipitation of acid in the form of rain in the simplest manner. When atmospheric pollutants like oxides of nitrogen and sulphur react with rainwater and come down with the rain, then these results in Acid Rain.

Acid rain is made up of highly acidic water droplets due to air emissions, most specifically the disproportionate levels of sulphur and nitrogen emitted by vehicles and manufacturing processes. Often called acid rain as this concept contains many types of acidic precipitation.

The acidic deposition takes place in two ways: wet, and dry. Wet deposition is any form of precipitation which removes acids from the atmosphere and places them on the surface of the earth. In the absence of precipitation, dry deposition of polluting particles and gases sticks to the ground through dust and smoke.

Causes of Acid Rain

The oxides of nitrogen, or NO_x, and sulphur dioxide, or SO₂, are the two main sources of acid rain. Sulphur dioxide, which is a colourless gas, is given off as a by-product when fossil fuels that contain sulphur are burned.

This gas is produced due to various industrial processes, like the processing of crude oil, utility factories, and iron and steel factories. Natural means and disaster can also result in sulphur dioxide being released into the atmosphere, such as rotting vegetation, plankton, sea spray, and volcanoes, all of which emit about 10% sulphur dioxide.

On the whole, industrial combustion is responsible for 69.4% sulphur dioxide emissions into the atmosphere, and vehicular transportation is responsible for about 3.7%. Nitrogen oxide is the other chemical that acid rain is made up of. Any nitrogen compound that contains oxygen atoms of any amount is known as oxides of nitrogen. For example, nitrogen dioxide and nitrogen monoxide are oxides of nitrogen.

These gases are produced in firing processes which involve extremely high temperatures, e.g., utility plants and automobiles, as well as in chemical industries, such as in the production of fertilizers.

Five per cent of nitrogen oxide is emitted by natural processes like lightning, volcanic eruptions, forest fires, and action of bacteria in the soil. Industrial processes emit 32% and vehicular transportation is responsible for 43%.

Nitrogen oxide, which is a dangerous gas in itself, causes damage to the respiratory organs by attacking the membranes in them, thus increasing the chances of respiratory diseases. It also causes smog and is a contributory factor for the damage of the ozone layer in the atmosphere. When there is acid rain, the nitrogen oxide can be carried far away from the original location of the rain.

Effects of Acid Rain:

Acid rain has serious implications for continuation of life on this planet. The main acid rain problems are:

Effects on Water Bodies:

Most rivers and lakes have a pH that ranges between 6 and 8. Acid rain that may fall directly in these water bodies or may be washed into them as surface runoff, alter their chemical environment. The flora and fauna in these water bodies are adapted for life in the original pH value of the water.

Altered acidity of their environment may be a threat to their survival. Although, some soils are capable of buffering increase in acidity, water bodies that have soil with poor buffering capacity

may release aluminium ions from the soil which is toxic for aquatic life forms. Read more on water pollution.

Effects on Soil and Forests:

Acid rain is being cited as one of the major causes of degradation of the forests at higher altitudes of the Appalachian Mountains from Maine to Georgia. Forests are affected directly as well as indirectly by acid rain. When leaves are frequently exposed to acid rain they are stripped off the essential nutrients present in them.

Acid rain falling on the soil, change soil acidity. In its bid to neutralize this change in pH, soil releases substances that are toxic for trees growing on it. Acidic water also dissolve nutrients in the soil and as it runs off the surface, it carries these essential minerals away with it, before they can be absorbed by flora growing on the forest floor.

Acid Rain Effects on Aquatic Flora and Fauna:

Acid rain has a long term can directly effect on the aquatic life, as the high amount of sulphuric acid and nitric acid levels in acid rains are directly consumed by aquatic animals and plants. The harmful acids affect the ability of fish to take in nutrients, salt, and oxygen.

Aquatic animals intake oxygen from the water through their gills, but harmful acids leads to mucus formation in the gills, which hinders their ability to respire. Acid rains affect the pH level of the water which reduces the absorption capacity of essential nutrients of the aquatic life. This also hampers the reproduction process in fish leading to weak or brittle eggs.

Effects of Acid Rain on Humans:

Most of all, acid rain affects human health adversely. It has the ability of harming us via the atmosphere as well as the soil where the food we eat is grown. Acid rain results in toxic metals breaking loose from the chemical compounds they occur in naturally.

While toxic metals may be dangerous, but as long as they exist in combination with other elements, they are not harmful. Once acid rain causes these toxic metals to be released they can infiltrate into the drinking water, and the animals or crops that humans use as sources of food.

This contaminated food can damage the nerves in children, or result in severe brain damage, or even death. Scientists suspect that aluminum, one of the toxic metals affected by acid rain, is associated with Alzheimer's disease.

Another adverse health effect of acid rain on humans is the respiratory problems it causes. The emissions of nitrogen oxide and sulfur dioxide cause respiratory problems like throat, nose and eye irritation; headache; asthma; and dry coughs. Acid rain is particularly harmful for those who have difficulty in breathing or suffer from asthma. In fact, even the lungs of healthy people can be damaged by the pollutants in acid air.

Acid Rain Effects on Historical Monuments:

Acid rain destroys stained glass windows, corrodes metal and also ruins the paint colour. Acid rain reacts with calcium to form calcium bicarbonate, which can be easily washed away. One drastic effect of acid rain can be seen on one of the Seven Wonders of the World, Taj Mahal in India.

The marble walls and pillars of this great man-made monument are found to be getting eroded by acid rains. Even St. Paul's Cathedral in London, and the Statue of Liberty in New York are few such examples.

Control Measure:

The numbers of possible solutions for acid rain that are available to us are plenty:

- i. One of the most fundamental acid rain solutions is to utilize fuels that burn more cleanly, or to burn coal more efficiently. This will greatly reduce the possibilities of acid rain developing in the atmosphere.
- ii. As far as industrial power plants are concerned, the best solution is to attach devices known as 'scrubbers' in the chimneys of these plants. These scrubbers reduce the amount of sulfur produced in the smoke by 90 – 95%
- iii. Vehicles and cars must be mandatorily required to comply with very tight and efficient emission standards. Fitting catalytic converters into the exhaust pipes of vehicles also reduces the amount of sulfur dioxide produced by the vehicles.
- iv. For industrial power plants, there are many more acid rain solutions that must be enforced, as they are clearly the biggest contributors to the formation of acidified water droplets in the atmosphere. Industries must regularly inspect and clean all their emission equipment and chimneys and pipes
- v. All these acid rain solutions will be pointless unless people are informed and educated about the ill-effects and harms of acid rain. A widespread and nationwide effort must be made to make people aware. Only after that is done will all the acid rain solutions actually make a difference.

Acid rain is one of the biggest environmental hazards that we are facing today, and strong measure must be taken to prevent it, before it is too late. Governments need to sit up and take notice, and do much more than what they are already doing.

Acid rain adversely affects plants, animals and human beings, and as a result it is not something that we can afford to ignore. It is our duty towards ourselves and towards our fellow human beings to do all we can to prevent and reduce the presence and increase of acid rain in our environment.

Ozone layer depletion

Ozone layer depletion is the thinning of the ozone layer present in the upper atmosphere. This happens when the chlorine and bromine atoms in the atmosphere come in contact with ozone and destroy the ozone molecules. One chlorine can destroy 100,000 molecules of ozone. It is destroyed more quickly than it is created.

Some compounds release chlorine and bromine on exposure to high ultraviolet light, which then contributes to the ozone layer depletion. Such compounds are known as Ozone Depleting Substances (ODS).

The ozone-depleting substances that contain chlorine include chlorofluorocarbon, carbon tetrachloride, hydrochlorofluorocarbons, and methyl chloroform. Whereas, the ozone-depleting substances that contain bromine are halons, methyl bromide, and hydro bromofluorocarbons.

Chlorofluorocarbons are the most abundant ozone-depleting substance. It is only when the chlorine atom reacts with some other molecule, it does not react with ozone.

Causes of Ozone Layer Depletion

The ozone layer depletion is a major concern and is associated with a number of factors. The main causes responsible for the depletion of the ozone layer are listed below:

Chlorofluorocarbons

Chlorofluorocarbons or CFCs are the main cause of ozone layer depletion. These are released by solvents, spray aerosols, refrigerators, air-conditioners, etc.

The molecules of chlorofluorocarbons in the stratosphere are broken down by the ultraviolet radiations and release chlorine atoms. These atoms react with ozone and destroy it.

Unregulated Rocket Launches

Researchers say that the unregulated launching of rockets result in much more depletion of ozone layer than the CFCs do. If not controlled, this might result in a huge loss of the ozone layer by the year 2050.

Nitrogenous Compounds

The nitrogenous compounds such as NO₂, NO, N₂O are highly responsible for the depletion of the ozone layer.

Natural Causes

The ozone layer has been found to be depleted by certain natural processes such as Sun-spots and stratospheric winds. But it does not cause more than 1-2% of the ozone layer depletion.

The volcanic eruptions are also responsible for the depletion of the ozone layer.

Ozone Depleting Substances (ODS)

“Ozone depleting substances are the substances such as chlorofluorocarbons, halons, carbon tetrachloride, hydrofluorocarbons, etc. that are responsible for the depletion of ozone layer.”

Following is the list of some main ozone-depleting substances and the sources from where they are released:

Ozone-Depleting Substances	Sources
Chlorofluorocarbons (CFCs)	Refrigerators, air-conditioners, solvents, dry-cleaning agents, etc.
Halons	Fire-extinguishers
Carbon tetrachloride	Fire extinguishers, solvents
Methyl chloroform	Adhesives, aerosols
Hydrofluorocarbons	Solvent cleaning, fire extinguishers, solvent cleaning

Effects of Ozone Layer Depletion

The depletion of the ozone layer has harmful effects on the environment. Let us see the major effects of ozone layer depletion on man and environment.

Effects on Human Health

The humans will be directly exposed to the harmful ultraviolet radiations of the sun due to the depletion of the ozone layer. This might result in serious health issues among humans, such as skin diseases, cancer, sunburns, cataract, quick ageing and an weakend immune system.

Effects on Animals

Direct exposure to ultraviolet radiations leads to skin and eye cancer in animals.

Effects on the Environment

Strong ultraviolet rays may lead to minimal growth, flowering and photosynthesis in plants. The forests also have to bear the harmful effects of the ultraviolet rays.

Effects on Marine Life

Planktons are greatly affected by the exposure to harmful ultraviolet rays. These are higher in the aquatic food chain. If the planktons are destroyed, the organisms present in the lower food chain are also affected.

Solutions to Ozone Layer Depletion

The depletion of the ozone layer is a serious issue and various programmes have been launched by the government of various countries to prevent it. However, steps should be taken at the individual level as well to prevent the depletion of the ozone layer.

Following are some points that would help in preventing this problem at a global level:

Avoid Using Pesticides

Natural methods should be implemented to get rid of pests and weeds instead of using chemicals. One can use eco-friendly chemicals to remove the pests or remove the weeds manually.

Minimize the Use of Vehicles

The vehicles emit a large amount of greenhouse gases that lead to global warming as well as ozone depletion. Therefore, the use of vehicles should be minimized as much as possible.

Use Eco-friendly Cleaning Products

Most of the cleaning products have chlorine and bromine releasing chemicals that find a way into the atmosphere and affect the ozone layer. These should be substituted with natural products to protect the environment.

Use of Nitrous Oxide should be prohibited

The government should take actions and prohibit the use of harmful nitrous oxide that is adversely affecting the ozone layer. People should be made aware of the harmful effects of nitrous oxide and the products emitting the gas so that its use is minimized at the individual level as well.

Salient Features of environmental protection act

Environment Protection Act

The Environment Protection Act was enforced in the year 1986 with the aim to protect and improve the environment and matters associated with it. The Environmental Laws (Amendment) Bill is a draft of the proposed amendment in Environment protection Act 1986 and the National Green Tribunal Act of 2010. The amendments are done with an objective of providing for an effective deterrent penal provisions and introducing the concept of a monetary penalty for violations and contraventions.

Objectives of this Environment Protection Act

- To protect and improve the environment and environmental conditions.
- To implement the decisions made at the UN Conference on Human Environment that was held in Stockholm in the year 1972.
- To take strict actions against all those who harm the environment.
- To enforce laws on environment protection in the areas that are not included by the existing laws.
- To give all the powers to the Central Government to take strict measures in favour of environmental protection.

The Air (Prevention and Control of Pollution) Act, 1981

The Air (Prevention and Control of Pollution) Act of 1981, or the Air Act, in short, was a law passed by the Parliament of India to prevent and control the harmful effects of air pollution in India. This act is seen as the first concrete step taken by the government of India to combat air pollution.

The details from this article will be useful for aspirants appearing for the Government exams this year.

Why was the Air (Prevention and Control of Pollution) Act of 1981 passed?

The effects of climate change caused by all forms of pollution became all too apparent in the early 1970s. To mitigate their harmful effects it was believed that nations would need to pass their own laws. Thus during the United Nations General Assembly on Human Environment held in Stockholm in June 1972, a resolution was passed which implored the nations of the world to preserve natural resources such as air.

India itself had issues regarding air pollution due to a wide variety of factors such as stubble burning, improper industrial practices, environmental factors etc. To combat these factors a special law was enacted under the Constitution of India, which was the Air (Prevention and Control of Pollution) Act of 1981.

Definitions under the Air Act

The following are the definitions under the Air (Prevention and Control of Pollution) Act.

Section 2(a) defines an 'air pollutants' as any solid liquid or gaseous substance which may cause harm or damage the environment, humans, plants, animals or even damage property. A 1987 amendment to the act also added 'noise' in the list of harmful substances.

The air act defines 'air pollution' as the presence of any dangerous pollutant that makes the air unbreathable

Section 2 (g) of the Act also set up the Central Pollution Control Board (CPCB) whose powers extended to the whole of India. To carry out the directives of the CPCB the act also called for the setting up of the State Pollution Control Board (SPCB) for the individual states of India

Salient features of this Act...

The Air Act consists of 54 sections divided into seven Chapters.

Chapter-I, containing Sections 1 and 2 deals with Preliminary and Definitions of certain terms respectively.

Chapter-II containing Sections 3 to 15 deals with Central and State Boards for the prevention and control of Air Pollution.

Chapter-III (Sections 16 to 18) lays down the powers and functions of Air Pollution Control Boards.

Chapter-IV (Sections 19 to 31-A) provides for prevention and control of Air Pollution.

Chapter-V (Sections 32 to 36) relates to funding, Accounts and Audit.

Chapter-VI (Sections 37 to 46) deals with Penalties and Procedure. Finally,

Chapter-VII (Sections 47 to 54) contains 'Miscellaneous Provisions'.

The major sections and features of this Act are-

Chapter I: This chapter defines the following terms such as air pollutant, air pollution, approved fuel, automobile, chimney emission, control equipment etc.,

Chapter II: It deals with the information regarding CPCB and SPCB, their constitutions, terms and conditions of service of members, delegation of powers to various officials.

Chapter III: This chapter emphasizes the function of central board and state board such as to collect, compile and publish the data regarding air pollution and to guide the concerned industry for the effective prevention and control of air pollution.

Chapter IV: This deals with prevention and control of air pollution. The boards are authorized to declare the air pollution control areas, instruct regarding the emission standards from automobiles and restrict the activities of certain industries. According to this chapter the industrial people are not permitted to allow excess pollutants with respect to standards and in such cases the board has the power to enter, inspect and collect sample, find out the reports in the state laboratories. On the basis of the report appeal can be made and the persons may be punished.

Chapter V: This chapter deals with the fund, accounts and auditing of the central and state boards.

Chapter VI: If the industry or person fails to follow the standards, they will be punished.

Punishment: Imprisonment for not less than one year and 6 months, it may extend to 6 years and with fine.

Chapter VII: It deals with the power to amend the schedules, the necessity of state board to maintain a register containing relevant particulars and about the power of central and state government to make rules regarding the air pollution control.

- **Section 3-** The Central and State Pollution Control Boards have the responsibility to exercise the powers provided under this Act without prejudice.
- **Section 4-** In states where there is a Water Pollution Control Board established, the same shall be given the joint responsibility of controlling and monitoring air pollution, and will be called State Pollution Control Board.
- **Section 5-** In states where there is no Water Pollution Control Board, a new Pollution Control Board will be set up.
- **Section 16** describes the functions of the Central Pollution Control Board, some of which includes-
 1. Advise the Central government on matters pertaining to air and air pollution.
 2. Advise and support State Boards in carrying out their functions.
 3. Carry out research related to air pollution.
 4. Through mass media, spread awareness and information about air and air pollution.
 5. Plan and organize the training of personnel.
 6. Set the standards for Air Quality in India.
- **Section 17** describes the functions of the State Pollution Control, some of which are-
 1. Advise the State Government on matters of air and air pollution.
 2. In collaboration with the Central Board, plan and organize the training of personnel.
 3. Carry out inspections in air pollution control areas at necessary intervals.
 4. Advise the State Government about the feasibility of conducting industrial activity with respect to air pollution.
- **Section 19-** The SPCBs have the authority to declare any area as an air pollution control area, with consultation from the CPCB.
- **Section 21** states that no person or entity shall establish an industry without prior permission from the Boards in an air pollution control area.
- **Section 22** states that no person or industry shall emit air pollutants above the standards set by the Pollution Control Boards. Under this, the Board can even approach a court to gain a restraining order on the industry that fails to meet its standards.
- **Section 26** gives any officer of the Pollution Control Boards, the power to take samples from any chimney, duct, etc. for testing and seeing whether the emissions are within prescribed standards or not.
- **Section 28-** This allows the SPCBs to set up State Air Laboratories, either as a new establishment or by declaring an existing lab as a State Air Lab. These labs have the authority to test the air samples and air quality procedures as described by the standards, for the SPCBs of that state in their areas.
- **Section 37,** the law states that failure to comply with the rules of Section 21 and 22 will result in punishment that is a minimum of one year and 6 months, but extendable up to 6 years with fine. If the failure continues, an additional fine of 25,000 rupees per day is introduced till the time the offence does not stop. If the failure continues for more than a

year, then the culprit is punishable by imprisonment for a minimum of 2 years and can extend up to 7 years with fine.

The environmental legislation in India is a combination of the Air Act 1986 and the Water (Prevention and Control of Pollution) Act, 1974. The two Acts have many overlapping features. Both these acts remain important, but the Environment Protection Act, 1986, become the major environment governing act after it came into force.

Composition, Powers and Functions of the Central Pollution Control Board

The CPCB would have a chairman with crucial knowledge regarding environmental protection. He/she would be aided by a secretary appointed by the Central Government. In addition, five more members would be nominated by the Central Government

The functions of the CPCB are as follows:

- The CPCB would take measures to mitigate the harmful effects of air pollution in India and make recommendations to the governments on how such steps can be taken.
- The board will lead technical assistance to in carrying out research relating to air pollution.
- The board would create and publish data about air pollution and prepare guidelines to on how to effectively reduce air pollutions.
- To know what are the Pollution Measurements adopted by the CPCB visit the linked article

The powers of the Central Pollution Control Board are as follows:

- The CPCB can declare an area as an 'air pollution area after consultation with the state government.
- The Central, as well as the State Pollution Control Board, have the power to prohibit the sale or use of any fuel that may cause air pollution
- Power to give restrictions for ensuring standards for emissions from automobile
- Restrictions on use of certain industrial plants.
- The Air Act empowers the State and Central Pollution Control Boards to carry out inspections of equipment, industrial plants or any other object which is believed to be the cause of air pollution. The person in charge will have to assist the board in their inspection and in refusing to do so will be considered an offence.

Water (Prevention and Control of Pollution) Act, 1974

The Water (Prevention and Control of Pollution) Act was enacted in 1974 to provide for the prevention and control of water pollution, and for the maintaining or restoring of wholesomeness of water in the country.

The Act was amended in 1988. The Water (Prevention and Control of Pollution) Cess Act was enacted in 1977, to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities.

This cess is collected with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974. The Act was last amended in 2003.

Act covers following aspects

- To prevent and control water pollution.
- To maintain “wholesomeness” of water, i.e. to maintain the qualities of water so that its consumption and use by living organisms is not hampered.
- To establish State Boards for prevention and control of pollution, which gets subsumed by the Air Act, passed in 1981.
- To empower the Boards for prevention and control of pollution.
- To provide penalties for breaking the rules of the provisions under this Act.
- To establish state water testing laboratories and develop its protocols.

The Act has 64 sections compiled in VIII chapters. Chapter II establishes the Central and State Pollution Control Boards; Chapter IV describes the powers of the Boards; Chapter V explains steps to prevent and control water pollution; and Chapter VII describes penalties and punishment procedure when these rules are flouted.

The Act was amended in 1978 and again in 1988. In 1988 Amendment made it conform closely with the provisions of the Environment Protection Act, 1986.

Salient features of the Water Pollution Act

Chapter I: This chapter explains the terms such as board, central, state board, member, outlet sewer sewage effluent, trade effluent, stream and pollution.

Chapter II: It elaborates about the constitution of central board, state board, committees, terms and conditions of service of members, meeting of the board. It also explains about delegation of powers to chairman, member secretary, officers and other employees of the board.

Chapter III: It deals with the constitution, composition and the special provision of joint board. For eg. A Joint board for the river Cauvery includes officials from Karnataka, Tamilnadu and Pondicherry along with the Central board officials.

Chapter IV: This chapter deals with the functions of central board, state board and their powers to give directions to concerned authorities.

Chapter V: It explains the power of state government to collect samples of effluent, analyze in government laboratory and publish the results. On the basis of the result they may restrict the outlets and discharges into stream or well.

Chapter VI: It deals with the maintenance of funds of central and state board, budgets, annual report submission, account and auditing.

Chapter VII: This elaborates about the penalty in case of offences committed by companies.

Punishment: Imprisonment for not less than one year and six months but which may extend to 6 years with fine. In case of failure, an additional fine of Rs.5000/ will be imposed for every day. In such case the names of the offenders may be even published.

Chapter VIII: It explains about the central and state water laboratories, analysts, reports of the analysts, protection, action in good faith and about the power of central and state government to formulate the rules. Important sections under this act are

- Section 3 and Section 4: **Constitution of the Central Pollution Control Board and State Pollution Control Boards**, respectively, are provided the authority to exercise the powers conferred to them under this Act.
- Section 13: **Constitution of a Joint Board:** Under this Section, the Act prescribes the constitution of a Joint Board for pollution control if there is an agreement between (a) two or more State Governments of contiguous states or, (b) Central Government (representing one or more Union Territories) and State Governments contiguous to one or more Union Territories.
- Section 16: **Functions of the Central Board** are described, some of which include:
 1. Advise the Central Government on any matter concerning the prevention and control of water pollution
 2. Co-ordinate the activities of the State Boards and provide technical assistance and guidance
 3. Collect, compile and publish technical and statistical data relating to water pollution
 4. Establish or recognize a laboratory or laboratories to enable the Board to perform its functions under this section efficiently including the analysis of samples of water from any stream or well or of samples of any sewage or trade effluents
- Section 17: **Functions of the State Board** are described, some of which include:
 1. Plan a comprehensive programme for the prevention, control or abatement of pollution of streams and wells in the State and to secure the execution
 2. Advise the state government on matters of water pollution

3. Inspect and lay down, modify or annul effluent standards for the sewage and trade effluents
4. Evolve economical and reliable methods of treatment of sewage and trade effluents
- Section 19: If the State Board feels that the provisions of this Act need not apply to some parts of the State, it may recommend the State Government to do so.
- Section 20: This section provides power to the State Board to appoint person(s) on its behalf to take surveys of any area and gauge and keep records of flow, volume and other characteristics of streams and wells to perform its functions dutifully.
- Section 33: This section gives power to the Boards to appeal to the courts to restrict certain actions, if it feels that it is likely to cause harm to water resources in an area. The court has the power to decide for or against such an application.

Functions of Central pollution Board

1. The main functions of the Central Board shall be to improve the quality of air and to prevent, control or abate air pollution in the country.
2. It may:
 - a. advise the Central Government on any matter concerning the improvement of the quality of air and the prevention, control or abatement of air pollution;
 - b. plan and cause to be executed a nation-wide programme for the prevention, control or abatement of air pollution;
 - c. co-ordinate the activities of the State and resolve disputes among them;
 - d. provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of air pollution and prevention, control or abatement of air pollution;
 - e. perform such of the function of any State Board as may, be specified in and order made under sub-section (2) of section 18;
 - f. plan and organize the training of persons engaged or to be engaged in programmes for the prevention, control or abatement of air pollution on such terms and conditions as the Central Board may specify;
 - g. organize through mass media a comprehensive programme regarding the prevention, control or abatement of air pollution;
 - h. collect, compile and publish technical and statistical data relating to air pollution and the measures devised for its effective prevention, control or abatement and prepare manuals, codes or guides relating to prevention, control or abatement of air pollution;
 - i. lay down standards for the quality of air,
 - j. collect and disseminate information in respect of matters relating to air pollution;
 - k. Perform such other functions as may be prescribed.
 - l. To promote cleanliness of streams and wells in different areas of the state.

- m. To advise the Central Govt, on matters concerning the prevention and control of water pollution.
- n. To co-ordinate the actions of the State Board and resolve disputes among them.
- o. To provide technical assistance and guidance to the State Boards to carry out research in prevention and control of water pollution problems.
- p. To organize training of persons engaged in pollution control.
- q. To organize comprehensive programme for pollution control through mass media.
- r. To lay down standards for streams or wells.
- s. To prepare manuals, codes or guides for treatment and disposal of sewage and trade effluents.
- t. To establish or recognize laboratories for analysis of water samples from any stream, well or trade effluents.

(3) The Central Board may establish or recognize a laboratory or laboratories to enable the Central Board to perform its functions under this section efficiently.

Functions of state boards

(1) The functions of a State Board shall be-

- a. to plan a comprehensive programme for the prevention, control or abatement of air pollution and to secure the execution thereof-,
- b. to advise the State Government on any matter concerning the prevention, control or abatement of air pollution;
- c. to collect and disseminate information relating to air pollution;
- d. to collaborate with the Central Board in organizing the training of persons engaged or to be engaged in programmes relating to prevention, control or abatement of air pollution and to organize mass-education programme relating thereto;
- e. to inspect, at all reasonable times, any control equipment, industrial plant or manufacturing process and to give, by order, such directions to such persons as it may consider necessary to take steps for the prevention, control or abatement of air pollution;
- f. to inspect air pollution control areas at such intervals as it may think necessary, assess the quality of air therein and take steps for the prevention, control or abatement of air pollution in such areas;
- g. to lay down, in consultation with the Central Board and having regard to the standards for the quality of air laid down by the Central Board, standards for emission of air pollutants into the atmosphere from industrial plants and automobiles or for the discharge of any air pollutant into the atmosphere from any other source whatsoever not being a ship or an aircraft;
- h. To promote cleanliness of streams and wells in different areas of the state.

- i. To advise the Central Govt, on matters concerning the prevention and control of water pollution.
- j. To co-ordinate the actions of the State Board and resolve disputes among them.
- k. To provide technical assistance and guidance to the State Boards to carry out research in prevention and control of water pollution problems.
- l. To organize training of persons engaged in pollution control.
- m. To organize comprehensive programme for pollution control through mass media.
- n. To lay down standards for streams or wells.
- o. To prepare manuals, codes or guides for treatment and disposal of sewage and trade effluents.
- p. To establish or recognize laboratories for analysis of water samples from any stream, well or trade effluents.

Indian Standard organization 14000

ISO 14000 refers to a family of standards for the design, implementation, and optimization of an environmental management system (EMS) for businesses and organizations.

The ISO 14000 family was first developed due to a rising need for standard operating procedures and policies for businesses to use to build their own EMS.

Let's break down each of the components of "ISO 14000".

ISO

- ISO, which stands for the International Organization for Standardization, is the body responsible for establishing and implementing various standards across a wide range of proprietary, industrial, and commercial applications.
 - Based in Geneva, Switzerland, the ISO was formed in 1947 with the goal to develop global standards for industrial and engineering processes. Since then, it has grown to become the world's largest and most reputable institution for internationally recognized standards, boasting over 11,000 standards.
 - Of the 11,000+ existing ISO standards, about 350 are related to environmental management systems (though not all of them are ISO 14000).
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- ISO standards are not mandatory; they are developed in accordance with market demands in order to maximize availability and adoption, and are usually developed by technical committees within the larger body of the ISO.
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14000

This number is an identifier, and in this case it refers to the broad family of EMS standards: ISO 14000.

Here, “14000” refers to standards for setting up and maintaining an EMS. Over 300,000 organizations and businesses in 171 countries around the globe are certified to an ISO 14000 standard.

The number following “ISO” can also refer to a specific standard within the family, e.g. “ISO 14001”. Typically, multiples of 1000 (like 9000, 14000, 16000) will denote families, and anything between will refer to a specific standard.

ISO 14000, which was initially released in 1996 and updated in 2004, is a global series of environmental management systems (EMS) standards. As a continuation of the standardization process that was initiated with the ISO 9000 series, the ISO 14000 series of international standards have been developed so that organizations may incorporate environmental aspects into operations and product standards. It is a set of voluntary environmental management standards, guides and technical reports, which specifically focuses on corporate environmental management systems, operating practices, products, and services. The ISO standards in general aim to facilitate international trade and commerce. Companies can implement any or all of the ISO 14000 series standards. They do not prescribe environmental performance targets, but provide organizations with the tools to assess and control the impact of their activities, products or services on the environment.

The ISO 14000 series addresses the following aspects of environmental management:

- Environmental Management Systems (EMS)
- Environmental Auditing & Related Investigations (EA&RI)
- Environmental Labels and Declarations (EL)
- Environmental Performance Evaluation (EPE)
- Life Cycle Assessment (LCA)
- Terms and Definitions (T&D)

Compliance to an ISO 14000 EMS:

- Assures customers of your commitment to demonstrable environmental management
- Maintains excellent public relations
- Satisfies investor criteria and improves access to capital

- Obtains insurance at reasonable cost
- Enhances your image and market share
- Meets your clients' registration requirements
- Improves cost control by identifying and eliminating waste and inefficiency
- Lessens incidents that result in liability
- Reduces your consumption of materials and energy
- Facilitates the attainment of permits and authorizations
- Decreases the cost of complying with environmental regulations
- Improves industry-government relations

What is an EMS?

An EMS, or environmental management system, is a set of policies and procedures designed to help organizations:

- Reduce negative environmental impact
- Improve efficiency and operational effectiveness

Just like a quality management system, an EMS is a set of guidelines for continuous improvement, based on proven methods of business process management and optimization.

Process for EMS Certification

The following is an overview of the 13 steps needed to make sure that nothing is missed during your implementation and preparations for certification:

1) Obtain management support – Management support is critical. Without this support your implementation of ISO 14001 will almost certainly fail. You need to have a good sales pitch to convince your management that ISO 14001 is a good idea, and if you need some help take a look at this ISO 14001:2015 benefits of early transition white paper and this Project proposal for ISO 14001:2015 implementation presentation.

2) Identify legal requirements – Making sure that you have identified the legal and other requirements for your EMS is another crucial step to make sure your implementation succeeds. See also: Demystification of legal requirements in ISO 14001.

3) Define EMS scope – To ensure you know the limits of what needs to be done, you need to define the scope of your EMS. This helps prevent the inclusion of areas of your business that might not have an effect on the environment. The key tools to define the scope are the environmental policy and environmental aspects (the interaction you have with the environment); these are the first documents you will need to create for the EMS.

4) Define EMS procedures and processes – These will include the processes and procedures you will identify as necessary to ensure consistent and adequate results when preventing negative environmental impacts and to respond to emergency situations.

5) Implement EMS procedures and processes – Often, these processes will be linked to the processes that are already in place at your organization, such as the tracking of waste from your facility. Since not all processes need to be documented procedures, it is important to decide which ones must be documented in order to prevent environmental damage. For a good overview, see this [Checklist of Mandatory Documentation Required by ISO 14001:2015](#).

6) Perform training and awareness – Employees should have training on what ISO 14001 is and why you are doing this, in addition to training for any changes to the processes they are involved in. It is important that everyone in your organization knows what you are doing with your EMS and how they fit into the equation.

7) Choose a certification body – The certification body is the company that will ultimately come in to audit your EMS processes for compliance with ISO 14001 requirements, as well as whether the system is effective and improving. It is best to interview several certification bodies to decide which is right for your company, since this can be a very important step in how effective your implementation is.

8) Operate the EMS; measure and keep records – This is when you will collect the records that will be required during an audit to show that your processes meet the requirements set out for them. The records also show that the processes are effective and that improvements are being made in your EMS as needed. Certification bodies will identify a certain length of time for this to happen in order to ensure that the system is mature enough to show compliance. See also: [ISO 14001 Control of Records](#).

9) Perform internal audits – The certification body will want you to audit each process internally before they come in to do the certification audit. This will give you a chance to make sure that the processes are doing what you had planned, and if not, you will have a chance to fix any problems that you find.

10) Perform management review – Just as important as the support that management gives for the implementation of ISO 14001, is the involvement of management in the continued maintenance of the EMS. In order to ensure that the processes have adequate resources to be effective and improve, management needs to review specified data from the activities of the EMS and react to that data appropriately.

11) Implement corrective actions – In order to fix problems and improve the system, you need to use corrective actions to find the root cause of any problems found and take action

to correct that root cause. These problems can be identified during your measurements, internal audits, and management review.

12-1) Certification audit – Stage 1 – Here the certification body will review your documentation to verify that, on paper, that you have addressed all the necessary requirements of the ISO 14001 standard. The auditors will issue a report outlining where you comply and where there are problems, so that you have a chance to implement any corrective actions to address the problems.

12-2) Certification audit – Stage 2 – During this main audit the certification body auditors will perform the on-site audit where they will review the records you have accumulated by operating your EMS processes, including your records of internal audits, management review, and corrective actions. After this audit, done over several days, they will issue a report detailing their findings and whether they have found your EMS to be effective and in compliance with the ISO 14001 requirements. The auditors will also make a recommendation for certification if you meet all requirements; however, if you have any major non-conformances then you will need to resolve the corrective action for these problems before certification can be recommended.

OR

1. The first step in the EMS-building process is gaining top management's commitment to supporting the EMS. Management must understand the benefits of an EMS and what it will take to put an EMS in place. Management commitment and vision should be clear and communicated across the organization.
2. Not all small or medium-size organizations have the luxury of choosing among multiple candidates, but your choice of project champion is critical. The champion should have the necessary authority, an understanding of the organization, and project management skills. The champion should be a "systems thinker" (some ISO 9000 experience would be a plus, but is not necessary) and must have the time to commit to the EMS-building process.
3. The project champion should prepare a preliminary budget and schedule for developing the EMS. Costs will likely include staff and employee time, training, some consulting assistance, materials, and possibly some equipment (such as a computer or word processor). The schedule should consider the various tasks described below, among others.
4. A team with representation from key management functions and production or service areas can identify and assess issues, opportunities, and existing processes. You may want to consider including contractors, suppliers, and other external parties to be part of the project team where appropriate. This team will need to meet frequently, especially

in the early stages of the project. The cross-functional team can help to ensure that procedures are reasonable and will build commitment to the EMS.

5. Employees are a great source of knowledge on environmental and health & safety issues related to their areas as well as on the effectiveness of current processes and procedures. They can help the project team in drafting procedures. Employee ownership of the EMS will be greatly enhanced by meaningful employee involvement in the EMS development process.
6. The next step is to conduct a preliminary review of your current environmental programs and system and compare these against the criteria for your EMS (such as ISO 14001). Evaluate your organization's structure and its procedures, policies, environmental impacts, training programs, and other factors. Determine which elements of your current system are in good shape and which need additional work.
7. The project plan might need to be modified based on the results of the preliminary review. The modified plan should describe in detail the key actions needed, which will be responsible, what resources are needed, and when the work will be completed.
8. At this point, you are ready to develop procedures and other system documents. In some cases, this might involve modifying existing environmental procedures or adapting other business procedures (such as quality or health & safety management procedures) for EMS purposes. In some cases, you might need to develop new procedures. Get help from employees and the cross-functional team, as discussed above.
9. In building your EMS, make sure that the system is sufficiently flexible. While you will likely need to modify your EMS over time, try to avoid making your EMS so rigid that you must change it frequently to reflect the realities of your operation.
10. Once the procedures and other documents have been prepared, you are ready to implement the EMS. As a first step, train your employees on the EMS, especially with regard to the environmental impacts of their activities, any new / modified procedures, and any new responsibilities.
11. After the EMS is up and running, be sure to assess system performance. This will be accomplished through periodic EMS audits and ongoing monitoring and measurement. Assessment of EMS performance provides the opportunity to improve the system and your environmental performance over time.