MODULE – 2

Air Pollution

Air pollution is the introduction of particulates, biological molecules, or other harmful materials into Earth's atmosphere, causing diseases, allergies, death to humans, damage to other living organisms such as animals and food crops, or the natural or built environment.

Types of Pollutants

In order to understand the causes of Air pollution, several divisions can be made. **Primarily air pollutants** can be caused by primary sources or secondary sources. The pollutants that are a direct result of the process can be called primary pollutants. A classic example of a primary pollutant would be the sulfur-dioxide emitted from factories

Secondary pollutants are the ones that are caused by the inter mingling and reactions of primary pollutants. Smog created by the interactions of several primary pollutants is known to be as secondary pollutant.

Causes of Air pollution

- **Burning of Fossil Fuels:** Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum and other factory combustibles is one the major cause of air pollution. Pollution emitting from vehicles including trucks, jeeps, cars, trains, airplanes cause immense amount of pollution. We rely on them to fulfill our daily basic needs of transportation. But, there overuse is killing our environment as dangerous gases are polluting the environment. Carbon Monoxide caused by improper or incomplete combustion and generally emitted from vehicles is another major pollutant along with Nitrogen Oxides, that is produced from both natural and man-made processes.
- **Agricultural activities:** Ammonia is a very common by product from agriculture related activities and is one of the most hazardous gases in the atmosphere. Use of insecticides, pesticides and fertilizers in agricultural activities has grown quite a lot. They emit harmful chemicals into the air and can also cause water pollution.
- **Exhaust from factories and industries:** Manufacturing industries release large amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air thereby depleting the quality of air. Manufacturing industries can be found at every corner of the earth and there is no area that has not been affected by it. Petroleum refineries also release hydrocarbons and various other chemicals that pollute the air and also cause land pollution.
- **Mining operations:** Mining is a process wherein minerals below the earth are extracted using large equipments. During the process dust and chemicals are released in the air causing massive air pollution. This is one of the reason which is responsible for the deteriorating health conditions of workers and nearby residents.

- **Indoor air pollution:** Household cleaning products, painting supplies emit toxic chemicals in the air and cause air pollution. Suspended particulate matter popular by its acronym SPM, is another cause of pollution. Referring to the particles afloat in the air, SPM is usually caused by dust, combustion etc.

Effects of Air pollution

- **Respiratory and heart problems:** The effects of Air pollution are alarming. They are known to create several respiratory and heart conditions along with Cancer, among other threats to the body. Several millions are known to have died due to direct or indirect effects of Air pollution. Children in areas exposed to air pollutants are said to commonly suffer from pneumonia and asthma.
- **Global warming:** Another direct effect is the immediate alterations that the world is witnessing due to Global warming. With increased temperatures worldwide, increase in sea levels and melting of ice from colder regions and icebergs, displacement and loss of habitat have already signaled an impending disaster if actions for preservation and normalization aren't undertaken soon.
- **Acid Rain:** Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. When it rains, the water droplets combines with these air pollutants, becomes acidic and then falls on the ground in the form of acid rain. Acid rain can cause great damage to human, animals and crops.
- **Effect on Wildlife:** Just like humans, animals also face some devastating effects of air pollution. Toxic chemicals present in the air can force wildlife species to move to new place and change their habitat. The toxic pollutants deposit over the surface of the water and can also affect aquatic organisms.
- **Depletion of Ozone layer:** Ozone exists in earth's stratosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth's ozone layer is depleting due to the presence of chlorofluorocarbons, hydro chlorofluorocarbons in the atmosphere. Thin ozone layer allows the passage of harmful UV rays onto earth and can cause skin and eye related problems. UV rays also have the capability to affect crops

Methods to reduce Air Pollution

- **Use public mode of transportation:** Encourage people to use more and more public modes of transportation to reduce pollution. Also, try to make use of car pooling. If you and your colleagues come from the same locality and have same timings you can use same vehicle at a time to save energy and money.
- **Conserve energy:** Switch off fans and lights when you are going out. Large amount of fossil fuels are burnt to produce electricity. We can save the environment from degradation by reducing the amount of fossil fuels to be burned.
- **Understand the concept of Reduce, Reuse and Recycle:** Do not throw away items that are of no use. In-fact reuse them for some other purpose or recycle them to produce new products.

- **Emphasis on clean energy resources:** Clean energy technologies like solar, wind and geothermal are utilized effectively these days. Governments of various countries have been providing grants to consumers who are interested in installing solar panels for their home. This will go a long way to curb air pollution.
- **Use energy efficient devices:** CFL lights consume less electricity as against their counterparts. They live longer, consume less electricity, lower electricity bills and also help you to reduce pollution by consuming less energy.
- **Monitor Air quality** in industry periodically to identify irregularities in pollutants level in air and keep pollutant level within limits.

Water Pollution

Water pollution is the contamination of water bodies(e.g. lakes, rivers, oceans, aquifers and groundwater). This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Sources of Water Pollution

There are various classifications of water pollution. The two chief sources of water pollution can be seen as **Point and Non Point.**

Point refers to the pollutants that belong to a single source. An example of this would be emissions from factories into the water.

Non Point on the other hand means pollutants emitted from multiple sources. Contaminated water after rains that has traveled through several regions may also be considered as a Non point source of pollution.

Causes of Water Pollution

- **Industrial waste:** Industries produce huge amount of waste which contains toxic chemicals and pollutants which can cause air pollution and damage to us and our environment. They contain pollutants such as lead, mercury, sulphur, nitrates and many other harmful chemicals. Many industries do not have proper waste management system and drain the waste in the fresh water which goes into rivers, canals and later in to sea. The toxic chemicals have the capability to change the color of water, increase the amount of minerals, also known as Eutrophication, change the temperature of water and pose serious hazard to water organisms.
- **Sewage and waste water:** The sewage and waste water that is produced by each household is chemically treated and released in to sea with fresh water. The sewage water carries harmful bacteria and chemicals that can cause serious health problems. Pathogens are known as a common water pollutant. Microorganisms in water are known to be causes of some very deadly diseases and become the breeding grounds for other creatures that act like carriers. These carriers inflict these diseases via various forms of contact onto an individual. Eg:- Malaria.

- **Mining activities:** Mining is the process of crushing the rock and extracting coal and other minerals from underground. These elements when extracted in the raw form contains harmful chemicals and can increase the amount of toxic elements when mixed up with water which may result in health problems. Mining activities emit several metal waste and sulphides from the rocks and get mixed with water.
- **Marine dumping:** The garbage produce by each household in the form of paper, aluminum, rubber, glass, plastic, food etc are sometimes deposited into water bodies.. These items take 2 weeks to 200 years to decompose. When such items enter the sea, they not only cause water pollution but also harm aquatic organisms.
- **Accidental Oil leakage:** Oil spill pose a huge concern as large amount of oil enters into the sea and does not dissolve with water; there by opens problem for local marine wildlife such as fish, birds and sea otters. For e.g.: a ship carrying large quantity of oil may spill oil if met with an accident and can cause varying damage to species in the ocean depending on the quantity of oil spill, size of ocean, toxicity of pollutant.
- **Burning of fossil fuels:** Fossil fuels like coal and oil when burnt produce substantial amount of ash in the atmosphere. The particles which contain toxic chemicals when mixed with water vapor result in acid rain.
- **Chemical fertilizers and pesticides:** Chemical fertilizers and pesticides are used by farmers to protect crops from insects and bacterias. They are useful for the plants growth. However, when these chemicals are mixed up with water produce harmful for plants and animals. Also, when it rains, the chemicals mixes up with rainwater and flow down into rivers and canals which pose serious damages for aquatic animals.
- **Leakage from sewer lines:** A small leakage from the sewer lines can contaminate the underground water and make it unfit for the people to drink. Also, when not repaired on time, the leaking water can come on to the surface and become a breeding ground for insects and mosquitoes.
- **Radioactive waste:** Nuclear energy is produced using nuclear fission or fusion. The element that is used in production of nuclear energy is Uranium which is a highly toxic chemical. The nuclear waste that is produced by radioactive material needs to be disposed off to prevent any nuclear accident. Nuclear waste can have serious environmental hazards if not disposed off properly. Few major accidents have already taken place in Russia and Japan.
- **Urban development:** As population has grown, so has the demand for housing, food and cloth. As more cities and towns are developed, they have resulted in increased use of fertilizers to produce more food, soil erosion due to deforestation, increase in construction activities, inadequate sewer collection and treatment, landfills as more garbage is produced, increase in chemicals from industries to produce more materials.

- **Leakage from the landfills:** Landfills are nothing but huge pile of garbage that produces awful smell and can be seen across the city. When it rains, the landfills may leak and the leaking landfills can pollute the underground water with large variety of contaminants.
- **Animal waste:** The waste produce produce by animals is washed away into the rivers when it rains. It gets mixed up with other harmful chemicals and causes various water borne diseases like cholera, diarrhea, jaundice, dysentery and typhoid.
- **Underground storage leakage:** Transportation of coal and other petroleum products through underground pipes is well known. Accidentals leakage may happen anytime and may cause damage to environment and result in soil erosion.

Methods to reduce water pollution

- **Sewage treatments:** The household water should be treated properly so that they become environmentally safe. Adequate care should be taken to ensure that effective sewage treatment process is in place and that contaminated water does not get mixed with the environment. in order to prevent water pollution, human and animal excreta should be prevented from mixing with its sources. Construction of pit toilet and proper sewage treatments can offer some solution to this problem.
- **Prevent river water to get polluted:** The flowing water of the river cannot be cleaned easily by natural process. Since, a large number of external substances are discharged into the water, the river water becomes polluted. This may cause diseases to the people using river water. Thus, every effort should be made to prevent the river water to get contaminated. People should not be allowed to throw wastes into the river water.
- **Treatment of wastes before discharge:** Factories are expected to treat its effluent wastes prior to discharge. Toxic material must be treated chemically and converted into harmless materials. If possible, factories should try to recycle the treated water.
- **Strict adherence to water laws:** Laws and legislation relating to pollution should be strictly followed by all.
- **Treatment of drainage water:** It cities, a huge amount of water is put into drains every day. The water that flows through the city drainage system should be properly treated. Harmful pollutants must be removed, before they are introduced into reservoirs.
- **Treatment plants:** Big cities and towns usually have effluent treatment plants. These plants filter out undissolved materials. Chemical treatment is also given to separate out unwanted dissolved chemicals. The treated water is either allowed to go into the water reservoirs or refused in houses. Occasionally, the treated water is used for farming if the fields to be irrigated lie in the vicinity of the water treatment plants.

- **Routine cleaning:** Ponds, lakes and wells meant for human use should be routinely cleaned and treated, so that it remains fit for human use. It is an essential step that should not be avoided. A system of regular testing of pond and lake water can be introduced to ensure the safety of the water.
- **Self hygiene:** Self hygiene must be maintained and drinking water must not be polluted. Drinking water should be kept undercover in a clean place. One should not put his hands into the drinking water containers. Also, the practice of cleaning the drinking water reservoirs on a regular basis needs to be strictly followed. The water meant for drinking should be purified prior to use. In the absence of good water purifier, it is recommended to drink boiled water.
- **Sanitation:** Sanitation system must be improved. The benefits of cleanliness on human health need to be understood. Human contact with hazardous materials should be prevented.
- **Public Awareness:** Common public should be aware about the effect of water pollution. Voluntary organization should go door-to-door to educate the people about environmental problems. They should perform street plays for creating awareness about the environment. They should run environmental education centers. Students can impart health education to enable people to prevent water pollution

Zero Waste Concept

Zero Waste Concept is a philosophy that encourages the redesign of resource life cycles so that all products are reused and no wastes will be produced. The process recommended is one similar to the way that resources are reused in nature.

Zero Waste concept requires:-

- designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials,
- conserving and recovering all resources,
- investment in community waste reduction and recovery systems
- Public participation in recycling.
- Eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health.
- Adopting 3R concepts (reduce, reuse, recycle)
- Acquiring waste to energy technologies.

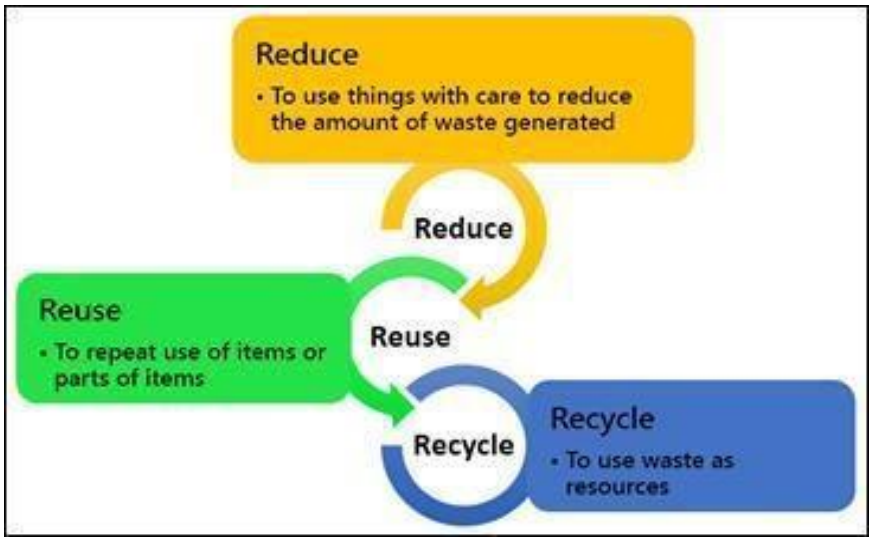
Zero waste is more of a goal or ideal rather than a hard target. Zero Waste provides guiding principles for continually working towards eliminating wastes. Zero waste promotes not only reuse and recycling, but, more importantly, it promotes prevention and product designs that consider the entire product life cycle.

Benefits proposed include:

- Saving money---Since waste is a sign of inefficiency, the reduction of waste can reduce costs.
- Faster Progress-- A zero waste strategy improves upon production processes and improving environmental prevention strategies which can lead to take larger, more innovative steps.
- Supports sustainability---A zero waste strategy supports all three of the generally accepted goals of sustainability - economic well-being, environmental protection, and social well-being.
- Improved material flows-- A zero waste strategy would use far fewer new raw materials and send no waste materials to landfills. Any material waste would either return as reusable or recycled materials or would be suitable for use as compost.

3R Concept of waste management

Reduce, Reuse and Recycle (R3) are the three essential components of environmentally-responsible consumer behavior.



Reduce

- Lower the consumption of products through hiring,sharing,borrowing etc
- Reduce number of components in product design
- Minimise wastes.

Here's how the 3R might apply to computers:

- The concept behind the first R, reduce, is that you should limit the number of purchases that you make in the first place. So, for example, you might limit your household to a single computer.

- The concept behind the second R, reuse, is that you should reuse items as much as possible before replacing them. For example, it generally makes more environmental sense to update your computer rather than get rid of it and buy a new one. However, if you do replace your computer, you should ensure that it, or its components, are reused. Many charitable organizations welcome donations of second-hand computers.
- The concept behind the third R, recycle, is that you should ensure that items or their components are put to some new purpose or create something new as much as possible. If your computer is not fit for reuse , you can donate it to one of several organizations, which will refurbish it or recycle its electronic components to manufacture new electronic devices.

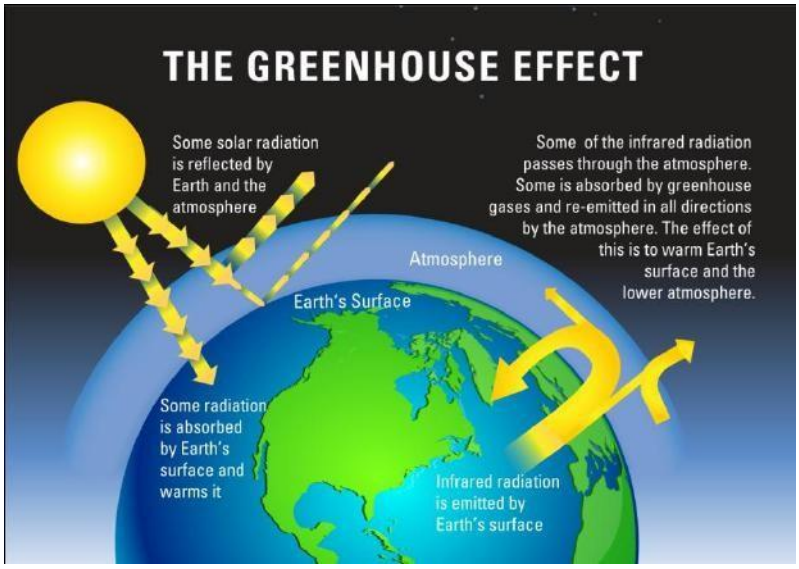
Advantages of 3R

- Protects environment and natural resources.
- Reduces energy consumption
- Reduces pollution, global warming etc
- Reduces waste generation
- Creates jobs at recycling sites.

Waste Management Hierarchy:

The waste management hierarchy is a nationally and internationally accepted guide for prioritising waste management practices.

Green House Effect



Greenhouse effect is a natural phenomenon which refers to the rise in temperature of the earth due to the presence of certain greenhouse gases (watervapour, carbon dioxide, methane, nitrous oxide etc) in the atmosphere. These gases are transparent to the incoming ultraviolet solar radiations but trap the outgoing infrared radiations, reflected back from the earth's surface. If these gases were not present, the annual average temperature of the earth would be much lower($-18\ ^0$ C) than they are now(15^0 C).But the excess amount of greenhouse gases will create problems . Excess amount of greenhouse gases will create excess hot conditions all over the earth.

Global Warming

Global Warming is the increase of Earth's average surface temperature due to the presence of excess amount of greenhouse gases, such as carbon dioxide, methane etc which trap heat that would otherwise escape from Earth.

Greenhouse gases include carbon dioxide, methane, nitrous oxide,sulphur hexafluoride, hydro fluorocarbons and perfluorocarbons.

Greenhouse Gas	Formula	100-year GWP
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298
Sulphur hexafluoride	SF_6	22,800

Releasing 1 kg of methane is equivalent to releasing 25 kgs of CO_2

Releasing 1 kg of nitrous oxide is equivalent to releasing 298 kgs of CO_2

Global Warming is caused by :

- Burning of fossil fuels
- Refrigerants and air conditioners release CFC
- Deforestation – carbon dioxide intake is reduced when forests are cut down.
- Methane emission occurs due to anaerobic decomposition at huge landfills.
- Methane emission from livestock (animal farm)

Global Warming Impacts

1. Rising Seas--- inundation of fresh water marshlands (the everglades), low-lying cities, and islands with seawater.
2. Changes in rainfall patterns --- droughts and fires in some areas, flooding in other areas.
3. Increased likelihood of extreme events--- such as flooding, hurricanes, etc.
4. Melting of the ice caps --- loss of habitat near the poles. Polar bears are now thought to be greatly endangered by the shortening of their feeding season due to dwindling ice packs.
5. Melting glaciers - significant melting of old glaciers is already observed.
6. Widespread vanishing of animal populations --- following widespread habitat loss.
7. Spread of disease --- migration of diseases such as malaria to new, now warmer, regions.
8. Bleaching of Coral Reefs due to warming seas and acidification due to carbonic acid formation --- *One third* of coral reefs now appear to have been severely damaged by warming seas.

Measures to control global warming

- Promote renewable energy usage (solar energy,wind energy etc)
- Depend more on public transport system to reduce the use of fossil fuels.
- Afforestation and reforestation
- Adopt 3R concept whenever possible.
- Reduce energy consumption at home, office etc

Climate Change

Climate change refers to a change in average weather conditions, that exists for an extended period of time. Many frequent changes in climate had occurred on our earth. A number of natural factors like continental drift, earth's tilt, ocean currents etc were responsible for such climatic changes. Recently , many anthropogenic (originating in human activity) causes have led to an alarming variations in climatic patterns all over the world. These include :-

- Increase in the usage of fossil fuels : Fossil fuels (coal, oil and natural gas) are used as energy sources all over the world. Burning of fossil fuels produce CO_2 ,which spreads into the atmosphere leading to global warming and increase in the temperature.
- Deforestation: When trees are cut down on a large scale, the amount of atmospheric CO_2 increases, leading to global warming and increase in the temperature.
- Population growth, urbanization and industrial revolution: More and more needs of the people have to be satisfied for which cities were developed and industries were set up on a large scale. All these have led to an increase in the amount of greenhouse gases resulting in global climatic changes.

Effects of climatic change

- Increase in global surface temperature: climatic changes lead to increase in temperature levels all over the world and thereby disturbing the balance of whole eco-system.
- Changes in climate can put pressure on the whole natural system, leading to ecological imbalance.
- Melting of glaciers : It leads to rise in sea levels
- Ocean acidification: oceans absorb CO_2 into the atmosphere, making them more acidic.
- Availability of fresh water decreases.
- Changes in rainfall pattern (high and low rainfall) may occur.
- Occurrence of drought, heat waves and flood.
- Breeding pattern, migration pattern and the entire life cycle of plants and animals are disturbed due to climatic change.
- Climatic change will increase the distribution of mosquitoes , bugs etc leading to diseases like malaria, dengue fever etc

Control measures

- Promote renewable energy usage(solar energy, wind energy etc)
- Depend more on public transport system to reduce the use of fossil fuels.
- Afforestation and reforestation
- Adopt 3R concept whenever possible.
- Reduce energy consumption at home, office etc

Ozone Layer depletion

Ozone layer is a deep layer in earth's atmosphere that contains ozone which is a naturally occurring molecule containing three oxygen atoms. These ozone molecules form a gaseous layer in the Earth's upper atmosphere called stratosphere. This lower region of stratosphere containing relatively higher concentration of ozone is called Ozonosphere. The ozonosphere is found 15-35 km (9 to 22 miles) above the surface of the earth. The ozone layer forms a thick layer in stratosphere, encircling the earth, which has large amount of ozone in it. It protects our planet from the harmful UV radiations. The ozone layer was discovered in 1913 by the French physicists Charles Fabry and Henri Buisson. The ozone layer has the capability to absorb almost 97-99% of the harmful ultraviolet radiations that sun emits and which can produce long term devastating effects on human beings as well as plants and animals.

Ultraviolet radiation can destroy the organic matter. For humans, excessive exposure to ultraviolet radiation leads to higher risks of cancer (especially skin cancer) and cataracts. It is calculated that every 1 percent decrease in ozone layer results in a 2-5 percent increase in the occurrence of skin cancer. Other ill-effects of the reduction of protective ozone layer include – increase in the incidence of cataracts, sunburns and suppression of the immune system.

Human activities had resulted in considerable reduction in the ozone layer of the atmosphere. Ozone depletion occurs when destruction of the stratospheric ozone is more than the production of the molecule. The scientists have observed reduction in stratospheric ozone since early 1970s. It was found to be more prominent in Polar Regions.

Man-made causes for ozone layer depletion:

The main reason for the depletion of ozone is determined as excessive release of chlorine and bromine from man-made compounds such as chlorofluorocarbons (CFCs). CFCs (chlorofluorocarbons), halons, CH_3CCl_3 (Methyl chloroform), CCl_4 (Carbon tetrachloride), HCFCs (hydro-chlorofluorocarbons), hydrobromofluorocarbons and methyl bromide are found to have direct impact on the depletion of the ozone layer. These are categorized as ozone-depleting substances (ODS). Chlorofluorocarbons are released into the atmosphere from:

- Cleaning Agents
- Coolants in refrigerators
- Air conditioning
- Aerosol spray cans etc.

The problem with the Ozone-Depleting Substances (ODS) is that they are not washed back in the form of rain on the earth and in-fact remains in the atmosphere for quite a long time. With so much stability, they are transported into the stratosphere. The emission of ODS account for roughly 90% of total depletion of ozone layer in stratosphere. These gases are carried to the stratosphere layer of atmosphere where ultraviolet radiations from the sun break them to release chlorine (from CFCs) and bromine (from methyl bromide and halons). The

chlorine and bromine free radicals react with ozone molecule and destroy their molecular structure, thus depleting the ozone layer.

- Halogen molecules in CFC's ($CFCl_3$) are converted into an active free radical by photochemical decomposition:

$$CFCl_3 + h\nu \longrightarrow CFCl_2 + Cl$$

- This chlorine reacts with ozone, and as a result chlorine monoxide and oxygen are formed:

$$Cl + O_3 \longrightarrow ClO + O_2$$

- Chlorine Monoxide react with nascent oxygen (formed by decomposition of ozone) to form chlorine again.

$$O_3 + h\nu \longrightarrow O_2 + O$$

$$O + ClO \longrightarrow O_2 + Cl$$

- Chlorine again reacts with ozone and this cycle continues. One chlorine atom can break more than 1, 00,000 molecules of ozone. Bromine atom is believed to be 40 times more destructive than chlorine molecules.

The implementation of Montreal Protocol in the year 1987 has helped to reduce the presence of ODS in the atmosphere. Montreal Protocol is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.

Carbon credit

A carbon credit (often called a carbon offset) is a financial instrument or permit representing the right to emit one tonne of CO_2 (carbon dioxide) or CO2 e (carbon dioxide equivalent gases) into the atmosphere. It represents the amount of GHG s removed or reduced from the atmosphere from an emission reduction project. This carbon credit can be used by governments, industry or private individuals to offset damaging carbon emissions that they are generating. *Thus carbon credits are used as a permit to emit certain amount of CO_2 into the atmosphere.*

So, in a nutshell, carbon credit (often called carbon offset) is a credit for greenhouse emissions reduced or removed from the atmosphere from an emission reduction project, which can be used, by governments, industry or private individuals to compensate for the emissions they are generating.

One carbon credit corresponds to one tonne of CO_2 .

Carbon credits are acquired through :-

- Project based transactions--- credits are acquired as a result of successful implementation of carbon reduction projects. For eg:- If a private organization has successfully implemented afforestation project and if it is found to have reduced carbon dioxide from the atmosphere, then that private company can acquire carbon credits equivalent to their reduction levels.

- Allowance based transactions ---Regulatory authority issues allowances or permits to industries. If one carbon credit is issued to an industry, it means that they can emit one tonne of carbon dioxide or equivalent.

Carbon trading: *It refers to buying and selling of carbon credits that have been either distributed by a regulatory authority or generated by GHG emissions reduction projects.* In cap & trade mechanism, a regulatory authority limits (cap) the amount of GHG to be released over a period of time. If organizations have a shortfall or surplus in GHG allowances, they can engage in trade with each other.

	Company A	Company B
Alloted :	10 carbon credits	12 Carbon credits
Used :	8 carbon credits	14 carbon credits
	2 carbon credits not used	2 carbon credits overused

Here company A can sell 2 carbon credits to company B for financial benefit. Thus a carbon market is created.

How Does Carbon Credits Work?

Carbon credits are typically measured in tonnes of CO_2-equivalents (or CO_2e) and are bought and sold through number of international brokers, online retailers and trading platforms. Businesses that find it hard to comply with the carbon emissions, purchase carbon credits to offset their emissions by making finance readily available to renewable energy projects, forest protection and reforestation projects around the world. These renewable energy and energy efficiency projects replace fossil fuel and industrial processes. This all helps businesses in mitigating their emissions and comply with the global standards.

Offsetting one tonne of carbon means there will be one less tonne of carbon dioxide in the atmosphere than there would otherwise have been. For e.g.: when solar energy companies sell carbon offsets, this helps them as these projects become more viable. The buyers of the credits benefit as they can use these credits to overcome their greenhouse gas emissions. Many types of activities can generate carbon offsets. Projects which acquire carbon credits include wind, solar, geothermal, biomass projects which replace fossil fuel powered plants, low cost household device projects that can eliminate need for extra energy, methane capture from landfill gas and agriculture, different afforestation projects, forest protection from illegal logging, destruction of heat trapping greenhouse gases from the atmosphere and many more.

Carbon Tax

A carbon dioxide tax is a tax on businesses and industries that produce carbon dioxide through their operations. The tax is designed to reduce the output of greenhouse gases and carbon dioxide. The tax is imposed with the goal of environmental protection.

Carbon footprint

It is a measure of the total amount of carbon dioxide emissions that is directly and indirectly caused by an activity, individual, organization etc.

In other words: When you drive a car, the engine burns fuel which creates a certain amount of CO_2, depending on its fuel consumption and the driving distance. When you heat your house with oil, gas or coal, then you also generate CO_2. Even if you use electricity, the generation of the electrical power may also have emitted a certain amount of CO_2 (thermal power plants). When you buy food and goods, the production of the food and goods also emitted some quantities of CO_2.Your carbon footprint is the sum of all emissions of CO_2 (carbon dioxide), which were induced by your activities in a given time frame.

Each of us contributes to the greenhouse gas emissions either by the way we travel, the food we eat, the amount of electricity we consume and many more. Every individual, organization, business unit etc should focus to reduce their carbon footprints.

Carbon footprint
- Primary footprint—direct emission of carbon dioxide as in the case of burning of fossil fuels
- Secondary footprint --- indirect emissions associated with manufacture of a product

Main Contributors to Carbon Footprint

- Population – more people lead to more carbon emission
- Energy – Here, carbon footprint emissions are collective, coming from a variety of sources, namely industrial processes, transport and electricity and fuel emissions.
- Industrialization – Since the industrial revolution began during the middle of the twentieth century, CO2 has continued to rise unchecked and at alarming rates.
- Agriculture – Most agricultural processes within developed and developing nations are still being carried out commercially with the result that mass production of livestock has led to large levels of methane gas being released into the atmosphere.

- Human action (and inaction) – Ultimately, the way humankind has become accustomed to doing things every day, keeping pace with the need to do things more quickly and with more convenience, has contributed towards the exponential increase in carbon footprints on an annual basis.

Ways to Reduce Your Carbon Footprint

- Energy efficiency at home – All appliances that are not being used must be switched off immediately. And all electrical outlets not in use must also be switched off. Hot-water geysers should be switched off for the entire day and only turned on when needed. These are simple, yet practical lifestyle habits which are easy to adopt.
- Buy renewable energy – It is quite possible to power your own home with environmentally-sustainable alternatives of energy production without compromising your lifestyle and waiting for national grids to be connected via green energy supply sources. For instance, technology is now available for you to install your own solar power panels.
- Recycle and re-use – Vegetable produce can be converted into compost (or manure) for gardens, even vegetable gardens. Instead of buying more food containers, plastic containers sourced from the supermarket can be refashioned as ideal kitchen utensils. Also, where plastic waste is no longer required, seek out recycling depots rather than relying on your supplied garbage disposal units.
- Plant a Tree – One of the best way to give it back to the environment is to plant trees. Plants absorb CO_2 and release oxygen that is then used by humans and animals. According to the Urban Forestry Network, a single young tree absorbs 13 pounds of carbon dioxide each year.
- Buy local – Adding to the above remark, buying local, organic produce effectively counters mass-produced agricultural outcomes. There is a dramatic reduction in the amount of plastic being used to package products and fuel usage during long road transits is also reduced.

Legal Provisions for Environmental Protection

Some of the important legislations for environment protection are as follows:

- The National Green Tribunal Act, 2010
- The Air (Prevention and Control of Pollution) Act, 1981
- The Water (Prevention and Control of Pollution) Act, 1974
- The Environment Protection Act, 1986
- The Hazardous Waste Management Regulations, etc.

The National Green Tribunal Act, 2010

The National Green Tribunal Act, 2010 (No. 19 of 2010) (NGT Act) has been enacted with the objectives to provide for establishment of a National Green Tribunal (NGT) for the effective and expeditious disposal of cases relating to environment protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.

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

The Air (Prevention and Control of Pollution) Act, 1981 (the "Air Act") is an act to provide for the prevention, control and abatement of air pollution and for the establishment of Boards at the Central and State levels with a view to carrying out the aforesaid purposes.

The Water (Prevention and Control of Pollution) Act, 1974

The Water Prevention and Control of Pollution Act, 1974 (the "Water Act") has been enacted to provide for the prevention and control of water pollution and to maintain or restore wholesomeness of water in the country. It further provides for the establishment of Boards for the prevention and control of water pollution with a view to carry out the aforesaid purposes. The Water Act prohibits the discharge of pollutants into water bodies beyond a given standard, and lays down penalties for non-compliance.

The Environment Protection Act, 1986

The Environment Protection Act, 1986 (the "Environment Act") provides for the protection and improvement of environment. The Environment Protection Act establishes the framework for studying, planning and implementing long-term requirements of environmental safety and laying down a system of speedy and adequate response to situations threatening the environment. It is an umbrella legislation designed to provide a framework for the coordination of central and state authorities established under the Water Act, 1974 and the Air Act. T

Hazardous Wastes Management Regulations

Hazardous waste means any waste which, by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics, causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances.

Some of the rules dealing with hazardous waste management are discussed below:

- **Hazardous Wastes (Management, Handling and Transboundary) Rules, 2008**, brought out a guide for manufacture, storage and import of hazardous chemicals and for management of hazardous wastes.
- **Biomedical Waste (Management and Handling) Rules, 1998**, were formulated along parallel lines, for proper disposal, segregation, transport, etc, of infectious wastes.
- **Municipal Solid Wastes (Management and Handling) Rules, 2000**, aim at enabling municipalities to dispose municipal solid waste in a scientific manner.