We know very well that we can live for some time without food, but we cannot live even for a few seconds without air. So, air is the first thing that we need to live. On the other hand, we all are aware that our environment is not what it used to be. Its quality and purity is falling day by day. We feel uncomfortable when you sit in a place where there is a lot of smoke. Sometimes even tears may come out of your eyes. While on hilly areas and sea shores the air is comparatively pure and fresh. Also, there is a difference in quality of air villages and cities, this is due to the fact that the air in mountains and villages is usually free from pollutants like smoke. The number of vehicles, industries and people is less in these areas.

The air around us consists of a mixture of gases. It contains about 78% nitrogen, 21% oxygen, 0.95% inert gases, 0.03% carbon dioxide and traces of several other gases, water vapour and dust particles. Composition of different constituents of air varies from place to place. Our environment is under a great threat because most of the activities of man practically add to the pollution of the air around us.

Pollution is the contamination of our physical environment consists of air, water and soil. The substances which contaminate environment are called pollutants.

AIR POLLUTION

Addition of harmful and undesirable substances in air is called air pollution. The harmful substances which pollute the air are called air pollutants.

If you see a beam of sunlight or a beam of light of torch in the dark, you will notice thousands of minute particles moving around in the air. These are the particles of dust. If air contains harmful impurities, it is said to be polluted. Dust, smoke, chemical fumes, pollens and disease germs are some of the other impurities present in the air.

Sources of Air Pollution

Air pollution can be caused by natural causes or by human activities.

Air Pollution by Natural Causes:

1. **Winds and storms**: Whenever there are strong winds and storms, huge amounts of dust and sand pollute the air.
2. **Explosions and Eruption of volcanoes** : Due to the volcanic eruptions lots of gases and particulate matter are released along with lava. Explosions also result in air pollution.
3. **Forest fires**: Huge amount of smoke and ash are released into the air whenever forest fire occurs.
4. **Marshlands** : Large amount of methane gas produced from marshlands pollutes the air by contributing to greenhouse effect.
5. **Pollen grains and fog** also pollute the air.

Pollution by Human Activity:

1. **Automobiles:** The numbers of vehicles are increasing rapidly in our cities. The exhaust emission from vehicles contain poisonous substances like sulphur dioxide, carbon monoxide, lead, nitrogen oxides, particulate matter and smoke which cause air pollution on entering in the environment.

2. Domestic activities: When wood, cow dung cakes, coal and kerosene are burnt to cook food, these generate thick smoke which pollute the air. This smoke contains sulphur dioxide, carbon monoxide and unburnt carbon compounds.

3. Industries: Many of the industries like chemical plants, steel, fertilizers, sugar and cement manufacturing units emit large amount of smoke and pollutants like oxides of sulphur and nitrogen, lead particles and chlorofluorocarbons (CFCs) which pollute the air. For example, the emissions from the oil refinery at Mathura and the numerous coal burning industries at Agra contain sulphur dioxide which causes acid rain. Many industries produce chemicals, some of which escape into the atmosphere causing air pollution.

4. Agricultural activities: Excessive use of fertilizers and pesticides in agriculture pollutes the air. Pesticides are those chemical compounds which are used for killing pests that destroy agricultural production or in some way are harmful to humans.

5. Burning of refuse: Due to the burning of refuse, a lot of smoke and ash is produced into the atmosphere. Air is polluted by the presence of gases like sulphur dioxide, carbon dioxide and oxides of nitrogen.

6.Thermal power plants: In thermal power plants huge amount of coal is burnt to produce electricity. Thus, smoke and fly ash is released into the atmosphere. Fly ash consists of minute particles of silica, alumina, lead, arsenic, etc. It can cause irritation and respiratory disorders.

7. Nuclear power plants: They pollute air by releasing radioactive rays.

8. Deforestation: Indiscriminate cutting of trees and clearing of forests increase the amount of carbon dioxide in the atmosphere and thereby pollutes it.

9. Use of chlorofluorocarbons In refrigeration, fire extinguishers and aerosol sprayers pollute air by depleting the ozone layer.

10.Smoke: Smoke is generated from the exhaust of vehicles like bus, car, autorickshaw, or a scooter. It also comes out from a factory chimney. Speeding cars and trucks cause dust to rise from the roads. Fly ash is generated by the thermal power plants. Cigarette smokers also add to air pollution. They not only harm themselves, but also harm people around them who are forced to inhale the cigarette smoke.

11. Stone dust: Fine dust of stone particles is produced when stones are dug out from beneath and cut, polished or crushed. This stone dust enters into the air. When the air is inhaled the damages the respiratory organs. It can cause many serious disorders like cancer, etc.

Air Pollutants, Their Sources And Their Effects. The major air pollutants are:

Gaseous Pollutants

These are the pollutants which remain in gaseous state at normal temperature and pressure. For example, carbon monoxide, carbon dioxide, oxides of nitrogen, sulphur dioxide.

(i) Carbon monoxide (CO): Carbon monoxide gas is the main air pollutant. It is very poisonous. It lowers the amount of oxygen that enters our blood. It can slow down our reflexes.

(ii) Carbon dioxide (CO_2): Accumulation of excessive carbon dioxide traps large amount of heat and increases the earth's temperature. This is called the greenhouse effect.

(iii) Sulphur dioxide (SO_2): Sulphur dioxide is a serious health hazard. Sulphur dioxide is so poisonous that it can damage our lungs by causing diseases like bronchitis. It also damages the plants by causing their leaves to dry up and fall off. It combines with the oxygen of the air and form sulphur trioxide (SO_3). This reacts water present in the clouds to form sulphuric acid (H_2SO_4). Rain mixed with sulphuric acid is called acid rain.

(iv) Nitrogen dioxide (NO_2):Nitrogen dioxide is poisonous. It irritates the eyes. Like SO_2, it damages our lungs and can cause breathing problems. The exhausts of vehicles, and some industries release this gas. Nitrogen dioxide re oxygen present in the air to form nitrogen trioxide (NO_3). Nitrogen trioxide so formed combines water vapour present in the air to form nitric acid (HNO_3). Nitric acid dissolves in rain water and reaches the earth in the form of acid rain.

Chemical Pollutants

(i) Chlorofluorocarbons (CFCs): Chlorofluorocarbons are the compounds containing carbon, chlorine and fluorine. These compounds are used as an insulating material in air conditioners and refrigerators. Chlorofluorocarbons are also used in shaving foam and cleaning agent. These chemical compounds (CFCs) react with the ozone gas and leads to the depletion of the ozone layer and formation of holes in it.

(ii) Lead: When petrol is burnt in automobiles it releases lead as a pollutant which is absorbed by our body. It is poisonous and can damage our brain, liver and kidneys.

Particulate Pollutants

These are the pollutants that are in the form of minute particles. It may be solid (like dust, sand, tobacco and smoke) or liquid (as water droplets, mist, fog). The particulate matter remains suspended in the atmosphere and are therefore, termed as Suspended Particulate Matter (SPM). The suspended particulate matter in air is also known as Aerosol. These tiny particles are also produced by automobiles. These are fine particles of carbon. Very fine SPM enter our lungs with the air we breathe in. They are the major cause of lung diseases. SPM settles on plants and interferes with photosynthesis. SPM reduce visibility, especially during winters. The presence of SPM is also visible in such areas where factories are located.

Smog

You must have seen a thick fog-like layer in the atmosphere, especially in winters. This is smog. Smog is a combination of smoke and fog. It is very dangerous for traffic. Smog contains oxides of nitrogen and hydrocarbons. It causes breathing difficulties such as asthma, cough and wheezing in children.

Non-biodegradable Pollutants

Those waste materials which cannot be broken down into nonpoisonous or harmless substance in nature by bacteria, such waste materials are called as non-biodegradable wastes.

Few non-biodegradable wastes are:

1. Aluminium cans,	2. Aluminium foils,	3. Silver foils
4. Pastics	5. DDT	6. Radio Active waste
7. Rubber,	8. Polythene bags,	9. Computer floppy and

10. Certain chemicals, etc.

ABHYAS Academy, Behind Pragat Shiv Mandir, Near Govt. College, Nishat Cinema Road, Ambala Cantt.
Ph No. +91-171-2631595, 9416541198, e-Mail: anusethi1968@yahoo.com Website: www. abhyasonline.in

Biodegradable Pollutants

Those waste materials that can be broken down into non-poisonous substances in nature due to action of bacteria and other microbes (organisms), in due course of time are called biodegradable wastes. Biological wastes include dead plants and animals, animal bones, animal excreta, cow-dung, urine, paper, wood, grains, cloth, leather goods, cardboard, cotton, plant fibres, newspaper, wool, etc.

The wastes that are poisonous before degradation or break down, after the break-down they get converted into non-poisonous substances and therefore, they do not disturb the ecological balance. Serious problems arise only when these start accumulating as a result of more deposition and slow decomposition, i.e., when

Indoor Air Pollution

Most of us are ignorant about the presence of indoor air pollution. It is caused by the items of daily use in our homes. It may be caused by the use of paints, aerosols, acids for cleaning toilets, sprays and deodorants, carpet cleaners (chemical used for cleaning carpets), objects made from plastics, smoking tobacco and many more things. Therefore, we should also be very careful about the causes and prevention of indoor air pollution.

Harmful Effects Of Pollution

Acid Rain: Acid rain is the rain, which has been made more acidic than normal by the presence of dissolved pollutants, such as sulphur dioxide (SO_2) and nitrogen oxides (NO_2, NO_3). These acidic oxides enter into the atmosphere by combustion of fossil fuels in homes, transport and industries. These gases arise from volcanic emissions also.

Harmful Effects of Acid Rain

- Acid rain can corrode buildings and statues, especially those made with marble and stone. The limestone (marble) dissolves is acid rain and slowly gets crumbled away. The phenomenon of corrosion of marble is also called “Marble cancer’

  The Taj Mahal: The Taj Mahal, situated at Agra in our country, which is a heritage building and India’s most famous tourist attraction is facing a threat to its remarkable beauty by acidic air pollutants from the neighboring factories like rubber processing, automobiles, chemicals and especially, the Mathura oil refinery produce pollutants like sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) which are responsible for acid rain.

  Experts have warned that the white marble of Taj Mahal has already developed patches of discoloration. Also the fumes emitted from the chimneys of Mathura oil refinery has been responsible for the corrosion of the marble of the Taj Mahal. However, timely steps and efforts of the Archaeological Survey of India (ASI) have resulted in restoring its past glory. Taj Mahal
- Acid rain can damage crops and trees. It washes away minerals like magnesium (Mg) and calcium present in the soil. As a result, the crops are not able to get nutrients in proper amounts.
- It damages plants by destroying their leaves. They first become yellow and then die.
- Aluminium ions present in the soil are washed out by acid rain. They can reach river and lakes and kill fishes.

- When acid rain falls on fresh water lakes, rivers, ponds, etc., their water becomes acidic. This cause damage to aquatic plants and animals.
- It cause extensive damage to forests, the wildlife and other forms of life.

Depletion of Ozone Layer (Ozone hole)

There is a layer of ozone gas (0_3) in the upper atmosphere. This ozone layer is very important for the existence of life on Earth because it absorbs most of the harmful ultraviolet radiations coming from the which can otherwise cause skin cancer. It has now been found that the amount of ozone is getting depleted (reduced) due to which the ozone layer is becoming thinner and thinner day by day. The depletion of ozone layer is due to the use of certain chemicals. Ozone holes have been discovered over Antarctica and the Arctic circles. scientists are worried that if ozone layer in the atmosphere disappears complete Then the harmful ultra-violet rays would reach the Earth and would cause cancer and also damage the plants.

Greenhouse Effect: The amount of carbon dioxide present in air remains almost the same. This happens because CO_2 is released into the air during burning of fuels and respiration. This CO_2 is in turn used by green plants for the process of photosynthesis. But this natural balance is being disturbed by the man. The amount of CO_2 in the atmosphere is increasing due to burning of a large amount of fuels and also due to massive deforestation because the number of trees which consume CO_2 becomes lesser, CO_2 helps in maintaining the temperature of the Earth so that life can exist on Earth. This can be explained as follows:

The solar radiations that reach the Earth consist of infrared radiations. Some of the infrared radiations are reflected by the surface of the Earth. Whereas, some of them are absorbed. (Carbon dioxide has the property of trapping heat of the reflected infrared radiations. It thus, ops heat from escaping the earth's surface. This causes the earth's surface to remain warm and thus helps in maintaining temperature). The heating of earth's atmosphere due to trapping of infrared radiations reflected by the surface of the earth by carbon dioxide (and other greenhouse gases) is called **greenhouse effect.**

As we know that the amount of CO_2 is now increasing due to human activities. Excess carbon dioxide present in the atmosphere traps a lot of heat and leads to warming of the earth's surface, hence increased temperature. This is called **Global Warming**.

Global warming can cause melting of ice at the poles. Because of this the sea level can rise and would lead to floods. There is news in the recent newspapers that the Gangotri glacier in the Himalayas had started melting because of global warming.

Reduced dependence on fossil fuels and afforestation are the most important methods of reducing the proportion of carbon dioxide in the atmosphere, and arresting global warming. Global warming has became a major concern for government all over the world. Many countries have reached an agreement to reduce the emission of greenhouse gases.

Prevention of Air Pollution

We all know that we need a healthy and clean air for breathing. The task of cleaning up air and improving its quality are not very difficult. For this we have to

ABHYAS Academy, Behind Pragat Shiv Mandir, Near Govt. College, Nishat Cinema Road, Ambala Cantt.
Ph No. +91-171-2631595, 9416541198, e-Mail: anusethi1968@yahoo.com Website: www. abhyasonline.in

take some steps and use devices that are necessary and observe some restraints. Some such steps are as follows:

Household:

(a) Improved smokeless chulhas and efficient stoves should be used to burn fuels like wood, coal, kerosene in our villages and cities.

(b) We should shift to smokeless energy sources like LPG, biogas, solar energy and electrical energy.

(c) We should not burn paper, dry leaves, plastic bags and garbage.

(d) We should reduce the use of aerosols and sprays such as perfumes, deodorant sprays, cosmetics and other similar sprays in homes because their solid or liquid particles remain suspended in the air for long.

(e) Smoking should be avoided.

In Indian villages, firewood is burned in an open chulha to cook food. The smoke from chulhas affects the health of the women in the villages. A smokeless chulha has therefore been developed by the government and popularized in the villages. Can you suggest another alternative to conventional chulha?

Automobiles:

(a) Use of efficient internal combustion engines for complete combustion of fuels.

(b) As far as possible lead free fuel such as Compressed Natural Gas (CNG); should be used for running cars, buses, trucks, etc.

(c) Catalytic converter is fitted in the exhaust pipes of the petrol driven vehicles. This converter converts the harmful exhaust gases-carbon monoxide(CO) and nitrogen dioxide (NO_2) into harmless carbon dioxide (CO_2), nitrogen and water.

(d) The vehicles should be subjected to air pollution check regularly and strictly.

A CNG filling station

Power Generation: There is a need for using the less polluting forms of power generation like solar energy, wind energy, tidal and geothermal energy and other forms of renewable energy.

Industries:

(a) Tall chimneys fitted with filters should be installed in factories, so that the air is not polluted much near the surface of the Earth.

(b) Mills and factories should not be run in the main city where there are lot of people but should be in secluded areas. Government is taking action against industrial units by not giving licenses to operate in thickly populated areas.

Use of Scrubbers: These are used to remove suspended particulate matter (SPM) from air emissions from factories. The SPM present in air emissions is removed by spraying a jet of water on air. Water thus wets the suspended particulate matter present in air and washes them away.

Use of Electrostatic Precipitation: This device is used if the SPM present in air emissions is in large amount. These are used in thermal power plants. In order to remove SPM, an electric current is passed through it. Because of this, the dust and smoke present in air get charged up and are thus attracted toward the electrodes and are collected.

We ourselves can also contribute to prevent the pollution of air and improve our environment.

(i) We can plant more and more trees and nurture the ones already present in the neighborhood. Because they are the nature's lungs and remove harmful gases. You know very well about Van Mahotsav when lakhs of trees are planted in July every year.
(ii) We should not use bags made from plastics, because they are non-biodegradable. We should use only cloth and jute bags.
(iii) We should not burn dried leaves, branches of trees, paper and garbage in the open. Instead they can be put in a compost pit rather than burning. Used paper can be recycled.
(iv) We should save electricity. In the long run, it will amount to burning less fossil fuels.
(v) Smoking should be avoided. Government is also trying to discourage people from smoking.
(vi) Pesticides like DDT should not be used. Many countries have banned the use of dangerous pesticides like DDT and have found ways of safe disposal of wastes.
(vii) You should advice your parents for travelling by car pool instead of travelling by car individually.
(viii) Use of CNG should be encouraged.

ABHYAS Academy, Behind Pragat Shiv Mandir, Near Govt. College, Nishat Cinema Road, Ambala Cantt.
Ph No. +91-171-2631595, 9416541198, e-Mail: anusethi1968@yahoo.com Website: www. abhyasonline.in