Chapter

10

NOT FOR DRINK NOT FOR BREATH

One day Akshay with his father Satyam went to Bazaar on Motor bike. A traffic constable stopped them and asked his father to show his driving license and other documents. He showed the driving license and other documents. Then the constable asked Satyam, to show the certificate of pollution check. He did not know what it was. The traffic constable fined him and asked him to go to any certified pollution check centre for pollution under control certificate or the pollution check certificate.

Satyam went to the pollution check up centre. There the emissions from his motor bike was checked and a pollution under control certificate was issued with details of amount of pollutants in the emissions.

Fig-1 Pollution checkup

In the evening when Satyam returned home, Akshay wanted to see the pollution under control certificate. You can also see that certificate. Here it is.

Fig-2 Pollution certificate

Observe this certificate try to find out answers for the following questions:

1. Which department issues the pollution under control certificate?
2. For how much time is it valid?
3. For which type of vehicle has it been issued?
4. What is emission test? What components are tested in the pollution check up center?

5. What will happen if Carbon monoxide (CO) and Hydrocarbons (HC) readings are higher than the permissible limits reading?

Discuss thsese issues in the class room.

- Think of why there is a need of "Pollution Under Control Certificate?"

With a rapid increase in the number of vehicles, the problem of automobile pollution has assumed greater significance. Since the emission of smoke from motor vehicles is a major source of air pollution, specific standards for the permissible limits for such emission have been prescribed in the Motor Vehicles Act 1988 and Central Motor Vehicles Rules 1989.

All vehicles which are in operation for more than a year should undergo emission tests every six months to obtain the certificate of pollution under control

The word pollution might not be new for us. Our elders talk about the blue sky, clean water and fresh air that was available in their times.

Now the media regularly reports on the falling quality of the environment. We ourselves feel the impact of the air and water pollution in our lives. Number of people suffering from diseases of the respiratory system, for example lung cancer, Asthma are steadily rising.

If we do not control pollution clean air and water may no longer be available! You have learnt about the importance of air and water in earlier classes.

Now, we will study about the harmful changes taking place in our surroundings and their effects on our lives.

What is Environmental Pollution

The environment is made up of systems, cycles, and specialized relationships between living and non-living elements. When everything is working the way it should be, all the living organisms within the environment, including humans, are healthy and thriving.

- What will happen if harmful organisms or substances enter your body? How do you feel?

In the same way if something harmful is introduced in to the environmental cycle, or part of the cycle is disrupted, it can cause a chain reaction of problems right through the rest of the system. These changes can really hurt the health and well being of living organisms. One of these negative changes is **pollution**, which is the result of unnatural elements entering the environment. Unfortunately, humans are usually at fault in this regard.

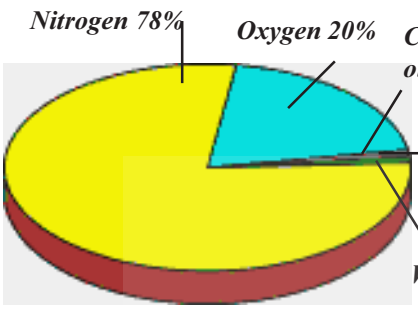
Anything that is harmful to the environment is pollution. Litter, car exhaust, motor oil, used tires, smoke, chemicals, disposed computer, mobile phone material etc,. all of these can have an instant or a gradual impact on the health of our earth.

What is Air pollution?

You know that air is a mixture of gases.

- List out the gases that you know present in the air.
- What are the four major gasses in the air?

The composition of air in the atmosphere comprises four major gases namely nitrogen, oxygen, argon and carbon dioxide. Other substances are present in a very little amount and hence, they are collectively known as trace components. Let us observe the composition of air in the atmosphere as shown in the diagram given below with composition in percentage.



Componet	Symbol	Volume
Nitroten	N2	78.084%
Oxygen	O2	20.947%
Argon	Ar	0.934%
Carbon Dioxide	CO2	0.033%
Water Vapor	H2O	0-2%
Argon	Ar	0.1%
Other Traces		

The atmosphere contains about 21% of oxygen which is an essential element for survival of all living organisms.

Also, it is equally important for the process of combustion we already read in the physics chapter 'Combustion, flame and fuels'. Carbon dioxide which is 0.033% is essential for the process of photosynthesis in plants.

All the other components have their own importance and all are in a naturally balanced state.

When this balanced state is disturbed either by some natural phenomena or by human activities, it is then called "Air-Pollution" and substances responsible disturbing this naturally occurring balance are said to be "Pollutants".

Activity-1

Natural Disasters-Pollution

Some pollutants that enter the air by natural disasters. For example, volcano eruptions, forest fires, and dust and sand from storms.

- Collect information from your school Library for the following natural disasters in the world.
  - ❖ Volcanic eruptions
  - ❖ Forest fires
  - ❖ Sand storms

These natural disasters leads to air pollution. But the majority of air pollutants come from things we do ourselves. So the maximum percentage of causes for air pollution is only because of human activities.

- If a person burnt out tires or dried leaves at a particular place. Where shall these smoke and ash goes.

Airborne pollutants make it tough to breathe and can even cause diseases like cancer. One problem is the way winds criss-cross the globe, picking up pollutants

and carrying them all over the world. This is how areas far away from where the actual pollution is created can become affected, too. Air pollution is not just a local concern.

Activity-2

Oil Paper Experiment

Take three square pieces of white paper of 5 X 5cm size dipped in oil. Hang these oil dipped paper at three different locations, say, your back yard, your school, near a park, or a parking lot, etc. Let it be there for 30 minutes. Observe and compare all three papers.

- What you found on those papers dipped in oil?
- Is there any difference observed for all the three locations?
- Try to find out the answer why this difference occurred?
- Do you know where the dust particles could have come from?

Pollutants

As we discussed above, Air pollutants arise from both man made and natural processes. But the effect of air pollution caused mainly by human activities.

Pollutants are also defined as primary pollutants resulting from combustion of fuels and industrial operations and secondary pollutants, those which are produced due to reaction of primary pollutants in the atmosphere.

Natural Activities:

Fig-3 Volconic eruption

- Forest fires release carbon particles (ash) into the air and pollute the air.
- Volcanic eruption releases various gases and ash in to the atmosphere.
- Decay of organic matter releases Ammonia gas in to the air.
- Decay of organic matter lying under water releases Methane gas as air pollution.
- The pollen grains released by plants remain floating in the air and pollute it.

Human activities:

Burning fuels pollute the air producing pollutants like carbon monoxide, sulfur dioxide, smoke, soot and ash.

- Name of the fuels we burnt in our daily activities including rural and urban areas.

Fig-4 Burning fuel

Vehicles: exhaust gases emitted by motor vehicles pollute air by producing the harmful pollutants like sulfur dioxide, nitrogen dioxide, carbon monoxide, unburnt hydrocarbons, lead compounds and soot.

Industries: Various industries like granite, lime, cement etc., pollute air by releasing pollutants such as sulfur dioxide, nitrous oxide, chlorine, fly ash , dust, asbestos dust etc.

- Name of the factories at nearby your place. How they effect air and water?

Do you know?

Most of the Granite factories are present at Chimakurthy of Prakasham district. Cement factories at Macharla, Limestone factories at Piduguralla are the most polluted areas because granite powder, cement dust, limestone dust is released into the air causing pollution.Thermal power plants of Parawada in Viskhapatnam, Krishnapatnam in Nellore districts are

releasing the pollutants like fly ash, Sulphur dioxide and radioactive substance causing the air, water and land pollution. Local people are suffering from lung cancer and skin allergies due to the pollutionThe people living near the granite factory have faced several health problems like respiratory bronchitis and asthma. Thermal power plants pollute air by emitting sulphur dioxide, radio-active substances and fly ash.

❖ **Nuclear power plants:** The two problems of nuclear power are radioactive waste and the possibility of melt downs like **Tchernobyl.** The waste is dangerous because it can cause cancer and other health problems. The radioactive waste posess radio activity for at least one million years. The other problems are melt downs. Melt downs are provoked by too much heat in the power plant. During a melt down the power plant makes more Radioactive pollution.

The biggest meltdown of Nuclear power reactor in the world was Tchernobyl in Russia in 1986. After the melt down of Tchernobyl, there was a fire and formation of radioactive cloud. The cloud was made up of radioactive chemicals. Those chemicals cause the cancer of the thyroid gland in the neck and sensitive to radiations. 5 million Russians got the cancer and hundreds died. About 125,000km^2 of fields was unusable because of the radioactive clouds. The forest area was damaged by the radioactive clouds.

Activity-3

Power Generation Plants

There are a number of power generation plants in our country. Some produce power by using water (Hydro electric power plants), by using coal and gas (Thermal power plants), by using Radioactive elements like Uranium (Nuclear power plants). Go to your school library and collect information to make a list of these power generation plants and where they are located.

In addition to these there are so many small power plants in our country which emits pollutants into air.

Fig-5 Pesticides

Fertilizers and Pesticides: Use of fertilizers and pesticides in agriculture pollutes not only air but also land and water. You discussed about these issues in the chapter 'production and management of food from plants'.

Deforestation: It is the destruction of forests and woods. It has resulted in the reduction of indigenous forests. Forests now cover only 19% of the earth's land surface. Plants use carbon dioxide for the process of photosynthesis. Due to lack of forests the level of carbon dioxide is increasing day by day resulting to global warming.

Fig-6 Deforestation

Chloro Flouro carbons (CFC): CFCs are used in refrigerators, Air conditioners and aerosol sprays. Use of CFCs pollutes air by depleting the ozone layer as a result of which, harmful ultraviolet rays reach the earth.

Mining: Mining of coal and stone releases coal dust and stone dust that cause air pollution.

Fig-7 Mining

Let us read the table given in the next page about pollutants and their sources.

- Ask your teacher about secondary pollutants why they called so?

Common pollutants and their sources

Pollutants	Sources
Suspended Particulate Matter, (SPM)	Automobile, power plants, boilers, Industries requiring crushing and grinding such as quarry, cement.
Chlorine	Sea-salt production, de-chlorination, biomass burning and pulp & paper mills.
Fluoride	Fertilizer, aluminum refining
Sulphur dioxide	Power plants, boilers, sulfuric acid manufacture, ore refining, petroleum refining.
Lead	Ore refining, battery manufacturing, automobiles.
Oxides of nitrogen, NO, NO_2 (NOX)	Automobiles, power plants, nitric acid manufacture, also a secondary pollutant
Peroxy acetyl nitrate, PAN	Secondary pollutant
Formaldehyde	Secondary pollutant
Ozone	Secondary pollutant
Carbon monoxide	Automobiles, incomplete fuel combustion.
Hydrogen sulphide	Pulp and paper, petroleum refining.
Hydrocarbons	Automobiles, petroleum refining
Ammonia	Fertilizer plant, degradation of dead animals.

Let us understand the effects of air pollution not only to human beings but also historical monuments. For this we need to study about Taj Mahal. Do you know the currently cars and buses are not allowed to drive to the Taj Mahal but battery run buses or horse-drawn carriages are allowed to reach the monument. The Archeological department of India declared that $2^1/_2$km around Taj Mahal is no drive zone .

Case Study: The TAJ MAHAL

The Taj Mahal one of the seven wonders of the world is located in Agra. It is made of white marbles. The effect of pollutants on it has become a matter

of concern for archeologists and environmentalists.

Motor vehicles and the industries located in and around Agra for rubber processing, Chemicals, Iron foundries, Mathura oil refinery have been responsible for producing pollutants like SO_2, NO_2, smoke, dust, soot etc.

These gases react with the rain to form acid rain. Acid rains corrode the marble of the Taj Mahal. Suspended Particulate Matter (SPM), such as the soot particles emitted by Mathura oil refinery has turned the marble from white to yellow.

Taking this in to account, the Supreme Court of India has suggested several steps to save the Taj. These are:

- Switch over to cleaner fuels like CNG and LPG.
- Use unleaded petrol in vicinity of Taj Mahal.
- Shift polluting industries to the outside of Agra city.

Bhopal – Unforgettable human sin:

Industries are the symbols of development. But other side of the coin is lack of safety measures and irresponsibility of emitting pollutants. On second December 1984 about 3000 human beings died, about 5000 were paralyzed and thousands of cattle, birds, dogs and cats died in just one night at Bhopal. This mass death was due to the leakage of Methyle Isocyanate (MIC) into the air from an insecticide factory managed by Union Carbide. Thousands of lives helplessly, crushed under the cruel foot of in human activity. This is the unforgettable industrial tragedy towards air pollution.

What are the effects by air pollution?

Air pollution continues to evoke a great deal of interest worldwide due to its negative impacts on human health and welfare. It causes certain diseases including shortness of breath, sore throat, chest pain, nausea, asthma, and bronchitis and lung cancer. Extreme effects of air pollution include high blood pressure and cardiovascular problems.

The World Health Organization states that 2.4 million people die each year from causes directly attributable to air pollution (WHO, 2007).

In addition to its negative health impacts, air pollution is known to cause injuries to animals, forests and vegetation, and aquatic ecosystems. Its impacts on

metals, structures, leather, rubber, and fabrics include cracks, soiling, deterioration, and erosion.

Some of the negative effects caused by these pollutants are discussed below.

The various harmful effects are:

- **Particulate Matter:** Dust and smoke spoil our cloths, reduce visibility and affect the buildings; dust and smoke get deposited on the leaves of the plants. Thus affects the rate of photosynthesis and transpiration. They also cause Bronchitis, Asthma in human beings. Particles of lead oxide present in automobile exhaust can cause Animic, Brain damage and even death. Particles of mercury cause Minimata disease which affect the nervous system and can cause death.
- **Hydrogen Sulphide:** Tarnishes silver objects and blackens lead paints and painting. It has a smell like Rotten Eggs. It causes head ache in humans when inhaled in a large quantity.
- **Carbon monoxide Poisoning** is a poisonous gas combines with hemoglobin of our blood and forms a stable compound called carboxy hemoglobin. Due to the formation of this compound Hemoglobin is unable to carry oxygen to various parts of our body. This leads to respiratory problems. It causes suffocation and may cause even death.
- Air pollution causes ozone depletion, Green House effects, Global warming and Acid rain. We will read these effects in higher classes.

Think and Discuss

When we go on a busy road in the evening a lot of smoke is spread in the surroundings. We get cough and feel uneasy even when we close the nose with napkins.

- Why this type of symptoms we observe? Think about it.
- If these symptoms will continue, what happens?

Air pollution is like a slow poison. The effects of air pollution are not seen immediately. But over a long period of time, the pollutants present in air damage our health and property.

Activity-4

Field visit

Visit nearby factory, industry (boiled rice mill, Brick making keln, oil mill, food processing mill, etc) present in your area and observe,

- what way they are polluting air and water?
- there any green belt around the factory? Name the trees they are growing.
- Which type of precautions they are taking to prevent pollution?

What can we do to reduce air pollution?

Air pollution cannot be totally eliminated, it can however be controlled. Some of the methods for controlling air pollutions are:

- Tall chimneys should be installed in all factories to reduce air pollution at the ground level.
- Better designed fuel burning equipment should be used in homes and industries so that fuel is burnt completely.
- Install electrostatic precipitators in the chimneys of industries.
- Reduce vehicular emissions by using non polluting fuels like CNG.
- Use LPG for domestic use.
- Improve the quality of fuel in automobiles and use catalytic converters in them.
- Make use of Renewable alternative source of energy like Solar Energy, Wind Energy and Hydro Energy.


ఇక.. విష(మ)మే!

భూగర్భం విషతుల్యం..

- All motor vehicles should be maintained properly so that they comply with pollution norms.
- Use unleaded petrol
- Plant and grow more and more Trees in your surroundings.
- We can protect plants and trees .Do you know about **Vanmahotsav** when lakes of trees are planted in July every year?

WATER POLLUTION

Air is the important resource for human survival. In the same way water plays vital role in our lives. The history of human civilization explains that they develop on the banks of rivers, because water is a main resource for human development. After industrial revolution water resources are being polluted. Water pollution is another hazard caused by greedy human being activities.

Let us read the following news paper clipping.

Answer the following questions based on your understanding of the paper clipping.

- What do you understand after reading the news paper clippings?
- What are the issues discussed in this news paper clipping?
- What are its causes and effects?
- How does the problem arise?

❖ Are you also facing this type of problems in your area? Can you explain reasons behind?

In the previous class we have already discussed about water, its usage, and sewage water treatment. Let us take class VII Science Textbook. Just go through the chapter 'Water too little to waste'. Now we will discuss about the water pollution, it causes and effects.

A CASE STUDY OF PATANCHERU

Patancheru is a suburban mandal headquarters in Medak district, located about 25km from Hyderabad. It is a major industrial hub of the State. It is one of the most polluted areas in India where nearly 14 villages were badly affected by pollution related diseases like cancer, respiratory diseases and heart diseases caused by "cocktail of poisons in air, water and on land."

The presence of pharmaceutical and chemical industries, pesticide units, steel rolling industries, distilleries releasing the pollutants like various dangerous gases like Chlorine, Hydrogen sulphide which are entering in to the Atmosphere. Most of the agricultural lands became barren. The lives of people there depend on agriculture and animal husbandry. They became helpless. Most of the people converted themselves as workers in the factories.

By observing all situations, for the sake of people and environment, the Supreme Court of India has released Interim orders as follows:

1. Stoppage of effluent flowing into air & water bodies immediately.
2. Provide drinking water to the affected villages.
3. Rectification of CETP.
4. Medical care to pollution victims.
5. Sustained continuous vigilance in discharge of effluents.
6. Discharge of treated effluents in to sewage line.

Lab Activity: Pollutants

Aim: Observation of pollutants in local available water samples.

Material: Glass tumblers, water samples from tap, pond, river, well, lake, Red, Blue litmus papers, soap.

Procedure: Collect water samples from a tap, pond, river, well and lake. Pour each into separate glass containers. Compare these for smell, color, P^H and hardness.

❖ pH of water samples can be determined by using litmus paper . If blue litmus paper turns to the red color, that water sample is acidic in nature and if red litmus turns to blue, water sample is basic in nature

❖ Hardness of water can be determined using soap. If water produces lesser foam, it is referred as hard water.

Observations and findings: Record your observation in the following table.

Water Sample	Smell	color	pH		Hardness of water	
			Acidic	Basic	More	less
Tap water						
Pond water						
River water						
Well water						
Lake water						
Drinage water						

Think and Discuss

- Do you find any relation between P^H and hardness of water?
- Which water sample is colorless?
- Which water sample is suitable for drinking and why?
- Change in colour and smell of water in some water samples? What are your reasons?
- Which water sample of your collection is basic in nature?
- Are there any visible pollutants in the water sample?

Precautions: While conducting the experiment you need to follow the following precautions. Observe carefully change in the colour of litmus paper. Wash your hands each time. Don't taste any water sample. (If you have any more precautions please add to the list.)

What do we mean by water pollution?

Water is a unique substance, because it can naturally renew and cleanse itself, by allowing pollutants to settle done (through the process of sedimentation) or break down, or by diluting the pollutants to a point where they are not in harmful concentrations. However, this natural process takes time, and is difficult when excessive quantities of harmful contaminants are added to the water. And humans are using more and more materials that are polluting the water sources that we drink from. Thus, the contamination of water with unwanted and harmful substances such as sewage, toxic chemicals, industrial wastes etc. is called water pollution and the substances that pollute water are called water pollutants.

Normal water is colorless without any smell or any unwanted substances. Thus, water suitable for drinking is called potable water.

Most of the water resources like rivers, tanks and canals are being polluted by adding various pollutants from factories and by adding garbage. River with great historical background and good resource

for drinking and agriculture are now becoming water stagnated dumping garbage. Let us read about the sad story of river Moosi.

Sad Story of River Moosi

As Hyderabad has grown in size and is emerging as a global mega city, its growing water requirements have been met by under taking long distance water projects over the years. These projects are dependent on Musi River. Thousands of people depend on it for their daily needs and livelihood. The Musi has been polluted for many years. The people living near the Musi River throw large quantities of garbage, untreated sewage, industrial waste, dead bodies, polythene bags, hot water and statues of deities and many other materials directly in to the river .

The 'Musi reservoir action plan project' was undertaken to reduce the pollution level in the river. Pollution control activities include under the project are.

- *Solid waste management.*
- *Installation of sewage treatment plant.*
- *Provision of low cost sanitary facilities.*
- *Development of River front.*
- *Efforts to develop public awareness*

Although we still have a long way to cover to make Musi River absolutely free from pollution, this programme helped in reducing Musi river pollution to a significant extent.

Acitivity-5

Visit your nearby pond/ lake or river and find out the material being discharged in it. Prepare a Biography on it.

Where is all of this pollution coming from?

There are two main sources of water pollution; definite sources and non-definite

Fig-8 Polluted water stream

sources. Definite source pollution is due to discharges from a single source, such as an industrial site. It includes factories, wastewater treatment facilities, septic systems, and other sources that are clearly discharging pollutants into water sources. Non definite-source pollution involves many small sources that combine to cause significant pollution. For instance, the movement of rain or irrigation water over land picks up pollutants such as fertilizers, herbicides, and insecticides and carries them into rivers, lakes, reservoirs, coastal waters, or groundwater. Non-definite sources are more difficult to identify, as they cannot be traced back to a particular location. Landfills can also be a non-definite source of pollution, if substances leach from the landfill into water supplies.

Water pollutants thus can be divided into the following categories:

Biodegradable waste: This consists mainly of human and animal waste. The biodegradable waste enters a water supply and thus pollute water. The waste provides an energy source (organic carbon) for bacteria. Organic carbon is converted to carbon dioxide and water, which can cause atmospheric pollution and acid rain; this form of pollution is far more widespread and problematic than other forms of pollutants as a large supply of organic matter in the water provides an opportunity for oxygen-consuming (aerobic) bacteria to multiply quickly, consume all available oxygen, and kill all aquatic life.

- Ask your teacher about aerobic bacteria and write a note on it with some examples.

Plants nutrients: Phosphates and nitrates – chemical fertilisers from agriculture run-off due to rain and industrial waste enter into water through sewage and pollute the water. It helps algae to bloom, weeds to grow and bacteria is spread. As a result water turn green and cloudy and smell bad. Decomposing plants use up the oxygen in water, disrupting aquatic life, reducing biodiversity and even killing aquatic life. Thus, this enrichment of water by nutrients leading to excessive plant growth and depletion of oxygen is known as '**Eutrophication**' This affects aquatic life badly.

- Do you know oil slog on sea water? In what way it is dangerous to aquatic life?

Heat: It can be a source of pollution in water. As the water temperature increases, the amount of dissolved oxygen decreases. Thermal pollution can be natural, in the case of hot springs and shallow ponds in the summertime is also a reason for increasing temperature in water. The discharge of water that has been used to cool power plants or other industrial equipment is another reason. Fish and plants require certain temperatures and oxygen levels to survive. So thermal pollution often reduces the aquatic life diversity in the water.

Fig-9 Chemical pollutants

Sediment: It is one of the most common sources of water pollution. Sediment consists of mineral or organic solid matter that is washed from land into water sources. Sediment pollution is difficult to identify, because it comes from non-definite sources such as constructional, agricultural, logging, flooding, and city runoff. Sediment can cause large problems, as it can clog municipal water systems,

smother aquatic life, and cause water

to become increasingly turbid. Turbid water can cause thermal pollution, because it absorbs more solar radiation.

Hazardous and toxic chemicals: These are usually human-made materials that are not used or disposed of properly. The industrial waste contains a large

number of harmful chemicals like acids, alkali and metals such as arsenic, lead, mercury and cadmium leading to toxicity. Domestic and personal use of chemicals also significantly contribute to chemical pollution. Household cleaners, dyes, paints and solvents are also toxic, and can accumulate when poured down drains or flushed down the toilet. In fact, one drop of used motor oil can pollute 25 litres of water! And, people who use pesticides in their gardens and lawns tend to use ten times more pesticide per acre than a farmer would!

Pharmaceuticals: Pharmaceuticals and personal care products including medications, lotions and soap, are being found in increasing concentrations in lakes and rivers causing water pollution.

Hazardous substances like fluorine mixed in ground water cause dangerous diseas called fluorosis see annexure for more details.

Prevention And Controlling of Water Pollution

Water pollution can be prevented or minimized by adopting following measures.

- Toxic industrial wastes should be treated chemically to neutralize the harmful substances present in it before discharging into rivers and lakes.
- The sewage should not be dumped in to the rivers directly. It should first be treated at the sewage treatment plant to remove the organic matter from it in the form of manure.
- The use of excessive fertilizers and pesticides should be avoided.
- The use of synthetic detergent should be minimized or biodegradable detergents should be used.
- Dead bodies of human beings and animals should not be thrown in to rivers.
- The excreta and other garbage should be treated in a biogas plant to get fuel as well as manure.
- The water of rivers, streams, ponds and lakes should be purified or cleaned. This can be done both by the industries and the govt. For example Ganga action plan lunched by the Indian Government.
- Trees and shrubs should be planted along the banks of the rivers.
- There should be general awareness among the masses regarding the harmful effects of water pollution and the ways of prevention. Waste paper, plastics, waste food materials and rotten food and vegetables should not be thrown in to open drains.
- Follow 3R's principles to reduce pollution and recover resources.
- Reduce the usage of the materials to the extent possible. Go for the alternate energy resources that can replenish themselves without affecting our environment.
- Once the materials are used for their primary purpose, reuse them for some secondary purpose. e.g if you have got your print outs on a plain white paper, you can use the other side of the paper once the project is over and the papers

are no longer needed for printing. In this manner you can save considerable amount of trees to be cut down to meet the demand of papers.

- Recycling is the next stage of reuse.

Most of the materials can be recycled for use and recycled again and again till their properties are useful and are not degraded to an extent that can prevent their effective use.

Natural resources are the divine gift for us by nature. We can use these resources in a meaningful way which wil help us. If we destroy these resources human life become an unsolvable puzzle. We should keep these resources clean and healthy not only for us but also future generations.

Key words

Polllution, air pollution, polluants, volcanic eruption, thermal power plants, chloro fluro carbons (cfcs), water pollution, potable water, toxic industrial wastes, fertilizers & pesticides, eutrophication, biodegradation, reduce, reuse, recycle suspended particulate matter (spm)

What we have learnt

- Pollution is any undesirable change in physical, chemical or biological characteristics of air, water or soil.
- Air pollution is the contamination of air by impurities which may have harmful impacts on the living organisms and the non- living components of the environment.
- Pollutants are the substances which contaminate the environment. Main pollutants are suspended particulate matter, Carbon monoxide, excess carbon dioxide, oxides of sulfur and nitrogen, CFCs and heavy metals.
- Causes of Air pollution: Burning of fuels, vehicles, industries, thermal power plants, Nuclear power plants, Fertilizers and pesticides, deforestation, CFCs and mining.
- Air pollution causes various diseases like respiratory diseases, cancer, etc.
- The contamination of water with unwanted and harmful substances such as sewage, toxic chemicals, and industrial waste is known as water pollution.
- Industrial wastes, sewage waste, fertilizers, and pesticides are releasing pollutants that cause water pollution.
- Water borne diseases like typhoid, cholera, dysentery, jaundice, and diarrhea are some of the effects of water pollution.
- Environmental pollution can be controlled taking preventive measures like using 3R's principles.

Improve your learning

1. What is air pollution? Make a flowchart to describe its causes and effects. (AS 5)
2. Sudheer is a traffic constable. What do you think about his health. Give some suggestions to protect is health during duty period. (AS 2)
3. Does what air pollution lead to water pollution? (AS 1)
4. 'Use Bicycle – Avoid motor bikes and cars.This slogan is prepared by Sravani. You also prepare some slogans on pollution. (AS 7)
5. Clear and transparent water is always fit for drinking. Comment. (AS 6)
6. If our monument like Taj Mahal is effected by air pollution, what is your advise to protect it? (AS 6)
7. What steps can be taken up to control air pollution and water pollution? (AS 1)
8. Write a short note on the effects of water pollution in your village or nearby area(AS1)
9. Why does the increased level of nutrients in the water affect the survival of aquatic organisms? (AS 1)
10. Reshma going to talk about controlling measures of soil pollution. Please prepare write up for her. (AS 6)
11. Road side plants cannot grow properly - Find your own reasons and explain with your argument. (AS 1)
12. Visit a pollution check centre. Observe the process of conducting a pollution check and record your findings. You may consider the following areas for your record:
    Average number of vehicles checked in a certain time period, Time taken to check each vehicle, Pollutants checked for, The process of testing, Permissible limits of emission of various pollutants, Measures taken if the emitted gases are above the permissible limits. (AS 4)
13. Organize a field visit to a pond / lake / river present in or near to your village with the help of your teachers. (AS 4)
    Observations followed by discussion could focus on... The history of the pond or lake or river, Water resources available other than that river/ pond/ or lake, Cultural traditions, Pollution concerns, Source of pollution, Effects of pollution on the people living by the river side as well as those living far away.
14. To conduct a quiz program on air and water pollution, prepare five thought provoking questions. (AS 6)
15. If you are a general manager of a chemical industry what precautions you would take to control air and water pollution. (AS 7)

ANEXURE

What is fluorosis?

Fluororsis Disease

Look at this picture. Do you know how and why? He is looking so. Yes, he is suffering a dangerous disease called fluorosis, which is caused by intake off fluorinated food and water. Most of the places of Nalgonda, Prakasham, Medak, Khammam and Nellore districts of our state affected by fluorosis.

Fluorosis is a disease caused by excessive ingestion of fluoride through water and or food. The upper limit of optimum fluoride level in drinking water for a tropical country like India is 0.5 PPM or 0.5 Mg/l. It is the total daily intake through water and food that determines the development of fluorosis.

Endemic skeletal fluorosis was identified in Podili, Darsi and Kanigiri areas of Andhra Pradesh in 1937. Yellareddyguda, Naibai and Yedavalli villages of Nalgonda district are known to have a very high (2.0 to 7.5ppm) incidence of fluorosis. Fluoride in take came from food.

Fluorosis diseases are of four forms dental, genu valgum, skeletal and neurological. Low endemicity is those villages, which have only cases of dental fluorosis. In addition if there are cases of Genu valgum, Skeletal and Crippling forms, they should be considered as the villages with high endemicity. Low endemicity cases only need calcium and vitamin supplementation to children and adolescents to prevent Genu valgum deformities occurring.

All children living in endemic areas of fluorosis consuming water containing more than 1.5 PPM of fluoride would develop dental fluorosis. Permanent teeth are affected which become rough, opaque and chalky white. Pitting and chipping of the teeth are also same. Brown, black or yellow pigmentation is deposited on the teeth.

Genu valgum is the deformities of limb bones, which are notably seen in weight bearing lower limbs in children in endemic areas of fluorosis. These occur only in poorly nourished children whose diet is low in calcium intake.

Bony changes occur due to excessive ingestion of fluoride over a long period of time. This becomes crippling in people in endemic regions beyond the age of 30 years. In these places river water is good for drinking than well or borewell water.

These deformities are to be prevented by providing adequate diet containing optimum amounts of calcium in growing children. Milk is a good source of calcium but it is expensive. There are many vegetables which are rich of source of calcium, magnesium and vitamin C like Thotakura, Chamakura, Ragi, Agathi, Amaranth, Colacasia leaves, Curry leaves, Poppy seed, Jagary, Gingelly seeds, Jowar, Cummin, Amla, Green chilly, etc. School children are provided milk and leafy vegetables in their midday meal.