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POLLUTION

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INTRODUCTION

Efforts to improve the standard of living for humans through the control of nature and the development of new products have resulted in the pollution, or contamination, of the environment. Much of the world's air, water, and land is now partially poisoned by chemical wastes. Some places have become uninhabitable. This pollution exposes people all around the globe to new risks from disease. Many species of plants and animals have become endangered or are now extinct. As a result of these developments, governments have passed laws to limit or reverse the threat of environmental pollution.

All living things exert some pressure on the environment:

- Predatory animals, for example, reduce the population of their prey, and animal herds may trample vast stretches of land.
- The weather could be said to cause pollution when a hurricane deposits tons of silt from flooded rivers into an estuary or bay. These are temporary dislocations that nature balances and accommodates to.
- Modern economic development, however, sometimes disrupts nature's delicate balance. The extent of environmental pollution caused by humans is already so great that some scientists question whether the Earth can continue to support life unless immediate corrective action is taken.

There are many types of pollution which are considered in the following pages. They can be listed as:

- Air pollution,
- Water pollution,
- Soil pollution,
- Heat pollution,
- Noise pollution.

Questions...

1. What is pollution?
2. What are the main causes of pollution today?

AIR POLLUTION

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Factories and transport depend on huge amounts of fuel. When these fuels burn they introduce smoke and other, less visible, by-products into the atmosphere. Although wind and rain occasionally wash away the smoke given off by power plants and cars the cumulative effect of air pollution poses a grave threat to humans and the environment.

In many places smoke from factories and cars combines with naturally occurring fog to form smog. For centuries London has been subjected to the danger of smog, long recognized as a potential cause of death, especially for elderly people and those with severe respiratory ailments. Air pollution in London originally resulted from large-scale use of heating fuels.

Scientists believe that all cities with populations exceeding 50,000 have some degree of air pollution. Burning rubbish in open dumps causes air pollution. Other sources include emissions of sulphur dioxide and other noxious gases by electric power plants that burn high sulphur coal or oil. Industrial boilers at factories also send large quantities of smoke into the air. The process of making steel and plastic generates large amounts of smoke containing metal dust or microscopic particles of complex and sometimes even deadly chemicals.

The single major cause of air pollution is the internal-combustion engine of cars. Petrol is never completely burned in the engine of a car, just as coal is never completely burned in the furnace of a steel mill. Once they are released into the air, the products of incomplete combustion, particulate matter (soot, ash, and other solids), unburned hydrocarbons, carbon monoxide, sulphur dioxide, various nitrogen oxides, ozone, and lead, undergo a series of chemical reactions in the presence of sunlight. The result is the dense haze characteristic of smog. Smog may appear brownish in colour when it contains high concentrations of nitrogen dioxide, or it may look blue-grey when it contains large amounts of ozone. In either case, prolonged exposure will damage lung tissue.

The costs of air pollution are enormous. Sulphur-dioxide exposure is the third leading cause of lung disease after active and passive smoking. Contaminants in the air also have been implicated in the rising incidence of asthma, bronchitis, and emphysema, a serious and debilitating disease of the lung's air sacs.

Questions...

1. What is air pollution?
2. What are the main causes of air pollution?
3. How can air pollution be reduced?

WATER POLLUTION

Since the beginning of civilization, water has been used to carry away unwanted refuse. Rivers, streams, canals, lakes, and oceans are currently used as receptacles for every imaginable kind of pollution. Water has the capacity to break down or dissolve many materials, especially organic compounds, which decompose during prolonged contact with bacteria and enzymes. Waste materials that can eventually decompose in this way are called **biodegradable**. They are less of a long-term threat to the environment than are more persistent pollutants. These substances remain in the water and can make it poisonous for most forms of life. Even biodegradable pollutants can damage a water supply for long periods of time. As any form of contamination accumulates, life within the water starts to suffer. Lakes are especially vulnerable to pollution because they cannot cleanse themselves as rapidly as rivers or oceans.

A common kind of water pollution is the effect caused by heavy concentrations of nitrogen and phosphorus, which are used by plants for growth. The widespread use of agricultural fertilizers and household detergents containing these elements has added large amounts of plant nutrients to many bodies of water. In large quantities, nitrogen and phosphorus cause tiny water algae to bloom, or grow rapidly. When the algae die, oxygen is needed to decompose them. This creates an oxygen deficiency in the water, which causes the death of many aquatic animals. Plant life soon reduces the amount of open water. These events speed up the process of eutrophication, the aging and eventual drying up of a lake.

Sedimentation also pollutes water. It is the result of poor soil conservation practices. Sediment fills water-supply reservoirs and fouls power turbines and irrigation pumps. It also diminishes the amount of sunlight that can penetrate the water. In the absence of sufficient sunlight, the aquatic plants that normally furnish the water with oxygen fail to grow.

Factories sometimes turn waterways into open sewers by dumping oils, toxic chemicals, and other harmful industrial wastes into them. In mining and oil-drilling operations, corrosive acid wastes are poured into the water.

Questions...

1. How does water pollution happen?
2. What does **biodegradable** mean?
3. How can water pollution be reduced?

SOIL POLLUTION

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In order to sustain the continually growing human population, current agricultural methods are designed to maximize yields. In many areas, the overuse of land results in the erosion of topsoil. This soil erosion, in turn, causes the over-silting or sedimentation of rivers and streams.

Pesticides are often designed to withstand rain, which means they are not always water-soluble, and therefore they may persist in the environment for long periods of time. Some pests have developed a genetic resistance to these chemicals, forcing farmers to increase the amounts or types of pesticide.

The pesticide DDT provides the best-known example of the dangers of introducing synthetic chemical compounds into the environment. At first it was highly regarded because it reduced the incidence of malaria throughout the world. Then, evidence began to show that DDT might be doing more harm than good. DDT, like other chemically stable pesticides, is not readily biodegradable. It has been found in the tissues of every organism tested for its presence. DDT is now known to affect biological activities. It reduces the rate of photosynthesis in organisms that form the basis of most ocean food chains.

Although DDT has been banned in the United States and most other countries, it is still manufactured and used in some parts of the world. Many other pesticides also have been banned. Thousands of pesticides remain in use and, in some cases, their agricultural value may balance out their risks.

Some urban areas are beginning to experience a serious problem regarding the disposal of garbage and hazardous wastes, such as solvents and industrial dyes and inks. In many areas landfill sites are approaching their full capacity and many municipalities are turning to incineration as a solution. Giant high-temperature incinerators have become another source of air pollution, however, because incineration ashes sometimes contain very high concentrations of metals as well as dioxins, a dangerous family of chemical poisons.

Questions...

1. Explain how soil can be polluted?
2. What solutions can you offer to reduce soil pollution?
3. What are the consequences of soil pollution?

HEAT POLLUTION

Heat pollution is a consequence of rising energy needs. As electric power plants burn fossil fuels or nuclear fuel to provide this energy, they release considerable amounts of heat. Power plants are usually located near bodies of water, which the plants use for heat-dissipation purposes. Living things, especially such cold-blooded animals as fish, are very sensitive to even small changes in the average temperature. Because of the added heat in waters affected by power plants, many aquatic habitats may be undergoing drastic change. In some instances, the warmer water may cause fish eggs to hatch before their natural food supply is available. In other instances, it may prevent fish eggs from hatching at all.

Heat can be unnaturally added to streams and lakes in a number of ways. One is to cut down a forest completely. The brooks and streams that flowed through it are then exposed to the sun. Their temperatures begin to rise. As they flow into larger bodies of water, these in turn are warmed. This can kill fish and other water animals incapable of tolerating the higher temperatures.

In addition, a very small rise in the average temperature of the Earth's surface could produce profound climatic changes. Some experts believe that it would cause the Greenland and Antarctic ice caps to melt, raising ocean levels and inundating large areas of land.

Average worldwide temperatures can be affected when the products of combustion, carbon monoxide, water vapour, and carbon dioxide, are emitted into the air, especially at high altitudes. Since the normal level of carbon dioxide in the air is quite small, any significant addition is a potential threat. Although solar energy on its way to the Earth's surface easily passes through layers of carbon dioxide, some of the heat escaping from the Earth would be absorbed by increased amounts of atmospheric carbon dioxide, much as heat is trapped in a greenhouse. A worldwide greenhouse effect of this type might produce a dangerously warmer world. Since the late 19th century, the average global temperature has increased between 0.54^{o} F and 1.08^{o} F (0.3^{o} C and 0.6^{o} C). Internationally, 1990 was the hottest year on record since official weather records first started being kept from about 1860.

Questions...

1. Give examples of heat pollution.
2. Is heat pollution a modern problem or did it exist in the past? Explain.
3. Can heat pollution ever be reduced? Give your reasons.

NOISE POLLUTION

The hearing apparatus of living things is sensitive to certain frequency ranges and sound intensities. Sound intensities are measured in decibels. For example, a clap of thunder has an intensity of about 100 decibels. A sound at or above the 120-decibel level is painful and can injure the ear. Noise pollution is becoming an unpleasant fact of life in cities, where the combination of sounds from traffic and building construction reverberates among high-rise buildings, creating a constant din.

In addition, the intense volume at which some popular music, especially heavy metal rock music, is played has resulted in the loss of some or all of the hearing of a few musicians and members of their audiences. There is some evidence that extreme levels of noise can produce other damaging effects on human health and on work performance.

Questions...

1. Give examples of noise pollution.
2. As the population increases is noise pollution bound to increase as well?
3. What are the effects of noise pollution?
4. Make a list of how you cause noise pollution. Do you think it could damage your quality of life or the quality of life of other people around you?

MY CONTRIBUTION TO NOISE POLLUTION.

1.

2.

3.

4.

5.

6.

Pollution is caused by several separate processes which combine:

- *The pollution caused by more people on the planet,*
- *The pollution caused by more expectations,*
- *The view that we are in competition with or are at war with Nature.*

*The explosion in **world population** is an obvious cause of pollution increase. Just think of all the 6 billion people on the planet. They all have to eat, wash, go to the toilet, and generally fulfil the processes of living. I sometimes think it is a miracle that there is not more pollution. Just imagining the sheer number of people on the planet is mind boggling.*

***Expectations** are another cause of pollution. Just think back to the way people lived before the second world war and compare that to the type and number of gadgets we have today. Then, most people did not have anything electrical in their homes except perhaps a radio and lighting. Just make a list of everything in your home today that is connected to a plug; fridge, freezer, microwave oven, television, radio, Hi-fi, computer, kettle, alarm clock, heaters, etc.*

All these things have to be made which requires energy and effort. The extraction of raw materials needs energy and effort. The distribution of the goods and delivery to your homes needs energy and effort. The result is a huge explosion of pollution from the first to the last process in producing and delivering the goods. Not to mention cars....

It is, perhaps, easier to see how expectations multiply pollution if we look at the example of India and China. The West is trying to stop the same expectations in these countries. The specific example is of fridge manufacture. With the ozone layer being depleted partly as a result of Chloroflluorocarbons (CFCs) produced by fridges, the West is fearful that an explosion of fridge manufacture and supply in India and China would be disastrous. The West tried to get them to use newer, more expensive, technology which does not threaten the ozone layer. Both India and China refused to cooperate stating that the West had no thought of the environment when they produced their fridges and don't seem to care now about the pollution they cause either. Just imagine nearly 2 Billion people in these two countries desiring the same things as the West already has. The pollution problem is set to get a lot worse.

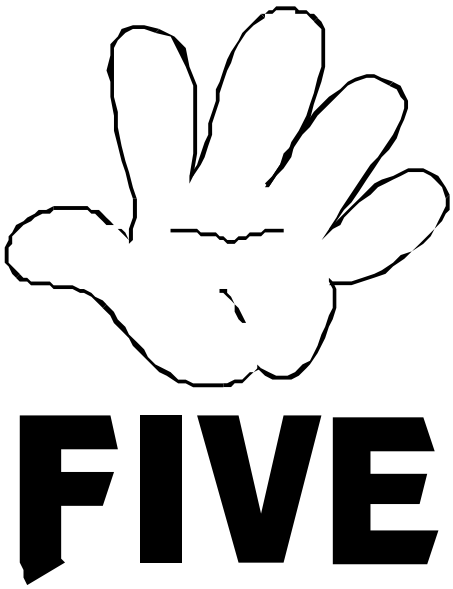
*Many people do not see nature as helpful but seem to think that we are in competition with, or **fighting the forces of, nature.** We need to understand that the Earth is our home and that we should cooperate with it. If we destroy the Earth we destroy ourselves.*

Questions...

1. How do expectations increase pollution? Give examples.
2. Do you agree with the viewpoint above?
3. Is it true that we try to overcome nature rather than work with it?

we can live in a cleaner, better world...

Most pollution is created as a by-product of other processes. For instance, a large amount of air pollution is caused by our desire to travel in cars. It seems obvious to me that in order to control pollution we need to change the way we live. We need to sort out those things which cause most pollution. Swapping cars for public transport, for instance, would solve much of the air pollution problems.



It is really about showing people that there are other ways to live. People seem to be very limited and like to do the same things without looking at new ways. The solution, I think, is to open people up to new ideas, new ways and outlooks, new possibilities.

We need a five point plan which will give real results in reducing pollution. Think about all types of pollution including:

- Air pollution,
- Land pollution,
- Water pollution,
- Noise pollution

MY FIVE POINT PLAN

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2.

3.

4.

5.

ECOLOGY

9

Ecology is the branch of science that deals with how living things, including humans, are related to their surroundings. The Earth supports some 5 million species of plants, animals, and microorganisms. These interact and influence their surroundings, forming a vast network of interrelated environmental systems called ecosystems including:

- The arctic tundra,
- A Brazilian rain forest,
- Island ecosystems.

If left undisturbed, natural environmental systems tend to achieve balance or stability among the various species of plants and animals. Complex ecosystems are able to compensate for changes caused by weather or intrusions from migrating animals and are therefore usually said to be more stable than simple ecosystems.

A field of corn has only one dominant species, the corn plant, and is a very simple ecosystem. It is easily destroyed by drought, insects, disease, or overuse. A forest may remain relatively unchanged by weather that would destroy a nearby field of corn, because the forest is characterized by greater diversity of plants and animals. Its complexity gives it stability.

Every environmental system has a carrying capacity for an optimum, or most desirable, population of any particular species within it. Sudden changes in the relative population of a particular species can begin a kind of chain reaction among other elements of the ecosystem. For example, eliminating a species of insect by using massive quantities of a chemical pesticide also may eliminate a bird species that depends upon the insect as a source of food.

Questions...

1. What is ecology?
2. How can ecology help us to reduce pollution?
3. Which other sciences are helpful in the bid to reduce pollution? Give examples.

SOME SOLUTIONS

One example of how pollution has been reduced is the example of the household fridge. The ozone layer which protects us from the harmful rays of the Sun was being destroyed, partly because of the gases released by fridges. These are called Chloroflluorocarbons, (CFCs). Fridge makers in many countries now use an alternative method which means that no CFCs are released into the air.

Another example is the use of hydrogen powered buses in some cities in Europe and the USA. By using these forms of power, the emissions are harmless to the environment. But car use is still the major source of pollution in cities and the hydrogen bus experiment is very small.

People are looking at ways in which we can change our lifestyles slightly which will have the effect of reducing pollution.

Questions...

1. Think of ways to change the way we live which will have an effect on the amount of pollution we cause. Make a list of things we might be able to change, and then offer solutions of how we can reduce pollution. Some examples include:

- Better use of electricity,
- More use of public transport,
- Recycling waste.

Now add your own examples and offer solutions.

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2

3