

Environmental Problems and Issues in Managing the Environment

- **The Global Scope of Environmental Problems**
- An environmental problem arises whenever there is a change in the quality or quantity of any environmental factor which directly or indirectly affects the health and well-being of man in an adverse manner.
- Environmental and ecological problems have been around for centuries.
- Beginning in the 18th century during the industrial revolution, science and technology were harnessed to produce new labour-saving devices, industrial machines, and goods for mass consumption.
- Manufacturing industries were fuelled by great quantities of inexpensive natural resources and raw materials, many of which were located nearby but the preponderance of which were located in colonial regions of the world.

- During the period of classic imperialism, the Europeans conquered and colonised the 3rd world for their resources and raw materials.
- Meanwhile, on the European continent, air, water, and soil pollution spread beyond local areas.
- The development of gasoline-driven engine at the end of the 19th century shifted demand away from coal and steam energy to oil and petroleum-based energy resources.
- As industrialisation spread throughout Western Europe and the United States, industrial pollution gradually became a bigger problem.

- The global magnitude of environmental problems was not fully realised until the 1960s.
- As the absolute amount of pollution discharged worldwide grew, so did scientific knowledge and public awareness.
- In 1972, a Conference on the Human Environment was held in Stockholm, Sweden, at which the UN instituted its Environmental Programme (UNEP).
- The Conference also produced an Action Plan for the Human Environment with 109 recommendations for governmental and international action covering a wide variety of environmental issues.

- The critical importance of the environment was further stressed in a shocking study done by the Club of Rome and released to worldwide attention in 1972.
- The Report which was entitled ***The Limits to Growth*** provided a set of projections for the world based on post-war economic activities and environmental trends.
- The study argued that if previous patterns of economic activities and environmental abuse continued, it would be the environment, not land , food, or other factors, that would limit global progress.

- In the 1980's, national and international attention to environmental issues reached new heights and attention shifted from pollution to broader issues of ecological mismanagement.
- Some of these events included:
 - A major chemical spill at a Union Carbide Pesticide plant in Bhopal, India on December 2, 1984;
 - The acid rain debate between the US and Canada;

- The Chernobyl nuclear reactor incident in the Soviet Union on April 26, 1986;
- Discovery of a hole in the ozone layer over Antarctica;
- Major drought and famine in Africa accompanied by drought in the US;
- A chemical spill in the Rhine River (river in western Europe, flowing northwestward from southeastern Switzerland through Germany and the Netherlands, emptying into the North Sea);

- Accelerated rates of deforestation in Brazil, Ivory Coast, Haiti, Thailand and other countries;
- The closing of many US beaches due to toxic waste or spills.
- In 1987, UNEP published a report entitled *Our Common Future* that shifted more attention to the connection between the environment and the survival of developing nations.
- Multilateral efforts to deal with the environment have been ongoing. However despite the coordinated efforts and activities to tackle the problems emanating from the environment, limited progress has been made.

- **The nature of Environmental Challenges**
- Overexploitation of Natural Resources;
- Ozone Layer Depletion
- Global Warming and Green House Effect;
- Desertification;
- Hazardous Waste
- Loss of biodiversity and Species extinction;
- Deforestation;
- Ocean Nuclear Waste Dumping

- **Overexploitation of Natural Resources**
- The natural environment is not only a delicate ecosystem requiring protection, but also a repository of natural resources.
- Because the extraction of resources brings wealth to states, these resources are overexploited with consequences on the environment.
- Similarly, the centrality of natural resources to national wealth has resulted in international conflicts.

- Three aspects of natural resources shape their role in international conflicts:
 - First, they are required for the operation of the industrial economy;
 - Their sources – mineral deposits, rivers and so on are associated with particular territories over which states may fight for control;
 - Third, natural resources tend to be unevenly distributed, with plentiful supplies in some states and an absence in others.

- **Ozone Layer Depletion**
- Earth's atmosphere is divided into three regions, namely:
 - Troposphere (the lowest and most dense layer of the atmosphere, extending 10 to 20 km)
 - Stratosphere (the region of the Earth's atmosphere between the troposphere and mesosphere, from 10 km/6 mi to 50 km/30 mi above the Earth's surface); and,
 - Mesosphere (the layer of the Earth's atmosphere in which temperature decreases rapidly, located between the stratosphere and thermosphere).

- The ***stratosphere*** extends from 10 to 50 kms from the Earth's surface.
- This region is concentrated with slightly pungent smelling, light bluish ozone gas.
- The ozone gas is made up of molecules each containing three atoms of oxygen; its chemical formula is O_3 .
- The ozone layer, in the stratosphere acts as an efficient filter for harmful solar Ultraviolet B (UV-B) rays.
- Ozone is produced and destroyed naturally in the atmosphere and until recently, this resulted in a well-balanced equilibrium.

- In the 1980s it was realized that industrial pollutants such as chlorofluorocarbons (CFCs) were damaging the ozone layer and that holes had appeared in it, especially over the Antarctic.
- The ozone depletion process begins when CFCs (used in refrigerator and air conditioners) and other ozone-depleting substances (ODS) are emitted into the atmosphere.
- These ODS compounds do not dissolve in rain, are extremely stable, and have a long life span.
- After several years, they reach the stratosphere by diffusion. The major effects of ozone layer depletion are:

- *i) Effects on Human and Animal Health:* - Increased penetration of solar UV-B radiation is likely to have high impact on human health with potential risks of eye diseases, skin cancer and infectious diseases.
- *ii) Effects on Terrestrial Plants:* In forests and grasslands, increased radiation is likely to change species composition thus altering the bio-diversity in different ecosystems.
- It could also affect the plant community indirectly resulting in changes in plant form, secondary Metabolism, etc.

- *iii) Effects on Aquatic Ecosystems:* High levels of radiation exposure in tropics and subtropics may affect the distribution of phytoplankton, which form the foundation of aquatic food webs.
- It can also cause damage to early development stages of fish, shrimp, crab, amphibians and other animals, the most severe effects being decreased reproductive capacity and impaired larval development.

- *iv) Effects on Air Quality:* Reduction of stratospheric ozone and increased penetration of UV-B radiation result in higher photo dissociation rates of key trace gases that control the chemical reactivity of the troposphere.
- This can increase both production and destruction of ozone and related oxidants such as hydrogen peroxide, which are known to have adverse effects on human health, terrestrial plants and outdoor material.

- **Global Warming and Green House Effect**
- Before the Industrial Revolution, human activities released very few gases into the atmosphere and all climate changes happened naturally.
- After the Industrial Revolution, through fossil fuel combustion, changing agricultural practices and deforestation, the natural composition of gases in the atmosphere is getting affected and climate & environment began to alter significantly.
- Over the last 100 years, it was found out that the earth is getting warmer and warmer.
- The key greenhouse gas (GHG) causing global warming is carbon dioxide.

- CFC's, even though they exist in very small quantities, are significant contributors to global warming.
- Carbon dioxide, one of the most prevalent greenhouse gases in the atmosphere, has two major anthropogenic (human-caused) sources: the combustion of fossil fuels and changes in land use.
- Net releases of carbon dioxide from these two sources are believed to be contributing to the rapid rise in atmospheric concentrations since Industrial Revolution.
- Because estimates indicate that approximately 80 percent of all anthropogenic carbon dioxide emissions currently come from fossil fuel combustion, world energy use has emerged at the center of the climate change debate.

- **Deforestation**
- One of the most obvious spreads of ecological impact around the globe is the loss of forest cover.
- Deforestation, once virtually concentrated in the temperate zones, has now reached all climatic zones, especially the South—which contains 77 percent of the New World's tropical forests (Rudel 1989).
- Globally, the 3.4 billion hectares (a hectare equals approximately 2.41 acres) of forestland that existed in 1980 had declined by 5 percent to 3.2 billion hectares just fifteen years later (FAO 1997).

- Deforestation connotes the indiscriminate cutting or over-harvesting of trees for lumber or pulp, or to clear the land for agriculture, ranching, construction, or other human activities.
- Deforestation threatens the earth's land, water, and air, making it truly a global problem.
- In many cases, forest materials are burned, releasing greenhouse gases that contribute to global warming.
- Rain forests are also home to millions of species of mammals, birds, fishes, reptiles, insects as well as plant varieties.

- The financial loss attributed to deforestation is incalculable because prices cannot be fixed for the loss of the many genetic codes in plants and insects, the diversity that comes with organism mutation, and the 99 percent of naturally occurring species not exploited by humans for food and medicines.
- Many of the tropical rain forests also contain plants that have proved to be effective in the fight against some forms of cancer and other diseases.
- The case of Haiti, Brazil and Ivory Coast demonstrate that deforestation creates refugees.

- Ecologically, the negative effects of deforestation also include an increase in watershed runoff, which can result in either desertification in countries such as Sudan or worsening flood conditions downstream in countries such as Bangladesh, India and Thailand.
- Tropical rain forests now represent roughly 6 percent of the land surface of the earth, half of what they did 50 years ago.
- Some 30 million acres (an acre is equal to 4,046.86 sq metres./4,840 sq yd) are cut down.
- Large tracts in Ivory Coast, the Philippines, Thailand and more than 30 other developing and developed countries have been cleared for farmland, grazing, mining and fuel

- The spread of deforesting practices is especially pronounced in the tropics where, for example, the amount of deforested land increased from 7.5 million hectares per year in 1979 to 13.2 million hectares in 1991, an increase of over 75 percent or an annual increase of 4.5 percent per year (Bawa and Dayanandan 1997).
- Worldwide, tropical forests are being lost at a rate of 14 to 16 million hectares per year.
- Examples of the most rapid spread of tropical deforestation include Brazil, where the Amazon region alone contains 40 percent of the world's remaining tropical rain forest. Over the last twenty-five years, Brazil has lost forest cover equivalent to the size of Germany.

- **Causes**
- *Resettlement*: In some countries such as Brazil, deforestation results in part from government efforts to resettle people away from urban areas into undeveloped jungles
- *Economic pressures*. Huge quantities of wood are shipped overseas to earn foreign exchange.
- As many as 33 LDCs have been net exporters of wood, yet by 1990s many of them became net importers of wood.
- **Efforts at Reversing Deforestation**
- What has been done worldwide with regard to deforestation is grossly inadequate.
- It is estimated that it would require 320 million acres to begin to replace the rain forests that play an important role in absorbing carbon dioxide and perpetuating biodiversity.
- **1. Forest Conservation programmes**. This implies the protection of plants and animals, natural areas, and interesting and important structures and buildings, especially from the damaging effects of human activity.

- **2. Use of legal tactics to slow down or even halt timber cutting and logging.**
- **3. Tree replacement.** Increasingly, in many places the timber industry has found it economically and also politically profitable to invest in tree replacement.
- **4. Employment of new technologies and management techniques** to sustainably manage the rain forest and stabilize the relationship between economic and ecological forces.
- In some poor countries burdened by large foreign debts, environmentalists and bankers from rich countries have worked out “debt-for-nature swaps” in which debt is cancelled in exchange for the state’s agreement to preserve forests. In 2006, the US government and NGOs helped Guatemala cancel more than \$20 million in debts in exchange for expanded conservation programme

- ***Desertification***
- Desertification simply refers to a process by which land becomes increasingly dry until almost no vegetation grows on it, making it a desert.
- It is the decline in the biological or economic productivity of the soil in arid and semiarid areas resulting from various factors, including human activities and variations in climate.

- Desertification is found on every continent except Antarctica, but international attention has focused mostly on Africa, particularly the region known as the Sahel, the region of northern Africa immediately to the south of the Sahara desert.
- Desertification has been recognized as a problem since the Dust Bowl of the 1930s in the Midwestern United States, but it only became an international issue during the Great Drought in the Sahel between 1968 and 1973

- **Factors Promoting Desertification**
- *i) Poor land management* - increased irrigation, improper cultivation or over-cultivation, and increased numbers of livestock.
- *2) Increasing population* mount pressure on the land leading to over-usage and subsequent alteration that undermine and diminish the quality of the land and soil and thus, increase the chances of desertification.
- *3) Drought* could also cause desertification. It is a primary cause of desertification. Desertification can occur without drought, and drought can occur without resulting in desertification. Droughts are short-term and cyclical. By themselves, they do not degrade the land. However, they intensify the pressures that lead to mismanagement of land, plant, and water resources.

- 4) Ironically, *the availability of water for irrigation* can cause desertification.
 - Nearly all irrigation water contains some salt.
 - If an irrigation system lacks a good drainage system, then the salt accumulates in the soil. Eventually, the salt reaches levels toxic to most plants.
 - This problem is now jeopardizing about one-third of the world's irrigated land.
 - For example, in the Euphrates Valley of Syria, irrigation costs dropped with the introduction of diesel pumps in the 1940s, encouraging development of new croplands. By 1980 half the land area had extremely high salt concentrations and a large part of the area had been abandoned

- 5) *Political Change.*
 - A political change in Mauritania was largely responsible for the desertification that began there in the 1960s.
 - Prior to Mauritania's independence in 1960, Mauritanian pastoralists could freely move south into Senegal during times of drought.
 - The border established at the time that independence was gained restricted these traditional movements.
 - This blockage increased competition for the limited forage available and resulted in overgrazing during times of drought. The consequence was a general decline in nomadic pastoralism, or livestock rearing, and an increase in Mauritania's urban population.

- 6) *Over-cultivation or the introduction of non-native plant species.*
 - This can lead to the loss of topsoil and degradation of the soil.
 - Before the Dust Bowl in the 1930s, high wheat prices and favourable climatic conditions in the Midwestern United States encouraged early 20th-century settlers to convert native grasslands to cropland.

- The native grasses had held the fine-grained soil in place in spite of recurrent droughts and strong winds.
- The crops planted by the settlers, however, were not adapted to either drought nor wind. When the drought came in the 1930s, the crops failed.
- Without the cover of crops to protect the soil, the soil began to blow away.

- **Dumping of Nuclear Wastes in the Oceans**
- The problem of ocean nuclear waste dumping has climbed high on the international environmental agenda.
- Apart from accidental oil spills that have become quite common, the US, Great Britain, France and the former Soviet Union have been dumping large amounts of nuclear waste into different areas of the ocean since the mid-1940s.
- In 1946, the US began dumping low-level radioactive waste near the Farallon Islands west of San Francisco.

- The International Atomic Energy Agency (IAEA) banned the dumping of high-level radioactive waste in the late 1950s.
- Up till 1970s, Western European industrial countries dumped nuclear waste into the ocean.
- The US dumped radioactive waste (approximately 112,000 drums) at sites in the Pacific, Atlantic, and Gulf of Mexico until 1982, when a moratorium on the practice was enacted.
- The US Congress enacted Ocean Dumping Act in 1989 in an effort to end the dumping of industrial waste and sewage sludge into the sea.

- The Soviet Union claimed that it never dumped radioactive wastes at sea, but after its disintegration, former Soviet officials admitted to having dumped nuclear waste into the Sea of Japan, Arctic Ocean and into ground wells.
- By some estimates, it is held that the Soviet Union dumped more nuclear waste into the ocean than the total of all other countries combined.
- Pakistan has also been accused of dumping radioactive waste into the ocean

- In 2006, the UK Environmental Minister reported that storage tanks on land might become unsafe and that the government would have to consider dumping waste into the sea.
- Some of the effects of ocean pollution include:
 - Destruction of the world's marine diversity;
 - Climate and sea level change brought on by changes in ocean temperature; and,
 - The destruction of salt marshes, mangrove swamps, coral reefs and beaches, which means the loss of habitat and biological diversity.

- The case of radioactive waste dumping in the ocean is possibly an even greater threat to the ecosystems.
- Many assume that because the oceans are so vast, they can absorb any amount of pollution.
- But radioactive waste tends to be absorbed by clay on the ocean floor and spreads easily through ocean storms.
- Even if the effects of radioactive waste on humans are not completely understood, the possibility always exists that localised concentrations of nuclear waste could cause cancers in humans and damage ecosystems in as yet unpredicted ways.

- **Global Efforts to Contain Ocean Waste Dumping**
- In 1972, the London Dumping Convention was formed with a membership of 71 nations.
- In 1983, its members agreed to stop putting even low-level radioactive waste into the world's oceans.
- In November 1993, a new international convention was agreed to in London that permanently banned the dumping of radioactive waste at sea.

- Japan and the US originally opposed the ban because they wanted to leave open the possibility of dumping low-level nuclear waste.
- Green peace and other environmental groups mounted a major campaign to support the ban.
- What led to change in the position of Japan and the US was that Russian navy ship was found dumping radioactive waste into the sea of Japan in October 1993.
- Britain, France and Belgium reserved the right to opt out of the agreement after 15 years.

- While Russia is interested in foreign aid to help it dispose of its nuclear waste as well as deactivate their nuclear weapons, it is not so interested in dealing with the problem of naval waste.
- In 2001, president Putin signed a new law whereby the Russians would earn \$20 billion for storing 20,000 tons of nuclear waste. Some of this waste would go to Siberia
- Motivated by terrorist threats, the US Dept of Energy transported five shipments of waste from Asia to storage facilities in Idaho via San Francisco. Another 150 shipments were expected to be shipped to the Charleston Naval Weapons Station in South Carolina.

- **Hazardous Waste**
- Hazardous wastes are products of industrialisation. In other words, the production of toxic, explosive, flammable and other types of hazardous wastes are products of industrialisation.
- As environmental awareness rose in developed countries during the 1970s, domestic regulations regarding waste disposal became stringent, giving strong incentives for exporting hazardous wastes to developing countries with lower labour costs, less local opposition and less-strict environmental laws that were often loosely enforced.

- The North-South shipments of hazardous wastes drew public attention with notorious incidents of illegal dumping.
 - In one case, the Cargo ship *Khian Sea* spent almost 2 years at sea in search of a disposal site for 14,000 tons of incinerator ash containing lead and cadmium that had originated in Philadelphia.
 - Eventually the ship dumped 4,000 tons on the beach of Haiti and the remaining 10,000 tons somewhere between the Suez Canal and Singapore.
 - Another example was the 1987 toxic dump in Koko, Delta state , Nigeria. The dump was toxic industrial waste from Italy.

- **Loss of Biodiversity and Species Extinction**
- The vast majority of species that have ever walked the earth are extinct. The bulk of these extinctions, however, are due to either *astronomical or terrestrial cataclysms* in geological history or to slow rates of extinction through evolutionary processes.
- In modern times the rates of extinction are extraordinarily faster, for some species groups one thousand to ten thousand times the evolutionary rate of extinction that existed prior to the appearance of the human species.

- It is estimated that as many as 137 species disappear each day, amounting to over fifty thousand species each year (Raven and McNeely 1998; Dowdeswell and Heywood 1995; Wilson 1992).
- Biodiversity refers to the tremendous diversity of plant and animal species making up the earth's (global, regional and local) ecosystems.
- It encompasses not just individual species but the relationships between species and their habitats, whether that habitat be a few acres of rain forest or an entire ocean touching several continents.

- Increasingly, scientists are studying whether various habitats, and the species they harbour, can survive the massive changes that human beings have wrought on the planet, particularly in clearing forests and plains for agriculture and ranching.
- Harvard University biologist Edward O. Wilson, one of the leading authorities on biodiversity, estimates that the world could lose 20 percent of all existing species by the year 2020.
- In effect man in contemporary era could be responsible for the **sixth** major extinction in the history of the Earth and the greatest since the dinosaurs disappeared 65 million years ago.

- In recent times, palaeontologists have discovered that not all extinction was slow and gradual.
- At various times in the fossil record, many different, unrelated species became extinct at nearly the same time.
- The cause of these large-scale extinctions is always dramatic environmental change that produces conditions too severe for organisms to endure.

- Environmental changes of this calibre result from extreme climatic change, such as the global cooling observed during the ice ages, or from catastrophic events, such as asteroid or comet impacts or widespread volcanic activity.
- Possible causes even include bursts of radiation from exploding stars called **supernovas**.
- Scientists recognize *five* such mass extinctions in the past 500 million years. The cause or causes of each of these mass extinctions are still under study and open to debate.

- The first global mass extinction occurred about 440 million years ago in the ***Ordovician Period***.
- At this time, all animals and plants on Earth still lived in the ocean.
- More than 85 percent of the species became extinct, including many families of invertebrate marine animals belonging to groups such as **brachiopods, echinoderms, and trilobites**.

- Scientists variously attribute the cause of the extinction to:
 - Climate change: Some scientists think that climate change could have caused many animals that lived in warm tropical reefs to die out as ice sheets formed over a continent at the South Pole and sea levels dropped.

- Supernova: Some researchers have proposed a different cause and think that a supernova explosion at the time may have bathed Earth in deadly gamma-ray radiation that stripped away Earth's ozone layer, exposing the planet to high levels of ultraviolet light from the Sun. Such radiation would have been harmful to things that lived near the surface of the oceans.
- ***Supernova is an exploding star: a catastrophic explosion of a large star in the latter stages of stellar evolution, with a resulting short-lived luminosity from 10 to 100 million times that of the Sun***

- The **second** mass extinction took place about 360 million years ago, near the end of the **Devonian Period**, when 82 percent of all species were lost.
 - Animals and plants now lived on land as well as in the sea.

- The greatest extinctions affected marine animals, including cephalopods and armoured fish.
- The cause is attributed to climate change associated with the development of glaciers (ice mass) on a giant southern continent.

- The **third** and greatest mass extinction to date occurred 251 million years ago at the end of the **Permian Period**.
 - In this mass extinction, as many as 96 percent of all species in the oceans and 70 percent of all species on land were lost.
 - The devastation was so great that palaeontologists use this event to mark the end of the **Paleozoic Era**, and the beginning of the **Mesozoic Era**, when many new groups of animals evolved.

Causes

- Current theories suggest that the Permian extinction was caused by a series of events that began with massive volcanic eruptions in Siberia.
- The gases released adversely affected the level of oxygen reducing it to 13% as against 21% now.

- The *fourth mass extinction* claimed 76 percent of the species alive at the time.
- This was about 200 million years ago at the end of the **Triassic Period**.
- During the Triassic Period, reptiles flourished and dinosaurs and evergreen forests first appeared.
- Primitive fishlike animals called conodonts disappeared from the seas, as did many types of marine reptiles.

- Many species of amphibians and reptiles on land also died out, including a number of groups of archosaurs, advanced reptiles that included dinosaurs.
- However, dinosaurs themselves managed to survive the mass extinction and went on to become the dominant animals on land for another 140 million years.
- Volcanoes and climate change may have contributed to the extinctions

- The **fifth** and most recent mass extinction occurred about 65 million years ago at the end of the **Cretaceous Period** and resulted in the loss of 76 percent of all species, most notably the dinosaurs
- Many geologists and palaeontologists speculate that this fifth mass extinction occurred when an asteroid struck Earth.
- They believe the impact created a dust cloud that blocked much of the sunlight—seriously altering global temperatures and disrupting photosynthesis, the process by which plants derive energy.

- As plants died, organisms that relied on them for food also disappeared.
- Supporting evidence for this theory comes from a buried impact crater in the Yucatán Peninsula of Mexico. Measured at 200 km (124 miles) in diameter, this huge crater is thought to be the result of a large asteroid striking the Earth.
- More species are becoming threatened with extinction in contemporary times.

- According to *Living Planet Index* (LPI), which measures overall trends in populations of wild species around the world, one-third of world's biodiversity has been lost since 1970.
- *Global Biodiversity Outlook* also concluded that “biodiversity is in decline at all levels and geographical scales” and called for targeted response options, including protected areas, resource management, pollution prevention programs and so on to reverse this trend for specific habitats or species.
- One of the most threatened sources of biodiversity is the rainforest ecosystem. Rain forests exist mainly in the tropics of Latin America, Africa and Asia.

- **The Remedies For Global Environmental Challenges**
- There are some uncertainties with regard to the effects of environmental degradation. However, its solution lies on the coordination of national actions within regional and international frameworks.
- The solution will need to involve countries world-wide because the impact on one location may be felt in a completely different location.
- Some of the significant remedies/solutions are:
- **i) Recycling**
- Recycling can decrease the number of pollutants entering the atmosphere and has been linked to lessening global climate change.
- Decreasing the amount of raw materials an industry has to use to create new products slows the cutting down of trees and reduces gas emissions.

- **ii) Water Conservation**
- Conserving water saves money and protects water reserves for future use. Water is necessary to the environment and makes the land habitable for all living creatures. Water conservation entails taking such measures as turning off the sink when water is not being used or storing rain water for daily needs such as watering a garden.
- **iii) Reduce Oil Dependence**
- The world's dependence on oil causes serious harm to the environment. Electric cars replace vehicles with highly polluting internal combustion engines. Ethanol fuel, made from corn, reduces gasoline consumption.

- **iv) Use Less Heat and Air Conditioning**
- In order to reduce the amount of fossil fuel used by households as well as the carbon dioxide released into the atmosphere, scientists have advised that those living in cold regions should insulate their walls and attic, and install weather stripping or caulking around doors and windows to lower both heating costs as well as reduce the amount of energy needed to heat and cool their homes.
- In the same vein, people are to drive less and drive smart as less driving means fewer emissions of pollutant gases.
- It is estimated that every gallon of gas saved not only helps your budget; it also keeps 20 pounds of carbon dioxide out of the atmosphere.

- **v) Plant a Tree and Encourage Others to Conserve**
- During photosynthesis, trees and other plants absorb carbon dioxide and give off oxygen.
- They are an integral part of the natural atmospheric exchange cycle here on Earth, but there are too few of them to fully counter the increases in carbon dioxide caused by automobile traffic, manufacturing and other human activities.
- A single tree will absorb approximately one ton of carbon dioxide during its lifetime.
- Share information about recycling and energy conservation with your friends, neighbors and co-workers, and take opportunities to encourage public officials to establish programs and policies that are good for the environment.

- **vi) Improvement of Structures for Education/Awareness**
- To promote action by all citizens, including children, the Government should improve environmental education, with emphasis placed on the global environmental issues and the role of forests.
- Furthermore, education on energy issues should be improved and offered at a variety of settings such as schools, local communities and at homes.
- The Government should have to develop facilities for environmental education where a broad range of generations, from children to adults, can learn about environmental problems, especially global environmental problems.