Chapter - 5

POLLUTION CONTROL AND DISASTER MANAGEMENT

Environmental Pollution

The word ‘pollution’ is derived from the Latin word ‘polluere’ which means ‘to soil or defile’ .

Any alteration to air, water, soil or food that threatens the health, survival capability or activities of humans or other living organisms is called environmental pollution.

Types of Environmental pollution

Air Pollution

Water Pollution

Noise Pollution

Soil Pollution

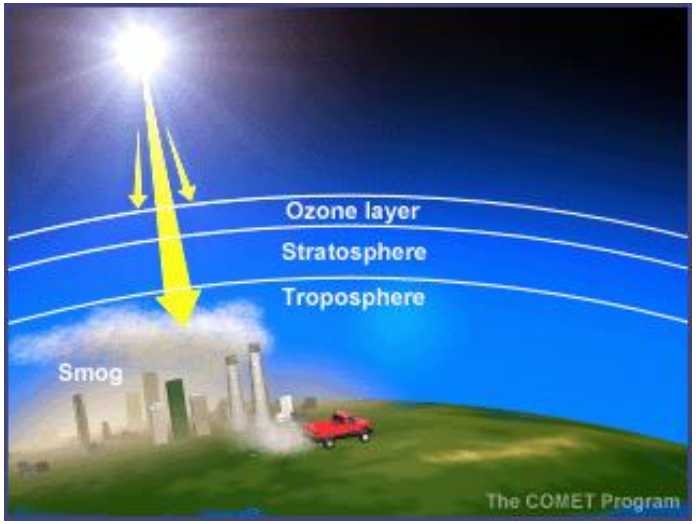
Marine pollution

Thermal pollution

Radiation Pollution

Solid waste Pollution

Air Pollution

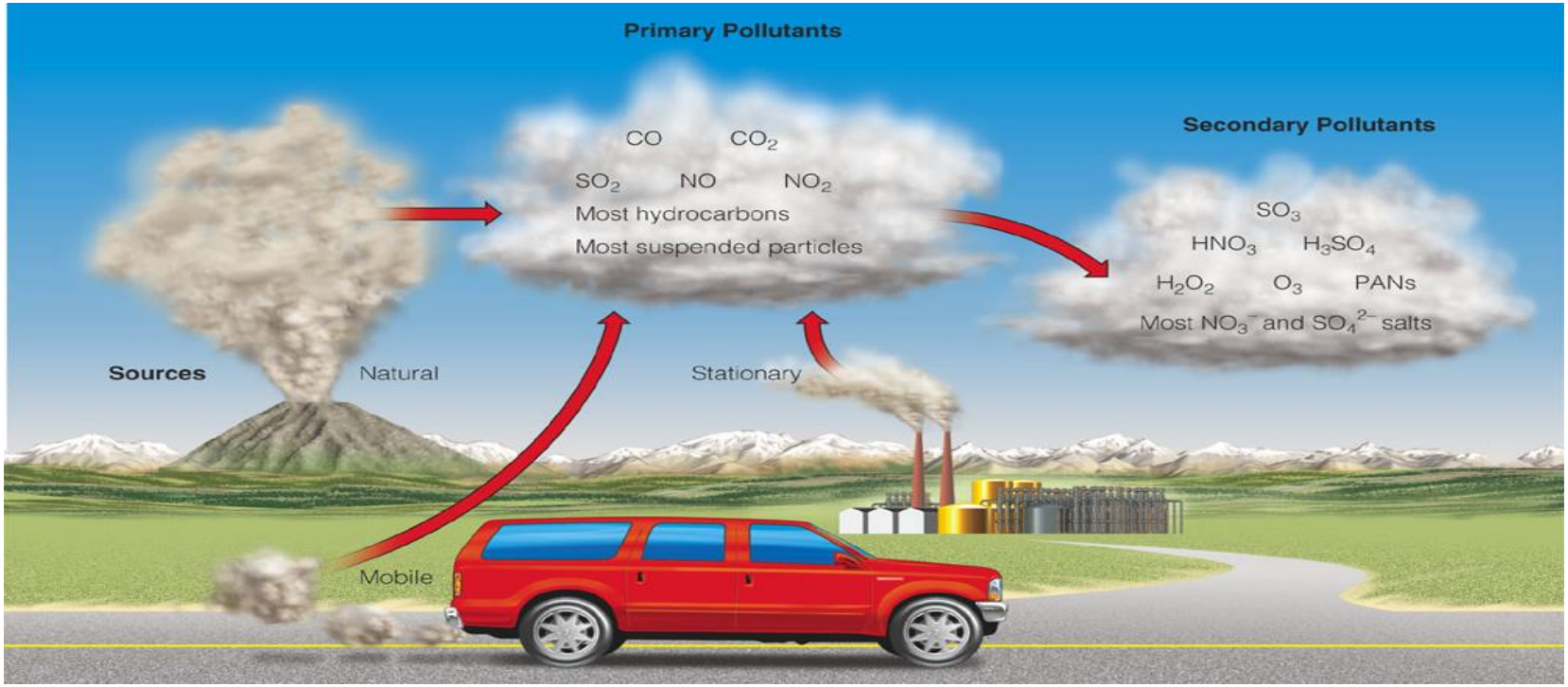


Air pollution is the introduction into the atmosphere of chemicals, particulates, or biological materials that cause discomfort, disease, or death to humans, damage other living organisms such as food crops, or damage the natural environment or built environment

Pollutants

Primary pollutants are the pollutants, which are emitted directly from identifiable sources.

Secondary pollutants, are those which are produced in the atmosphere when certain chemical reactions take place among primary pollutants.

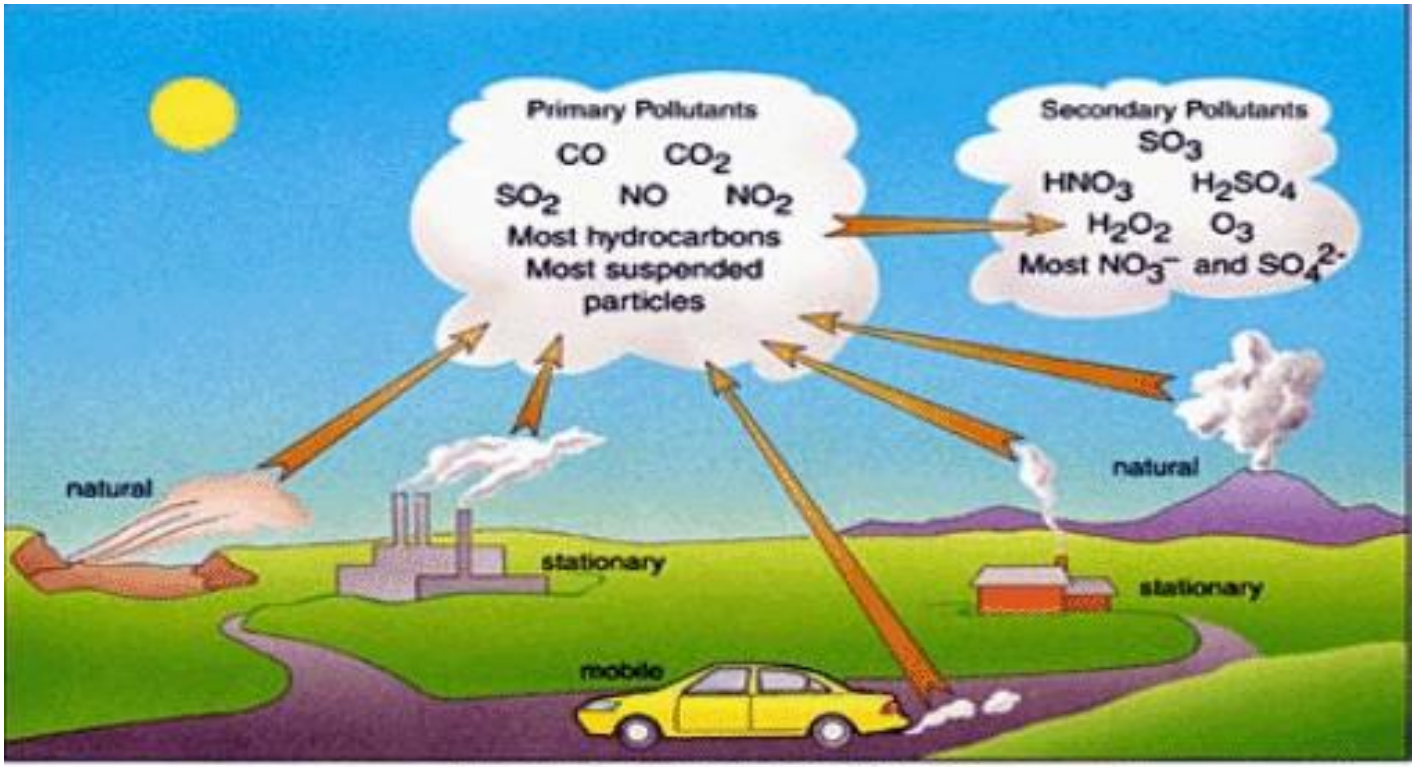


Primary Pollutants

Particulate matter (PM),
Sulfur dioxide,
Nitrogen oxides,
Volatile organic compounds (VOCs),
Carbon monoxide, Lead, Ozone

Secondary Pollutants

Atmospheric sulfuric acid
Photochemical smog
Ozone



Types and sources of air pollutants

Main Sources of Air Pollution

Major Pollutants:

1.) Carbon Monoxide and Carbon Dioxide

2.) Sulfur Dioxide

3.) Nitrogen Dioxide

4.) Particulate Matter

5.) Ground Level Ozone

6.) Hydrocarbons

7.)Chloroflourocarbons (CFC)

8.) Suspended particulate matter (SPM)

Carbon Monoxide

- *colorless, odorless*
- *produced when carbon does not burn completely in fossil fuels*
- *present in car exhaust*
- *deprives body of O_2 causing headaches, fatigue, and impaired vision*

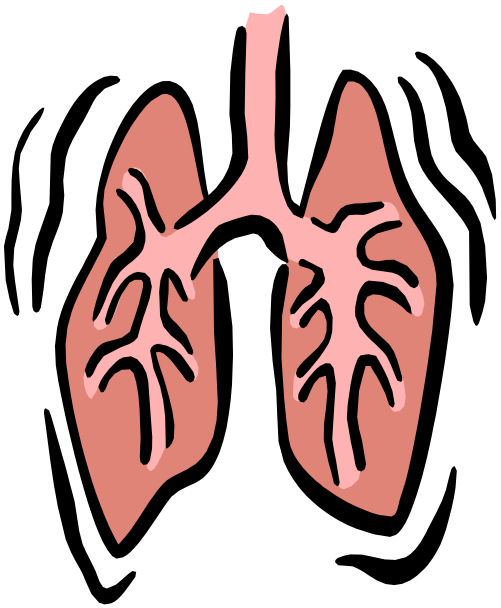
Carbon Dioxide:

It is chief green house gas released in the atmosphere as a result of human activities such as burning of coal, oil and natural gas.

Sulfur Dioxide

- produced when coal and fuel oil are burned
- present mainly in thermal power plants, production of paper, melting of metals.
- narrows the airway, causing wheezing and shortness of breath, especially in those with asthma
- Major contributor to smog and acid rain.

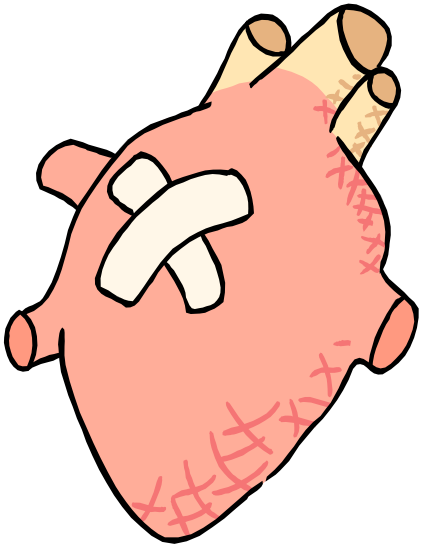
Nitrogen Dioxide

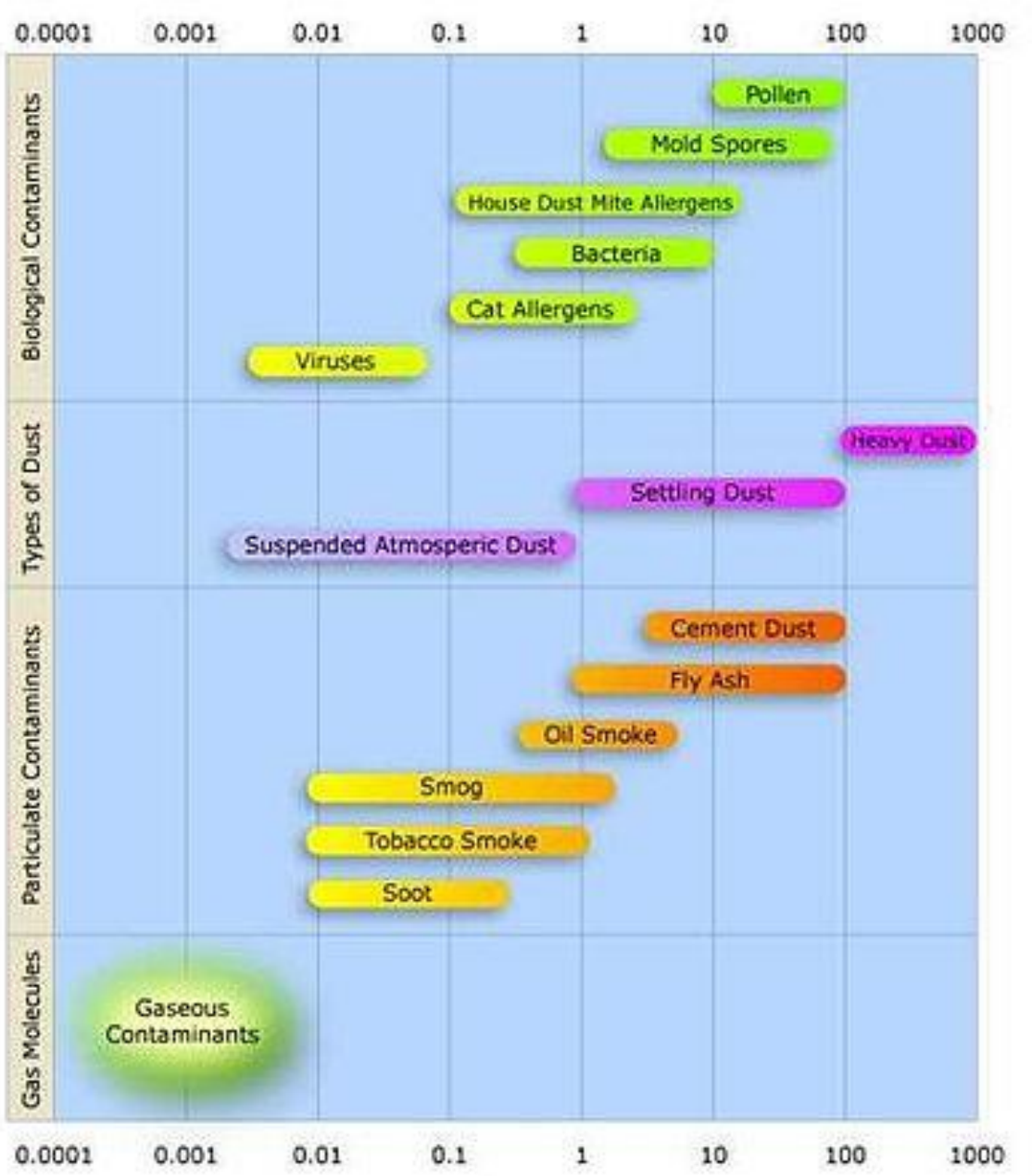


- reddish, brown gas
- produced when nitric oxide combines with oxygen in the atmosphere
- Form by burning of fuel, petrol, diesel and coal.
- present in car exhaust and power plants.
- affects lungs and causes wheezing; increases chance of respiratory infection
- contributor to smog and acid rain.

PARTICULATE MATTER/ATMOSPHERIC AEROSOL

- particles of different sizes and structures that are released into the atmosphere
- present in many sources including fossil fuels, dust, smoke, fog, etc.
- can build up in respiratory system
- aggravates heart and lung disease; increases risk of respiratory infection





This diagram shows the size distribution in micrometres of various types of atmospheric particulate matter. It also shows the different types of particulates in the atmosphere

Hydrocarbons

- Vehicles, industries and refineries are the source of these.
- Irritation in respiratory system and leads to lung cancer

Chlorofluorocarbons

- These are the gases released from AC's and other refrigeration systems. These rise to atmosphere and destroys the ozone layer

Ground Level Ozone

- at upper level, ozone shields Earth from sun's harmful UV rays
- at ground level, ozone is harmful pollutants
- formed from car, power and chemical plant exhaust
- irritate respiratory system and asthma; reduces lung function by inflaming and damaging lining of lungs

Causes of air pollution

Natural causes

Dust storms
Volcanoes
Forest fires

Man-made causes

Industrial Emissions
Automobiles
Thermal power stations
Nuclear explosions
Nuclear power plants
Agricultural activities
Disposal of garbage

Natural Causes:

- **Natural disasters such as cyclone, volcanic eruptions and earthquakes cause suspension of dust particles and ash in air and cause air pollution. Air pollution may also be caused by other natural factors such as forest fires, pollen grains, microbes etc.**
- **Methane gas is released in natural gas fields due to decay of organic matter.**
- **Randon gas is released due to radioactive decay with in the earth's crust .**
- **Smoke and carbon monoxide are emitted during forest fires.**

Man made causes:

- Industrial Wastes: The increasing number of industries contribute heavily to air pollution. Different industries produce air pollution in different manners depending on the processes involved. Petroleum refineries emit large amount of hydrocarbons and particulate matter and industries such as iron and steel mills , paper mills , chemical plants and cement plants release vast amounts of different types of particulates into the atmosphere.

AUTOMOBILES

- Due to increase in population the number of automobiles on the roads are increased. These make transportation easy and convenient, but also emit dangerous pollutants such as carbon dioxide , sulphur dioxide,nitrogen oxides, hydrocarbons, ozone, lead and chlorofluorocarbons. These lead to variety of respiratory problems and serious ailments in human beings and other living creatures.

Thermal Power Stations:

- **To meet the need of electricity a large number of thermal power stations have been set up. Most of them use coal as main fuel and coal ash is generated as product. Due to lack of disposal system of this coal ash leads to adverse environment effect. Other pollutants generated are fly ash, sulphur dioxide and other gases which are harmful to us.**

Nuclear explosions:

- Nuclear explosions release huge amounts of pollutants including many hazardous chemicals and dust particles into the atmosphere. Huge amounts of radioactive material with long life times cause huge effects on human health.

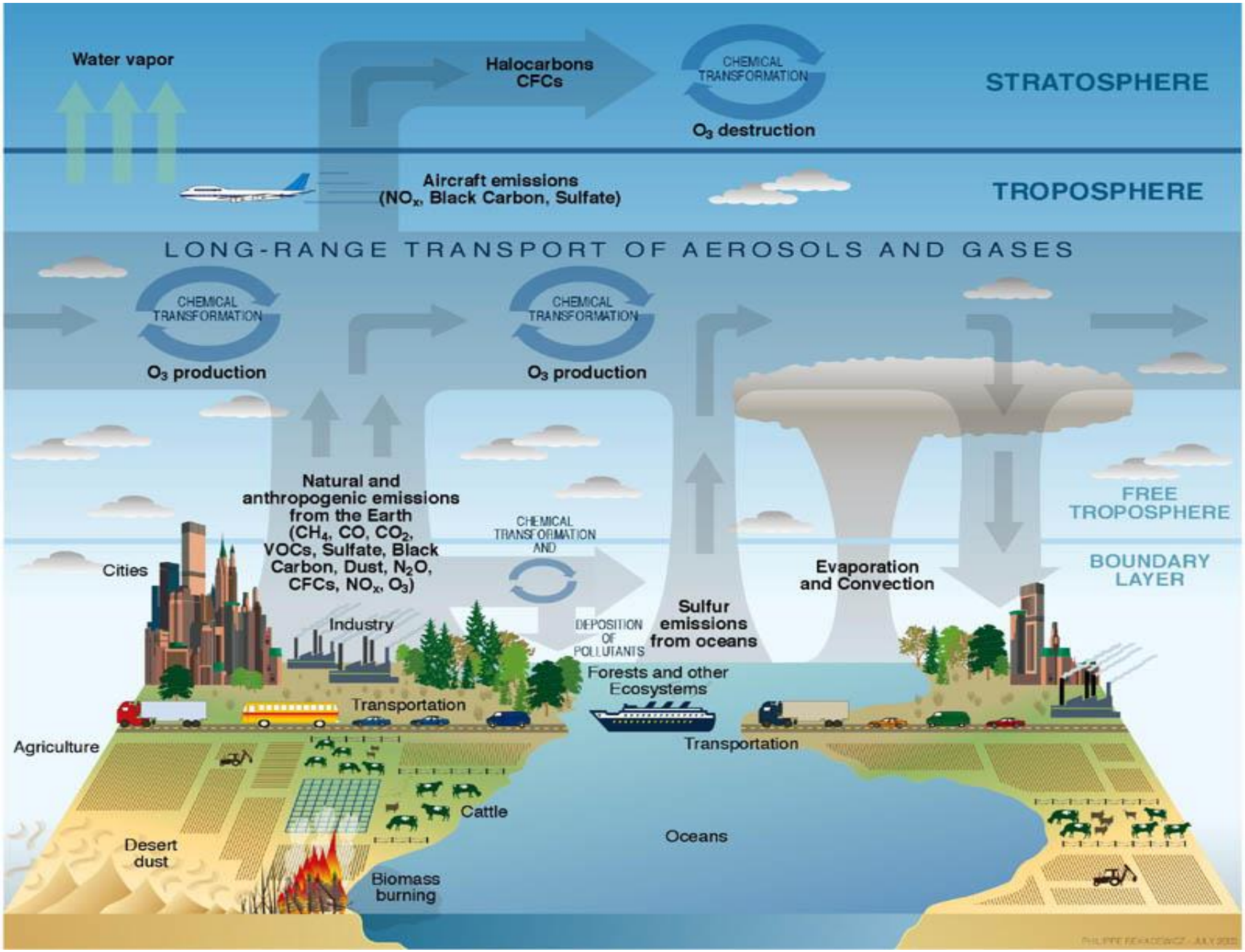
Nuclear Power Plants

- These plants damage the environment owing to uranium mining , radioactive effluent emission and generation of waste heat. However the damage caused by nuclear power plant are less than those from fossil fuel plants. An average coal plant kills 25 people per year while pollution from similar nuclear plant kills 0.018 people.

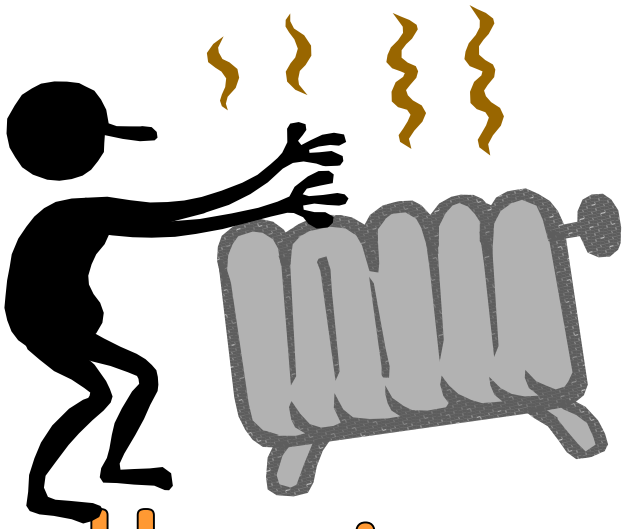
Agricultural activities:

- The excessive use of fertilizers ad pesticides for increasing productivity leads to severe environmental damage. These chemicals cause air pollution when sprayed and travel through air and hence cause air pollution. It has been found that only 10-15% of the substances reach to the source and rest of the chemical are blown to about 20 miles. Other agriculture based industries like sugar mills, oil mills and crop –residue burning, cotton mills, seed cleaning, etc.

- Disposal of garbage: All types of biodegradable and non biodegradable waste materials produce smoke and soot when burnt hence cause air pollution. Burning of waste material is an unhealthy mode of garbage disposal since it releases toxic fumes into the atmosphere which may adversely effect health of living being.



Many processes contribute to atmospheric pollution and trace gases.



Indoor Air Pollution

What Causes Indoor Air Pollution??

- **Air tightness of buildings**
- **Poorly designed air conditioning and ventilation systems**
- **Indoor sources of pollution**
- **Outdoor sources of pollution**

What Causes Indoor Air Pollution??

Poorly Designed Air Conditioning Systems Results into the production of fungi, molds and other sickness causing microbes.

Problems of IAQ Enclosed spaces inhabited by humans produce following effects-

- **Reduction in oxygen level of spaces.**
- **Increase in CO2 level.**
- **Increase in temperature.**
- **Increase in humidity**
- **Increase in Bioaerosols and odor**

Main indoor pollutants and their sources

Pollutant	Sources
Environmental tobacco smoke	**Cigarette and water pipe smoking**
Carbon monoxide	**Unburned kerosene, gas water heaters, gas stoves, automobile exhaust, tobacco smoke**
Lead	**Lead based paints, contaminated soil, dust and drinking water**
Asbestos	**Deteriorating, damaged, or disturbed insulation, fireproofing, acoustical materials, and floor tiles**

Main indoor air pollutant and their sources

NO2	**Kerosene heaters, un-vented gas stoves and heaters. Environmental tobacco smoke**
Formaldehyde	**Furniture made with pressed wood products, urea-formaldehyde foam insulation, environmental tobacco smoke, glues**
Volatile organic compounds	**Paint, paint stripper, solvent aerosol sprays**
Respirable particles	**Kerosene heaters, wood stoves, fireplaces, environmental tobacco smoke**
Biological pollutants	**Dust mite, Pet dander, droppings and body parts of cockroaches rodents and other pests**
Radon	**Building materials and well water**

What Can You Do?

Indoor Air Pollution

- Test for radon and formaldehyde inside your home and take corrective measures as needed.
- Do not buy furniture and other products containing formaldehyde.
- Remove your shoes before entering your house to reduce inputs of dust, lead, and pesticides.
- Test your house or workplace for asbestos fiber levels and for any crumbling asbestos materials if it was built before 1980.
- Don't live in a pre-1980 house without having its indoor air tested for asbestos and lead.
- Do not store gasoline, solvents, or other volatile hazardous chemicals inside a home or attached garage.
- If you smoke, do it outside or in a closed room vented to the outside.
- Make sure that wood-burning stoves, fireplaces, and kerosene- and gas-burning heaters are properly installed, vented, and maintained.
- Install carbon monoxide detectors in all sleeping areas.

AQI: Air Quality Index (National Air quality standard)

- **Environmental protection agency (EPA) calculate AQI for 5 major air pollutants (ground level ozone, partiulate matter, CO, SO2, NO2).**
- Indicates whether pollutant levels in air may cause health risks.
- Ranges from 0 (least concern) to 500 ppm (greatest concern)
- AQI value above 100 indicate unhealthy air quality.

Air Quality	Air Quality Index	Protect Your Health
Good	0-50	No health impacts are expected when air quality is in this range.
Moderate	51-100	Unusually sensitive people should consider limiting prolonged outdoor exertion.
Unhealthy for Sensitive Groups	101-150	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
Unhealthy	151-200	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion, everyone else, especially children should limit prolonged outdoor excertion.
Very Unhealthy (Alert)	201-300	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion everyone else, especially children, should limit outdoor exertion.

Effects of Air Pollution

Effects on Human Health: *Long term and short term effects*

Air pollution has long term as well as short term effects on human health. **Irritation in eyes, nose and throat and upper respiratory** infections are short term effects, while **chronic respiratory diseases**, **lung cancer, heart diseases and damage to brain, nerves, liver or kidneys** are some of the long term effects of air pollution. Following are the adverse effects of air pollutants.

- **CO : CO + Hb = Carboxyhaemoglobin-** As a result of this **oxygen carrying capacity of the blood tissues declines**. Severe deficiency of oxygen leads to death.

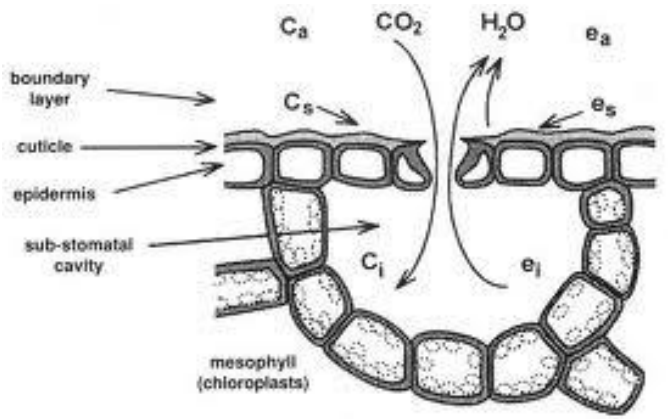
- **Sulphure Dioxide (SO_2):** It causes **burning sensation of eyes and irritation in respiratory tracts**.

- **Nitrogen Dioxide:** Inhalation of a high concentration of NO_2 for long periods of time results in inflammation of lungs .
- **Metal Particulates** cause damage to the respiratory system, blood vascular system and excretory system.
- **Effect of Smoke:** It causes lung cancer and birth weight of babies whose mother smoke cigarettes are lower than the babies of non smoking mothers.

Effects of plants

Air pollution is considered to be the **major factor in the decline of forests** in the heavily polluted areas of the world. Air pollution affects **stomata movements, photosynthesis and growth**. Some adverse effects are described as below:

- At high concentration of sulphur dioxide the amount of chlorophyll declines causing chlorosis of leaves. A very high concentration leads to the death of leaves.
- High conc. of NO_2 leads to the development of necrotic spots
- High conc. of CO leads to premature falling of **leaves , smaller leaf size and curling**.



Effects on climate

- SMOG
- GREEN HOUSE EFFECT AND GLOBAL WARMING
- ACID RAIN
- O_3 LAYER DEPLETION


SMOG

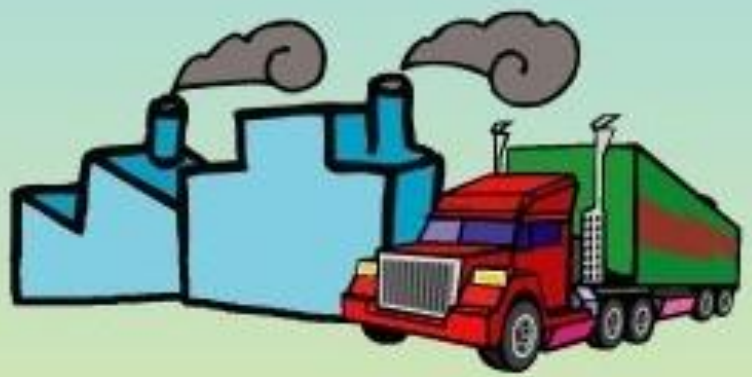
SMOG

- Smog is a combination of the words smoke and fog. It is a form of air pollution formed from the emissions from combustion reacting with sunlight to produce secondary pollutants.

- A form of air pollution produced by the photochemical reaction of **sunlight with hydrocarbons and nitrogen oxides** that have been released into the atmosphere, especially by **automotive emissions**.

Sources of SMOG

- Smog is produced by a set of complex photochemical reactions involving **volatile organic compounds (VOCs), nitrogen oxides and sunlight, which form ground-level ozone**. Smog-forming pollutants come from many sources such as **automobile exhaust, power plants, factories and many consumer products, including paint, hair spray, charcoal starter fluid, chemical solvents, and even plastic popcorn packaging.** In typical urban areas, at least half of the smog precursors come from cars, buses, trucks, and boats.



Motor Vehicles, VOC-Containing Products, etc.

Motor Vehicles, Power Plants, Industrial Activities, etc.

Volatile Organic Compounds (VOCs)

Nitrogen Oxides (NOx)

Ground-level Ozone, Fine Particulates

(Smog)

Examples of Smog

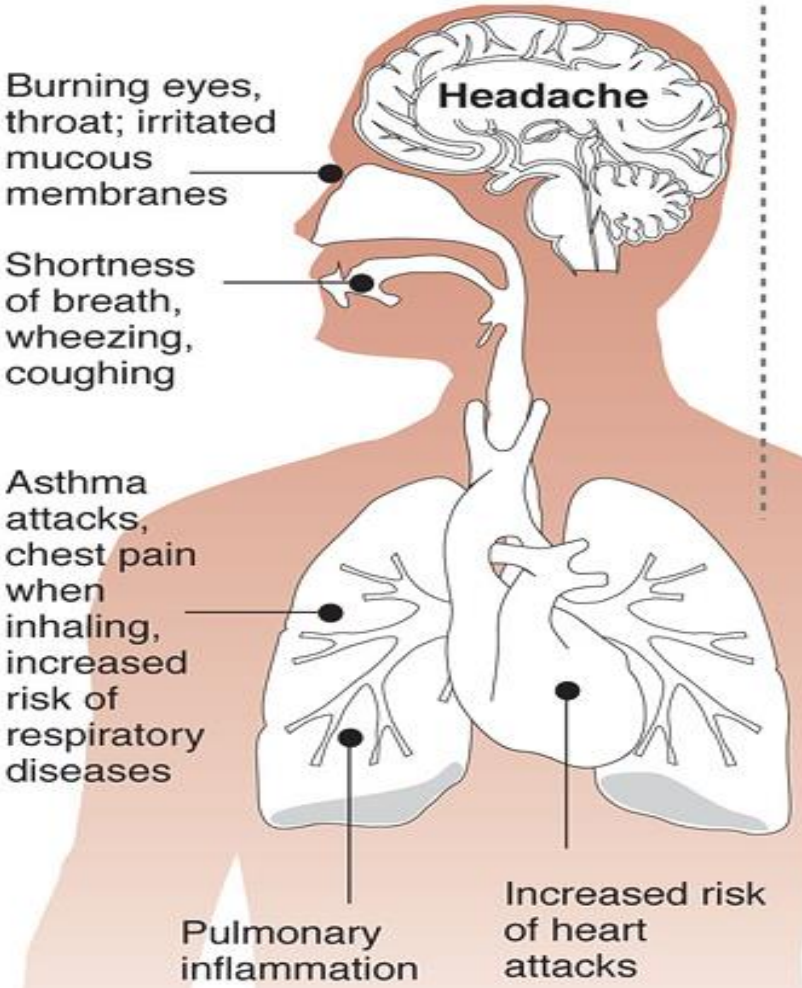
- Combination of gases with water vapor and dust
  - Combination of words smoke and fog
    - Forms when heat and sunlight react gases (photochemical smog)
      - Occurs often with heavy traffic, high temperatures, and calm winds

Its effects.....

Why smog is harmful

Ozone, the main ingredient in smog, is one of the most widespread air pollutants and among the most dangerous.

Effects on health



How ozone forms

1 **Oxygen** in the atmosphere  O_2

2 **Nitric oxide,** byproduct of combustion  NO

3 **Sunlight** breaks up nitric oxide

4 **Ozone** formed by three oxygen atoms

 O_3

U.S. ozone limits

In parts per billion

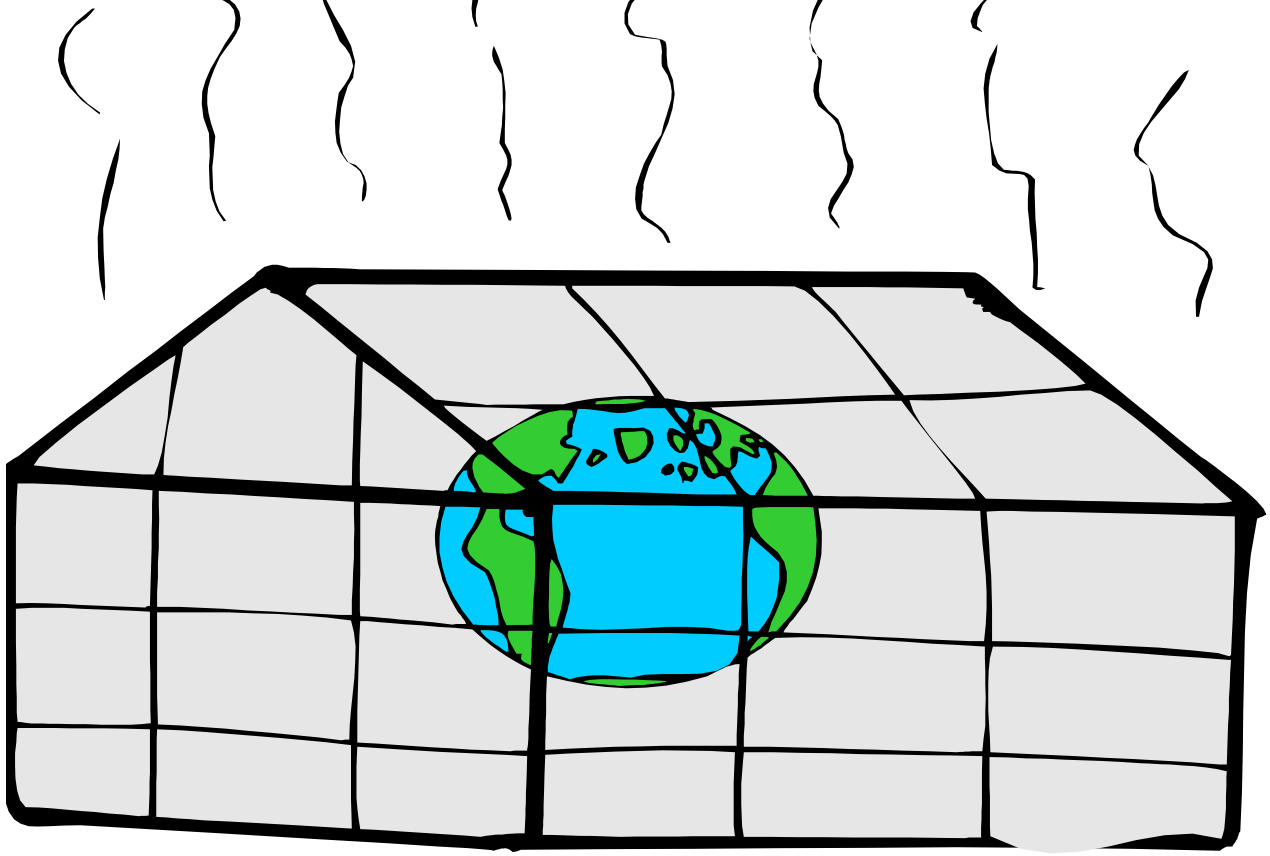
• 1997-2008	**84**
• 2008-present	**75**
• New EPA proposal	**60-70**

Source: American Lung Association, State of the Air 2008, AP Graphic: Staff

- 1st smog related deaths were in London in 1873; death toll 500 people; can you imagine how much worse the atmosphere is now?!
- Limits visibility
- Decreases UV radiation
- Yellow/black color over cities
- Causes respiratory problems and bronchial related deaths.

- Smog creates many harmful health effects. It can cause anything from minor pain to deadly diseases such as lung cancer. Smog slowly ruins people's lungs to an extent as great as that of cigarettes.
- Smog can irritate and inflame pulmonary membranes, causing chest pains, coughing, and throat irritation. Other illnesses such as colds and pneumonia can also be brought on by exposure to smog.
- People with asthma problems are under an even greater threat. Even minor exposure to smog may cause these people to get asthma attacks.
- Mexico City has the world's worst levels of smog. As a result, children and the elderly are advised not to live in the city. The heavy smog levels have had serious health effects in the city, though many poorer people who need city jobs have to live there and suffer from the smog.

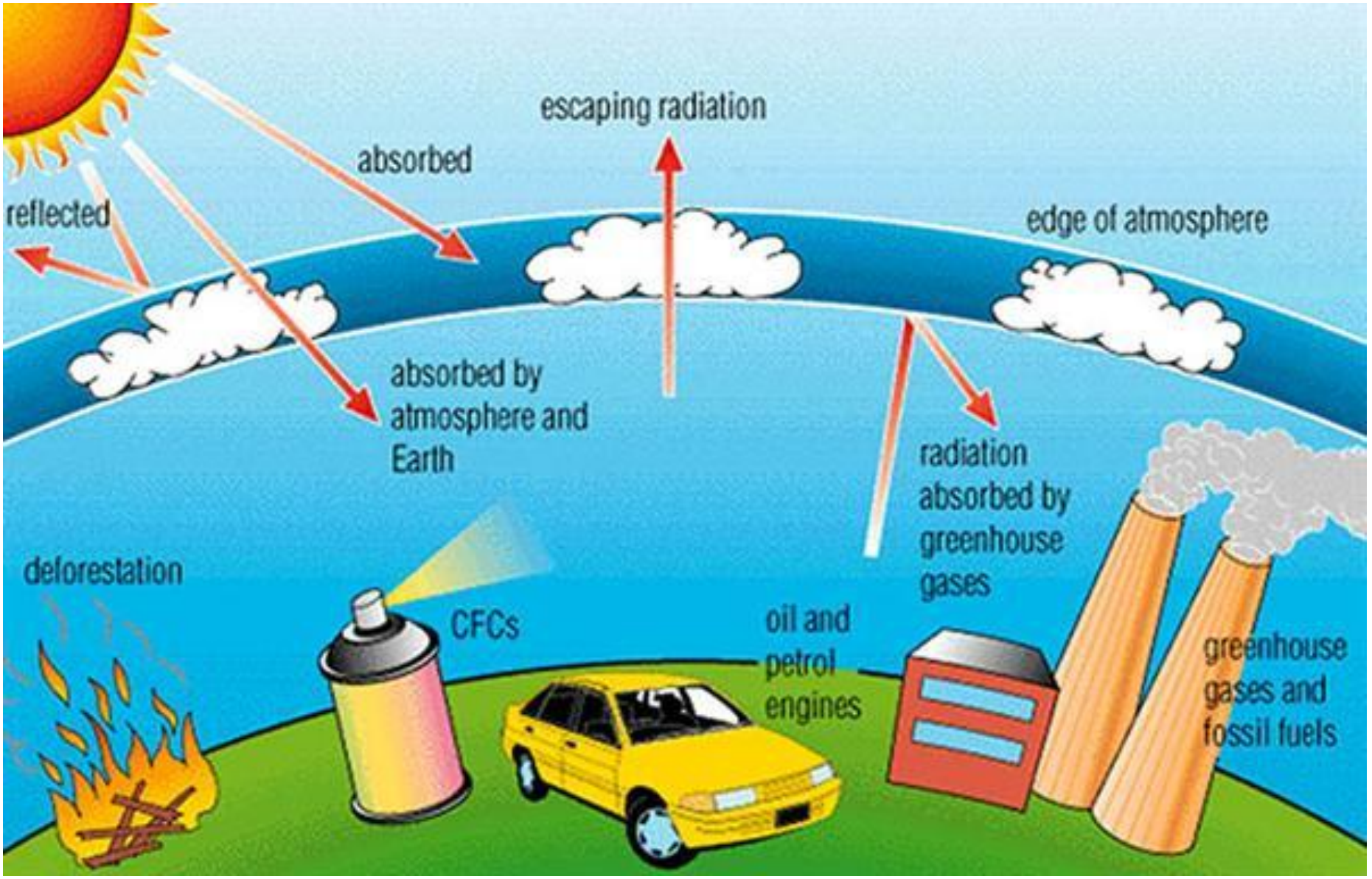
The Greenhouse Effect



Definition

- The phenomenon whereby the earth's atmosphere traps solar radiation, caused by the presence in the atmosphere of gases such as carbon dioxide, water vapour, and methane that allow incoming sunlight to pass through but absorb heat radiated back from the earth's surface.
- The heated surface then radiates some of that energy into the atmosphere in the form of longer-wavelength infrared radiation. Although some of this radiation escapes into space, much of it is absorbed by greenhouse gases in the lower atmosphere, which in turn re-radiate a portion back to the Earth's surface.

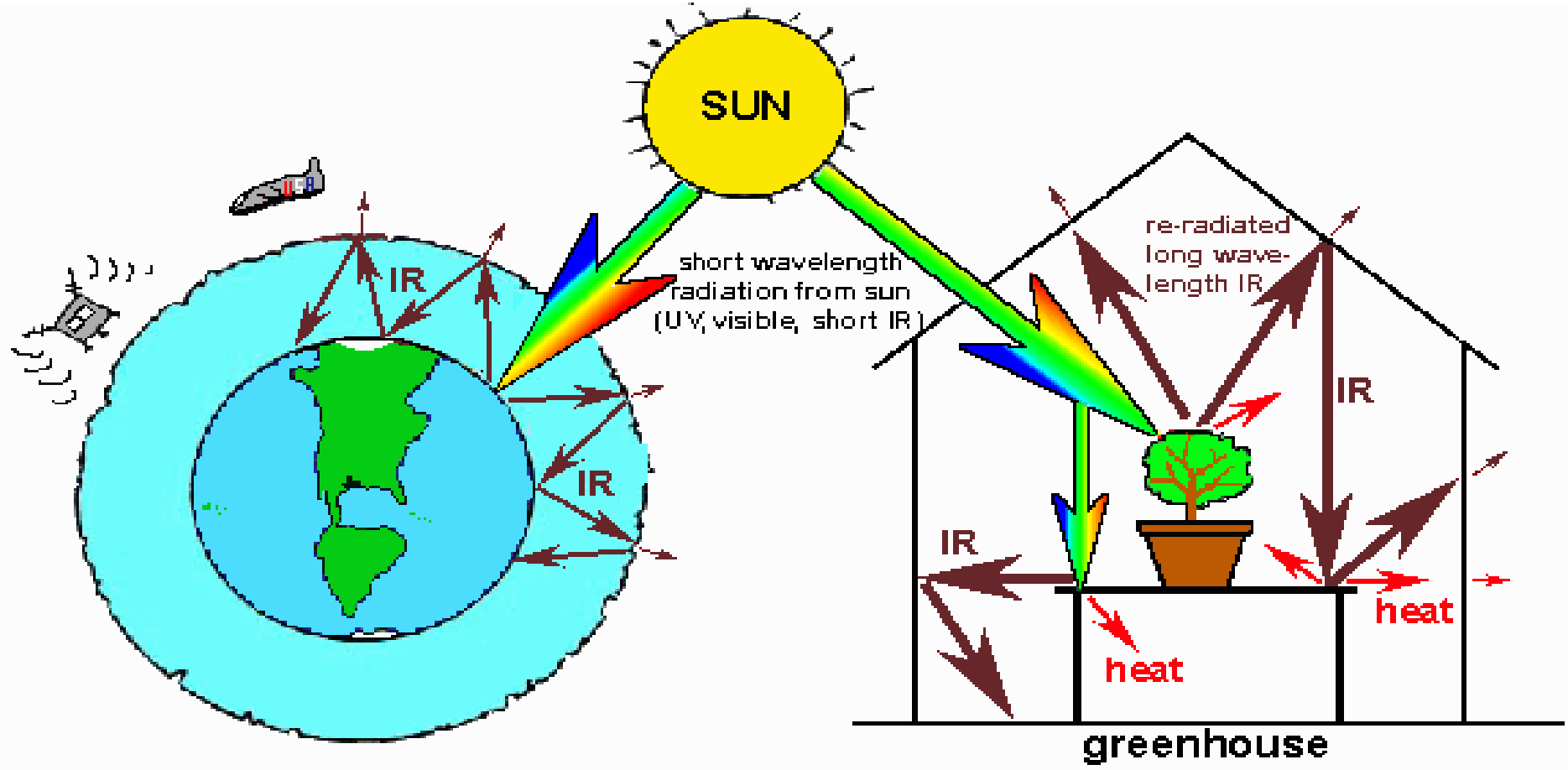
- The atmosphere thus acts in a manner roughly analogous to the glass in a greenhouse, which allows sunlight to penetrate and warm the plants and soil but which traps most of the resulting heat energy inside. The greenhouse effect is essential to life on Earth; however, the intensification of its effect due to increased levels of greenhouse gases in the atmosphere is considered to be the main contributing factor to **global warming** .


escaping radiation
absorbed
reflected
edge of atmosphere
absorbed by atmosphere and Earth
radiation absorbed by greenhouse gases
deforestation
CFCs
oil and petrol engines
greenhouse gases and fossil fuels

The “Greenhouse Effect”

- The Earth’s surface thus receives energy from two sources: the sun & the atmosphere, As a result the Earth’s surface is ~33°C warmer than it would be without an atmosphere

Greenhouse gases are transparent to shortwave but absorb longwave radiation, Thus the atmosphere stores energy



Selected Greenhouse Gases

- **Carbon Dioxide (CO_2)**
  - Source: Fossil fuel burning, deforestation
  - Anthropogenic increase: **30%**
  - Average atmospheric residence time: **500 years**
- **Methane (CH_4)**
  - Source: Rice cultivation, cattle & sheep ranching, decay from landfills, mining
  - Anthropogenic increase: **145%**
  - Average atmospheric residence time: **7-10 years**
- **Nitrous oxide (N_2O)**
  - Source: Industry and agriculture (fertilizers)
  - Anthropogenic increase: **15%**
  - Average atmospheric residence time: **140-190 years**

Effects:

Greenhouse gases absorb infrared radiation and prevent it from escaping to space.

Carbon dioxide, methane, and nitrous oxide are very good at capturing energy at wavelengths.

Effects-----

- The greenhouse effect‘s impact is to make life as we know it possible on planet Earth, but the greenhouse effect may also bring an end to life as we know it.
- **The greenhouse effect refers to** the trapping of heat by certain gases in the atmosphere, including carbon dioxide and methane. Although these gases occur in only trace amounts, they block significant amounts of heat from escaping out into space, thus keeping the Earth warm enough for us to survive.

Effects-----

- **Humans have been adding** greenhouse gases in excessive amounts to the atmosphere ever since the Industrial Revolution, which is enhancing the greenhouse effect and resulting in what is now known as "global warming." This increase in greenhouse gases has the potential to cause catastrophic problems for Earth and its inhabitants.


Global Warming

Are you actually feels this

- Is the world getting warmer?
- If so, are the actions of mankind to blame for earth's temperature increases?
- What can/should be done about these issues?

Definition

- "Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities."

Causes of Global Warming

- Global Warming is caused by many things. The causes are split up into two groups, man-made or anthropogenic causes, and natural causes.

Natural Causes

- Natural causes are causes created by nature. One natural cause is a release of methane gas from arctic tundra and wetlands. Methane is a greenhouse gas. A greenhouse gas is a gas that traps heat in the earth's atmosphere.

- **Man-made Causes**
- Man-made causes probably do the most damage. There are many man-made causes.
- Pollution is one of the biggest man-made problems. Pollution comes in many shapes and sizes.
- Burning fossil fuels is one thing that causes pollution. Fossil fuels are fuels made of organic matter such as coal, or oil. When fossil fuels are burned they give off a green house gas called CO2.
- Also mining coal and oil allows methane to escape. How does it escape? Methane is naturally in the ground. When coal or oil is mined you have to dig up the earth a little. When you dig up the fossil fuels you dig up the methane as well.

Causes of Global Warming

- Another major man-made cause of Global Warming is population. More people means more food, and more methods of transportation, right? That means more methane because there will be more burning of fossil fuels, and more agriculture.
- Another source of methane is manure. Because more food is needed we have to raise food. Animals like cows are a source of food which means more manure and methane.
- Another problem with the increasing population is transportation. More people means more cars, and more cars means more pollution. Also, many people have more than one car.

Causes-----

- Since CO_2 contributes to global warming, the increase in population makes the problem worse because we breathe out CO2. Also, the trees that convert our CO2 to oxygen are being demolished because we're using the land that we cut the trees down from as property for our homes and buildings. We are not replacing the trees (an important part of our eco system), so we are constantly taking advantage of our natural resources and giving nothing back in return.
-

How to reduce Global Warming------

- Global warming is the increase in the average temperature of the Earth's near-surface air and oceans in recent decades and its projected continuation. Global warming is a very serious issue. The future would be very terrible if we don't take any action to reduce it right away.

- Use Public Transport:
- Use Renewable Energy Like Wind Power:
- Use Smart Cooler, Heater & Air Conditioner
- Tune up and maintain vehicles properly
- Clean the air in your house.
- Reduce electricity usage to the maximum
- Prefer recycling

Small changes really add up

Replace your old refrigerator with a new Energy Star:
Annual savings:
$90; 700 pounds CO_2

Set your thermostat down a few degrees in the winter
Annual savings:
$135; 1400 pounds CO_2

Drive JUST 10 fewer miles per week
Annual savings:
$80; 520 pounds CO_2

Wash clothes in cold water only
Annual savings:
$70; 500 pounds CO_2

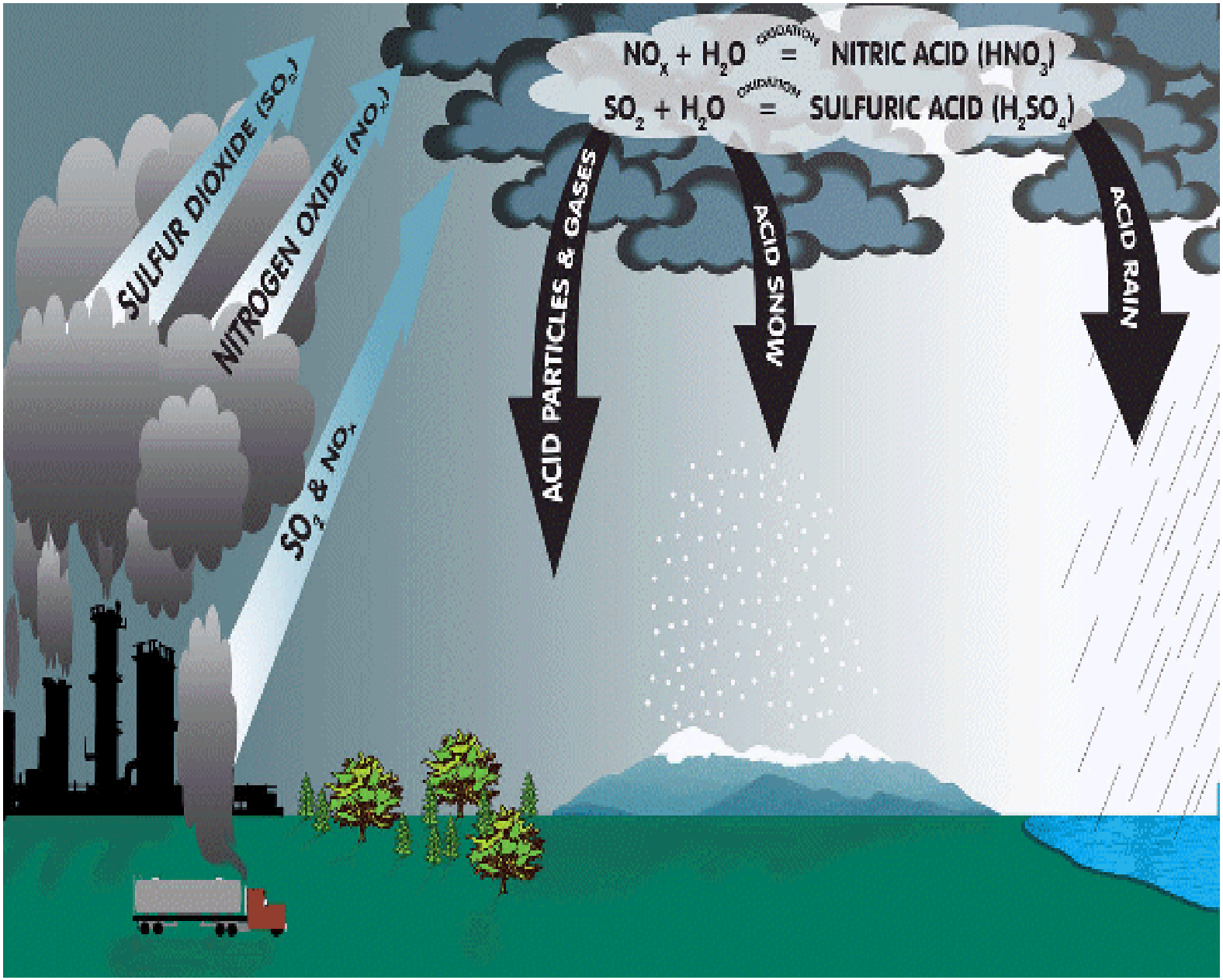
Reduce your garbage by 10% through greater recycling or reduced packaging
Annual savings:
1200 pounds CO_2

Caulk and weather-strip around doors and windows
Annual savings:
$80; 650 pounds CO_2

* These are mid-range estimates from published sources; your savings may vary.

Acid Rain

Acid Rain


$NO_x + H_2O$ OXIDATION = NITRIC ACID (HNO_3)
$SO_2 + H_2O$ OXIDATION = SULFURIC ACID (H_2SO_4)
SULFUR DIOXIDE (SO_2)
NITROGEN OXIDE (NO_x)
SO_2 & NO_x
ACID PARTICLES & GASES
ACID SNOW
ACID RAIN

pH of Rain

- Natural Rain: Water in rain combines with carbon dioxide to form carbonic acid (a weak acid that causes normal rain to be slightly acidic or below a pH of 7)

- Acid Rain: Sulfur and nitrogen oxides from the burning of fossil fuels combine with water in rain to form sulfuric and nitric acids (strong acids that cause rain to have pH below 5.6 or be acid rain)

Preventing acid rain

- International agreements to reduce sulfur dioxide pollution.
- Energy efficiency means less coal burned to make electricity.
- Ultra low sulfur petrol.
- Alternative energy sources like

natural gas, solar, wind farms and

nuclear.

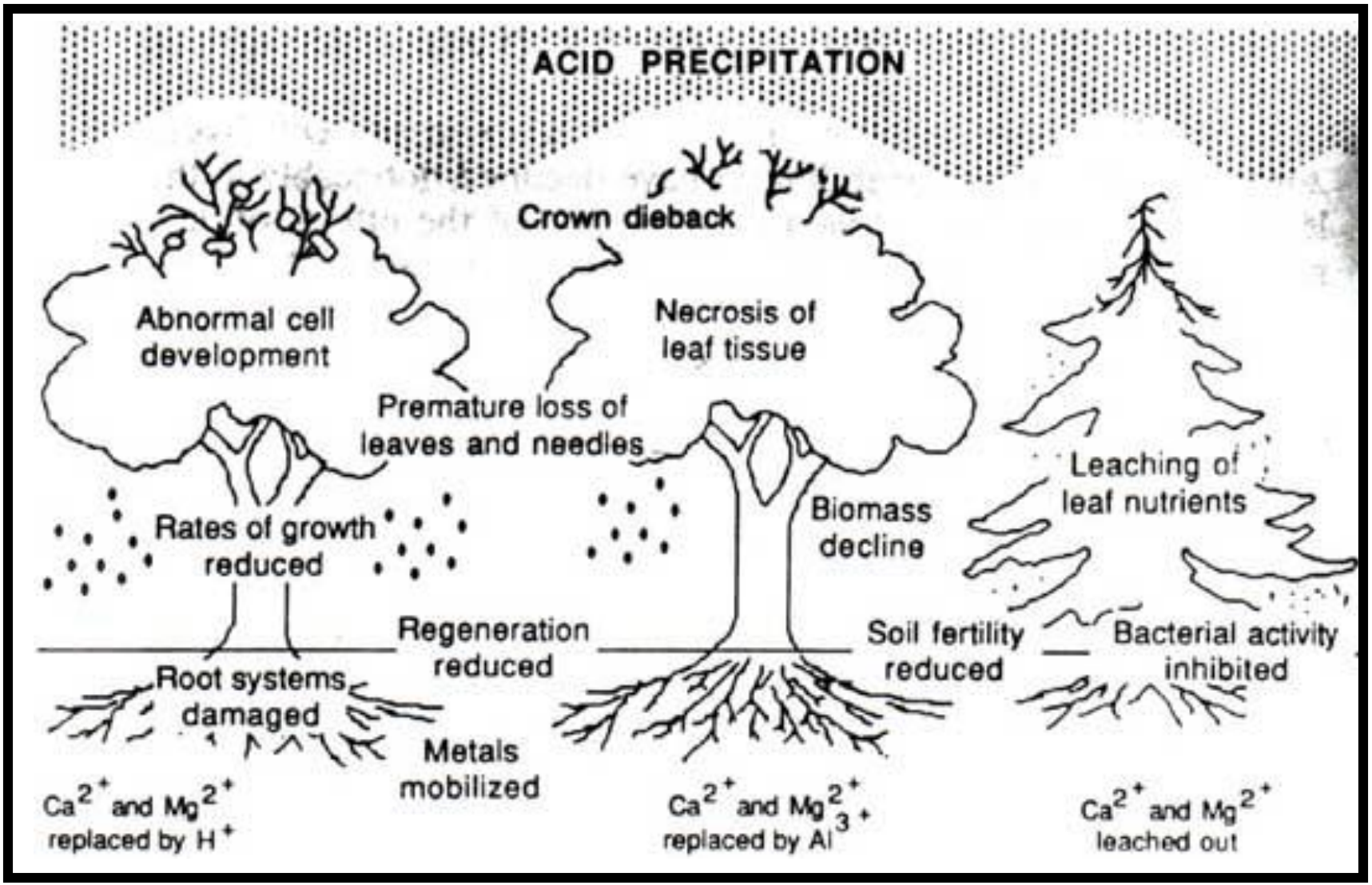
Key Points to understand

- When we burn fossil fuels, carbon dioxide is released into the atmosphere.
- Sulfur dioxide & nitrogen oxide can be released when fossil fuels are burnt. These gases dissolve into rain (water) making it acidic. This solution then falls as acid rain.
- Acid rain may damage trees directly and make rivers too acidic so plants & animals cannot live in them.
- Acid rain kills organisms by stopping some enzymes from working. These enzymes control reactions & are very sensitive to pH (acid/alkaline scale).
- Acid rain often falls a long way from where it was produced

How does Acid Rain effect us

- It kills micro-organisms
- It poisons plants
- It damages metals and limestone
- It kills fish, and other aquatic animals.
- Damage buildings.
- Damage plants.

Acid Rain and Trees



Control of Air Pollution

- The industrial gaseous wastes should be treated from discharging them into the atmosphere.
- The air quality can be improved and maintained by growing and developing green belts and forests.
- Instead of using low grade and conventional fuels, non-conventional fuels like goober gas, LPG, natural gas, must be prepared and used.
- The vehicular pollution can be controlled by using good quality fuel by keeping the engine fully effective and by minimizing the use of motored vehicles.

Water Pollution

The addition of various organic and inorganic substances changes the physical and chemical properties of water and thereby causes adverse effects on life and water usability.

In a simple sense, water pollution is the adding to water of any substance, or the changing of water's physical and chemical characteristics in any way which interferes with its use for legitimate purposes.

Causes of Water Pollution

Natural causes

Soil eroded by rains
Dead and decay of vegetation and dead organisms
High speed winds
Floods

Man made causes

Sewage and other wastes
Industrial waste
Agricultural waste
Human activities
Customs and traditions

Effects of water pollution

Adverse effects on human health

Loss of aquatic biodiversity

Disruption of aquatic ecosystem

Loss of scenic beauty

Control of Water Pollution

Industrial waste should be treated before it is discharged into the pond or lake.

Paper, plastic, food material etc. should not be thrown in rivers.

Human activities like bathing and washing must be stopped.

The laws of pollution should be implemented strictly.

Washing of trucks, tractors and other heavy vehicles in the water bodies should not be allowed.

Use of harmful chemicals such as pesticides and fertilizers must be controlled in agriculture

Noise pollution

The unwanted noise dumped into the atmosphere that leads to discomfort and health hazards is known as noise pollution.

Causes of Noise Pollution

Natural causes

Chirping of birds
Thunder and lightening
Storms
Rainfall
Exchanging voices of living organs including man and animals

Man made causes

Domestic appliances
Industries
Transportation
Entertainment
Community functions
Agricultural operations
Crowded markets

Effects of Noise Pollution

Auditory Effects

Non Auditory Effects

Control of Noise Pollution

The workers should be provided with ear plugs and ear muffs to minimize their health related problems.

The vehicular noise can be reduced by keeping the engine clean.

Industrial noise can be reduced by keeping the machines well serviced and making special glass or wooden cabins for such machines.

Designing silencing devices in aircraft engines.

By planting trees which are effective sound absorbers.

Creating public awareness

Soil pollution

Any change in the physical chemical and biological properties of soil due to natural or man-made activities is known as soil pollution.

Causes of Soil Pollution

Industrial waste

Urban waste

Mining

Agricultural waste

Domestic waste and garbage

Radioactive wastes

Effects of Soil Pollution

Reducing the fertility of the soil and degrading the quality of land.

Increase in the the growth of a number of mosquitoes, flies which cause diseases in human beings .

Loss of soil microorganisms

Water Pollution

Causing diverse health effects such as cancer, deformities in bones, etc in human beings .

Loss of aesthetic value of land.

Control of Soil Pollution

The industrial waste must be treated in the proper treatment plants and then allowed to be discharged through the proper drains.

The city garbage must be properly separated so that the bio-degradable waste may be used to make fertilizers.

Soil can be conserved by planting trees like mango, neem, etc. around the fields so that their leaves continuously supply the nutrients to the soil.

The release of radioactive materials in the soil should be minimized. Activities such as nuclear testing should be prohibited.

Paper, glass, tin, iron, etc. present in solid waste should be reused after recycling.

Solid waste can also be used for electricity generation.

Use of chemical fertilizers and toxic chemicals should be minimized as far as possible.

Marine pollution

Marine pollution occurs when harmful, or potentially harmful effects, can result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms.

What causes Marine Pollution ?

Oil and Petroleum

Toxic chemicals

Hazardous wastes

Raw sewage

Thermal pollution.

Effects of Marine Pollution

Reduction in photosynthetic rate

Decline in dissolved oxygen

Toxicity

Eutrophication

Diseases

Effect on marine animals

Control of marine pollution

Control of oil pollution by the use of certain chemicals, microbes and antifouling paints.

Hot water discharged from thermal power plants should be mixed with ordinary water (nutrient rich) and be used for aqua-culture.

Recycling of solid waste such as plastic, glass, metal, papers, etc.

Sewage and factory wastes should be treated before releasing into seawater.

Establishment of marine protected areas, bioregional management approach and negotiation of international agreements.

Maintenance and proper security of ships

Thermal pollution

Chemical industries, fossil fuel and nuclear power plants use water for cooling purpose and return this water to stream at higher temperature. The rise in water temperature due to warm water discharged after cooling the machines in factories and in nuclear and thermal power plants is called thermal pollution.

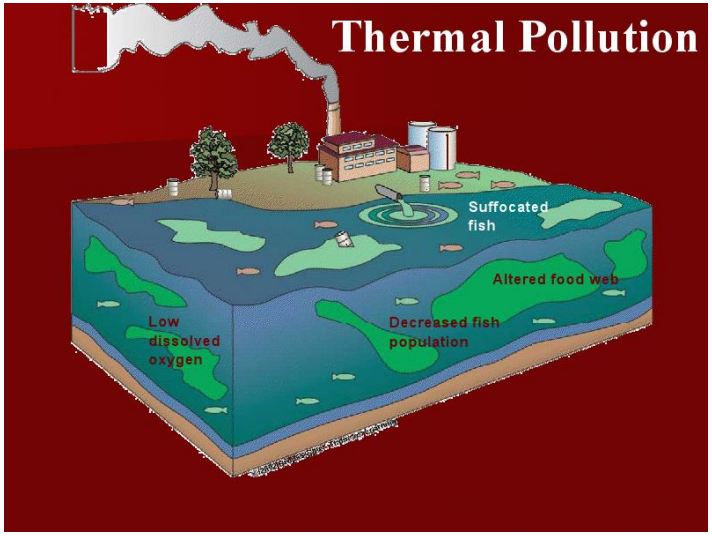
Effects of Thermal Pollution

Change in the physical and chemical properties of water.

Decreases in the concentration of dissolved oxygen in water making it unsuitable for the survival of aquatic life.

Decline in microbial population

Reduction in the productivity of aquatic ecosystems.



Control of Thermal Pollution

Establishment of cooling towers.

Constructing ponds for collecting hot water.

Artificial lakes can be made for the hot effluents from where the cool water can be recycled.

The cold water or air showers may be used in the industries to check hot gases, at the source.

Radiation pollution-nuclear hazards

Among the hazardous substances radioactive materials are most damaging. In nuclear reactors uranium, plutonium, etc. are used as fuel. The remains of such reactions are called nuclear waste and this type of pollution is called radioactive pollution.

Causes of Radioactive or Radiation Pollution

Natural causes

Cosmic rays are high-energy protons and electrons that are released from sun.

Environmental sources – Soil, rock, air ,etc.

Man made causes

Radioactive waste from nuclear power plants

Nuclear explosions

Medical use

Radiations from luminous watches, clock dials, X-rays from microwave, etc. constitute th
miscellaneous sources of exposure.

Effects of Radiation Pollution

Somatic Effects

Genetic Effects

Control Measures of Radioactive Pollution

Plantation of dense trees around the atomic power plants.

Proper management of radioactive waste.

Unnecessary X-ray examination should be avoided.

Suitable waste disposal methods and better technology for nuclear power plants should be developed to protect against radiation health hazards.

During nuclear installations, various efforts including the process of site selection, its design, construction, operation, and its short and long term effects should be seriously considered to control radiation.

Solid Waste Management (SWM)

What is solid waste ?

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area.

Why Management ??

Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life.

From where does waste come from ?

Domestic garbage

Industrial waste

Commercial waste

Mining waste.

Radioactive waste

Agricultural waste

Hospital waste

Effect of Urban and Industrial Solid Waste

Increase in the population of disease causing organisms such as mosquitoes, flies, etc.

Water pollution

Air pollution

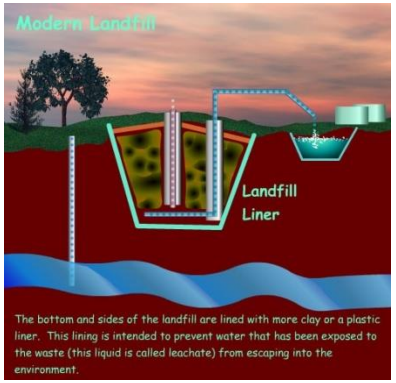
Diseases in human beings

Reducing the aesthetic value of land

Waste Disposal Methods

Open Dumping

Land Fill



Incineration

Ocean Dumping

Composting

Role of an individual in prevention of environmental pollution

Less use of non renewable energy sources.

Plantation of more and more trees.

Minimizing the use of insecticides, pesticides and chemical fertilizers in agriculture.

Conservation of natural resources

Promote environmental awareness and actively participating in public hearing on environmental issues.

By keeping the city and surroundings clean.

By using paper and cloth bags instead of using polythene bags

Adopt and popularize renewable energy resources