

3. Environmental Pollution



THINGS TO BE LEARNED...

- Definition
- Air pollution
 - Causes, effects and control measures
 - Global Warming
 - Ozone layer depletion
 - Acid rain
 - Photochemical smog
 - Control measures
 1. Bag House filter
 2. Venturi scrubber
 - Case Study-Bhopal gas tragedy

Continued...

- Water pollution
 - Sources, Treatment
 - Concept of waste water
 - Domestic and Industrial, Treatment
 - Case study- Minamata Disease
- Soil / Land pollution
 - Solid waste
 - Solid waste management
 1. Land filling
 2. Composting
- Noise pollution - Sources and effects
- E pollution - Sources and effects

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- ..\..\Videos\5 Pollution is a Global Killer.mp4

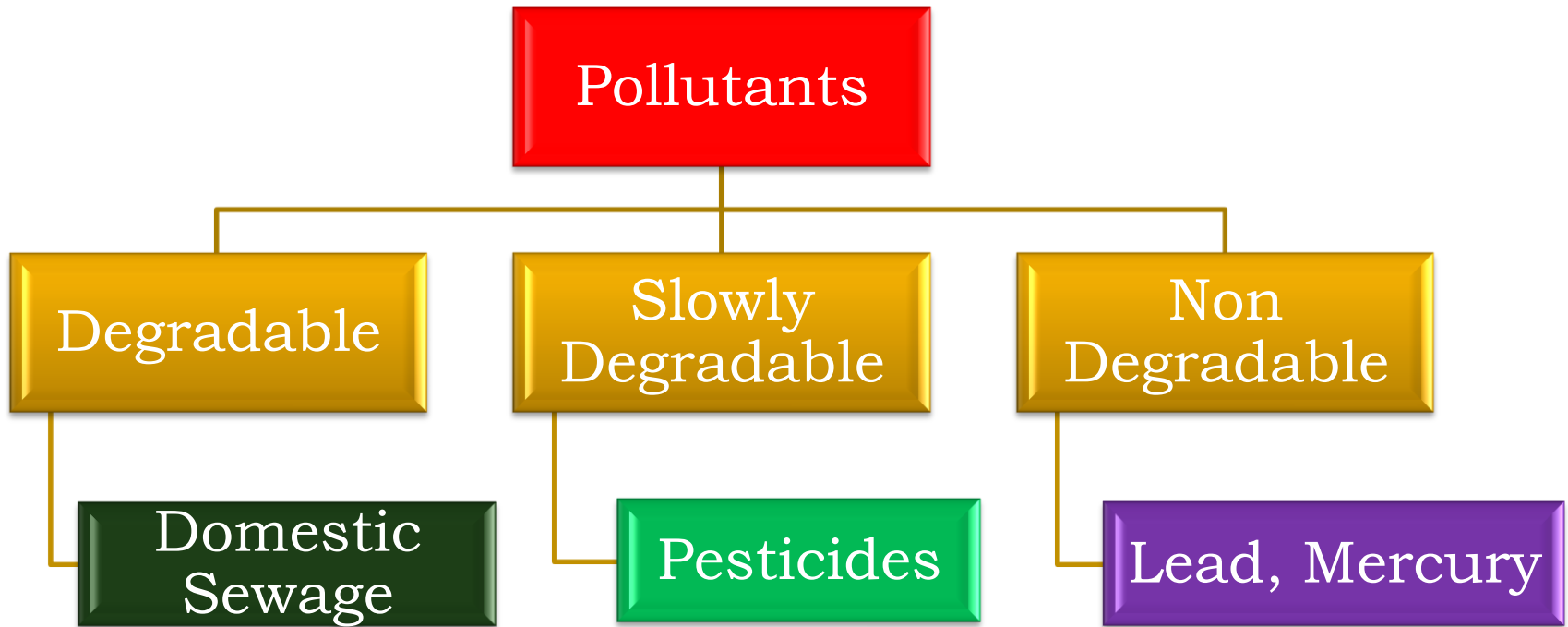
Definition

Pollution :-

- Pollution is the harmful alteration of our environment by our own actions.
- *“Undesirable changes in our surroundings that have harmful effects on plants, animals and human beings.”*

Pollutants :-

- Unwanted by-products
- Our activities responsible
- The residues of things used and which is thrown away



Types Of Pollutions

Air pollution

- Definition:-

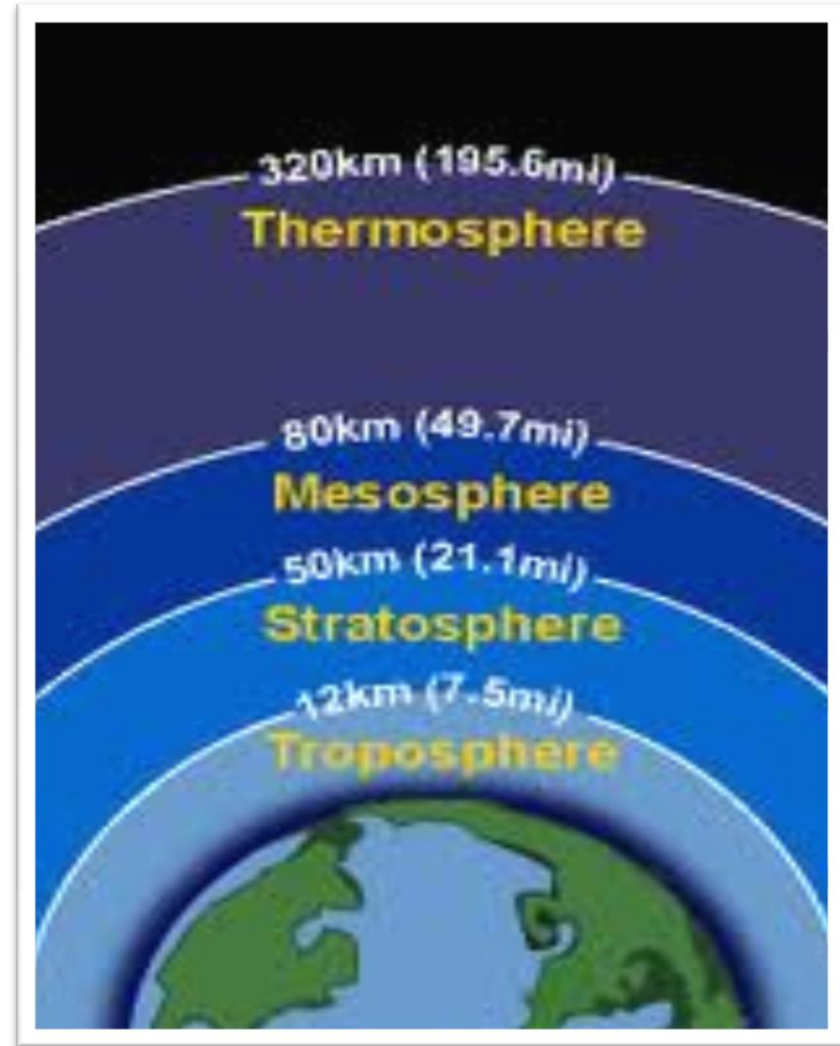
“Presence of undesirable solid or gaseous particles in the air.”

- History of air pollution:-

In beginning of 20th century with development in transportation systems and use of petrol and diesel.

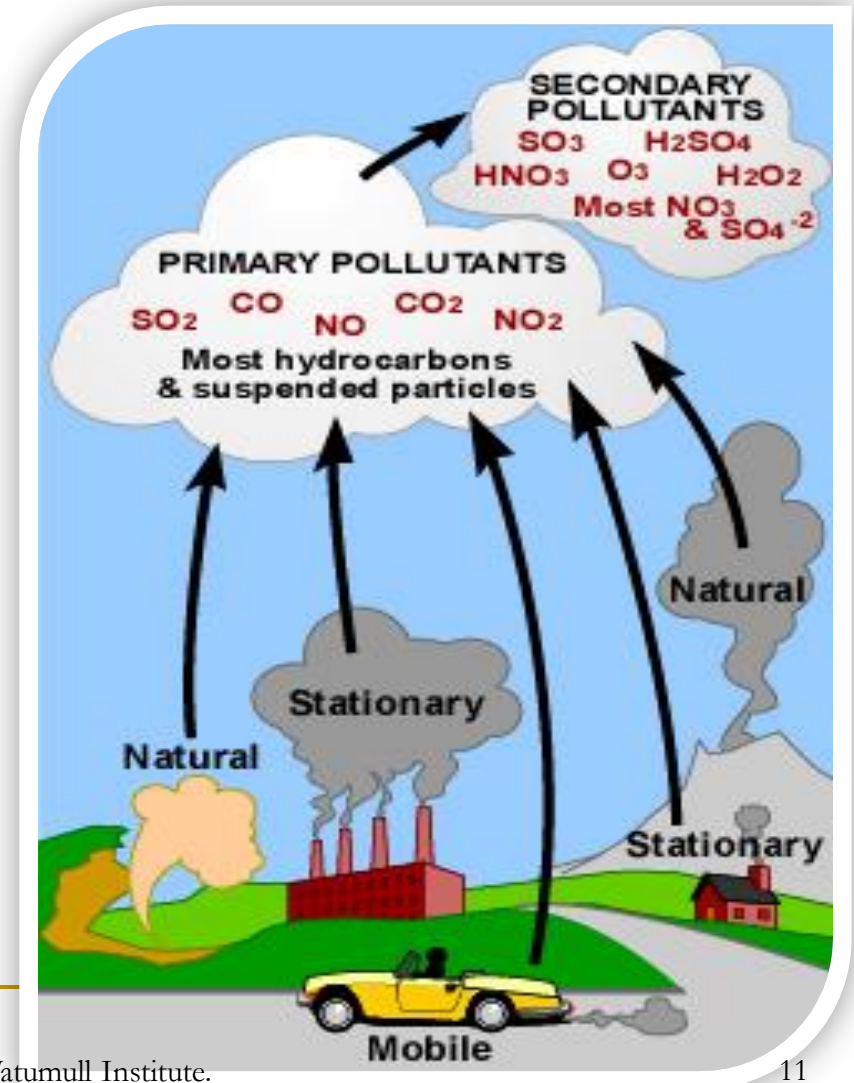
Structure of atmosphere

1. Troposphere (0-12 km)
2. Stratosphere (12-50 km)
3. Mesosphere (50-80 km)
4. Thermosphere (80-320 km)



Types and sources of Air Pollutants

- Primary pollutants
- Secondary pollutants



- Primary pollutants like natural events (Dust storms, volcano's), human activities (Vehicles, industries)
- Secondary pollutants includes sulphuric acids, nitric acids which are produced because of chemical reactions.



Causes

Automobile emissions

Combustion of coal



- Power plants



- Paint fumes and Aerosol sprays



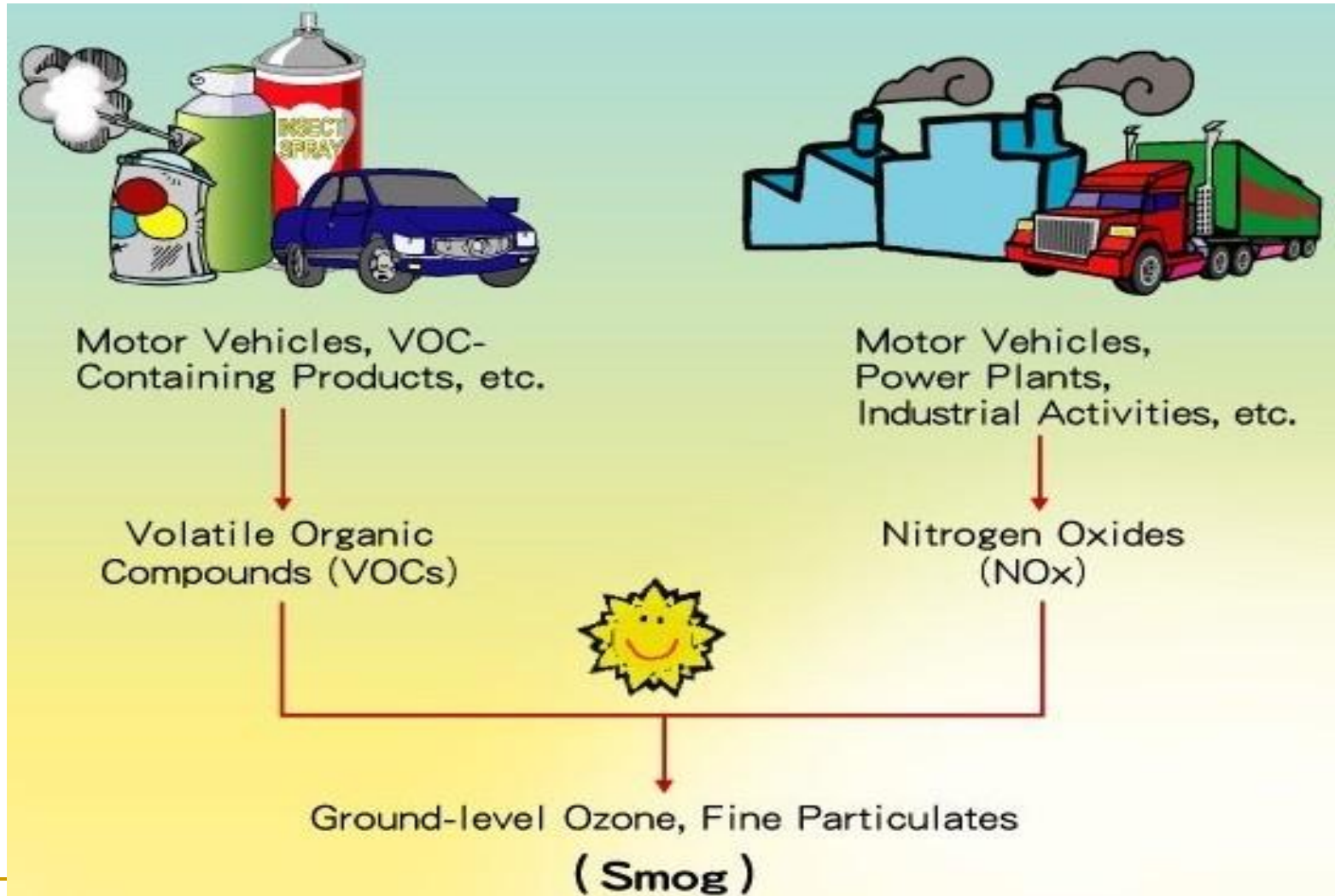
■ Wildfires



- Nuclear tests



■ Smog

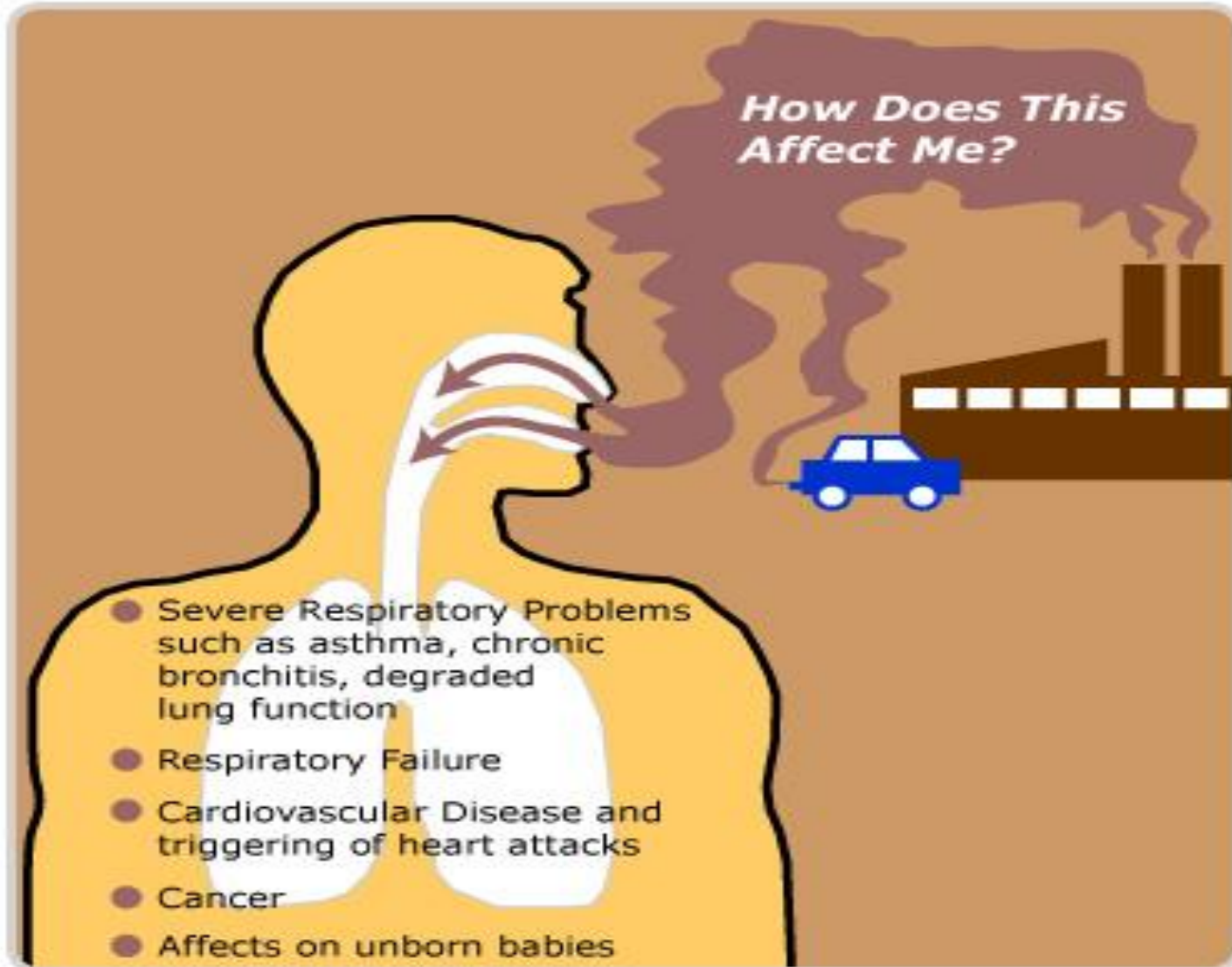


Effects of Air pollution

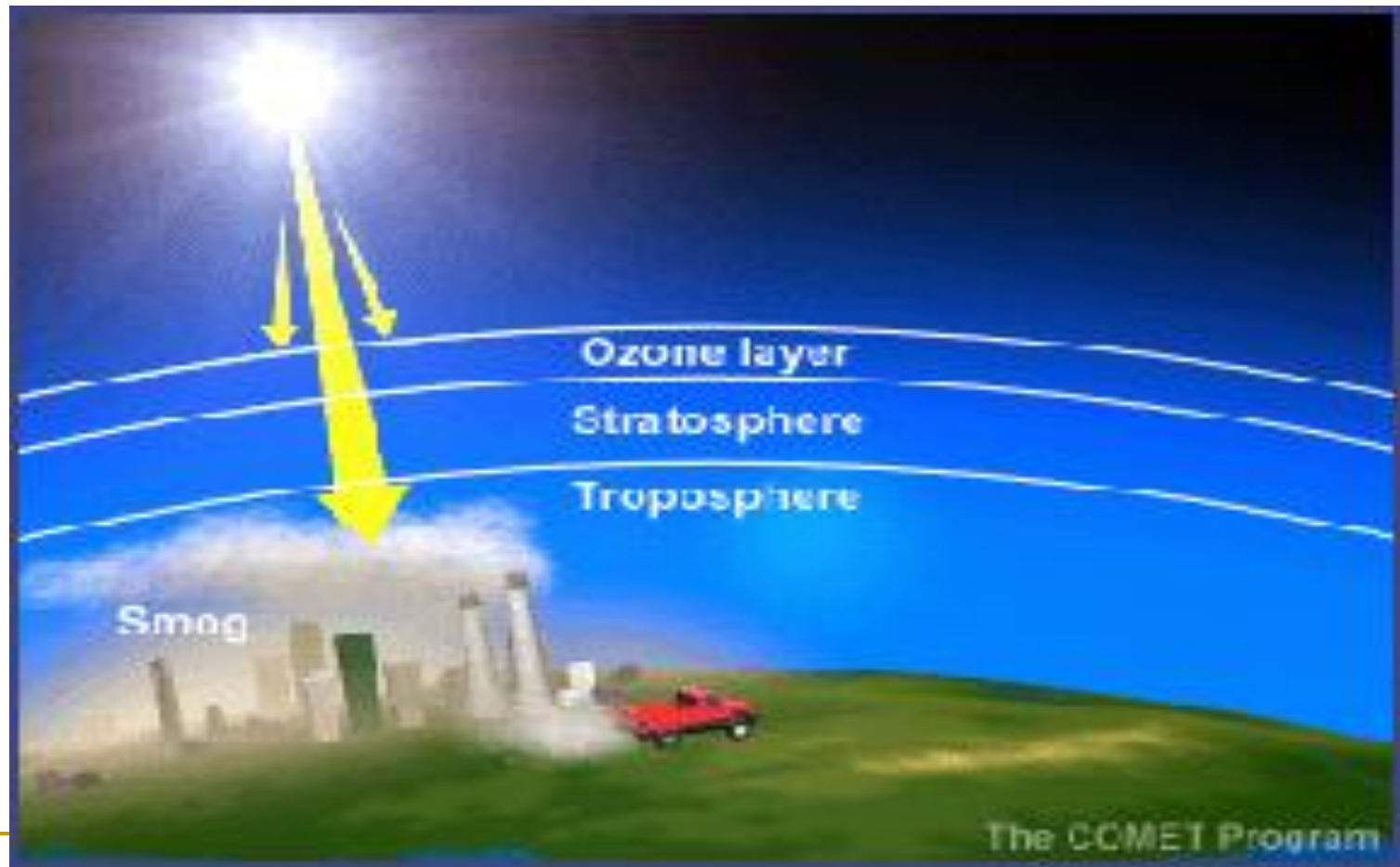
On Plants



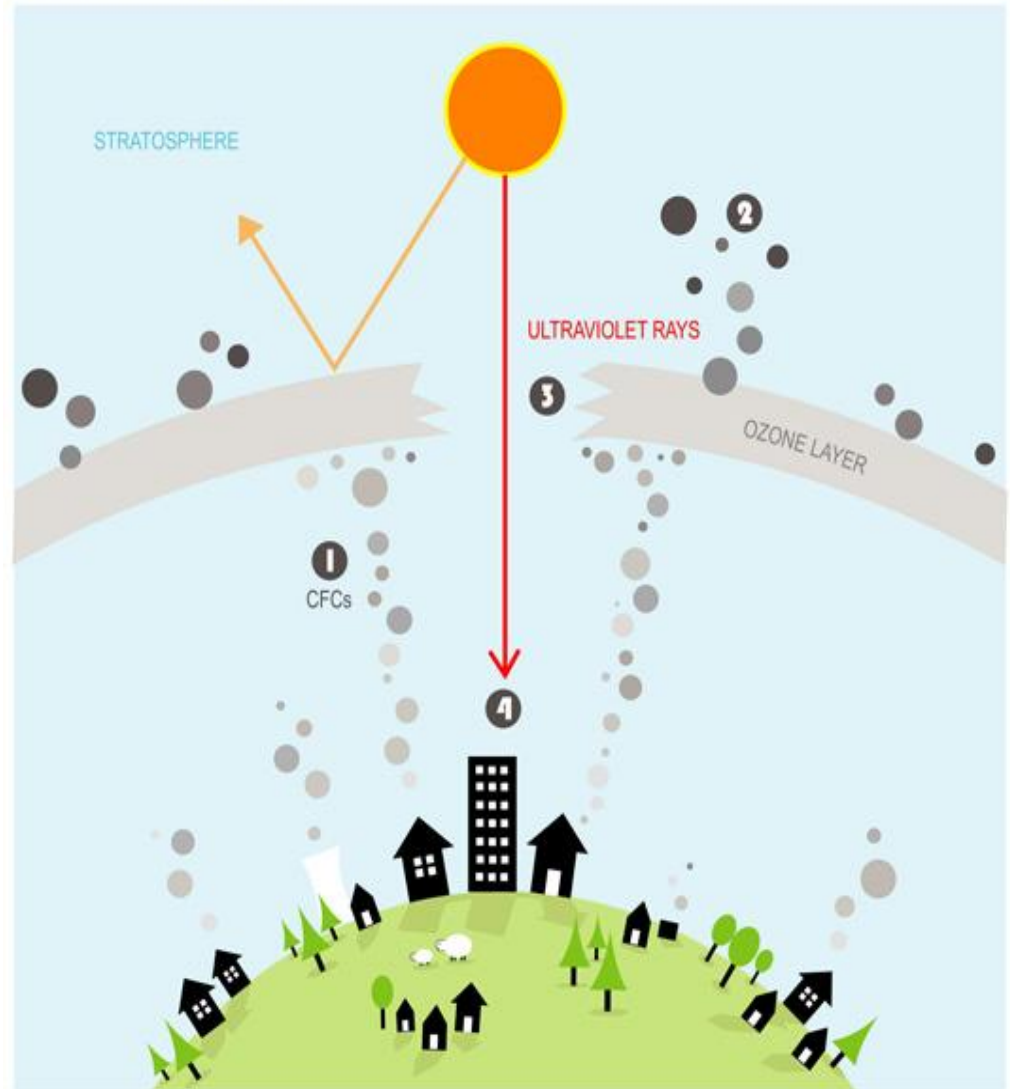
On living organisms



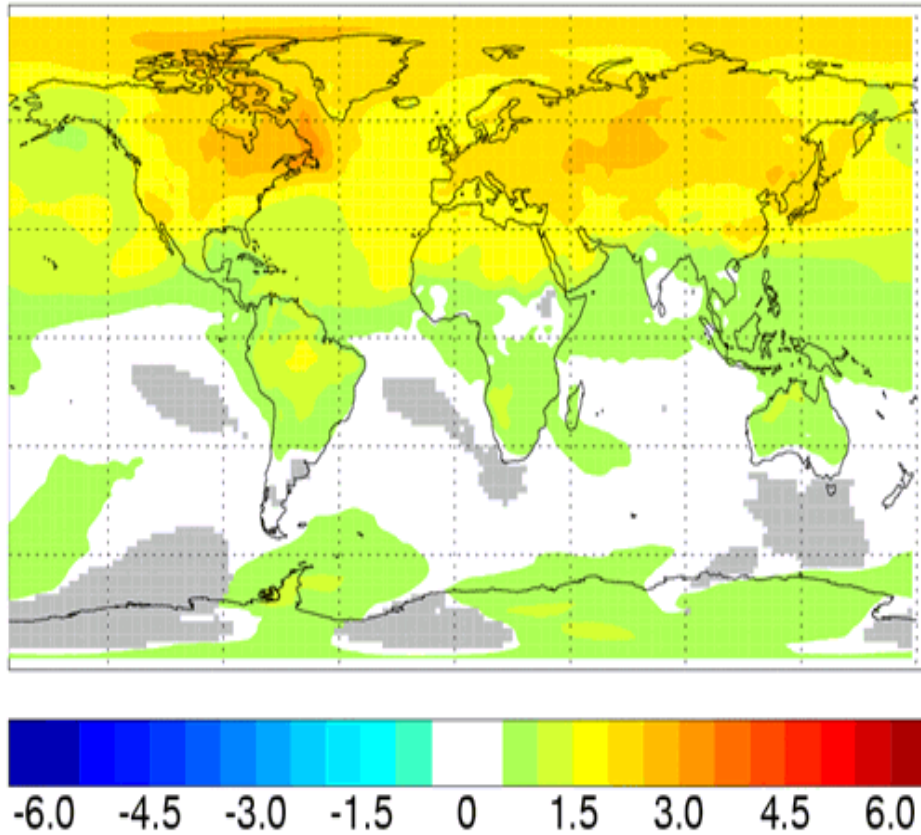
- On materials-Abrasion & Corrosion
- On stratosphere



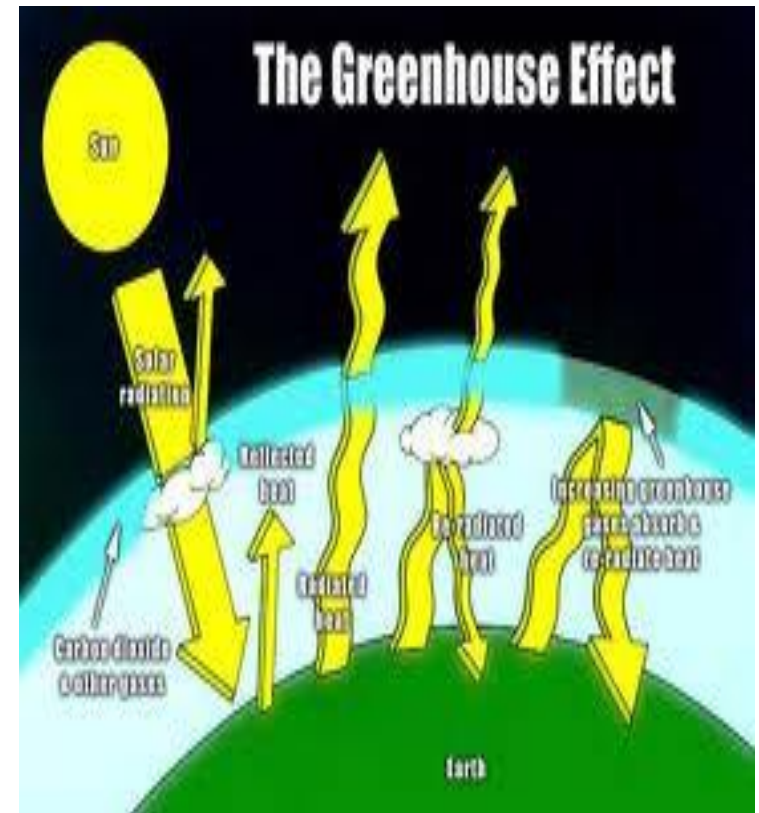
■ On Ozone Layer **ozone depletion**



On Climate



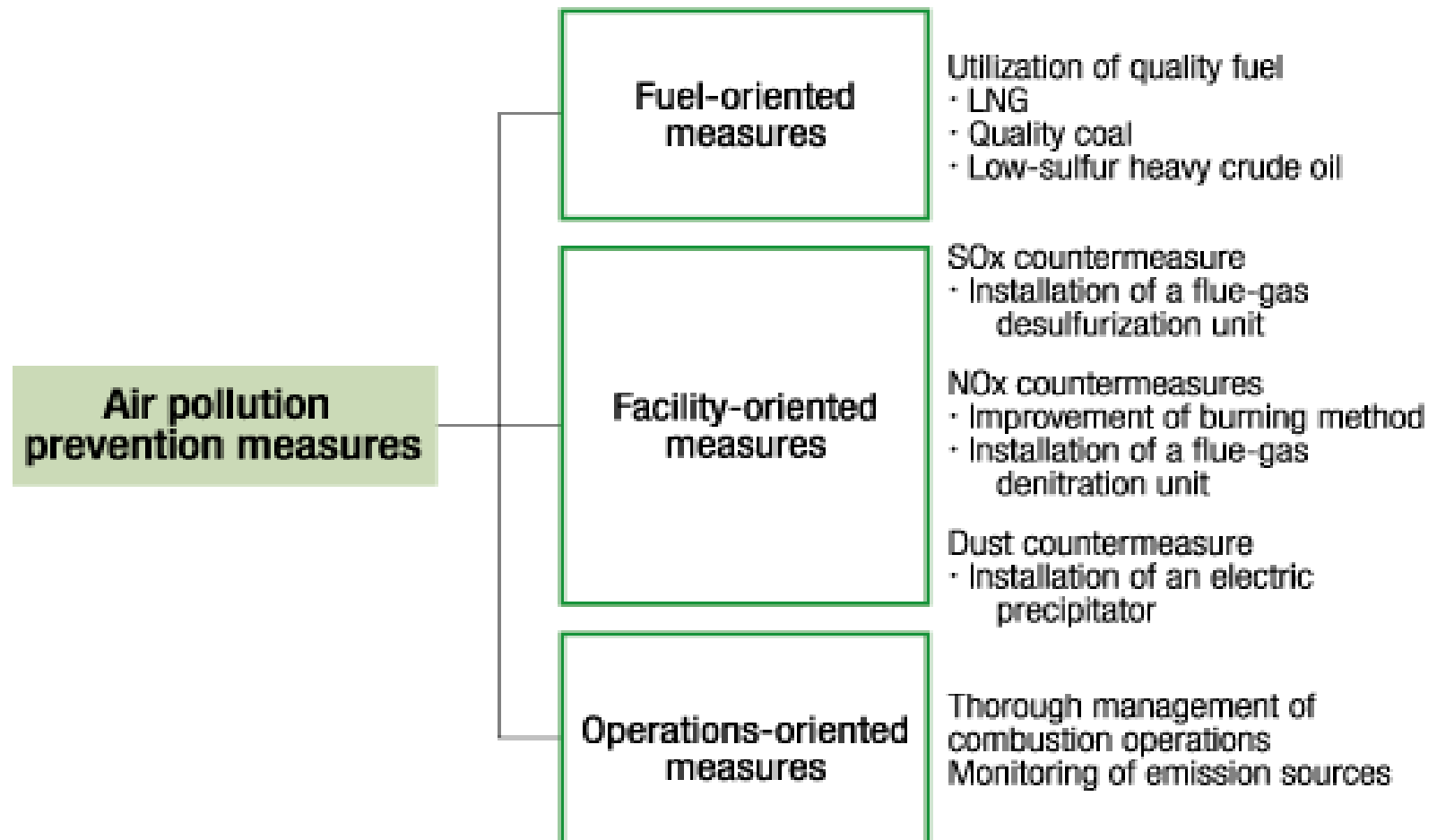
Greenhouse effect



Control measures

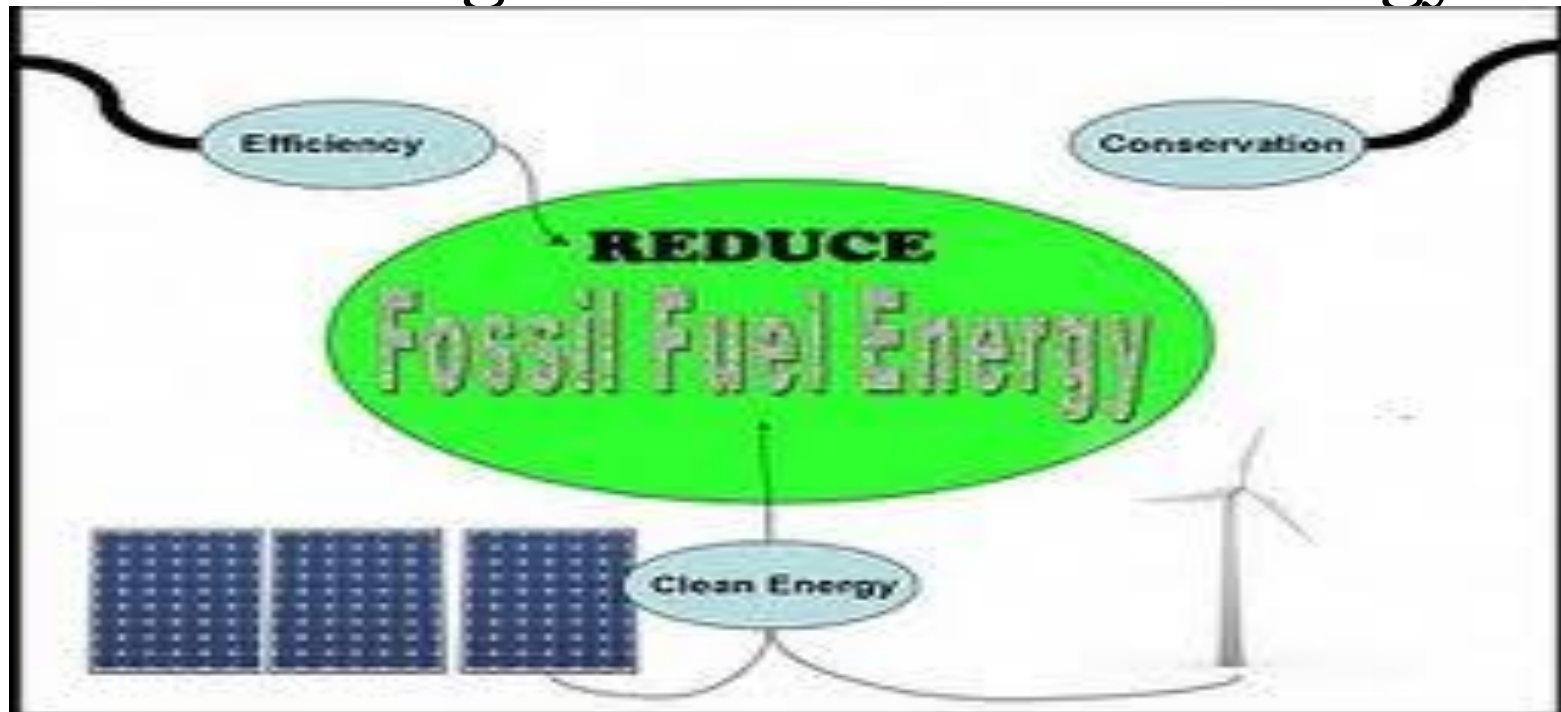
- Control at the source only-
 1. Use of gravitational settling chambers
 2. Wet scrubbers
 3. Centrifugal separators
 4. Electrostatic precipitators

■ Putting greater emphasis on prevention



Continued...

- Reducing use of fossil fuels
- Improving quality of vehicular fuel
- Increasing use of renewable energy

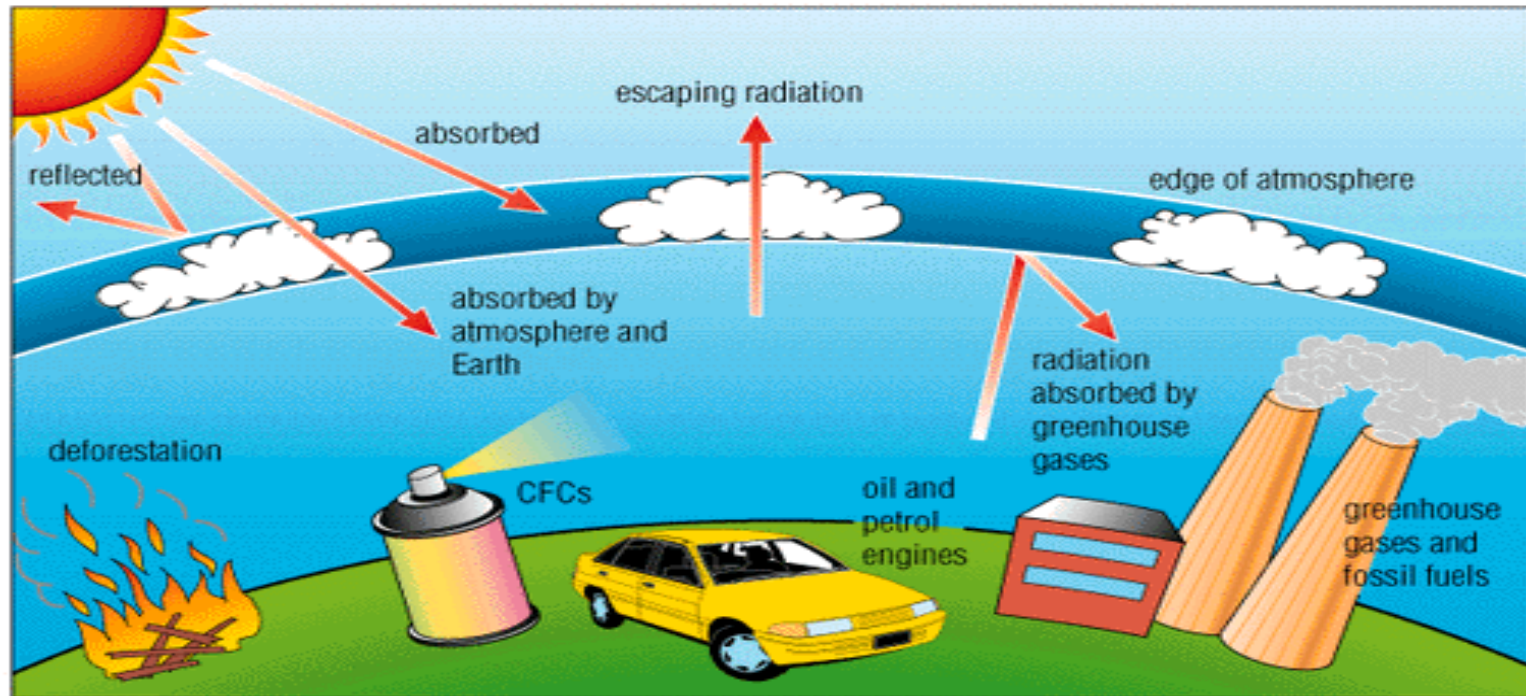


Summary...

- ..\..\Videos\5.1 Air Pollution Causes, Effects And Solutions.mp4

Global Warming

- An increase in the average temperature of the earth's atmosphere (especially an increase that causes climatic changes)



Causes

- Green House gases- CO_2 , Methane, H_2O
- Combustion of fossil fuels
- CFC
- Industries
- Deforestation

Continued...

■ Effects-

- Rise in temperature
- Rise in sea level
- Dry up surface Water bodies
- Reduce ground water level
- Reduction in yields of crops
- Affect ecological cycles

Global Warming...

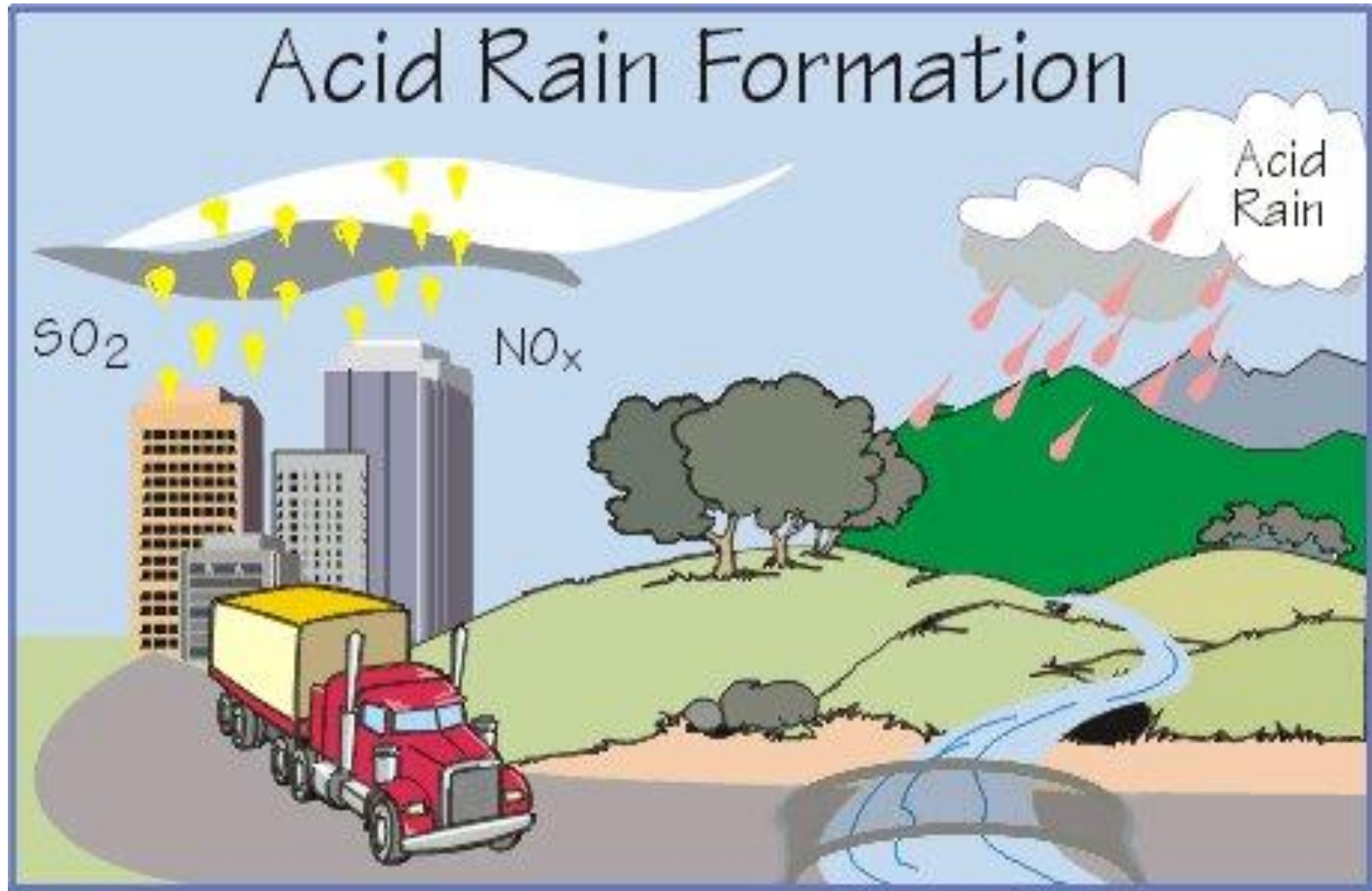
- ..\..\Videos\5.7 What Is Global Warming.mp4
- ..\..\Videos\6.1 Blue Man Group on Global Warming.mp4

Acid rains

- A rain that is unusually acidic, meaning that it possesses elevated levels of hydrogen ions (pH value less than 7)
- Caused by emissions of –
 - Carbon dioxide
 - Sulfur dioxide
 - Nitrogen oxides

which react with the water molecules in the atmosphere to produce acids.

Acid Rain



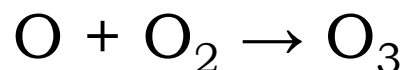
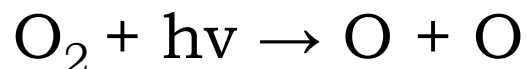
Effects

- Washes away Nutrients Of soil
- Reduces fertility of soil
- Vegetation-Brown dead spots on leaves of plants
- Affects Aquatic ecosystem
- Damages buildings, other structures
- Ground water pollution
- Skin irritation

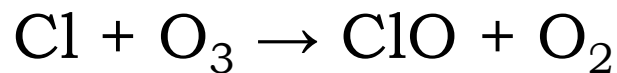
Ozone layer depletion

- Causes
- Effects
- Control Measures

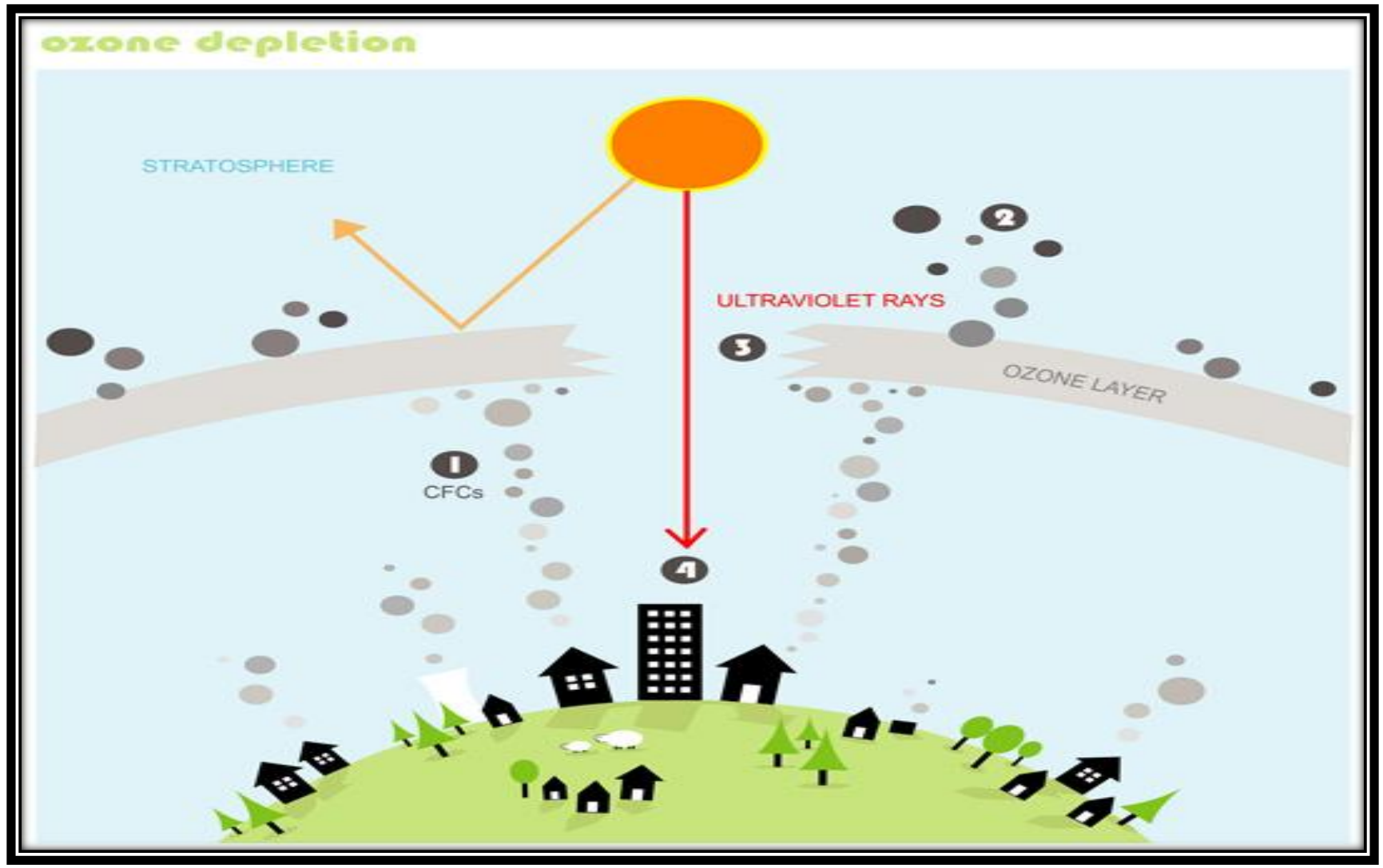
- O₃ is formed when UV from Sun strikes Stratosphere
- Splitting O₂ into atomic O which quickly combines with O₂ forming O₃



- Depletion of Ozone layer caused by Cl⁻ & Br⁻ compounds.
- CFC → broke down by sunlight to give Cl⁻



Ozone layer depletion



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- CFC's are mainly responsible for the degradation of ozone layer
 - Many developed countries have already phased out CFC's and are using environmentally friendly chemicals in their place.
 - [..\..\Videos\6.2 Ozone depletion.flv](#)

Photochemical smog

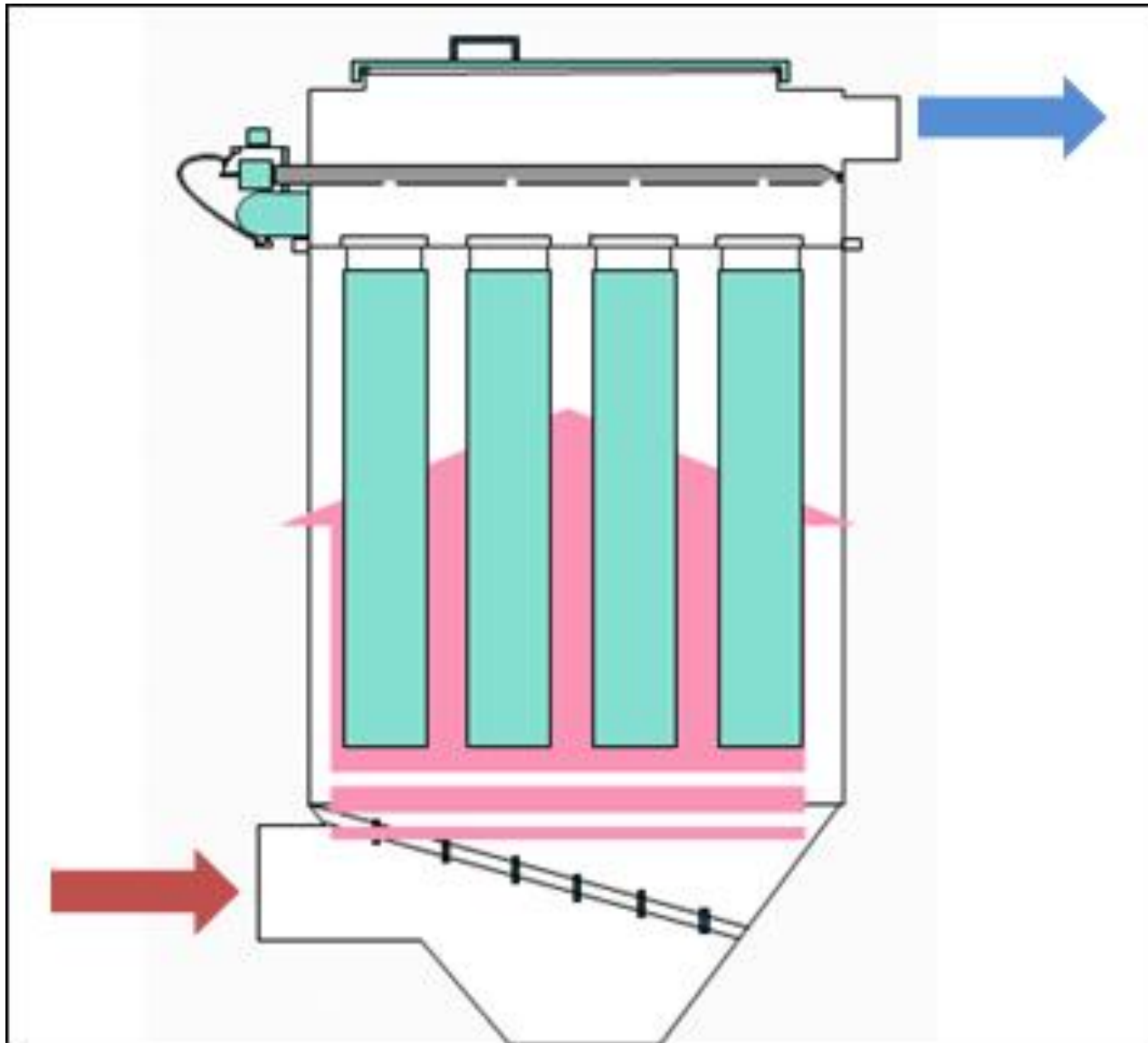
- Outdoor pollution caused by chemical reaction between pollutants & Sunlight in presence of Particulate matters as Catalyst.
- Mixture of pollutants –
Particulates + Oxides of Nitrogen + Ozone + Aldehydes + Peroxy acetyl nitrates + Unreacted Hydrocarbons
- Effects-
 - Headache, irritations, Lung infection
 - Deterioration of Fabrics, Rubber
 - Damage Plants, Crops

Control measures

- Bag House filter
- Venturi scrubber

Bag House filter

- Device that removes particulates from air or gas
- From power plants, steel mills, food mfg
- Came in picture in 1970s
- Has particulate collection efficiency of 99%



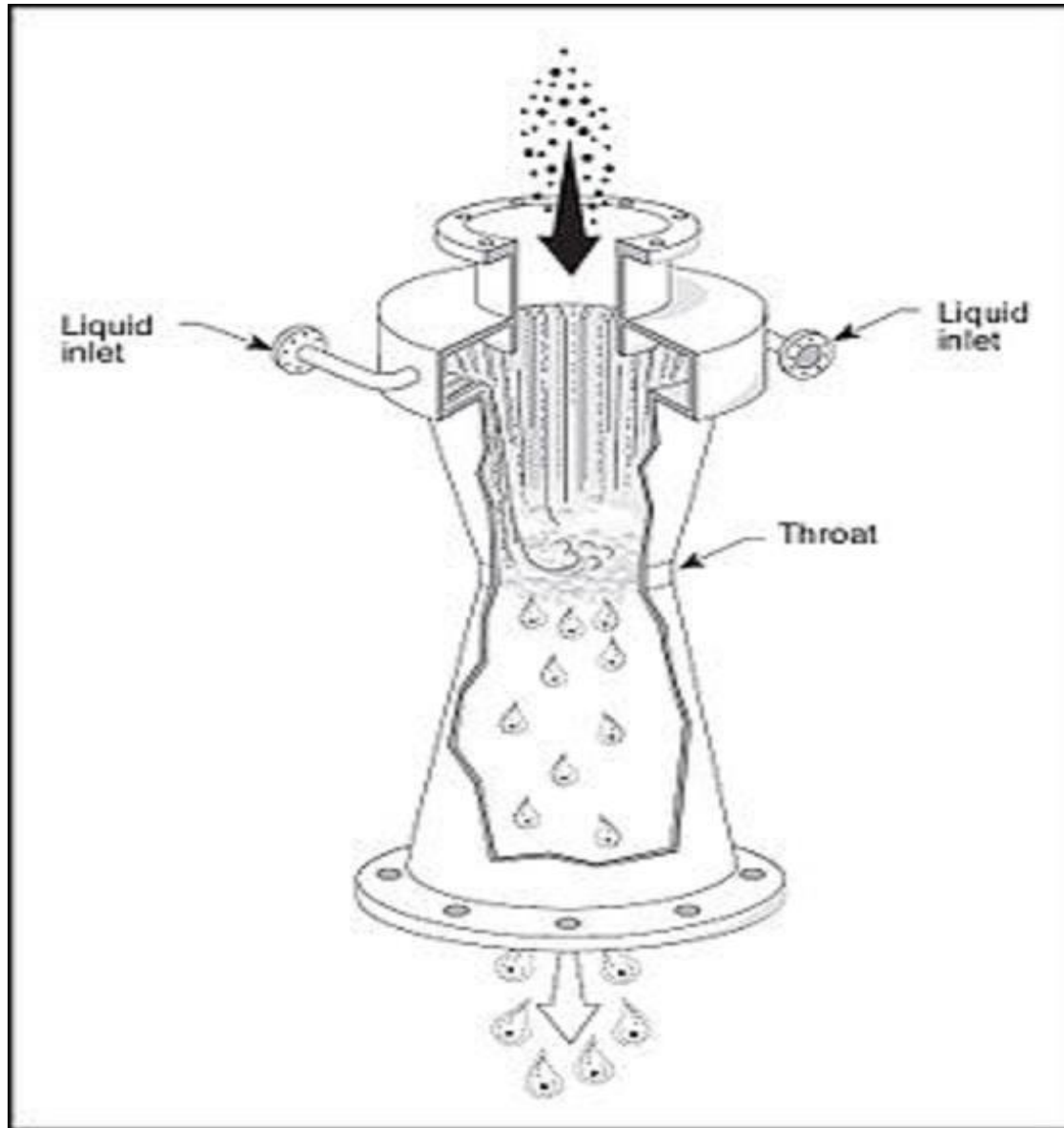
Working...

- Dust-laden air—Bag house compartment—Inside / outside bags—Layer of dust on filter media surface
- Pressure drop—Cleaning of Bag house may be Online or offline
- Increase resistance to gas flow
- Efficient particulate collectors because dust cake formed on the surface of the bags

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- ..\..\Videos\5.8 BAG FILTER.mp4
 - ..\..\Videos\5.9 Scrubber.mp4

Venturi Scrubber

- Designed to effectively use the energy from the inlet gas stream to atomize the liquid being used to scrub the gas stream
- Used to collect both particulate and gaseous pollutants
- Three sections-
 1. Converging
 2. Throat
 3. Diverging



Working...

- Inlet stream from converging section—Increased gas velocity at throat – Liquid introduced at throat – Gas absorption by tiny liquid droplets—Exit of inlet steam
- High efficiency, sometimes exceeding 99 %

Case Study-Bhopal gas tragedy

Water pollution

“Introduction of chemical, biological and physical matter into large bodies of water that degrade the quality of life that lives in it and consumes it.”

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- ..\..\Videos\5.2 water pollution.mp4

Sources of water pollution



Sources

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graph TD; A[Sources] --> B[Point Sources]; A --> C[Non Point Sources];
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Point Sources

Non Point
Sources

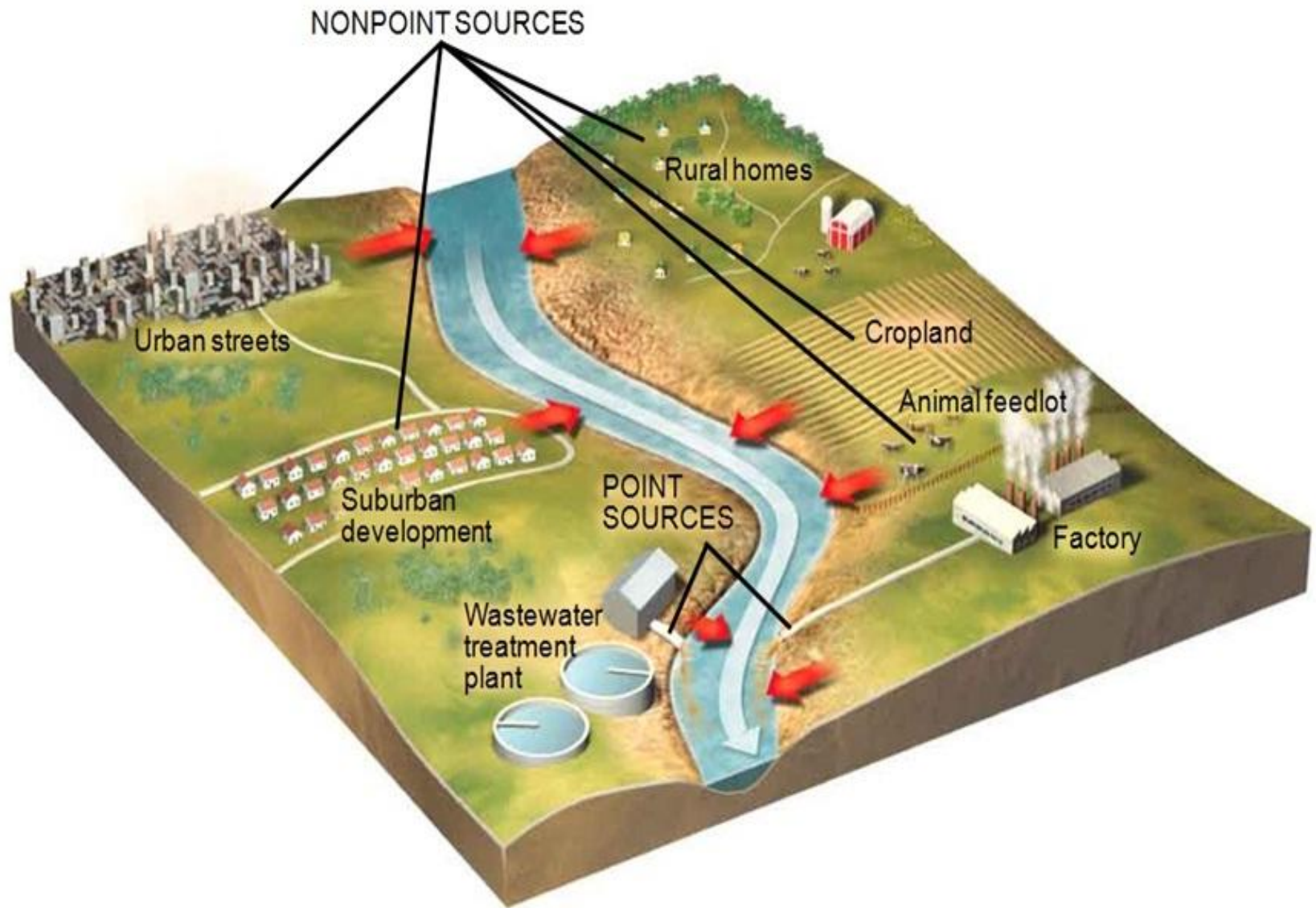
Water Pollution Sources

1. **Point sources**

- ❑ Discharge at specific locations
- ❑ Easier to identify, monitor, regulate

2. **Nonpoint sources**

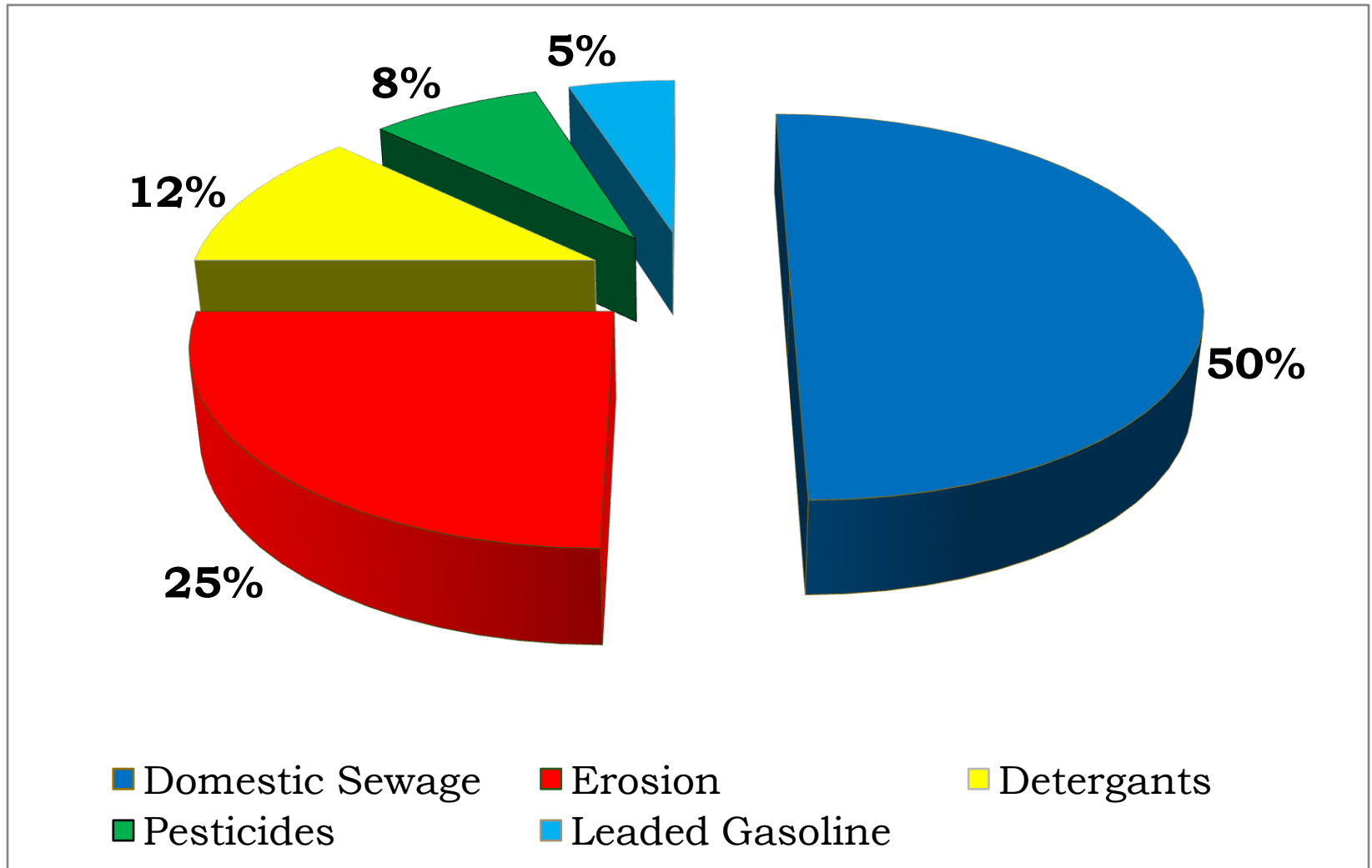
- ❑ Runoff of chemicals and sediment
- ❑ Agriculture
- ❑ Control is difficult and expensive



Common Water Pollutants

- Inorganic Plant Nutrients
- Organic chemicals
- Oxygen demanding Wastes
- Water-soluble inorganic chemicals
- Sediment / Suspended Matter
- Radioactive Substances
- Disease causing agents
- Heat

Causes



■ Factories and Refineries





- Pesticides, herbicides and fertilizers
- Oil spills

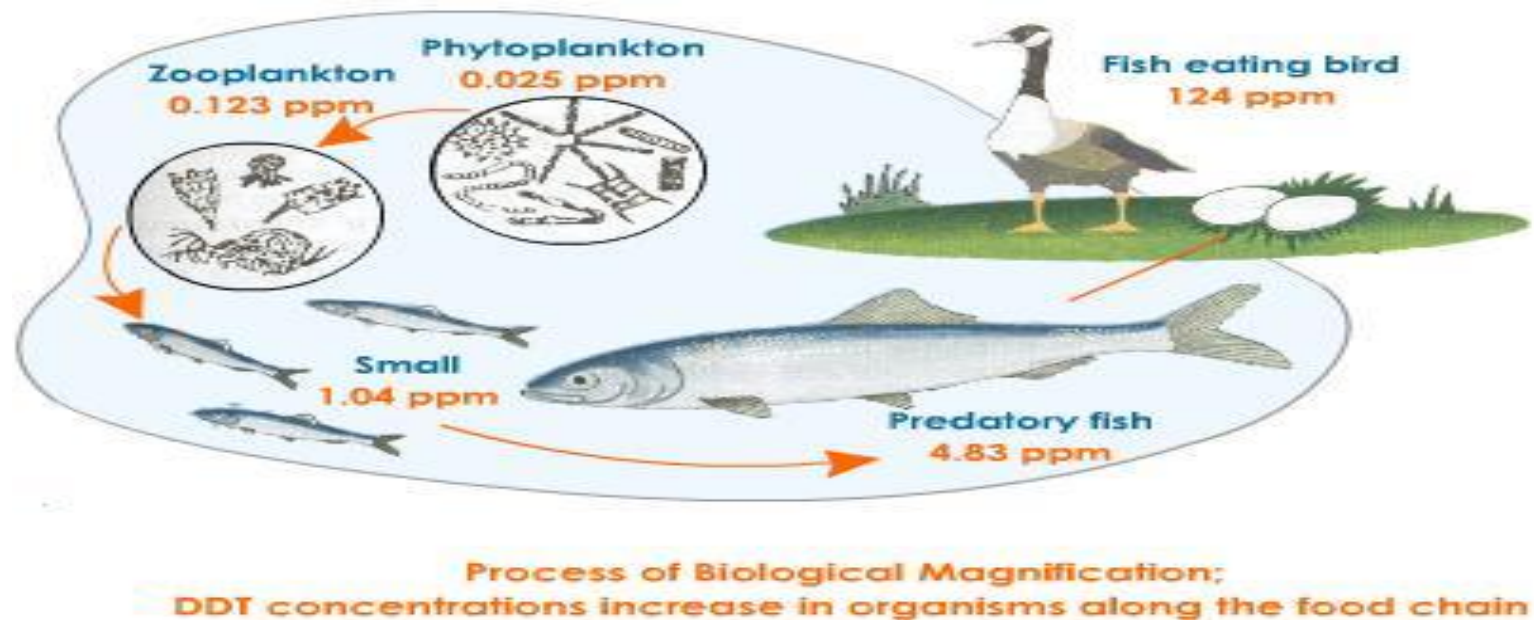


- Household chemicals and Animal waste

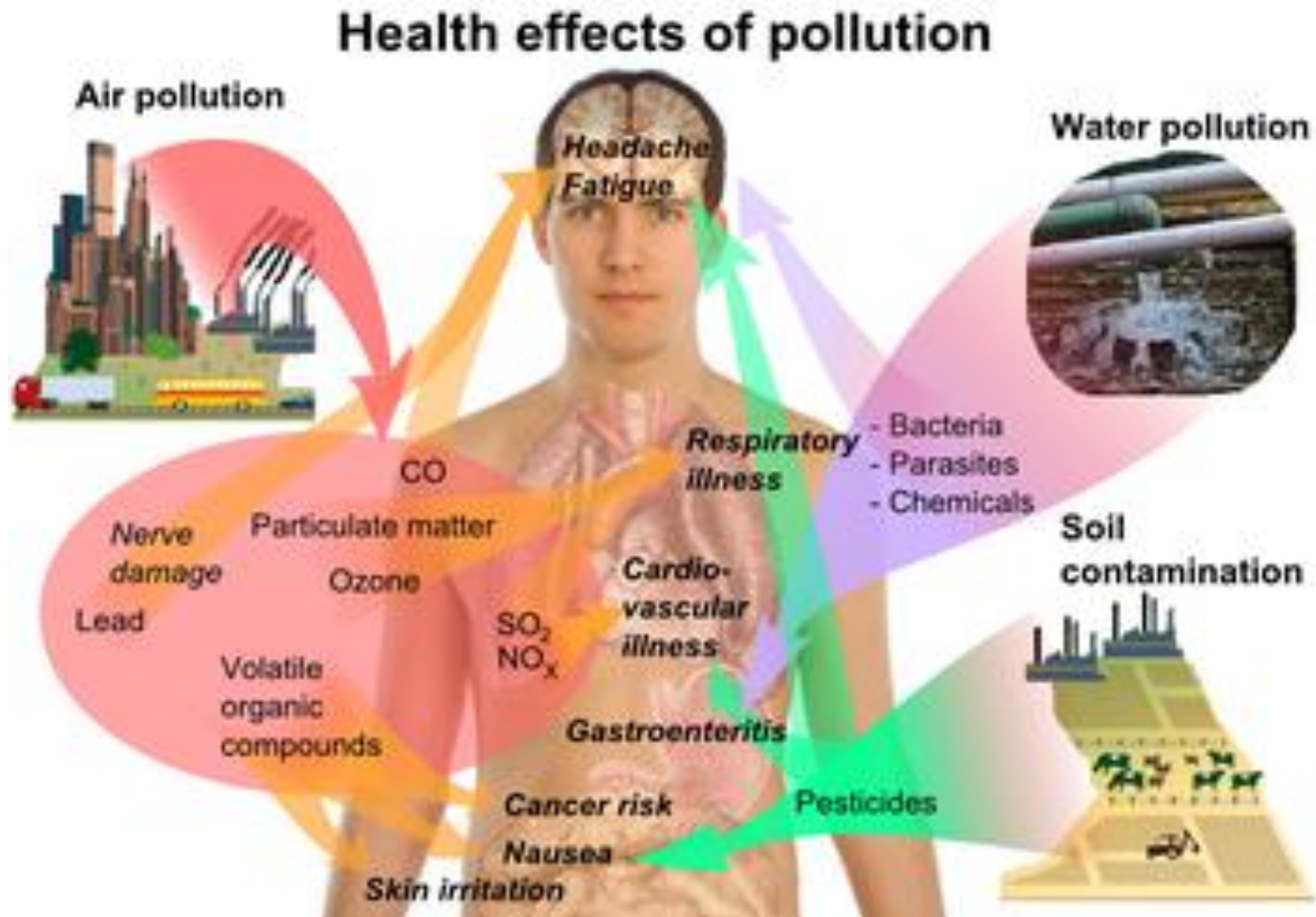


Effects

- On aquatic ecosystem
- Biological magnification
 - Certain pollutants concentrations in food chain and food webs.



- On human health

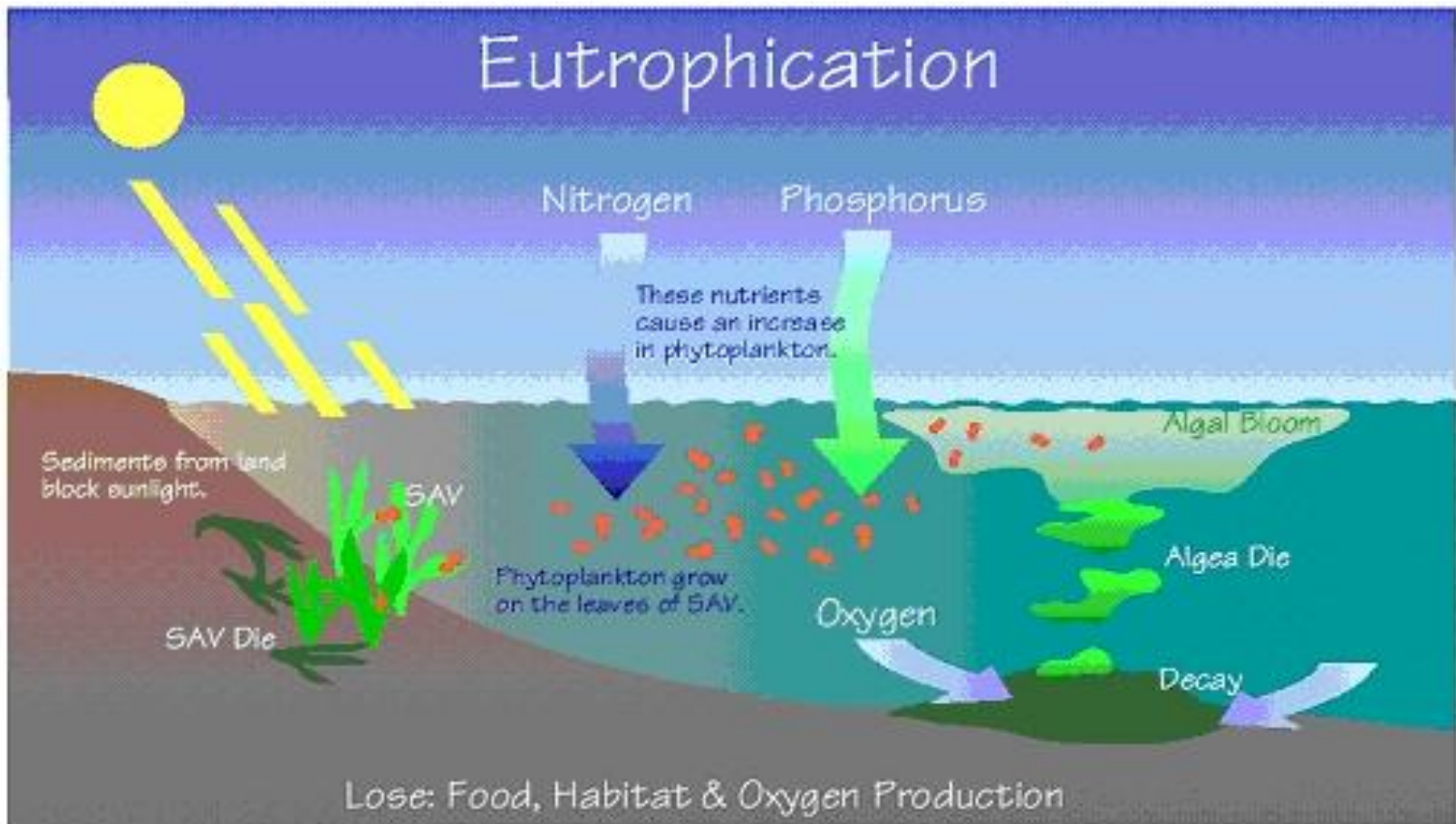


■ Hazards of ground water pollution



■ Eutrophication

- Increase in nutrients level in water (Algae)



Control measures

- Disinfection of water-**Chlorination**
- **Sedimentation**-Removal of suspended particles
- **Filtration**
- Prohibition on washing clothes, directly bathing in tanks.

Continued...

- Sewage treatment.
- Hot water cooling before releasing from power plants.
- Excessive use of fertilizers should be avoided.



Sewage treatment

- Sewage treatment, or domestic wastewater treatment, is the **process of removing contaminants from wastewater and household sewage**, both runoff and domestic.
- It **includes physical, chemical, and biological processes** to remove physical, chemical and biological contaminants.

3 stages of water treatment

1. Primary

- Solids are separated

2. Secondary

- Dissolved **biological matter is converted into a solid mass.**
- 95% of the suspended molecules are removed.

3. Tertiary

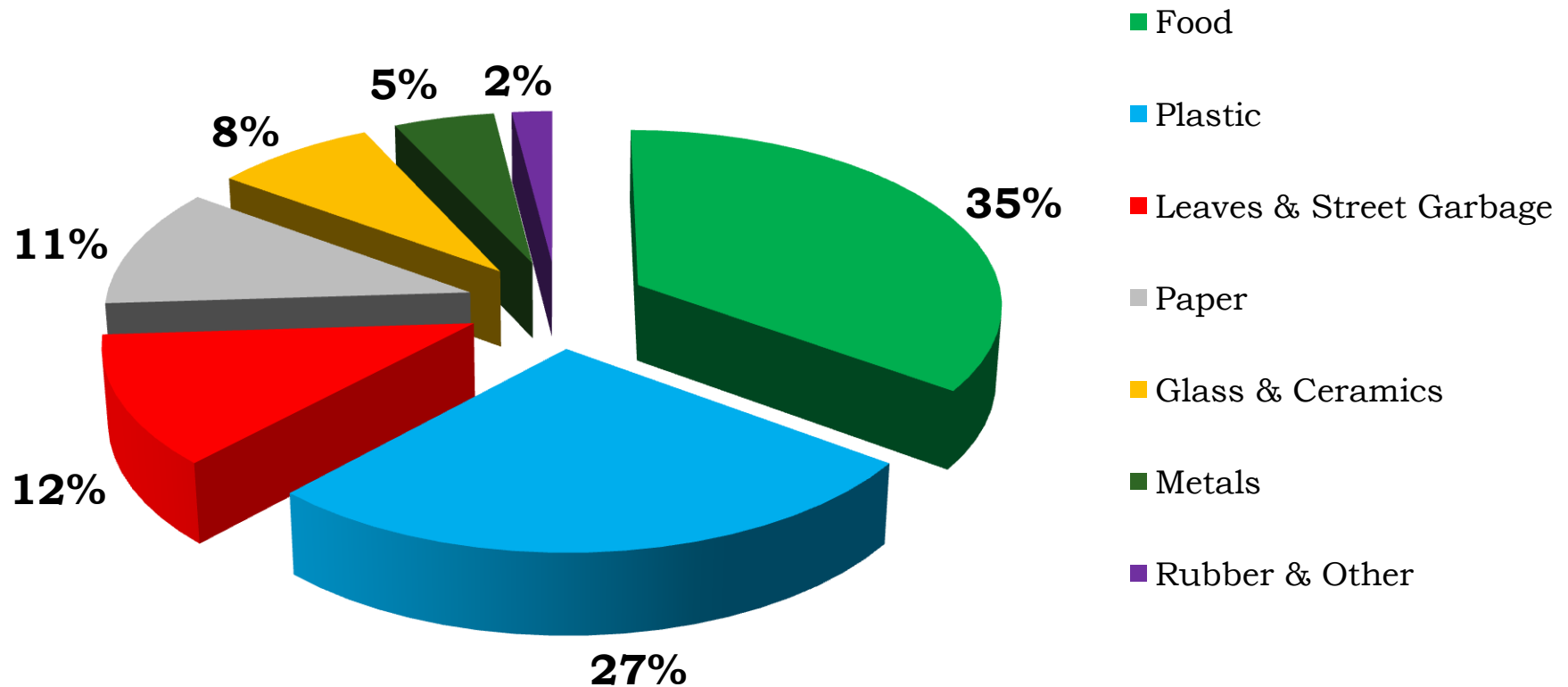
- Biological **solids are neutralized and then disposed,** and treated water may be disinfected chemically or physically

Case Study-Minamata Disease

Soil pollution

“Pollution of the Earth’s natural land surface by industrial, commercial, domestic and agricultural activities.”

Composition Of Urban Waste



Classification of Waste

Biodegradable waste



Non-Biodegradable waste



❑ Toxic Waste



- Non-toxic waste
- Biomedical waste



Causes

- ❑ Discarded materials like rubber, plastic
- ❑ Garbage



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- Industrial waste-Iron, copper, lead
 - Chemical wastes-Acids, alkalies
 - Radioactive waste-mines, nuclear process
 - Pesticides (chemicals used to kill insects defined as pests)
 - Herbicides (chemicals used to kill plant life, particularly weeds)
 - Fertilizers

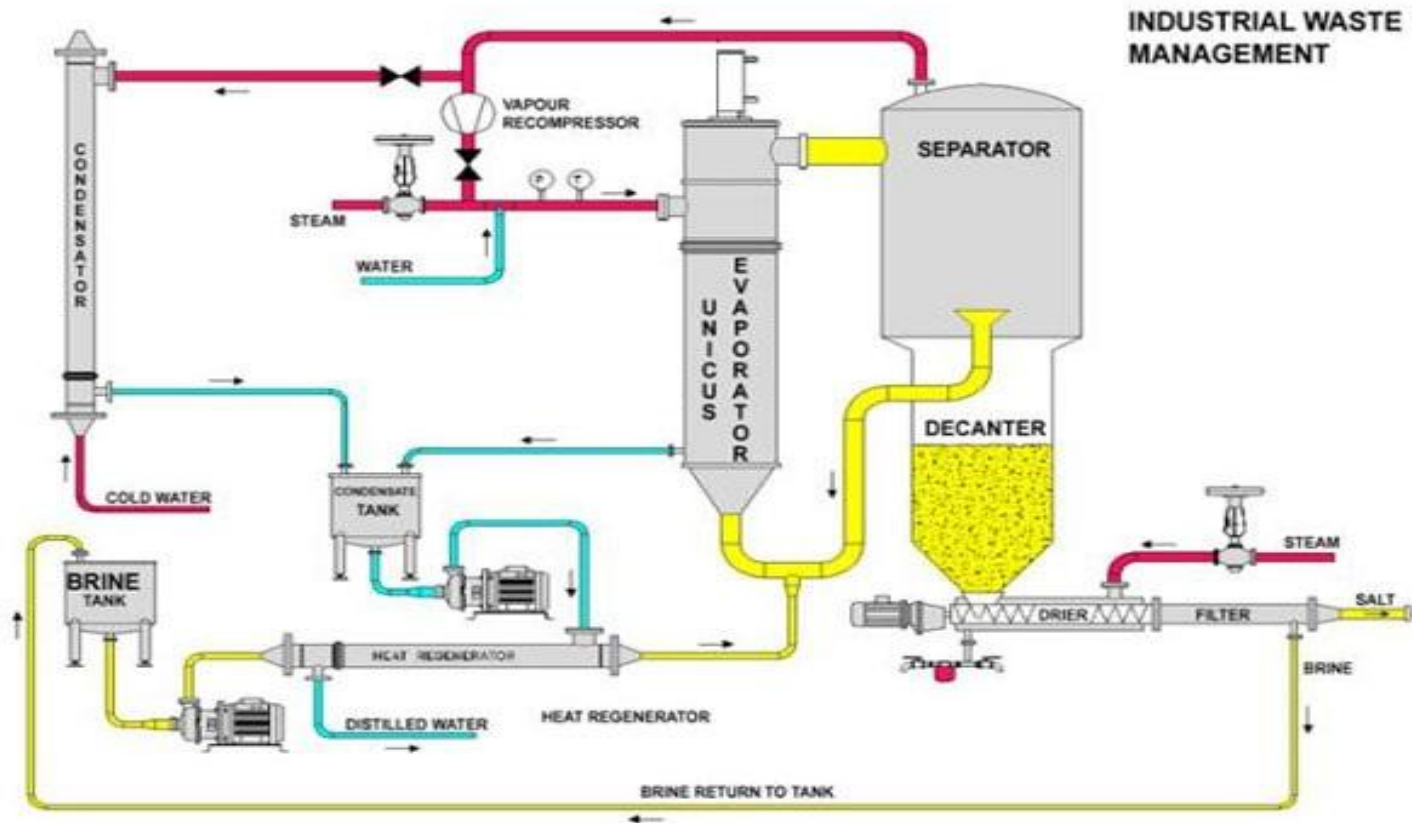
Effects

- Soil erosion
- Decreased Soil production capacity
- Reduced water holding capacity
- Salination Of Soil
- Effect on terrestrial and aquatic life
- Health hazards-Chronic diseases due to domestic garbage

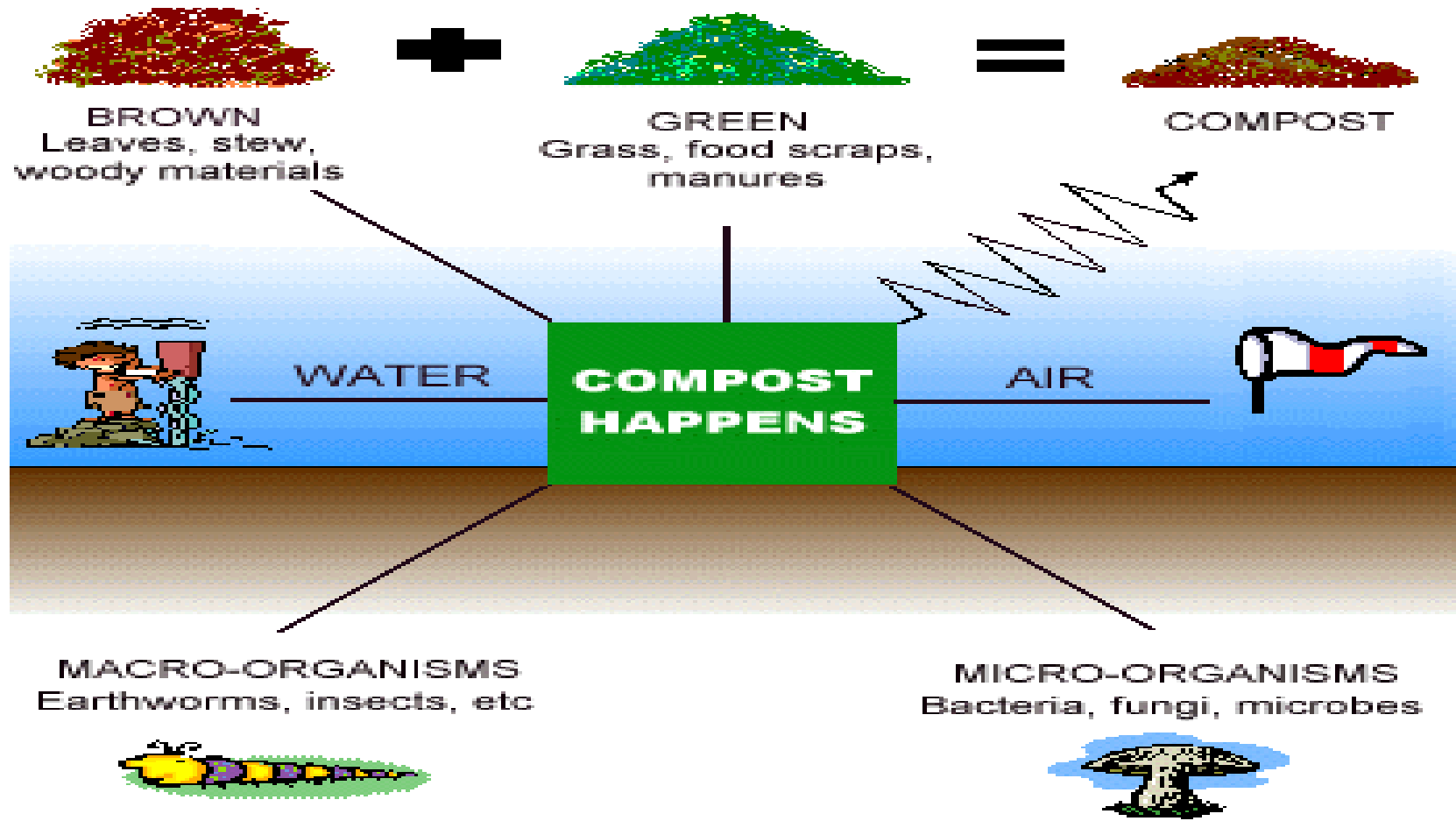
Solid Waste Management

Control Measures

- Proper treatment of industrial waste



Composting / Vermiculture



- Natural way of degrading organic material into humus and minerals
- A natural aerobic microbiological process that returns plant nutrients to the soil where they can again be absorbed by plants for new growth.
- Supplies plants with nitrogen or nitrogen containing materials, additional nutrients and beneficial microorganisms

❑ Recycling



- Incineration (combustion of organic substances)



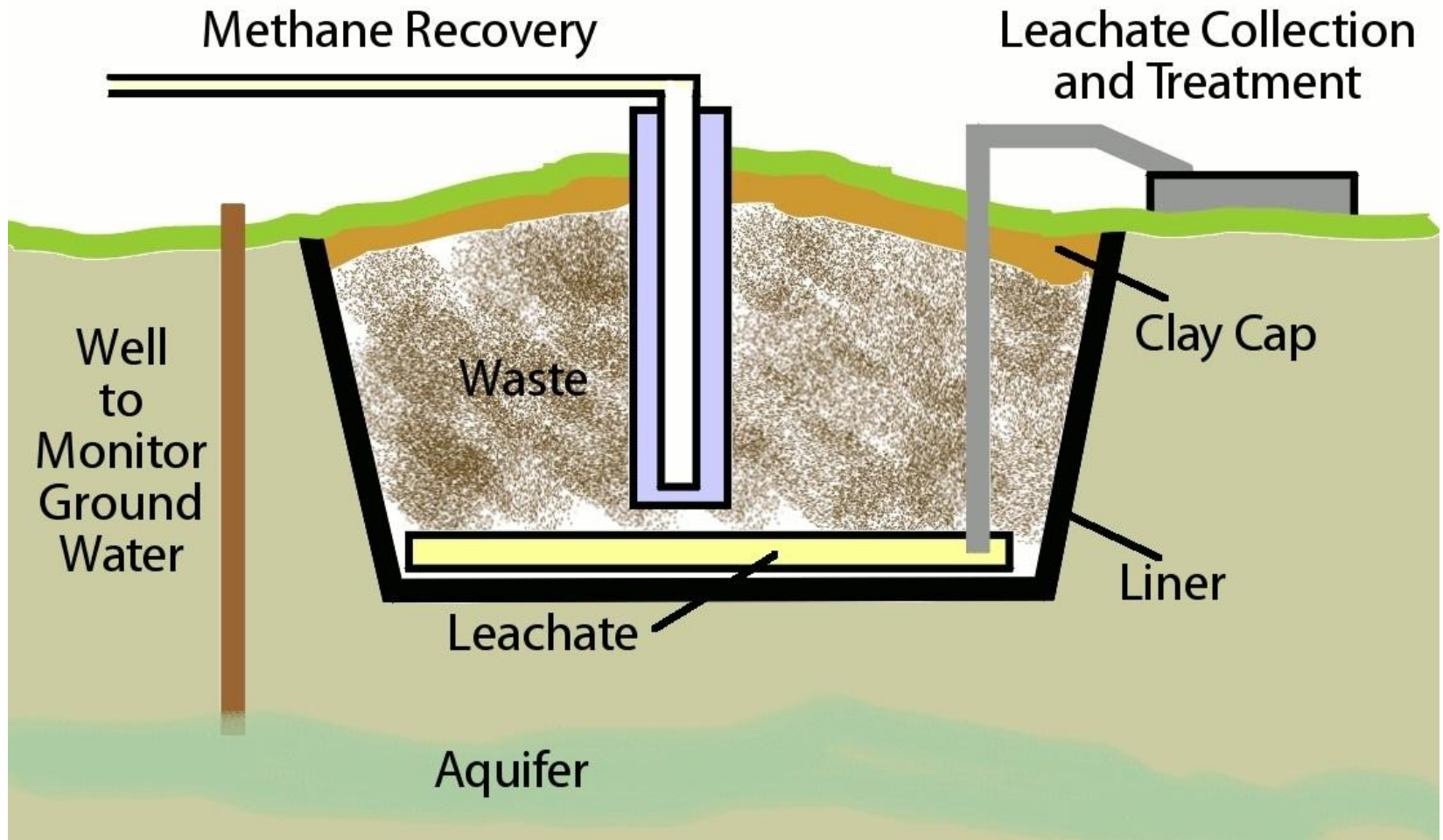
□ Land Filling



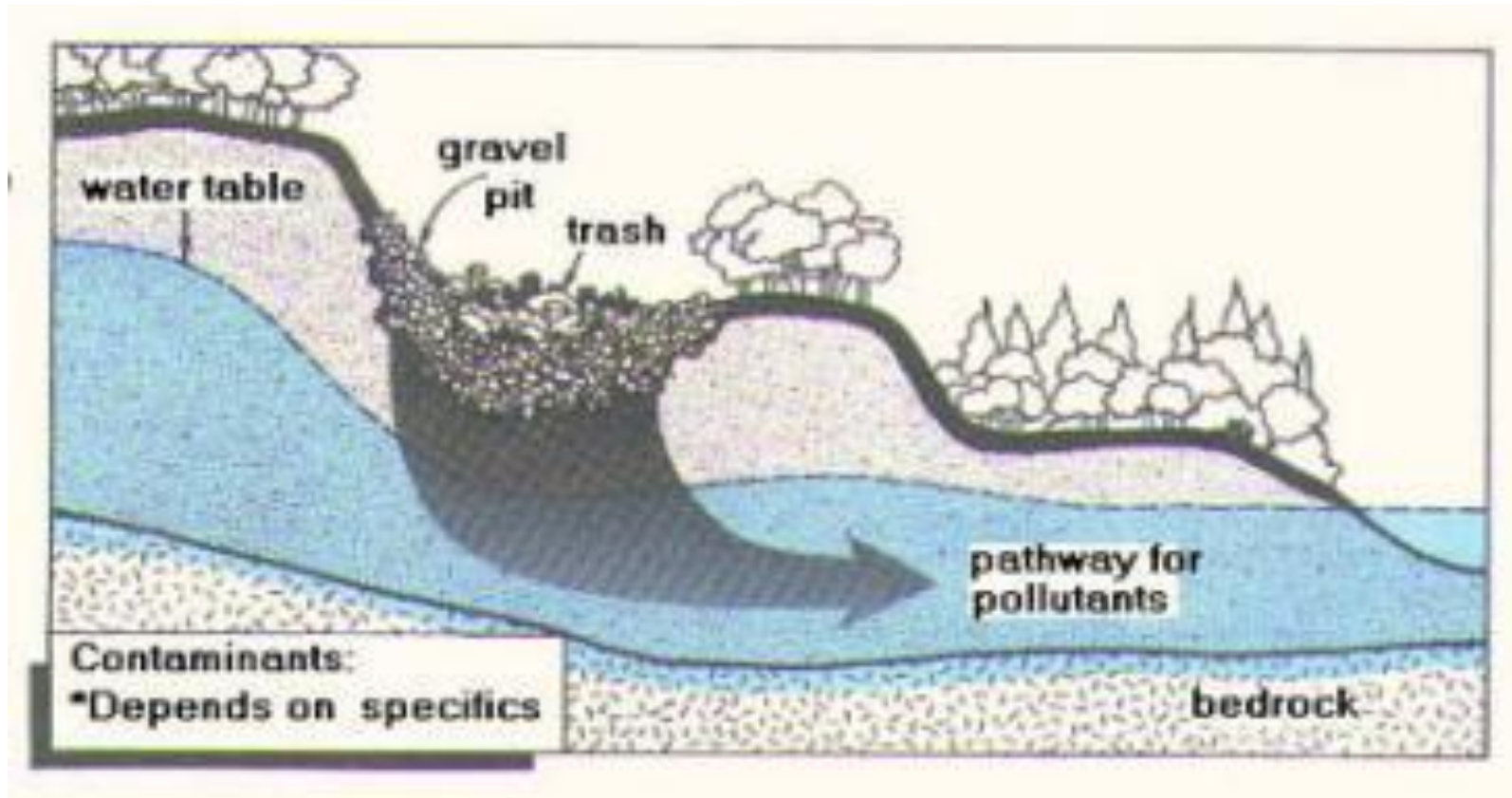
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- ❑ Each day's deposit of fresh garbage is covered with a layer of soil to prevent it from blowing around and to discourage animal scavengers.
 - ❑ Traditionally been primary method of waste disposal.
 - ❑ Cheap and Convenient

- New landfills have complex bottom layers to trap contaminant-laden leachate.
- Monitoring systems necessary to detect methane gas production and groundwater contamination.
- In some cases, methane collected and used to generate electricity


Methane from Landfill



- Special pits or low lying areas for dumping of wastes.



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- Production of biogas from agricultural waste.
 - Reduce Use of chemical fertilizers
 - Recycling of some materials like paper, glass
 - Improvement in mining techniques
 - Proper collection and disposal of waste
(Pneumatic pipes)



Better Management
Lower Hazardous Waste
Higher Life Quality



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- ..\..\Videos\5.6 Ways 2 Go Green Right Now.mp4

Definition-

- *“Excessive, displeasing environmental noise which is created by human or machine, that disrupts the activity or balance of humans”*
- *In simple terms, noise is unwanted sound released in atmosphere*

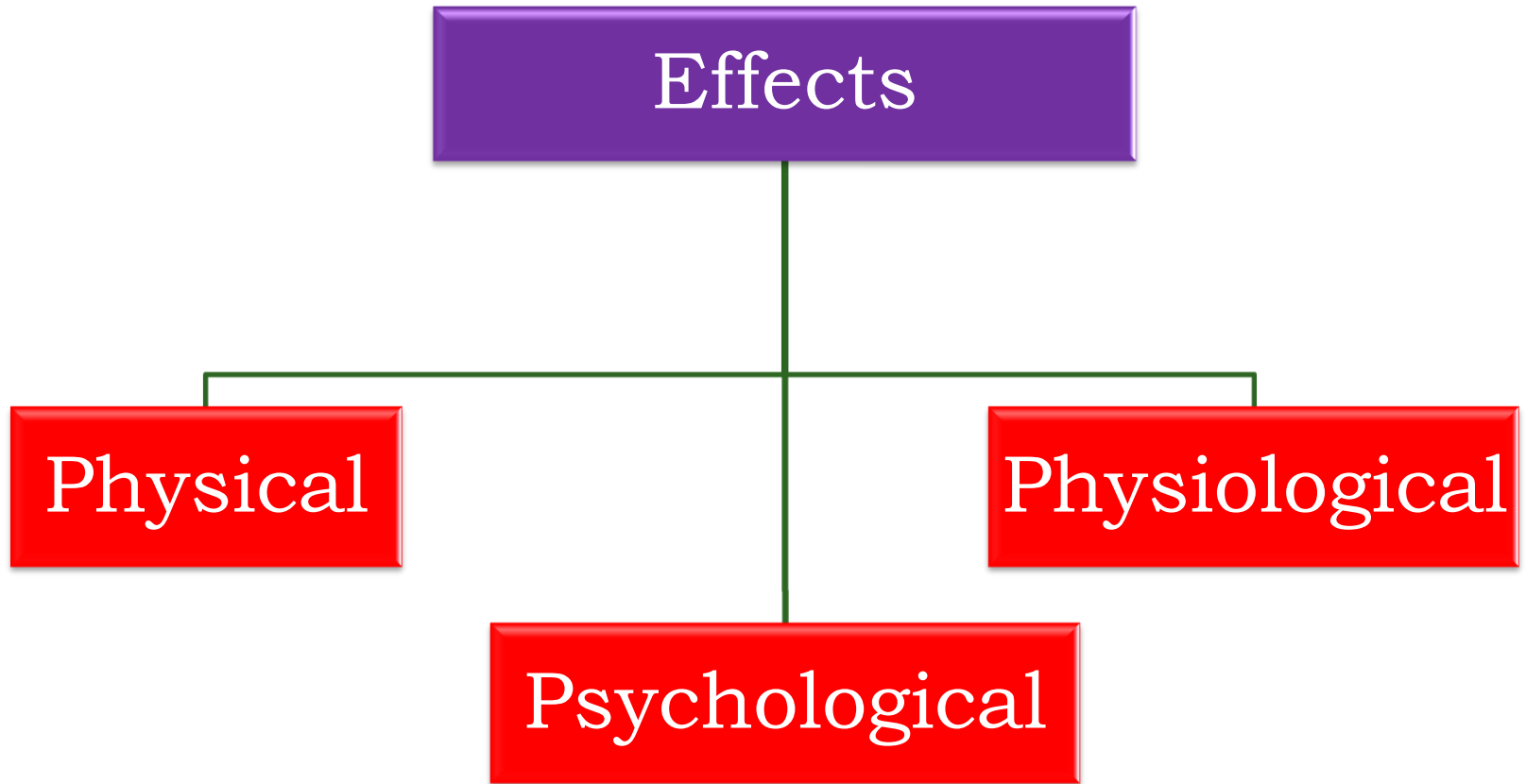
Permissible levels of sound-

Zones	Day (6 to 21 hrs)	Night (21 to 6 hrs)
Industry	75 dB	70 dB
Commercial	65 dB	55 dB
Residential	55 dB	45 dB
Silent zone	50 dB	40 dB

Causes

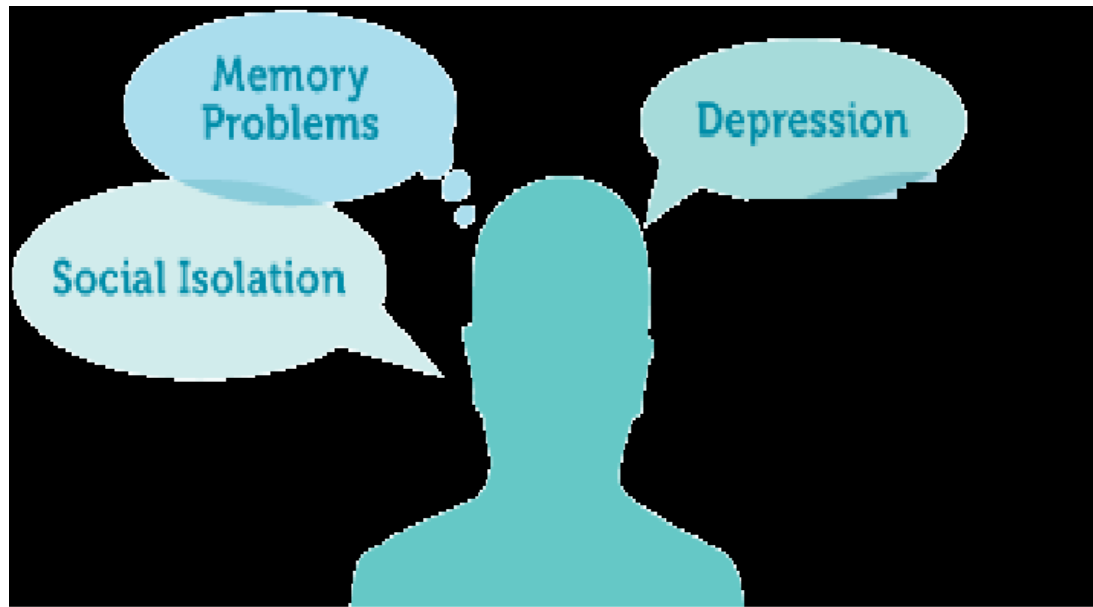
- ❑ Industries (Textile, Mfg)
- ❑ Vehicles (Tanks, Artillery)
- ❑ Domestic gadgets
- ❑ Public address systems
- ❑ **Nanjing – 105 dB**
- ❑ **Mumbai - 82 dB**





Effects

- ❑ Effect on hearing ability (Ear drum, sensory cells)
- ❑ Effect on general health (Stress, Anxiety, Heart rate)



Control measures

- ❑ Proper maintenance of machines
- ❑ Sound proof chambers for noisy machines
- ❑ Location of industries away from human settlements
- ❑ Silence zones



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- ❑ Control over vibrations
 - ❑ Planting coniferous trees around roads.
 - ❑ Installation of sound barriers
 - ❑ Protective devices such as ear muffs, cotton plugs.

E-Pollution



Today's Electronic Gadgets ,
Tomorrow's Electronic Waste

What is Electronic Waste?

It is the term used to describe old, end-of-life or discarded appliances using electricity and battery.



Electronic Equipments



Computers



Mobile
Phones



Air
Conditioner



Laptops



Telephone



Irons



Drill Machines



Treadmills



Printers

How these become E-Waste?

- ❑ Changes and Advancement in technology
- ❑ Changes in fashion, style, and status
- ❑ Changing configuration
- ❑ Attractive offers from manufacturers
- ❑ Small life of equipments

Why E-Waste A Problem?



- ❑ Composed of Hazardous Materials
- ❑ Products are quickly obsolete and discarded
- ❑ Electronic products are difficult to recycle
- ❑ Discarded electronics are managed badly
- ❑ Most e-waste goes to Landfills
- ❑ Most recyclers don't recycle , they export

Source of e-wastes	Constituent (Hazardous)	Health effects
printed circuit boards, computer monitors	Lead (Pb)	<ul style="list-style-type: none">• Damage to nervous system and kidney• Affects brain development of children.
Chip resistors and semiconductors	Cadmium (Cd)	<ul style="list-style-type: none">• Accumulates in kidney and liver.• Causes neural damage.

Relays and switches, printed circuit boards	Mercury (Hg)	Chronic damage to the brain. Respiratory and skin disorders
Motherboard	Beryllium (Be)	lung cancer
Front panel of CRTs.	Barium (Ba)	Muscle weakness; Damage to heart, liver and spleen

E-Waste Disposal



Methods

- Recycle
- Landfill
- Incineration
- Reuse



What should be done?

- Proper laws and policies should be made
- Awareness among consumers and manufacturers
- Recycling should be preferred
- Products should be made recyclable
- Make usage of recycled products
- do not throw away old equipments

ANY
QUESTIONS
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Thank You...