Environmental Biochemistry

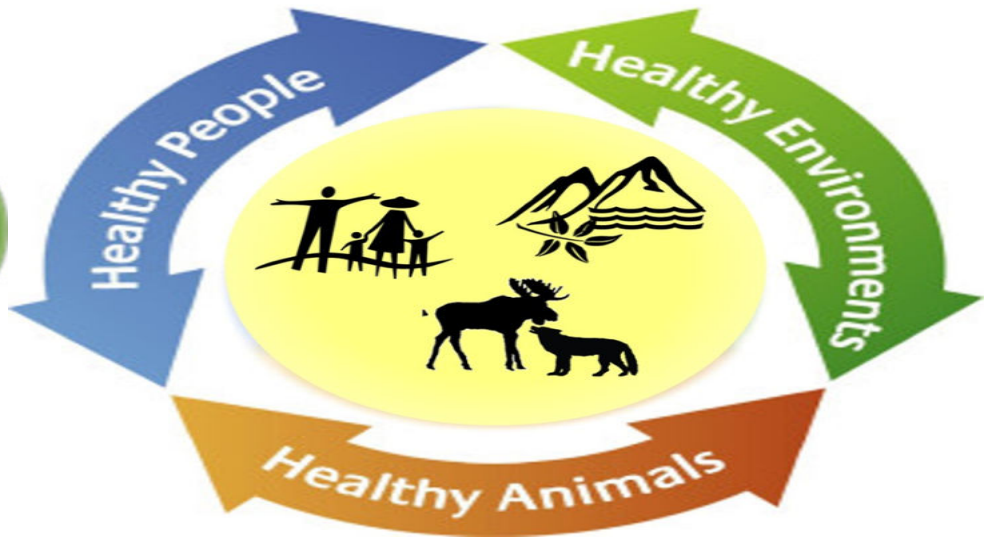
Health and Ill-Health Effects Of Unpolluted and Polluted Environment

Do’s and Don'ts To Maintain Clean and Green Environment

Contents

- What is an Environment?
- Significance of an Environment on Human Health
- **Environmental Pollution and Pollutants :** Types, Sources, Effects on human health Control and Prevention

What Is An Environment ?



- **Environment**
  - the external conditions, circumstances, and influences surrounding and affecting the growth and development of an organism or community of organisms.
- **Environmental Health**
  - study and management of environmental conditions that affect human health
- **Environmental Hazards**
  - factors or conditions in the environment that increase the risk of human injury, disease, or death.

Features Of An Environment

- Next to **Nutrition, Environment** is most important factor for human healthy life
- Environment is **purely a natural e**ntity where human being in his living is surrounded with it.
- **Environment of human being comprises of** : Atmosphere,air,water,soil,radiations,sound ,Temperature etc.
- Environment is **directly and indirectly connected** to human body
- **Natural environment** is balanced and healthy

Environmental Entities

- **Atmosphere**

General

- physical structure
- chemical composition

Outer Atmosphere

- ozone - photochem,

Troposphere

- Sulfur, acid rain
- CO
- NO_x, smog
- CO_2, H_2O
- Climate

- **Water**

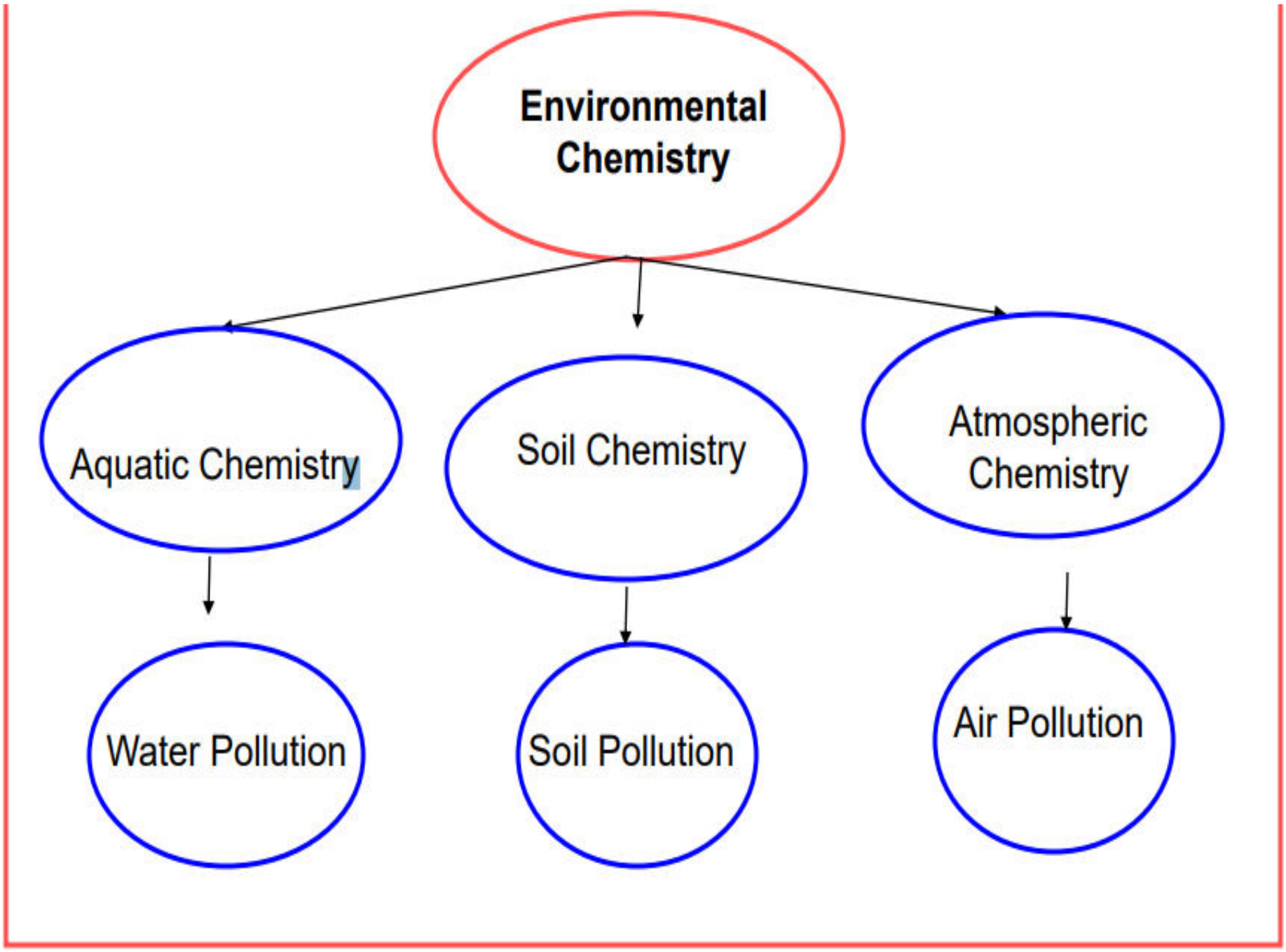
Oceans

- composition, desalination

Fresh water

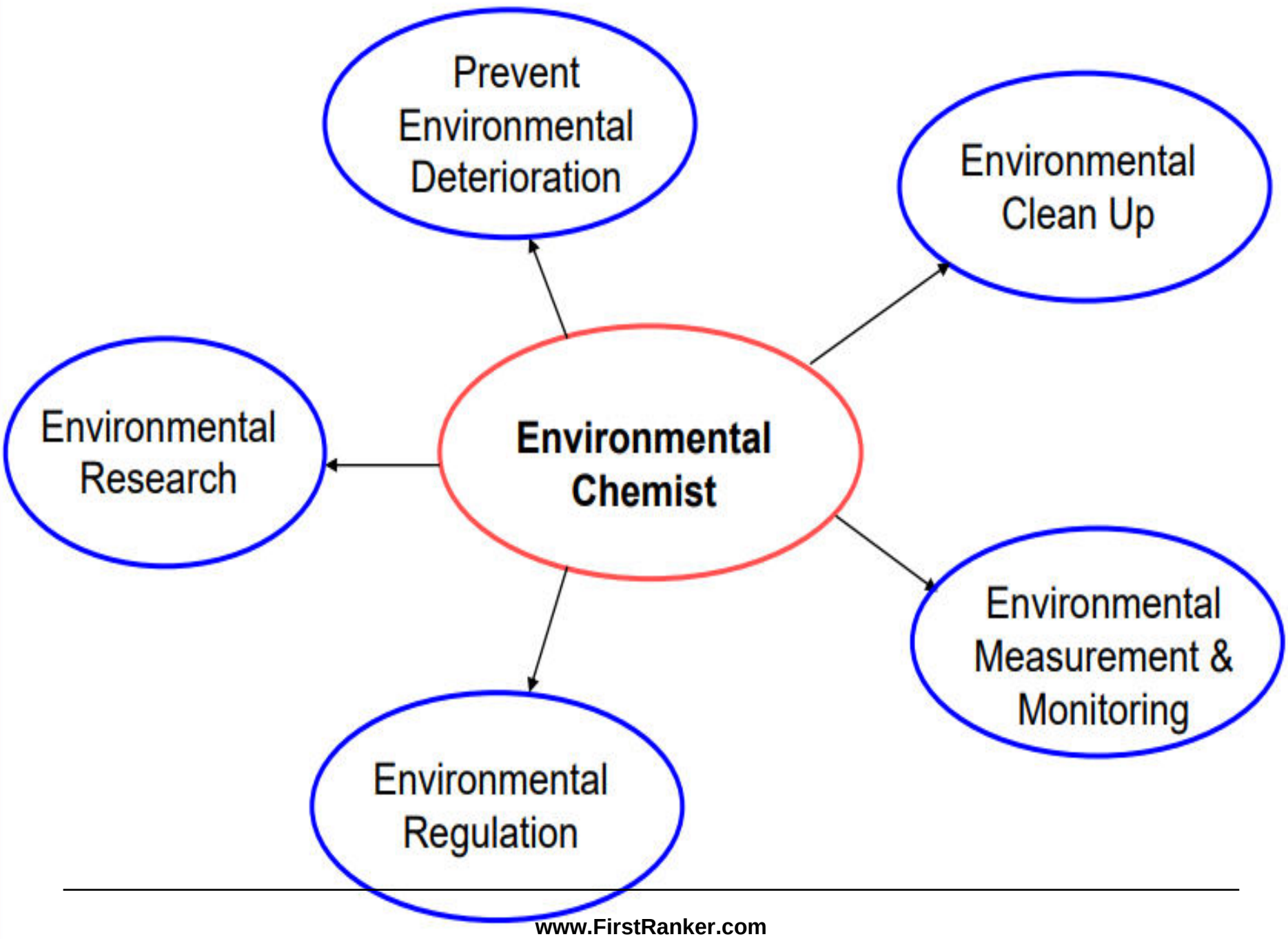
- Oxygen, water treatment

- **"Green Chemistry"**



Human Beings Leaders Of Universe are Responsible For Maintaining State Of An Environment

Significance Of An Environment On Human Health



Close Relationship Of Environment And Human Health

ENVIRONMENT AND HUMAN HEALTH

- Environment and human health are intricately related.
- A good environment is an indication of healthy human beings and a developed nation.
- Now polluted atmosphere has become a serious threat to the very existence of human species.
- Pollution growth and intensification of man's activities on various fronts like agricultural development, urbanisation and industrialisation all over the world have created a hazardous environment.

Environmental Pollutants

Pollutant

Any thing (solid, liquid or gas) that cause pollution is called pollutant

Eg. Lead, sulphuric acid, carbon monoxide,

Types of pollutants

Primary pollutants

Pollutants that are emitted directly from identifiable sources – produced by both natural events or human activities

Eg. Dust storms, emission from vehicles

Secondary pollutants

When certain chemical reactions take place among the primary pollutants

Eg. Sulphuric acid

Primary pollutants

- Carbon oxides (CO2 and CO)
- Nitrogen oxides
- Sulphur oxides
- Volatile organic compounds – hydro carbons
- Suspended particulate matter

	Sources	Pollutants
Anthropogenic pollutants	Combustion: Unvented gas/kerosene heaters	CO, CO_2, NO_3, PAHs
	Combustion: Biomass (wood/coal) for heating/cooking	CO, CO_2, PM, PAHs
	Combustion: Tobacco smoke	CO, CO_2, PM, VOCs, PAHs
	Combustion: Wood (fireplaces), gas ranges – pilot lights	VOCs
	New furniture, solvents, painting, adhesives, insulation, cleaning products, materials for offices	VOCs, formaldehyde
	Building materials, water	Radon
	Allergens: Dust, beds, carpets	Acarides (HDM)
	Allergens: Pets, birds, insects, rodents	
	Allergens: Dampness	Moulds
	Allergens: Plants	Pollens
	Viruses, bacteria	Biological contaminants

Environmental Pollutants Directly Affect Human Health

Toxicity Of Pollutants Depends Upon Amount,Duration,Potency

- Toxicity of pollutants is measured by dose and response
  - **Dose:** An amount that enters body of an exposed organism
  - **Response:** An amount of damage caused by a specific dose
- **LD_{50}**
  - Lethal dose to 50% of test organisms
  - Smaller LD_{50} more lethal is the chemical
  - Determined for all new synthetic chemicals

Table 7.1 LD_{50} Values for Selected Chemicals

Chemical	*LD_{50} (mg/kg)**
Aspirin	1750.0
Ethanol	1000.0
Morphine	500.0
Caffeine	200.0
Heroin	150.0
Lead	20.0
Cocaine	17.5
Sodium cyanide	10.0
Nicotine	2.0
Strychnine	0.8

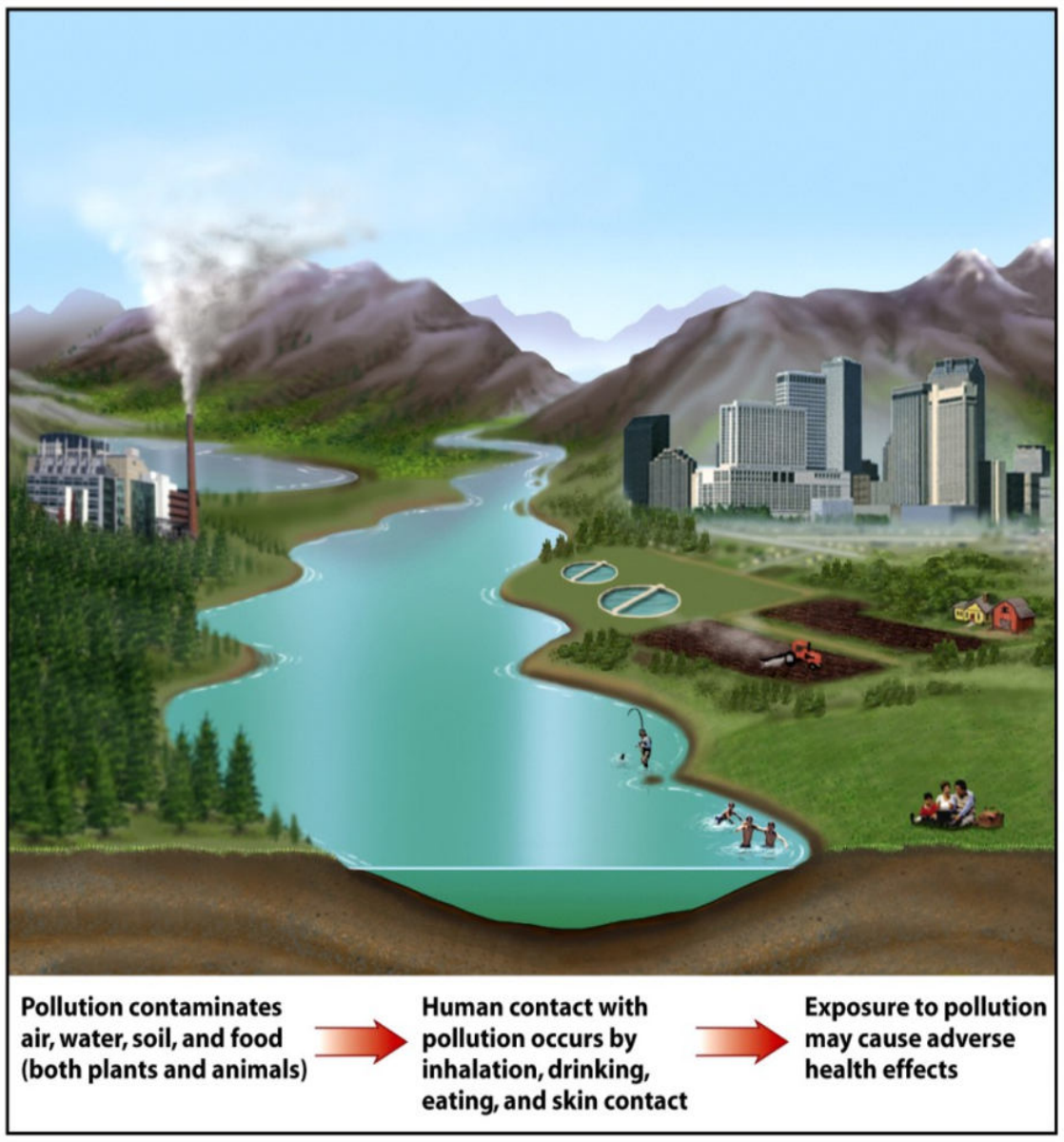
* Administered orally to rats.
Source: M. D. Josten and J. L. Wood

Toxicity

- **ED_{50}**
  - Effective dose to 50% of test organisms
  - ED_{50} causes 50% of population to exhibit whatever effect is under study
- **Dose-Response Curve**
  - Illustrates an effect of different doses on a population
  - Threshold Level
    - Maximum dose with no measurable effects

Environmental Pollutants and Disease

- Often difficult to link pollutants to their effects on people
  - **Persistence**
  - **Bioaccumulation**
  - **Biomagnification**



Persistence

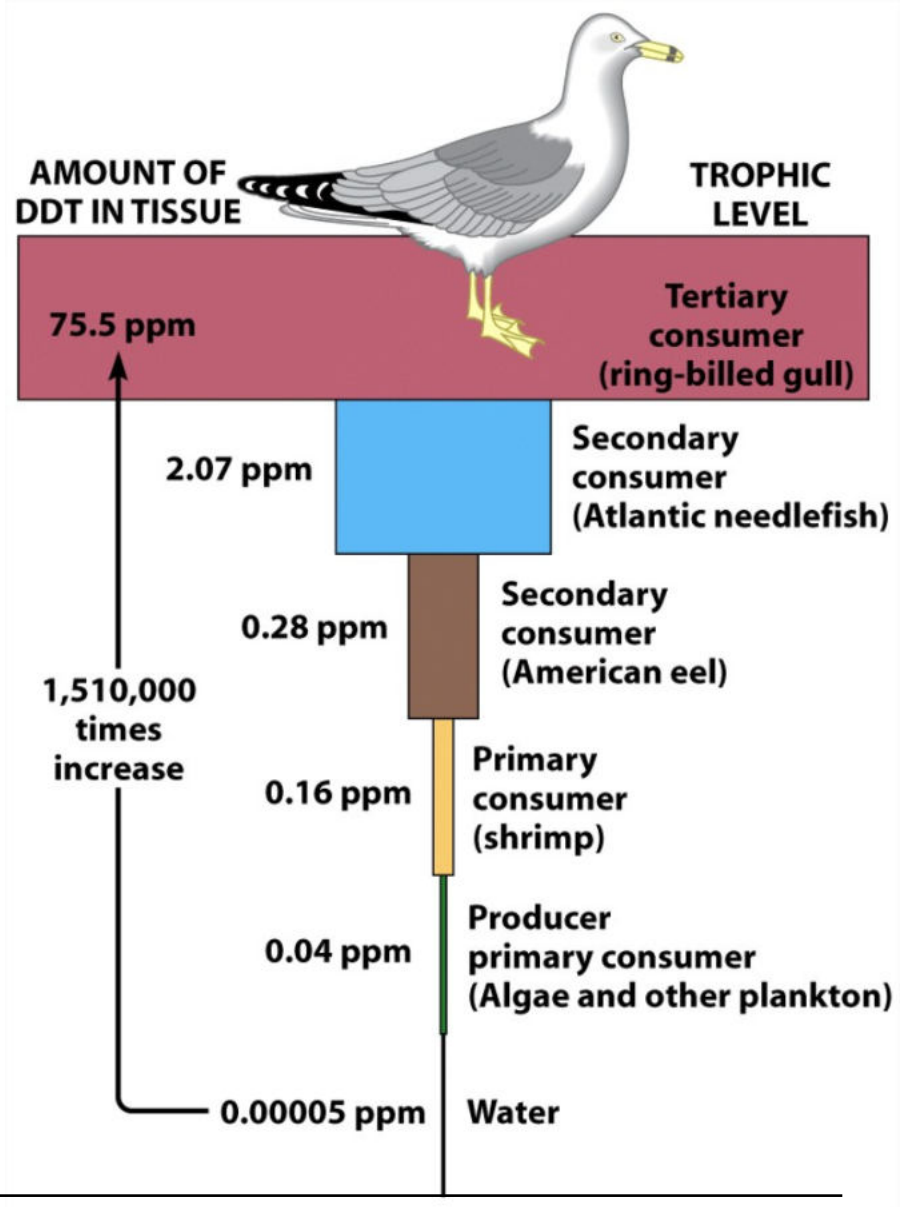
- A characteristic of certain chemicals that are extremely stable and may take many years to be broken down into simpler forms by natural processes
  - Synthetic chemicals (those not found in nature)
  - Ex: DDT
- Natural decomposers (bacteria) have not evolved a way to break it down

Bioaccumulation

- Buildup of a persistent toxic substance in an organism's body, often in fatty tissues
  - Synthetic chemical do not metabolize well
  - They remain in body for extended periods of time

Biomagnification

- An increased concentration of toxic chemicals in tissues of organisms that are at higher levels in food webs
- Diagram is example of biomagnification of DDT



Groupings of Chemical Pollutants:

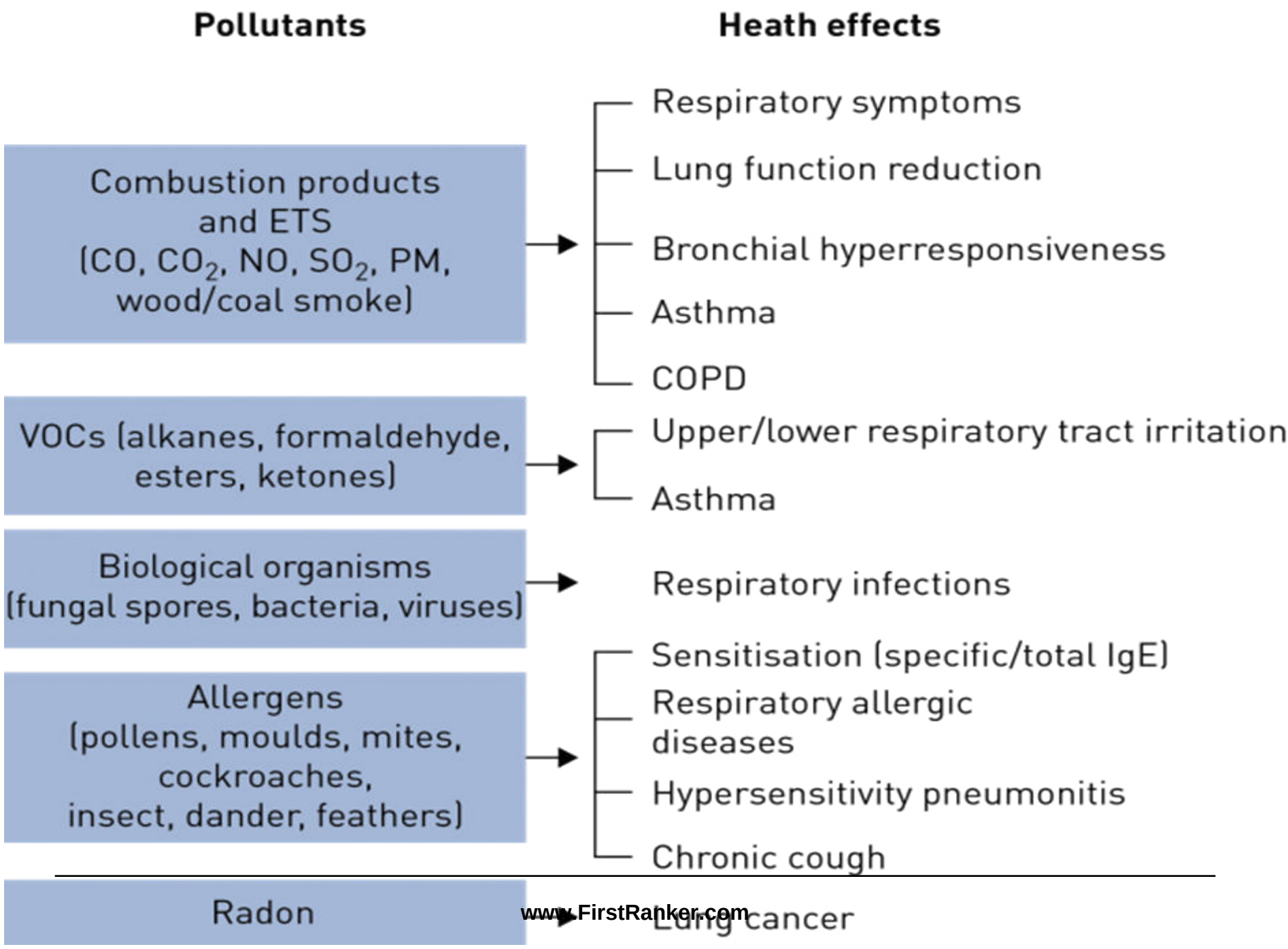
Grouping	Grouped According to:
EDC (Endocrine Disrupting Chemical) **CMR** (Carcinogenic, Mutagenic, toxic to Reproduction)	toxicological mode of action or endpoint
PBT (Persistent, Bioaccumulative Toxic) **vPvB** (very Persistent, very Bioaccumulative) **POP** (Persistent Organic Pollutant)	environmental properties
PPCPs	type of intended usage
priority pollutants and others	legislation
"**emerging" contaminants/pollutants**	novelty, fad, timeliness, or new concern

PPCPs as Environmental Pollutants

- PPCPs are a diverse group of chemicals comprising all human and veterinary drugs (available by prescription or over-the-counter; including new genre of "biologics"
- **Diagnostic agents** (X-ray contrast media)
- **Nutraceuticals** (bioactive food supplements such as huperzine A)
- **Fragrances,Perfumes,Deos Sprays** (e.g., musks)
- **Sun-screen agents** (e.g., 4-methylbenzylidene camphor octocrylene)
- **Excipients** (so called "inert" ingredients used in PPCP manufacturing and formulation; e.g., parabens)

Mechanism of Environmental Pollutants

- Environmental pollutant of physical, chemical or biological origin
- Interacts with various biomolecules of human body as per specific affinity
- Accumulate in cells and tissues
- Disturb biomolecule structural features
- Distract biomolecules from true function
- Loads immune system, liver and kidneys
- Alter normal health
- Leads to ill-effects/disorders- Anemia,Cancers



OVERVIEW OF HEAVY METALS

HEAVY METALS	DESCRIPTION	SOURCE	HEALTH EFFECTS
MERCURY	Most volatile, highly toxic in vapour.	Incineraton of municipal waste, electrical switches, fluorescent light bulbs and mercury bulbs.	Skin burns, damage to the kidneys,severe brain damage, damage to vision.
CADMIUM	It most toxic, it lies in the same sub group of the periodic table.	Cigarette smoke, fertilizer and pesticides, photovoltaic device in tv screens.	Kidney problems, bone diseases, severe pain in joints.
LEAD	Low melting point, structural metal, water ducts in cooking vessels.	Batteries and sinkers in fishing, pipes paints, ceramics.	Neurological and reproductive system effects, blood brain barrier effects.
ARSENIC	Similar to phosphorous, common poison used for murder and suicide.	Pesticides, herbicides, tobacco smoke, wood preservative.	Diarrhea, severe vomiting, GI-damage.

Pollutant	Description	Sources	Health Effects	Welfare Effects
Carbon Monoxide (CO)	Colorless, odorless gas	Motor vehicle exhaust, indoor sources include kerosene or wood burning stoves.	Headaches, reduced mental alertness, heart attack, cardiovascular diseases, impaired fetal development, death.	Contribute to the formation of smog.
Sulfur Dioxide (SO_2)	Colorless gas that dissolves in water vapor to form acid, and interact with other gases and particles in the air.	Coal-fired power plants, petroleum refineries, manufacture of sulfuric acid and smelting of ores containing sulfur.	Eye irritation, wheezing, chest tightness, shortness of breath, lung damage.	Contribute to the formation of acid rain, visibility impairment, plant and water damage, aesthetic damage.
Nitrogen Dioxide (NO_2)	Reddish brown, highly reactive gas.	Motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.	Susceptibility to respiratory infections, irritation of the lung and respiratory symptoms (e.g., cough, chest pain, difficulty breathing).	Contribute to the formation of smog, acid rain, water quality deterioration, global warming, and visibility impairment.
Ozone (O_3)	Gaseous pollutant when it is formed in the troposphere.	Vehicle exhaust and certain other fumes. Formed from other air pollutants in the presence of sunlight.	Eye and throat irritation, coughing, respiratory tract problems, asthma, lung damage.	Plant and ecosystem damage.
Lead (Pb)	Metallic element	Metal refineries, lead smelters, battery manufacturers, iron and steel producers.	Anemia, high blood pressure, brain and kidney damage, neurological disorders, cancer, lowered IQ.	Affects animals and plants, affects aquatic ecosystems.
Particulate Matter (PM)	Very small particles of soot, dust, or other matter, including tiny droplets of liquids.	Diesel engines, power plants, industries, windblown dust, wood stoves.	Eye irritation, asthma, bronchitis, lung damage, cancer, heavy metal poisoning, cardiovascular effects.	Visibility impairment, atmospheric deposition, aesthetic damage.

Endocrine Disrupters

- A chemical that mimics or interferes with the actions of the endocrine system in humans and wildlife
  - i.e. It effects the ability of the hormones in the organisms to function properly
- Examples include:
  - PCBs, Dioxins
  - Heavy metals – lead and mercury
  - DDT
- Animals exposed to these chemicals have altered reproductive development and are often sterile

Endocrine Disrupters and Humans

- Infertility and hormonally related cancers are increasing
  - Breast cancer and testicular cancer
- Phthalates have been implicated as potential endocrine disrupters
  - Common ingredient in: cosmetics, fragrances, nail polish, medication, toys, food packaging
- Cannot make a link between endocrine disrupters and human illness
  - Too few studies have been performed

Determining Health Effects of Pollutants

- Toxicants to human body
  - Toxicant- chemical with adverse human health effects
- **Acute toxicity**
  - Adverse effects occur within a short period after exposure to toxin
- **Chronic toxicity**
  - Adverse effects occur some time after exposure, or after prolonged exposure to toxin
  - Symptoms often mimic other diseases- hard to assess source

Children and Chemical Exposure

- **Children are more susceptible to chemicals**
  - **Weigh less than adults**
  - **Bodies are still developing**
  - **Play on floors and lawns**
    - **Exposed to cleaning products and pesticides**
  - **Put things into their mouths**

Exposure Of Chemical Mixtures

- Generally humans body is exposed to chemical mixtures
  - **Ex: automobile exhaust**

- Chemical Mixtures interact by
  - **Additivity**
  - **Synergy**
  - **Antagonism**

Risk Assessment

- Risk- probability that a particular adverse effect will result from some exposure or condition

- **We assess risk daily with four steps:**

1. Hazard identification
2. Dose response assessment
3. Exposure assessment
4. Risk characterization

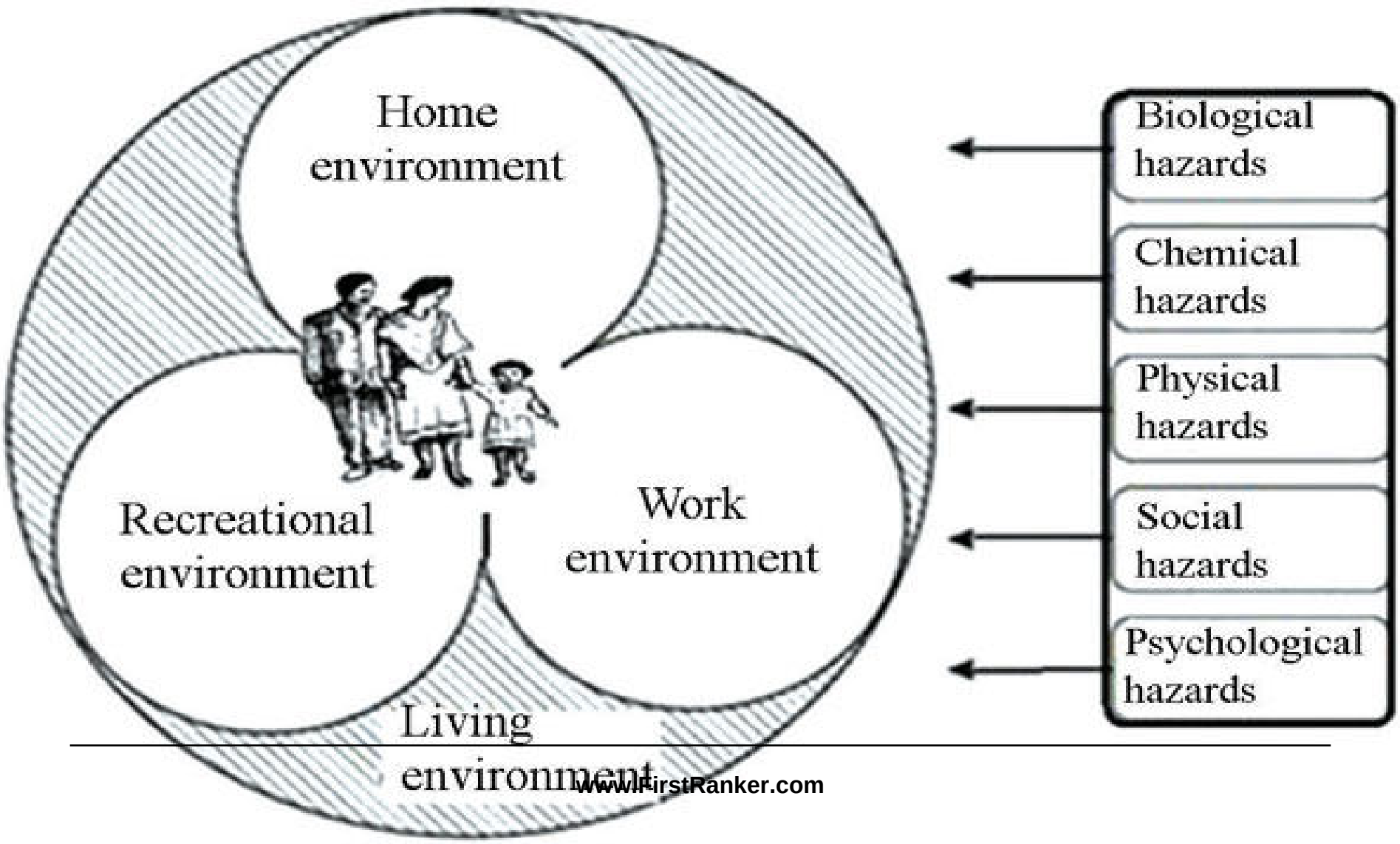
WHO IS AT RISK OF CLIMATE CHANGE?

Those living in poverty, as well as women, children and the elderly.

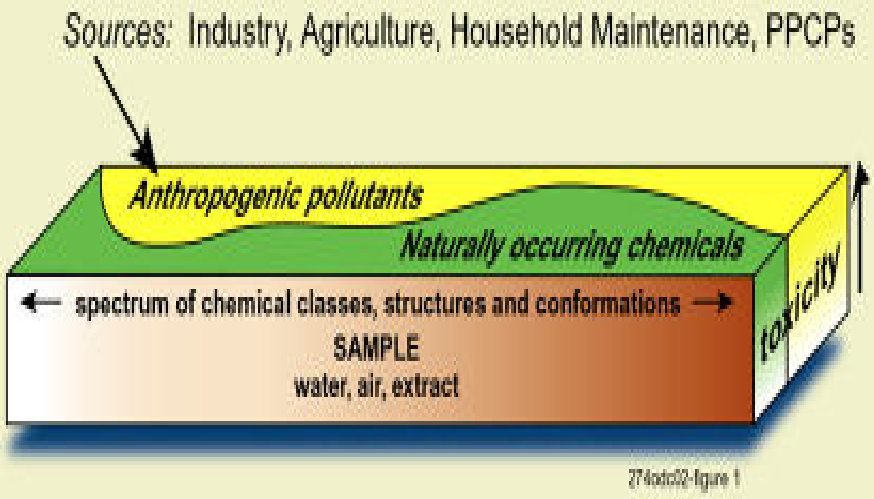
Outdoor workers and people living with chronic medical conditions.

Children are the most vulnerable due to long exposure to environmental risks.

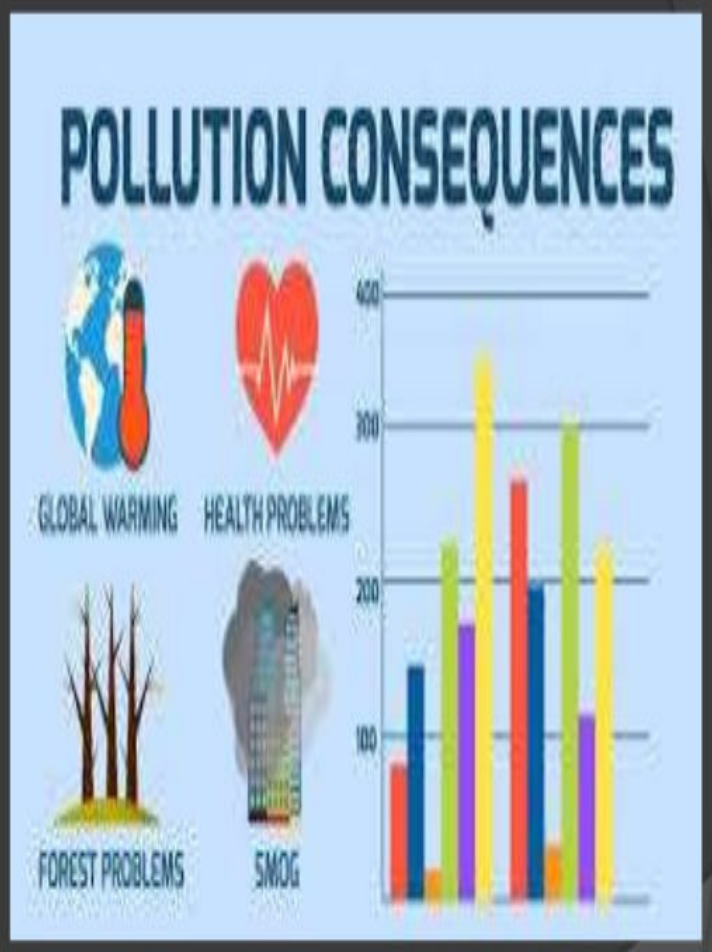
Environmental Hazards



Universe of Chemicals in the Environment



For more discussion, see:
http://epa.gov/nerlesd1/chemistry/pharma/critical.htm



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ENVIRONMENTAL POLLUTION

- Environmental Pollution can be defined as any undesirable change in **physical, chemical**, or **biological** characteristics of any component of the environment i.e. air, water, soil which can cause harmful effects on various forms of life or property.
- **Pollution:** The term pollution can be defined as influence of any substance causing **nuisance, harmful effects**, and **uneasiness** to the organisms
- **Pollutant:-** Any substance causing **Nuisance** or **harmful effects** or **uneasiness** to the organisms, then that particular substance may be called as the pollutant.

POLLUTION:- (ªÀiÁ°£Àå)

- Pollution may be defined as addition of undesirable material into the environment as a result of human activities.
- Pollution is the introduction of harmful substances or products into the environment.
- Pollution means make earth dirty or non-beautiful planet by adding a harmful chemical or any other substances.

Types of Pollution

Air	Water	Land or Soil
Noise	Thermal	Nuclear

Types of Pollution

Degradable

Non-degradable

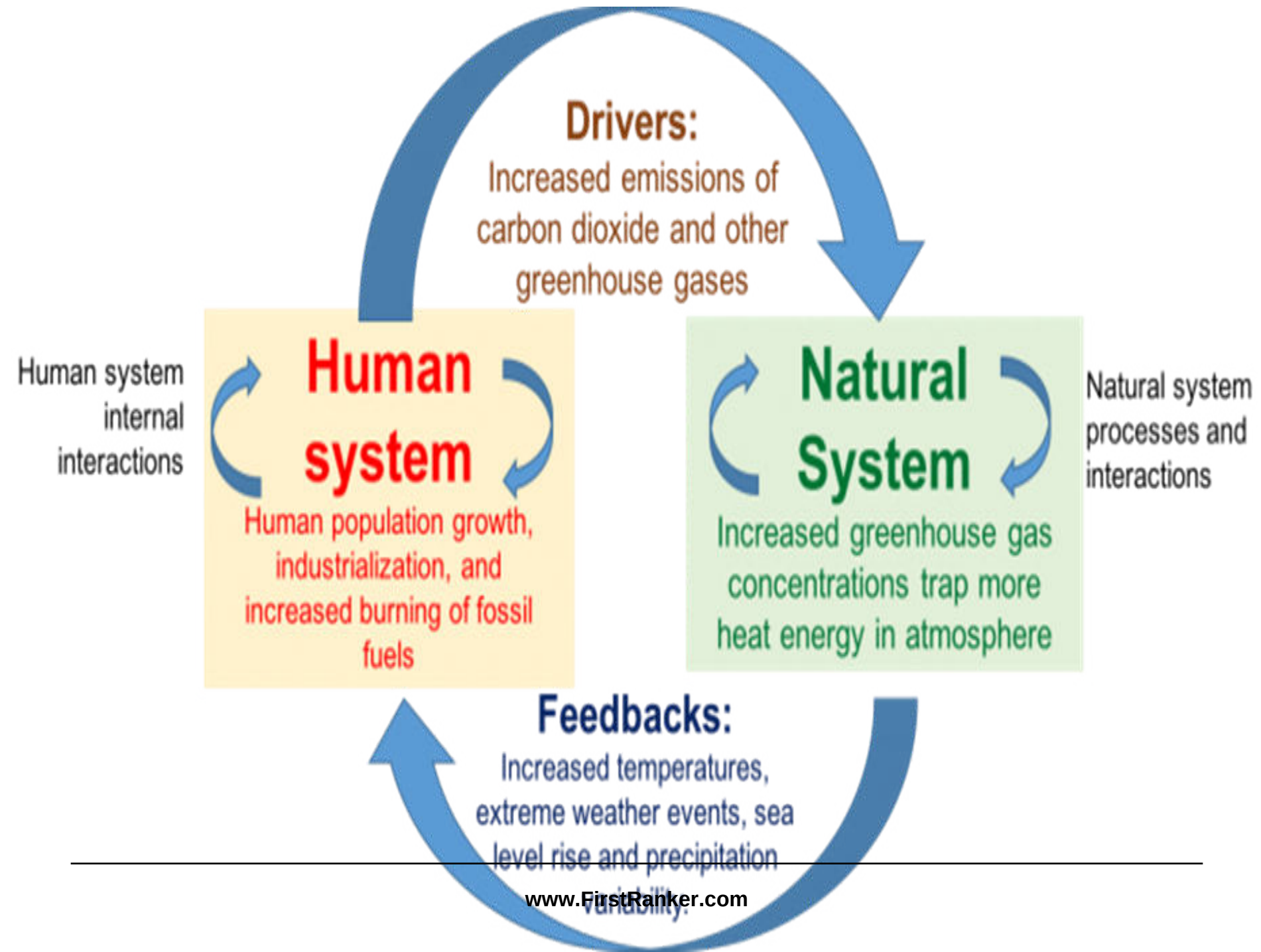
Degradable: Those can be readily broken down by natural processes

Eg. Discarded vegetables

Non-degradable: Those can not be degraded by natural processes

Eg.plastics

- **Pollution:**
  - Pollution is the introduction of contaminants into a natural environment that causes instability, disorder, harm or discomfort to the ecosystem .Pollution can take the form of chemical substances or energy such as noise, heat or light.
- **Types of Pollution:**
  - Air pollution
  - Water pollution
  - Land pollution
  - Noise pollution



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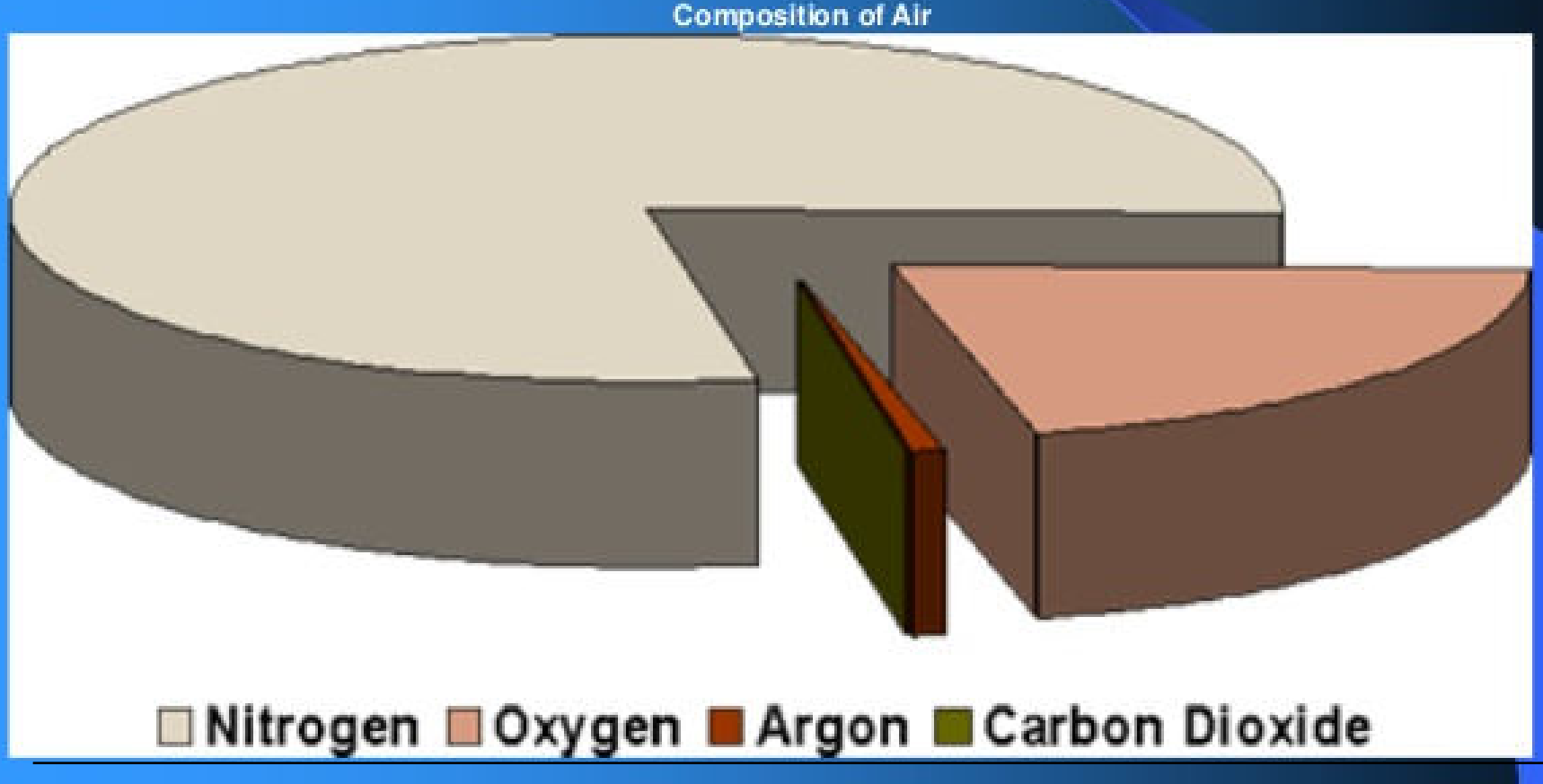
Composition of Air



Composition of Atmosphere

- Composition of gases in an atmosphere is not uniform.
- Lighter gases tend to rise to top.

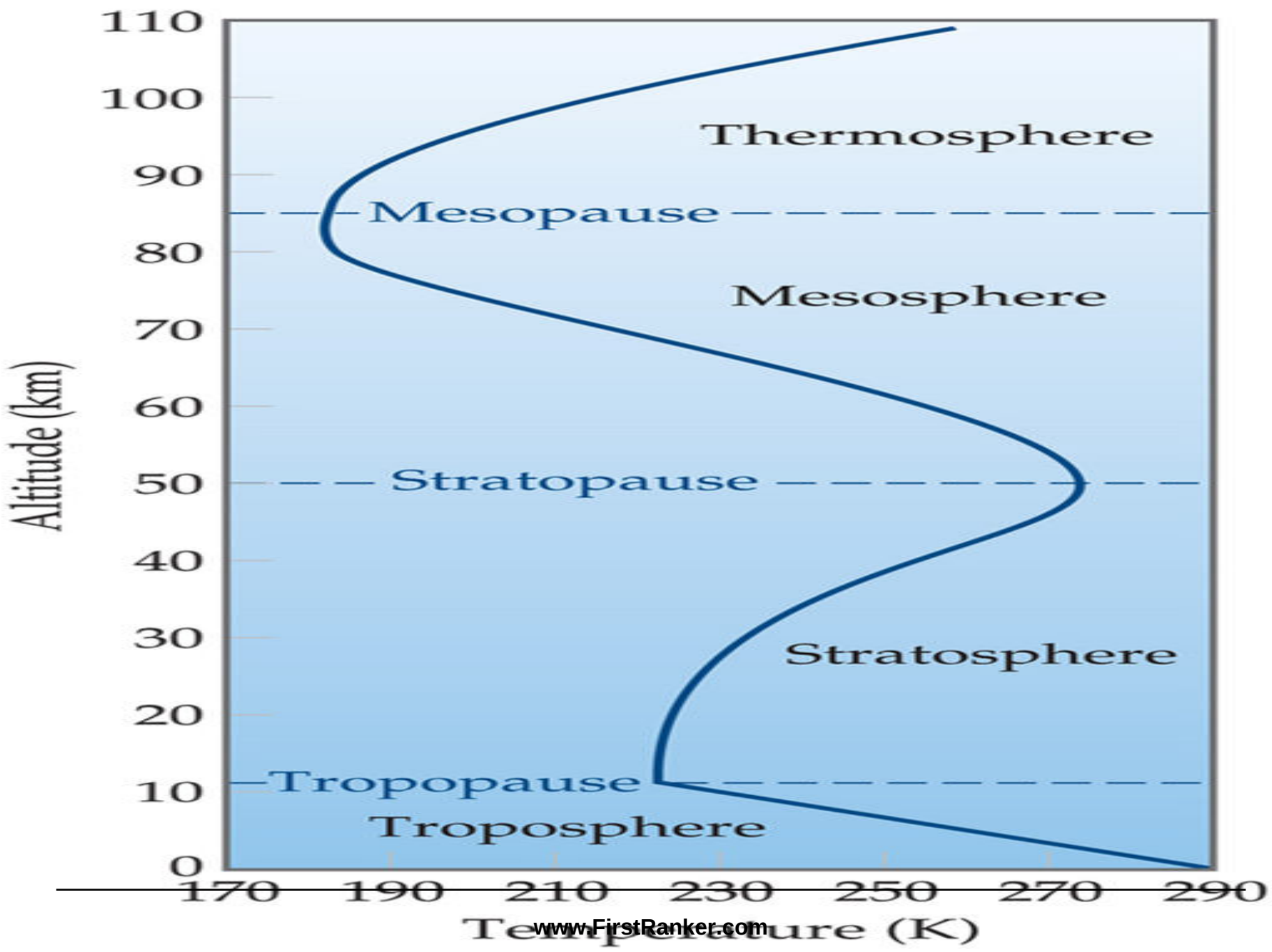
TABLE 18.1 Composition of Dry Air Near Sea Level

Component*	Content (mole fraction)	Molar Mass
Nitrogen	0.78084	28.013
Oxygen	0.20948	31.998
Argon	0.00934	39.948
Carbon dioxide	0.000375	44.0099
Neon	0.00001818	20.183
Helium	0.00000524	4.003
Methane	0.000002	16.043
Krypton	0.00000114	83.80
Hydrogen	0.0000005	2.0159
Nitrous oxide	0.0000005	44.0128
Xenon	0.000000087	131.30

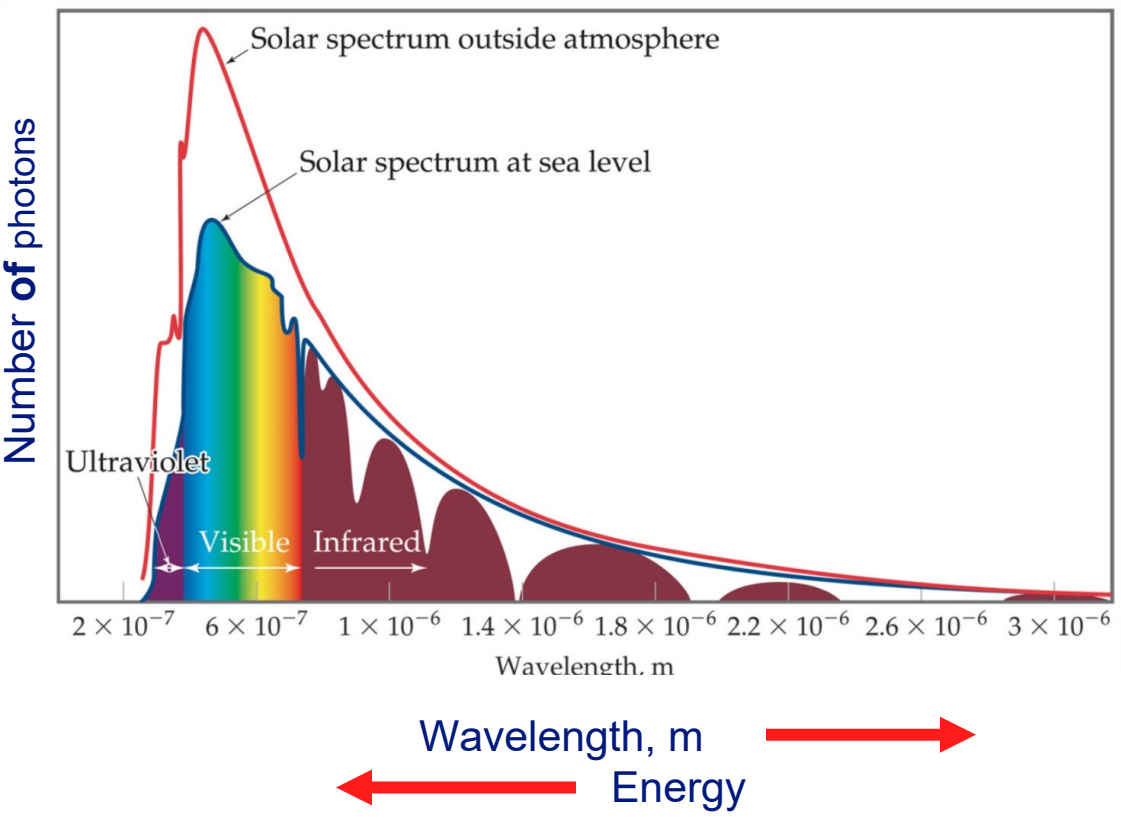
*Ozone, sulfur dioxide, nitrogen dioxide, ammonia, and carbon monoxide are present as trace gases in variable amounts.

Gases are measured in ppm *volume (μL/L)*, which is directly proportional to mole fraction.

$$mole\ fraction \times 10^6 = ppm$$



Outer Atmosphere

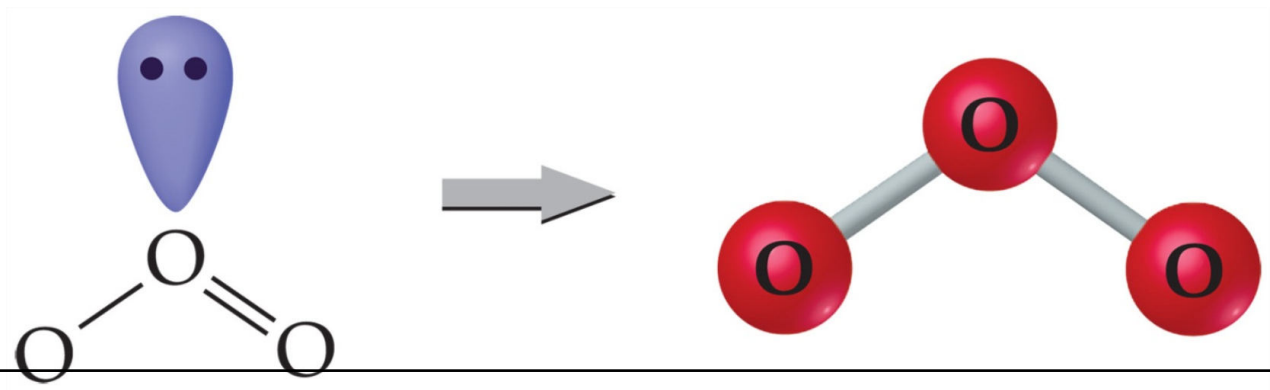


- Sun emits radiation across an electromagnetic spectrum.
- Light in an ultraviolet region has enough energy to break chemical bonds.

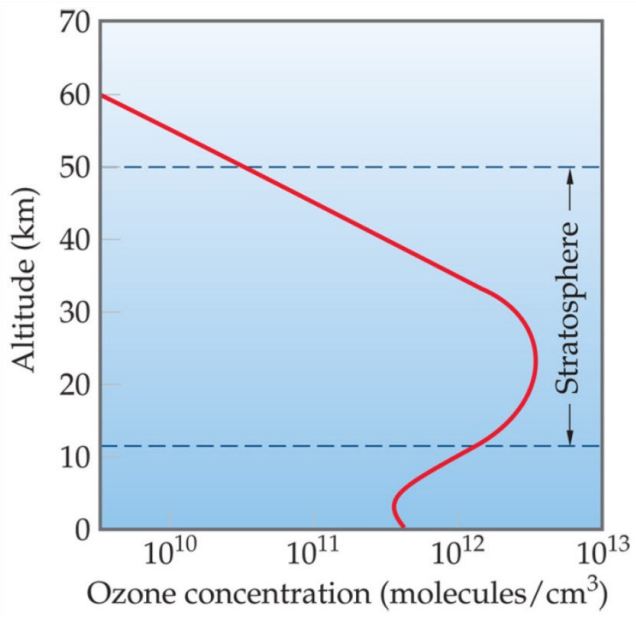
Ozone

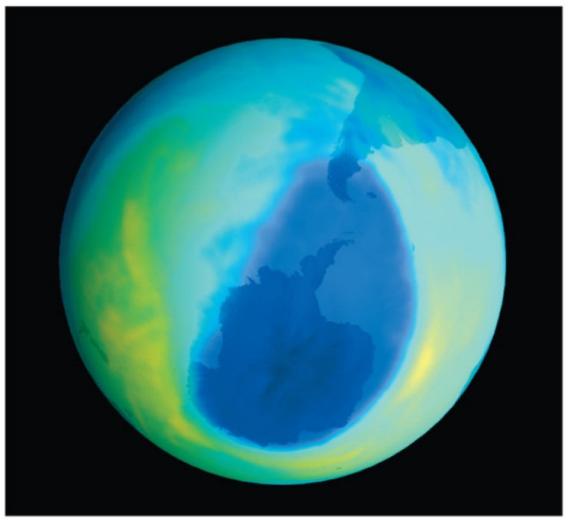
- Ozone absorbs much of radiation between 240 and 310 nm.
- It forms from reaction of molecular oxygen with an oxygen atoms produced in upper atmosphere by photodissociation (< 242 nm).

$$O + O_2 \longrightarrow O_3$$



Ozone Depletion





In 1974 Rowland and Molina (Nobel Prize, 1995) discovered that chlorine from chlorofluorocarbons (CFCs) may be depleting the supply of ozone in the upper atmosphere.

Troposphere

Although Troposphere is made up almost entirely of nitrogen and oxygen, other gases present in relatively small amounts still have a profound effect on troposphere.

Minor Constituent	Sources	Typical Concentrations
Carbon dioxide, CO_2	Decomposition of organic matter; release from the oceans; fossil-fuel combustion	375 ppm throughout the troposphere
Carbon monoxide, CO	Decomposition of organic matter; industrial processes; fossil-fuel combustion	0.05 ppm in unpolluted air; 1–50 ppm in urban traffic areas
Methane, CH_4	Decomposition of organic matter; natural-gas seepage	1.77 ppm throughout the troposphere
Nitric oxide, NO	Electrical discharges; internal combustion engines; combustion of organic matter	0.01 ppm in unpolluted air; 0.2 ppm in sm
Ozone, O_3	Electrical discharges; diffusion from the stratosphere; photochemical smog	0 to 0.01 ppm in unpolluted air; 0.5 ppm in photochemical smog
Sulfur dioxide, SO_2	Volcanic gases; forest fires; bacterial action; fossil-fuel combustion; industrial processes	0 to 0.01 ppm in unpolluted air; 0.1–2 ppm in polluted urban environment

Radiation

Aurora Formed here { Atmosphere is first line of defense against radiation from Sun.

Chlorofluorocarbons

CFCs were used for years as aerosol propellants and refrigerants.

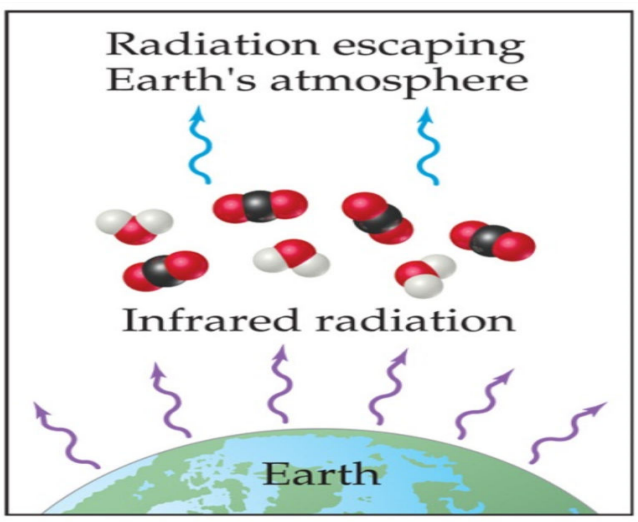
Mostly = $CFCl_3$, CF_2Cl_2.

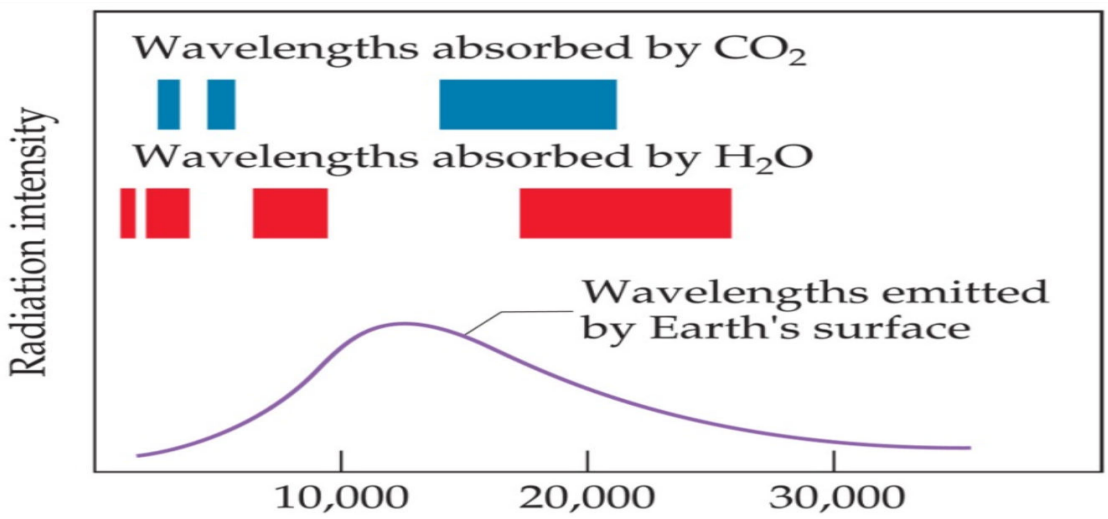
They are not water soluble (so they do not get washed out of the atmosphere by rain)

and are quite unreactive (so they are not degraded naturally).

Water Vapor and Carbon Dioxide

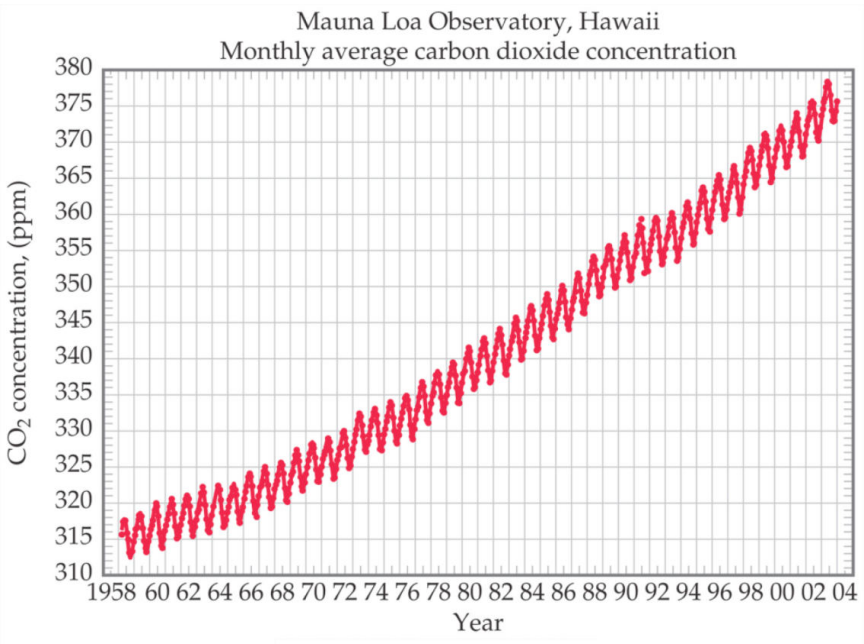
- Gases in an atmosphere form an insulating blanket that causes the Earth's thermal consistency.
- Two of the most important such gases are carbon dioxide and water vapor.





Water Vapor and Carbon Dioxide

- This blanketing effect is known as the "greenhouse effect."
- Water vapor, with its high specific heat, is a major factor in this moderating effect.
- But increasing levels of CO_2 in an atmosphere is causing an increase in global temperatures.



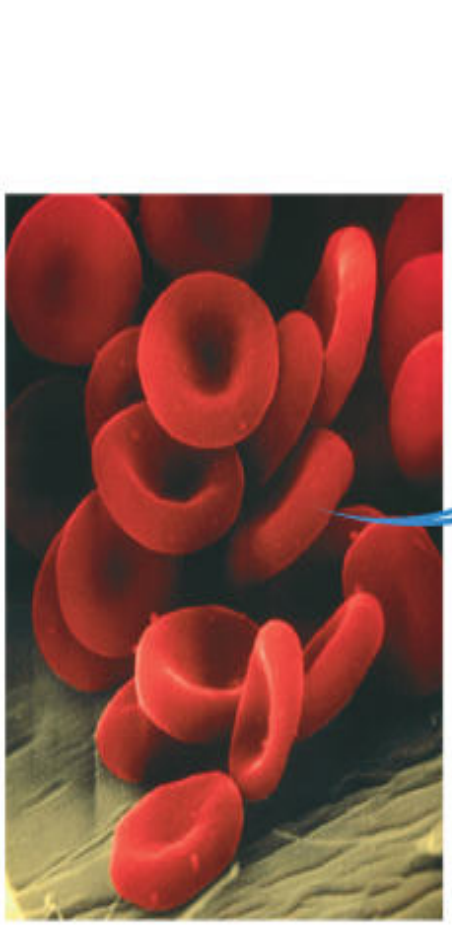
Sulfur

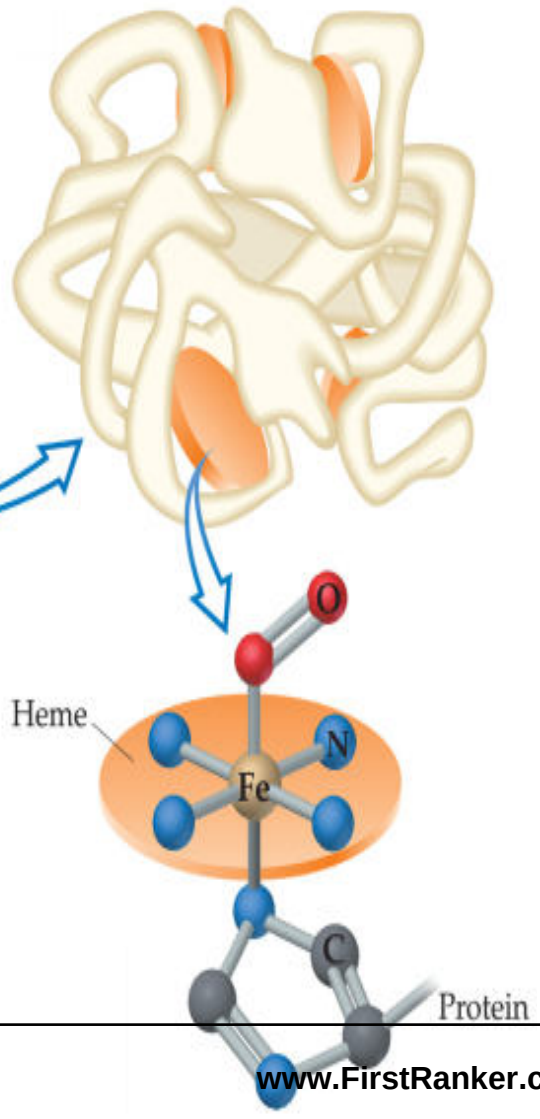
- Sulfur dioxide is a by-product of burning of coal or oil.
- It reacts with moisture in air to form sulfuric acid.
- It is primarily responsible for **acid rain.**

$$SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$$

$$H_2SO_4(aq) \rightarrow 2H^+(aq) + SO_4^{2-}(aq)$$

Carbon Monoxide





- Carbon monoxide binds preferentially to the iron in red blood cells.
- Exposure to CO can lower O_2 levels to the point of causing loss of consciousness and death

Nitrogen Oxides

- What we recognize as smog, that brownish gas that hangs above large cities like Los Angeles, is primarily nitrogen dioxide, NO_2.
- It forms from the oxidation of nitric oxide, NO, a component of car exhaust.

$$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$$

Smog

- "Smog" = smoke + fog
  - coined in 1905 to describe sulfur dioxide emissions
- A mixture of oxidants and particulate matter that caused haze, reduced sunlight and health effects.
- Can come from natural and anthropogenic sources

Name:	**London smog** (New York smog, gray smog)	**Photochemical smog** (L.A. smog, Denver smog, brown smog)
Weather:	cool, damp	sunny
Content:	particulates, sulfur oxides	NO_x, ozone, hydrocarbons.
Sources:	coal, etc.	gasoline, combustion.

Formation of Photochemical Smog

- The term smog was derived from the words 'fog' and 'smoke'. The term was first used in 1905 by H.A. Des Voeux.
- VOCs and NOx react in presence of sunlight to produce ozone and PAN (peroxy acetyl nitrate)
- breathing ozone results in respiratory distress, headaches.
- In 1952 the London smog incident killed 6, 500 people .
- In 1963, New York City smog incident killed 400 people.

Photochemical Smog

Smog also contains ozone, carbon monoxide, hydrocarbons, and particles.

TABLE 18.5 National Tailpipe Emission Standards*

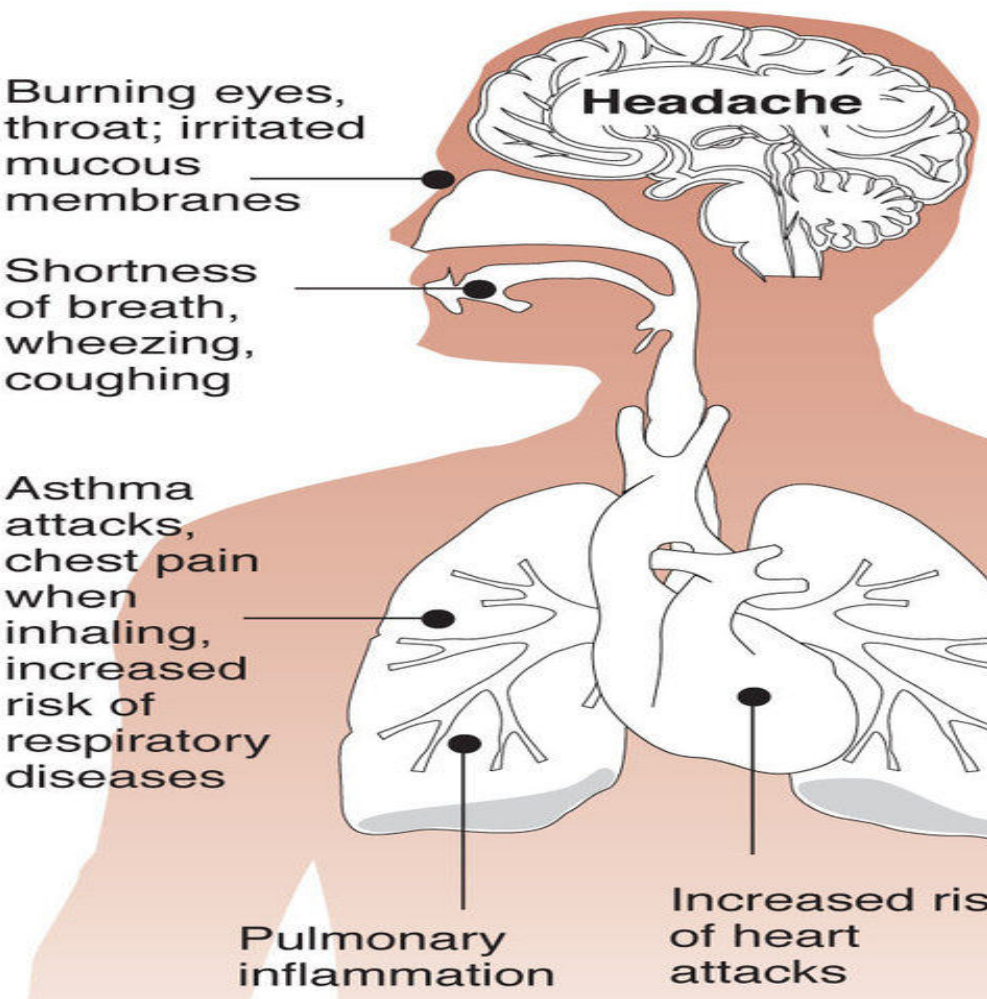
Year	Hydrocarbons (g/mi)	Nitrogen Oxides (g/mi)
1975	1.5 (0.9)	3.1 (2.0)
1980	0.41 (0.41)	2.0 (1.0)
1985	0.41 (0.41)	1.0 (0.4)
1990	0.41 (0.41)	1.0 (0.4)
1995	0.25 (0.25)	0.4 (0.4)
2004	0.075 (0.05)	0.07 (0.05)

*California standards in parentheses

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

N + O

4 **Ozone** formed by three oxygen atoms — O_3

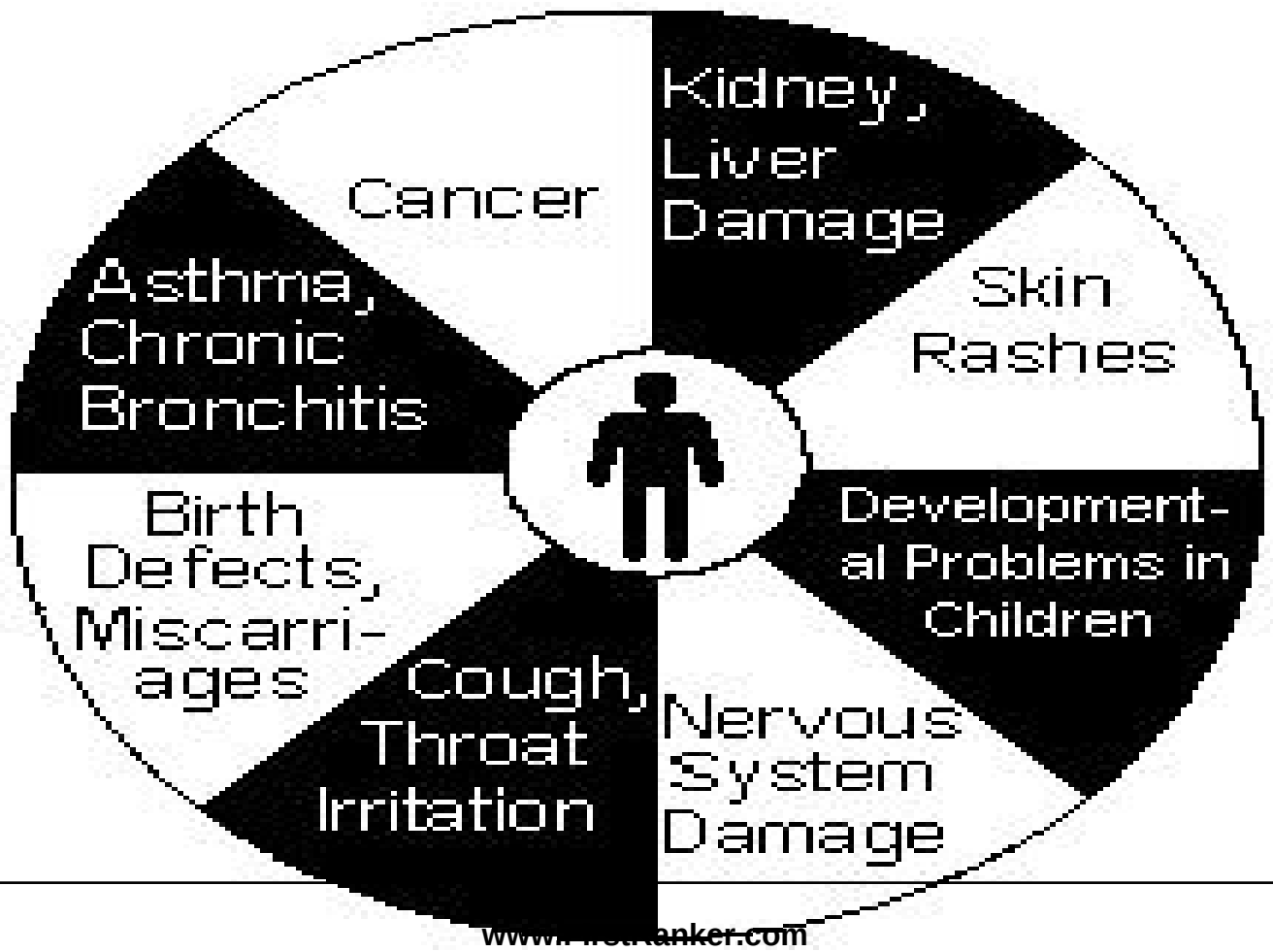
U.S. ozone limits

In parts per billion

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

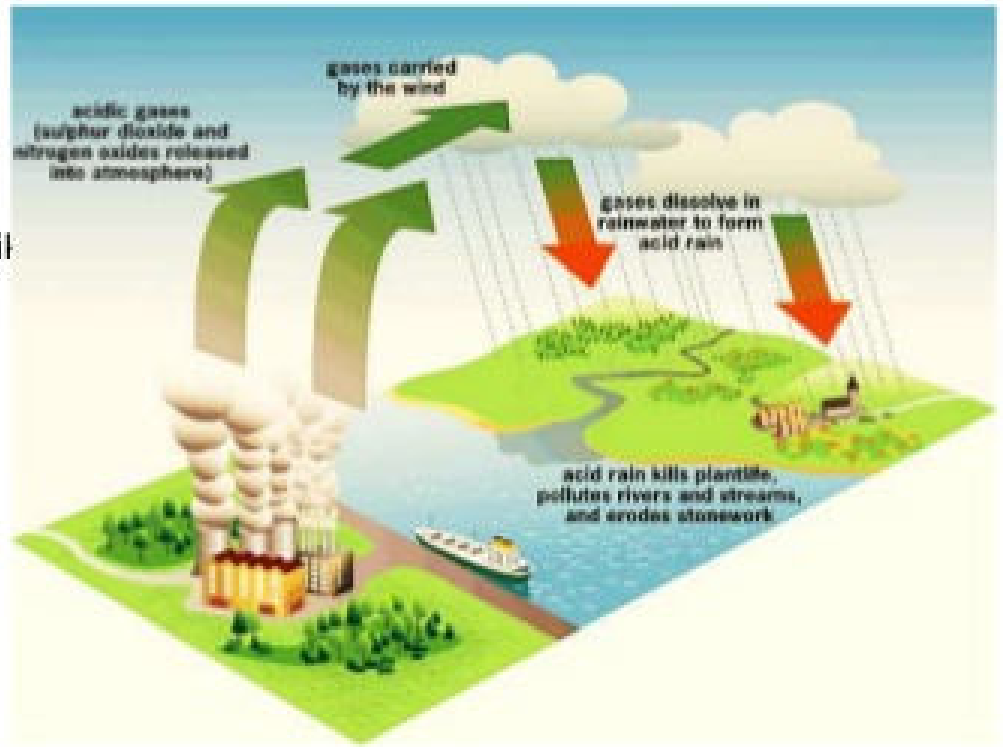
Source: American Lung Association, State of the Air 2008, AP Graphic: Staff

Effect of Photochemical Smog on Human Health



Air Pollution

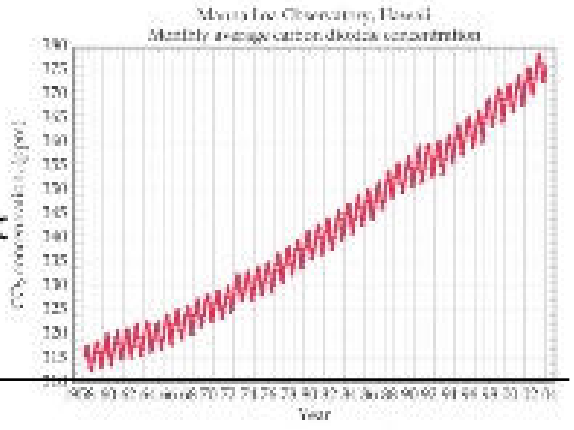
- **Definition:**
  - Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment into the atmosphere.
- **Air Pollution Causes by:**
  - Industries.
  - Automobiles and Domestic fuels
  - Fire
  - High Proportion of undesirable gases li
    - sulphur dioxide
    - carbon monoxide
- **Air Pollution Effects:**
  - Human health
  - Animals
  - Plants
  - The atmosphere as a whole
  - Acid rain



ATMOSPHRIC POLLUTION

- Addition of undesirable materials into the atmosphere by natural phenomena or by human activity.
- Air pollution changes the quality of the air and affects flora & fauna.
- Air pollutants are Gases and Particulatse
- Gasses are oxides of sulphur & nitrogen, hydrocarbons, ozone and other oxidants etc
- Source for Pollution;

  Natural (1/3), Vehicles, Domestic, Industries ,
  - Volcano, erosion, photo dissociation/ photoionisatic
  - Burning of fossil fuel, Waste incineration
  - Emission from industries, etc



ATMOSPHRIC POLLUTION

- **Dust:** is fine solid particles produced during crushing, grinding and attribution of solid materials. Cement and fly ash from factories etc.
- **Mists:** are produced by particles of spray liquids and by condensation of vapours in air.
- **Fumes/ vapours:** are generated by various operation like chemical reactions, condensation, sublimation, distillation, boiling etc...
- **Air borne particles are dangerous for human health**

ATMOSPHRIC POLLUTION

- SMOG (smoke and fog): common air pollution from major cities
- Classical smog or reducing smog: it occurs in cool humid climate. It is the mixture of smoke, fog and sulphur dioxide.
- Photochemical smog: occurs in warm, dry and sunny climate. Reaction components due chain reaction by sunlight on unsaturated hydrocarbons and nitrogen oxides and free oxygen atom
- It has high concentration of oxidizing agents and is, therefore, called as oxidizing smog.
  - $NO_2 + O_2 + h\nu \rightarrow NO + O_3$
  - $O_3 + h\nu \rightarrow O + O_2$
  - $O + H_2O \rightarrow 2\ \mathbf{OH}$ [OH] ~ 10^6 molecules/cc
  - OH radical is dominant oxidizer in troposphere!

Effects of air pollution

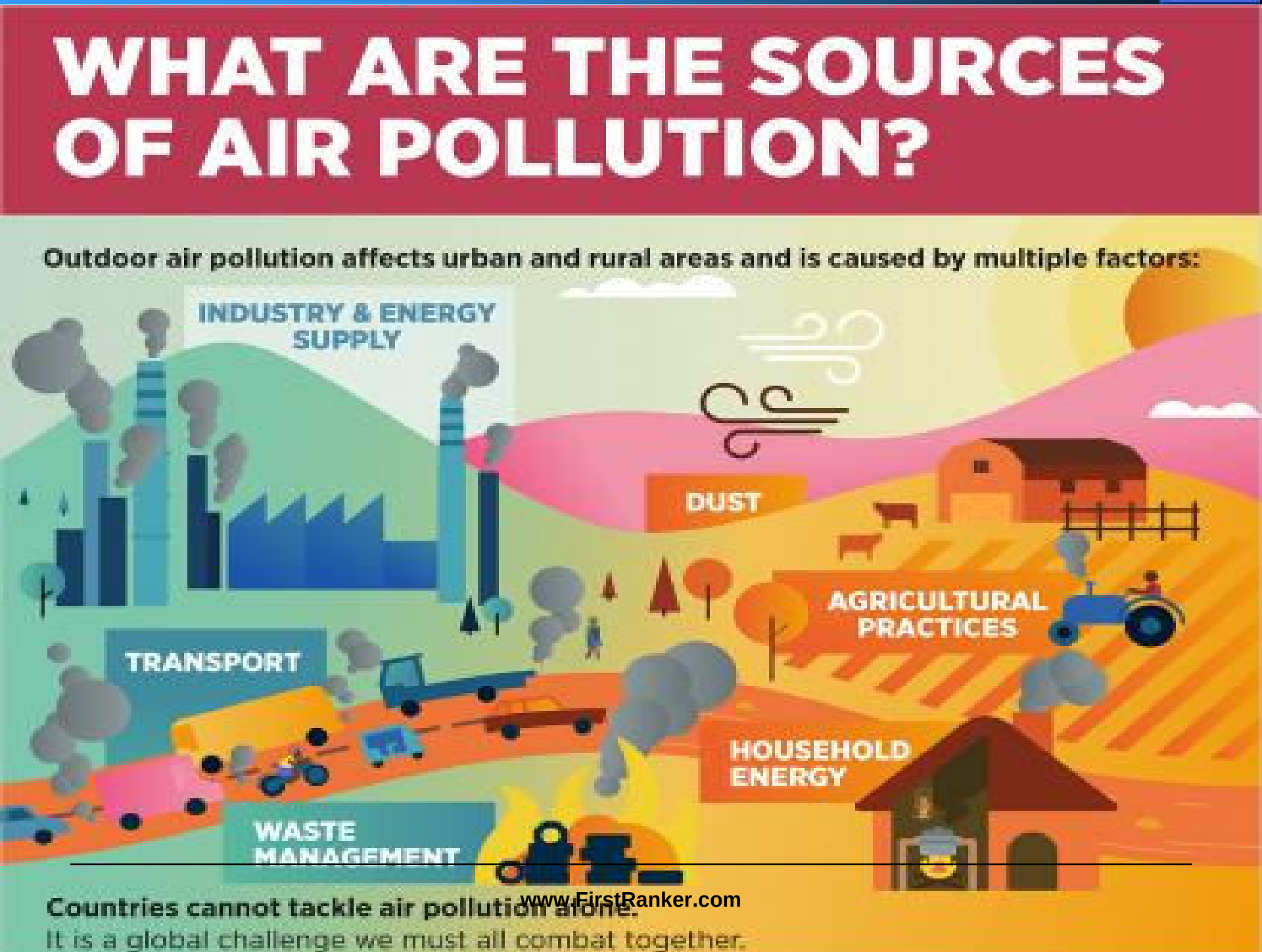
- Prolonged smoking or exposure to air pollutants can overload or break down the natural defenses such as hair in our nose, sticky mucas in the lining of the upper respiratory tract causing diseases like lung cancer, asthma, chronic bronchitis etc.,

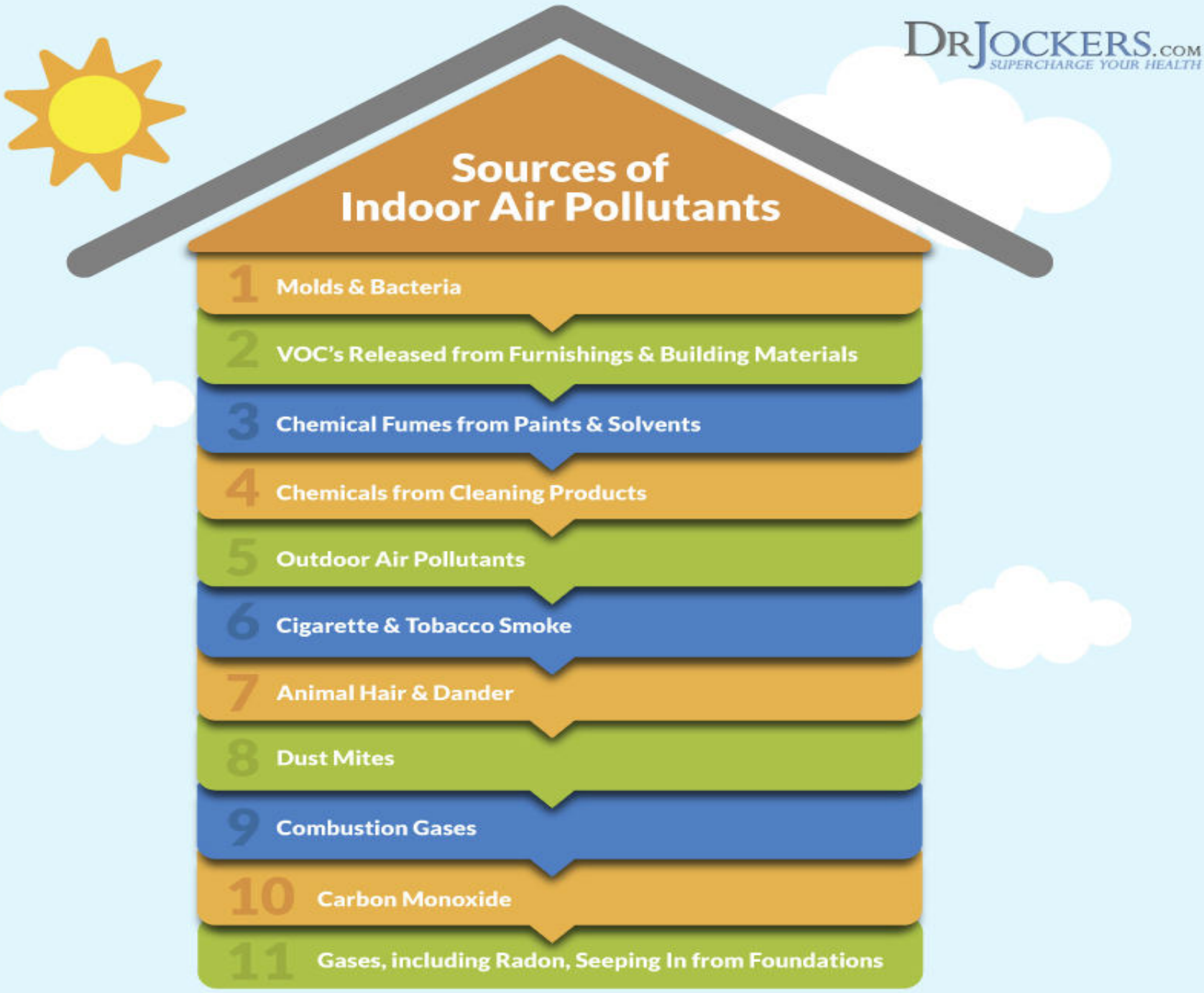
Nitrogen oxides and suspended particles both can irritate lungs, aggravate asthma or chronic bronchitis and increase respiratory infections.

Many volatile organic compounds such as benzene and formaldehyde and toxic particulates such as lead and cadmium can cause mutations, reproductive problems and cancer, breathlessness and irritation of the eye, nose and throat.

Sulphur dioxide irritates respiratory tissues, chronic exposure causes a condition similar to bronchitis.

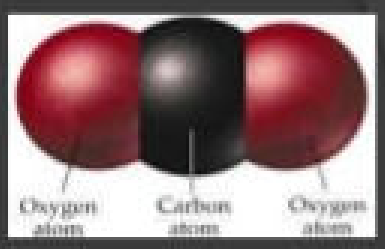
It also reacts with water, oxygen and other materials to form sulphur containing acids – The acids can become attached to particles which when inhaled are very corrosive to the lung.

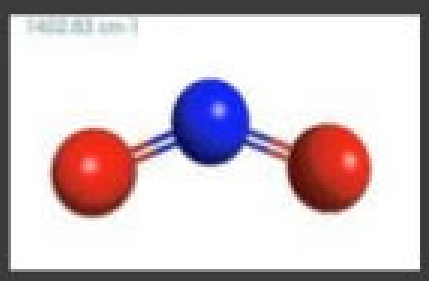




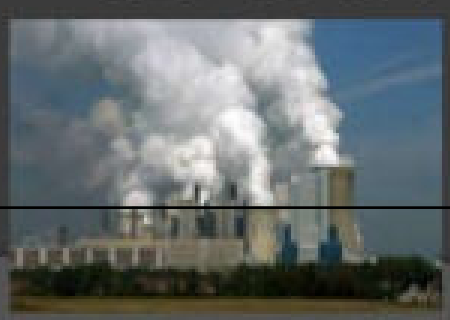
CAUSES(PÁgÀtUÂ¼ÀÄ) OF AIR POLLUTION:-

- Air pollution results from human activities such as burning fossil fuels.
- Pollution emitting from vehicles.
- The air pollutants are:-
  - CARBON DIOXIDE (CO2)
  - CARBON MONOXIDE(CO)
  - SULFUR DIOXIDE(SO2)
  - NITROGEN DIOXIDE(NO2)
  - NITRIC OXIDE(NO)





These are source may be industries, automobiles and vehicles.



SPM (Scanning Probe Microscope) permissible residential 140-200 mg/m³, industrial 360-500 mg/m³ (Year 2000)

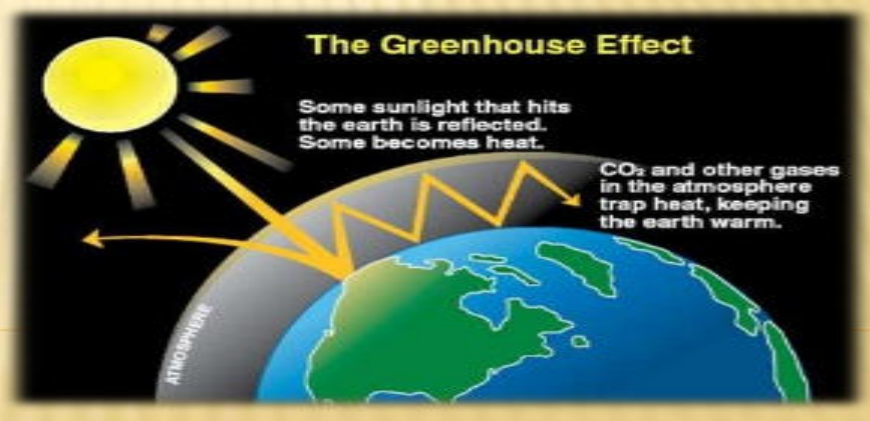
CITY	*RESIDENCIAL AREA*	*INDUSTRIAL AREA*
Agra	349	388
Bhopal	185	160
Delhi	368	372
Kanpur	348	444
Kolkata	218	405
Nagpur	140	157

CONSEQUENCES (¥ÀjuÁªÀÄUÀ¼ÀÄ) OF AIR POLLUTION:-

- CO_2 » Green House Effect
- CO_2 » Global Warming
- Increasing of any gaseous into atmosphere they forms the A Smoggy City.

GLOBAL WARMING AND THE GREENHOUSE EFFECT

Global Warming



Greenhouse Effect

Causes of global warming

Sources of **carbon dioxide**: burning fossil fuels in cars, factories and power plants

Sources of **nitrous oxides**: vehicle exhaust, pipes, fertilizer, in stock water

Increase in greenhouse gas emissions due to human activities

Sources of **CFCs**: Aerosol cans, air conditioners, refrigerators, plastic foams

Sources of **methane**: Landfills, rice paddies, guts of cattle

Causes of Global Warming

- Increase in concentration of carbon dioxide which is emitted by automobiles, industries, etc,.
- Increase in concentration of methane which is emitted when vegetation is burnt, paddy fields, coal mines etc,.
- Increase in concentrations of CFCs which is commonly produced or emitted by refrigerators, A.C.s, etc,.

DIFFERENCE BETWEEN GLOBAL WARMING AND THE GREENHOUSE EFFECT

- **Global warming** refers to a rise in the temperature of the surface of the earth.

- The **Greenhouse Effect** is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions.

•Global Warming& Greenhouse Effect

- About 75% of the solar energy reaching the earth is absorbed by the earth's surface, which increases its temperature. The rest of the heat radiates back to the atmosphere. Some of the heat is trapped by gases like carbon dioxide, methane, ozone, chlorofluorocarbon compounds (CFCs) and water vapour in the atmosphere. Thus, they add to the heating of the atmosphere. This causes "Global Warming".
- Just as the glass in a greenhouse holds the sun's heat near the earth's surface and keeps it warm. This is called *natural greenhouse effect.*

- $4NO_2\ (g) + O_2\ (g) + H_2O\ (l) \rightarrow 4HNO_3\ (aq)$

• Results of Acid Rain

- Acid rain is harmful for agriculture, trees and plants as it dissolves and washes away nutrients needed for their growth. It causes respiratory ailments in human beings and animals.
- When acid rain falls and flows as ground water to reach rivers, lakes etc. it affects plants and animal life in aquatic ecosystem. It corrodes water pipes resulting in the leaching of heavy metals such as iron, lead and copper into drinking water.

2.PARTICULATE POLLUTANTS

- Particulates pollutants are the minute solid particles or liquid droplets in air. These are present in vehicle emissions, smoke particles from fires, dust particles and ash from industries. Particulates in the atmosphere may be viable or non-viable. The viable particulates e.g., bacteria, fungi, moulds, algae etc., are minute living organisms that are dispersed in the atmosphere. They cause plant diseases.
- Non-viable particulates can be classified according to their size and nature as follows:

(a) Smoke particulate consist of solid and liquid particles formed during combustion of organic matter. Ex. Cigarette and oil smoke.

(b) Dust is composed of fine solid particles, produced during crushing, grinding and attribution of solid materials. Sand from sand blasting, saw dust from wood works, cement and fly ash from factories etc.

(c) Mists are produced by particles of spray liquids and by condensation of vapours in air.

(d) Fumes are generally obtained by the condensation of vapours during sublimation, distillation, boiling and several other chemical reactions.

- The effect of particulate pollutants are largely dependent on the particle size. Air borne particles are dangerous for human health.

Photochemical smog has high concentration of oxidizing agents and is, therefore, called as oxidizing smog.

•FORMATION OF PHOTOCHEMICAL SMOG

•When fossil fuels are burnt, a variety of pollutants are emitted into the earth's troposphere. A chain reaction takes place between hydrocarbons and nitrogen oxide in interaction with sunlight and forms nitrogen dioxide. This nitrogen dioxide absorbs energy and breaks up into nitric oxide and free oxygen atom.

$$NO_2(g) \xrightarrow{h\nu} NO(g) + O(g) \quad \text{(i)}$$

Oxygen atoms are very reactive and Combines with dioxygen to form ozone

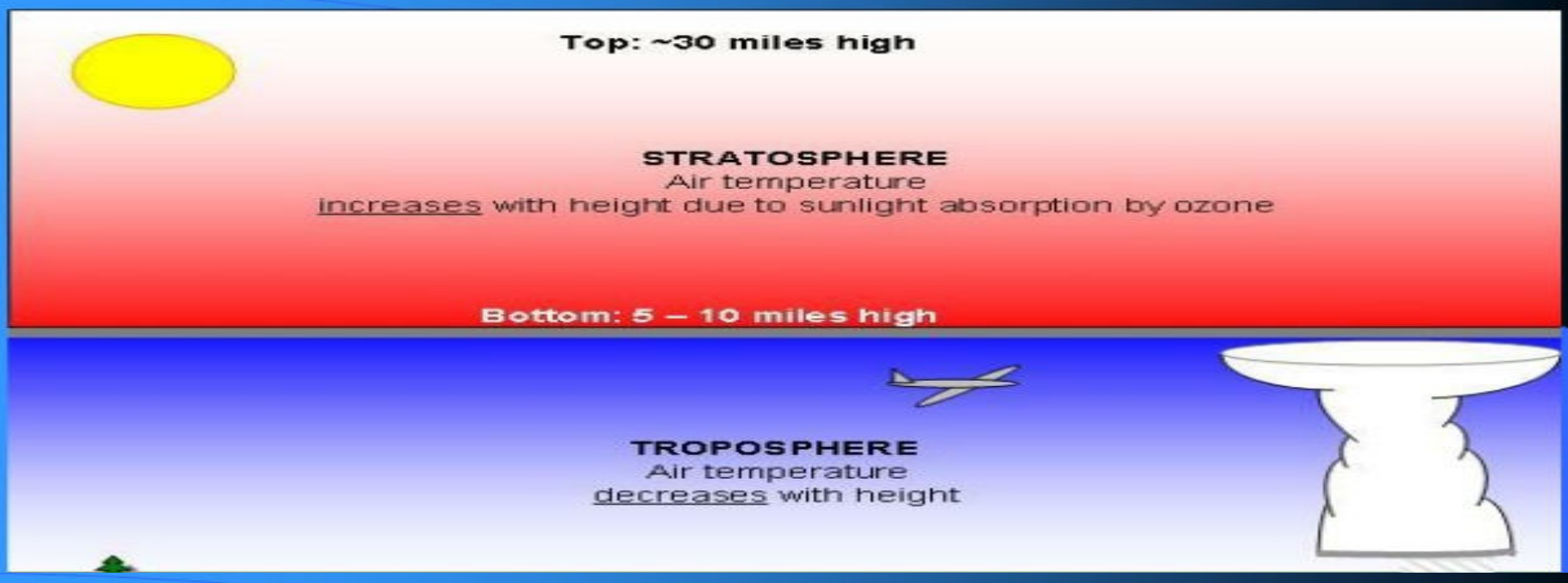
$$O(g) + O_2(g) \rightleftharpoons O_3(g) \quad \text{(ii)}$$

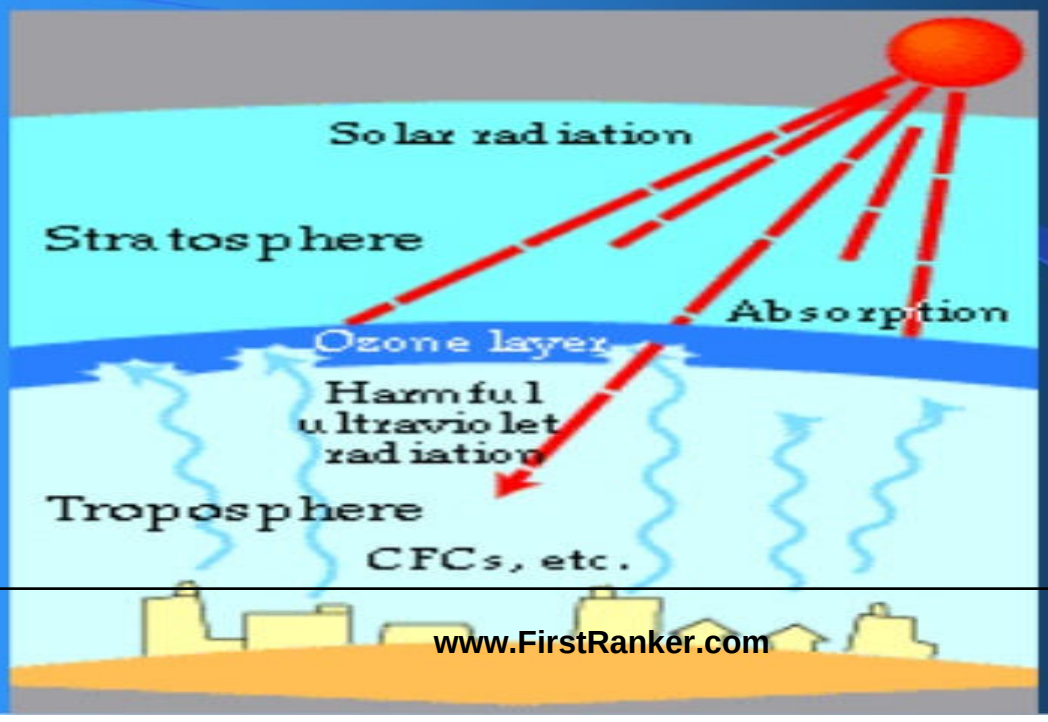
EFFECTS OF DEPLETION OF OZONE LAYER

- With the depletion of ozone layer, more UV radiation filters into the troposphere. UV radiations lead to ageing of skin, cataract, sunburn, skin cancer, killing of many phytoplanktons, damage to fish productivity etc.
- The plant protein gets easily affected which leads to the harmful mutation of cells. Increase in UV radiations damage paints and fibres, causing them to fade faster.

Ozone depletion

- The upper stratosphere consists of considerable amounts of ozone which works as an effective screen for UV light.





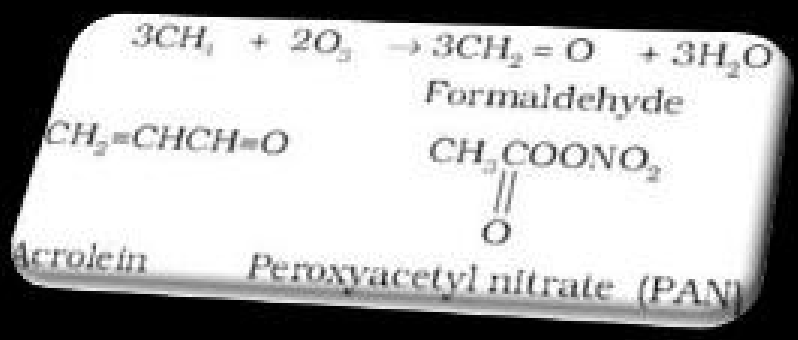
Effects of ozone depletion

- On human- sunburn, cataract, skin cancer, weakens the immune system
- Food production – uv radiation causes reduction in photosynthesis – reduces nutrient contents and the growth of plants
- On materials- damages paints and fabrics causing them to fade faster.
- On climate- global warming – Green house effect- increase in concentration of certain gases like carbon di oxide, nitrogen oxides, methane, CFCs trap heat in the form of infra red radiation near the earth's surface- Green house effect

•**The ozone formed in the above equation (ii) reacts rapidly with NO (g) formed in equation (i) to regenerate nitrogen dioxide.**

$$NO\ (g) + O_3\ (g) \rightarrow NO_2\ (g) + O_2\ (g) \quad \textbf{(iii)}$$

•**Ozone is a toxic gas and both nitrogen dioxide and ozone are strong oxidizing agents and can react with unburnt hydrocarbons in the polluted air to produce chemical such as formaldehyde, acrolein and peroxidyacetyl nitrate (PAN).**



•**EFFECTS OF PHOTOCHEMICAL SMOG**

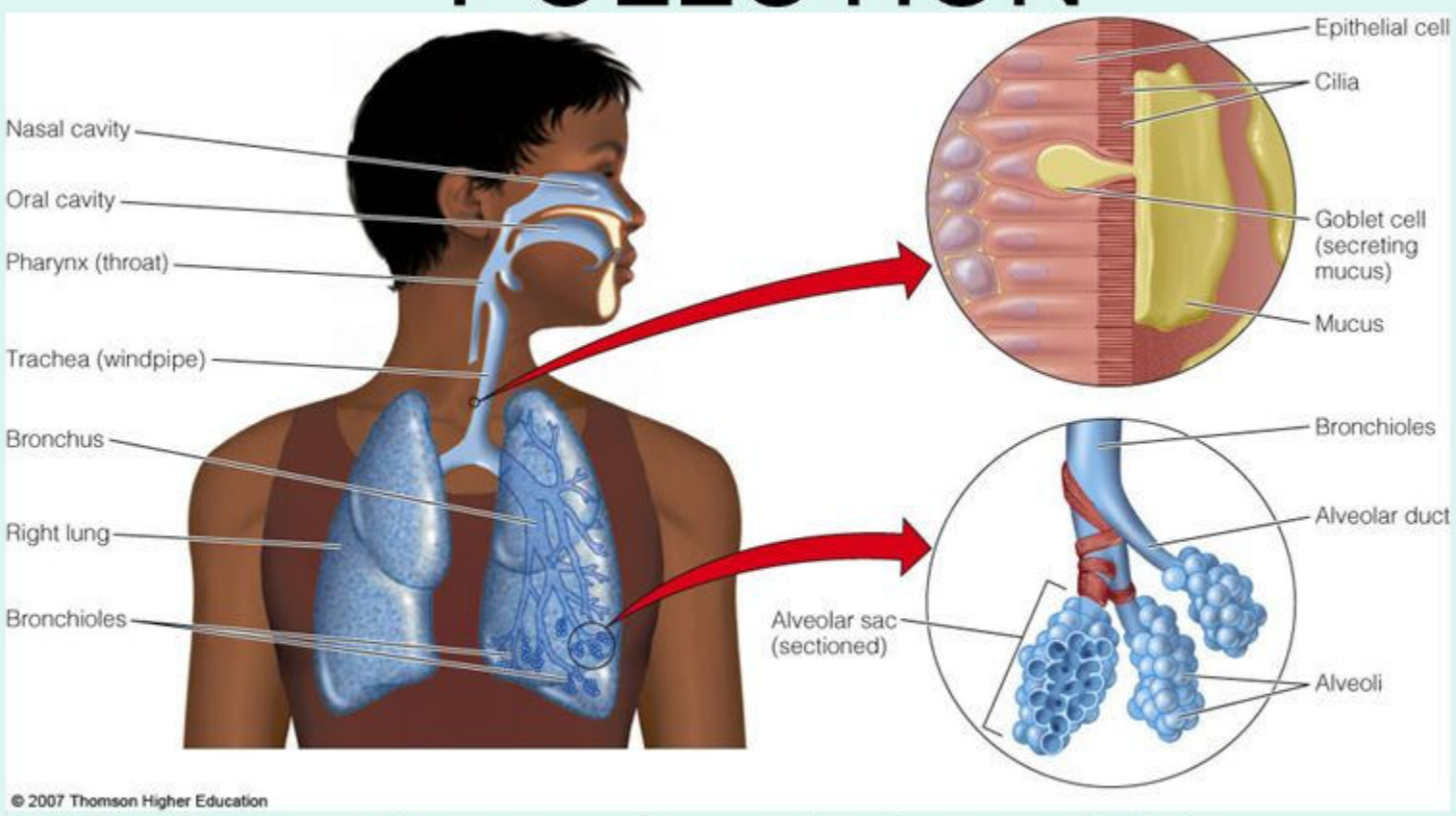
•**They damage metals, stones, buildings materials.**

•**Produce irritation in the eyes and respiratory system.**

Integrated Pest Management

- Organic farming
- Use of biofertilzers
- Earthworms- vermicomposting
- Pest control through microbes – Bacillus thrungiensis, Azadirachta indica- Neem

HEALTH EFFECTS OF AIR POLLUTION



- Cancer, asthma, chronic bronchitis, emphysema

Figure 19-14

Air pollution

- **How to control air pollution:**
  - Maintaining a healthy distance between the industrial and residential areas.
  - The chimneys should be constructed tall in size so that the emissions must be released higher up in the environment
  - The sulphur must be removed after burning.
  - The gasoline must have anti knocking agents
  - The mining area should be planted with trees.
  - The coal fuel should be replaced with gas fuel to control the air pollution.
  - The automobiles must be designed with emission control system.
  - The wastes must be removed and recycled in the industrial plants and refineries.
  - Plants like pine and ribs need to be planted to metabolize the nitrogen oxides and other pollutants.

How to control air pollution?

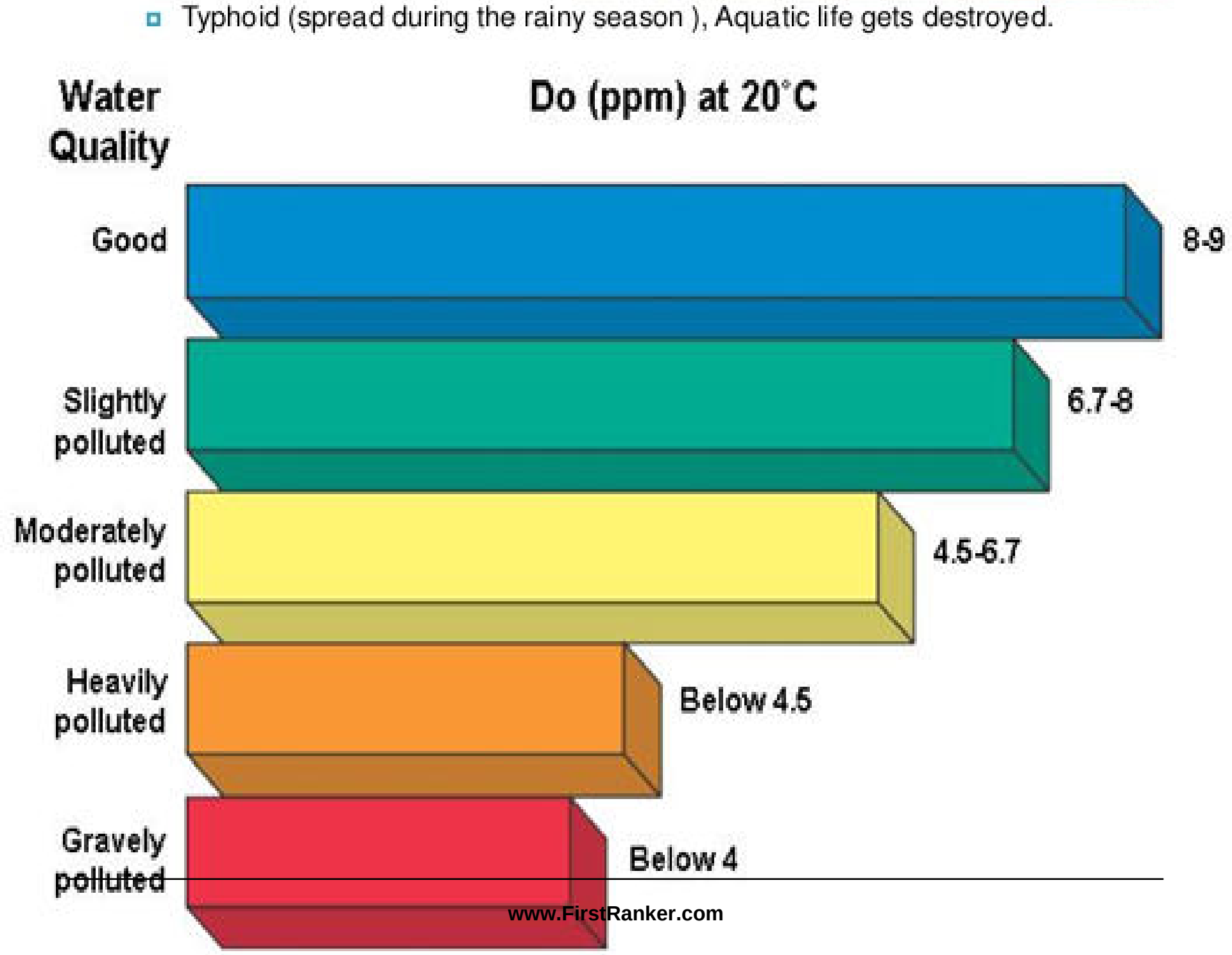
- Maintaining a healthy distance between the industrial and residential areas.
- The chimneys should be constructed tall in size so that the emissions must be released higher up in the environment
- The sulphur must be removed after burning.
- The gasoline must have anti knocking agents..
- The mining area should be planted with trees.

Steps to reduce air pollution

- Walk or bike more
- Carpool or use public transportation
- Maintain your vehicle
- Combine errands to reduce driving
- Drive smart
  - Accelerate slowly
  - Drive slower
  - Avoid letting your car idle
- Don't smoke
- Avoid using products in aerosol spray cans
- Use a push or electric lawn mower instead of gas-powered
- Avoid chemicals or cleaners that emit fumes
- Maintain gas appliances and heaters

Water pollution

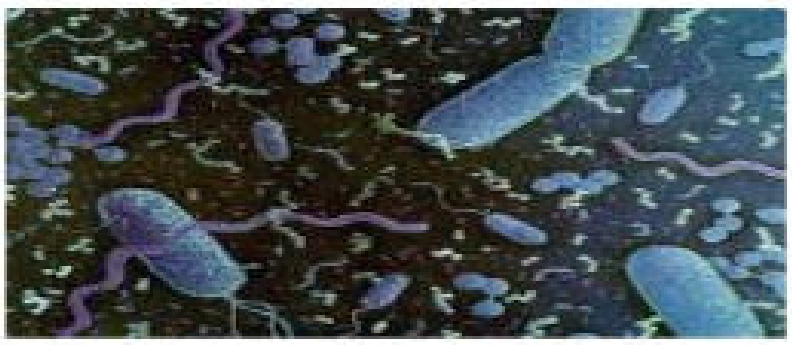
- **Water Pollution:**
  - Definition Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater. Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove h[illegible]
- **Water Pollution Causes by…**
  - Marine Dumping
  - Industrial Waste
  - Sewage
  - mainly from households
  - Nuclear waste
  - Oil pollution
  - Underground storage leaks
- **Water Pollution Effects:**
  - Diseases like Cholera, Malaria, Typhoid (spread during the rainy season), Aquatic life gets destroyed.



Types Of Water Pollution

1.Biological

- Infectious Disease (Pathogens)
- Oxygen-Demading Waste



2. Chemical

- Nutrients (Fertilizers)
- Toxic Inorganic Materials
- Persistent Organic Pollutants (POPs)

3. Physical

- Sediments
- Thermal Pollution
- Solid waste

SOURCES OF WATER POLLUTION

- Most of Water Pollution is man made It may also occur naturally by addition of soil particles through erosion animal wastes and leaching of minerals from rocks

- The sources of water pollution can be classified as
  - Municipal Waste Water
  - Industrial Waste
  - Inorganic Pollutants
  - Organic Pollutants
  - Agricultural Wastes
  - Marine Pollution
  - Thermal pollution

MUNICIPAL WASTE WATER

INDUSTRIAL WASTE

ORGANIC POLLUTANTS

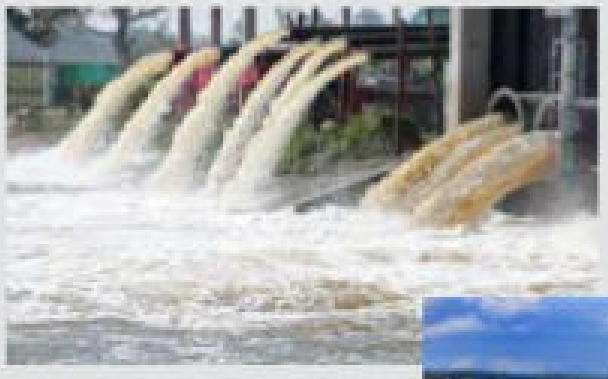
- They Include oils, fats, phenols, organic acids grease and several other organic compounds

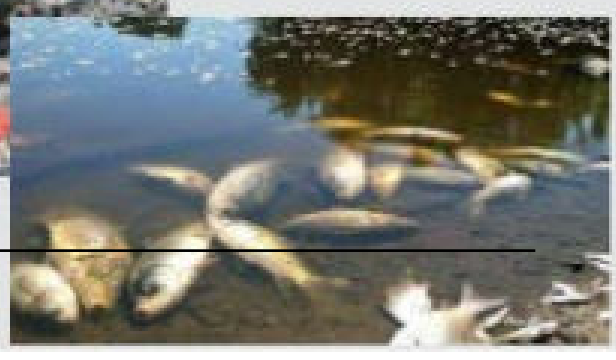
AGRICULTURAL WASTES

- Chemical fertilizers and pesticides have become essential for present day high yielding crops.
- Consequently , they have become a potential source of water pollution. These fertilizers contain major plants nutrients mainly nitrogen, phosphorous, and potassium.
- Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.

SOURCES AND EFFECTS OF WATER POLLUTION

1) Sewage and domestic waste
2) Industrial wastes and effluents
3) Insecticides and pesticides
4) Detergents and fertilizers
5) Siltation
6) Thermal pollution
7) ~~Radioactive materials~~





Water Pollution

- Pollution of water is due to human activities.
- Major contamination is from domestic (municipal) discharged water and industries.
- Organic matter such as leaves, grass, trash etc. Excessive phytoplankton's growth within water.
- Bacteria decomposes the above organic matter and consume oxygen dissolved in water.
- Pathogens: Disease causing microorganisms called pathogens and harmful bacteria
- Micro organism enter water from domestic sewage and animal excreta.

Water Pollution

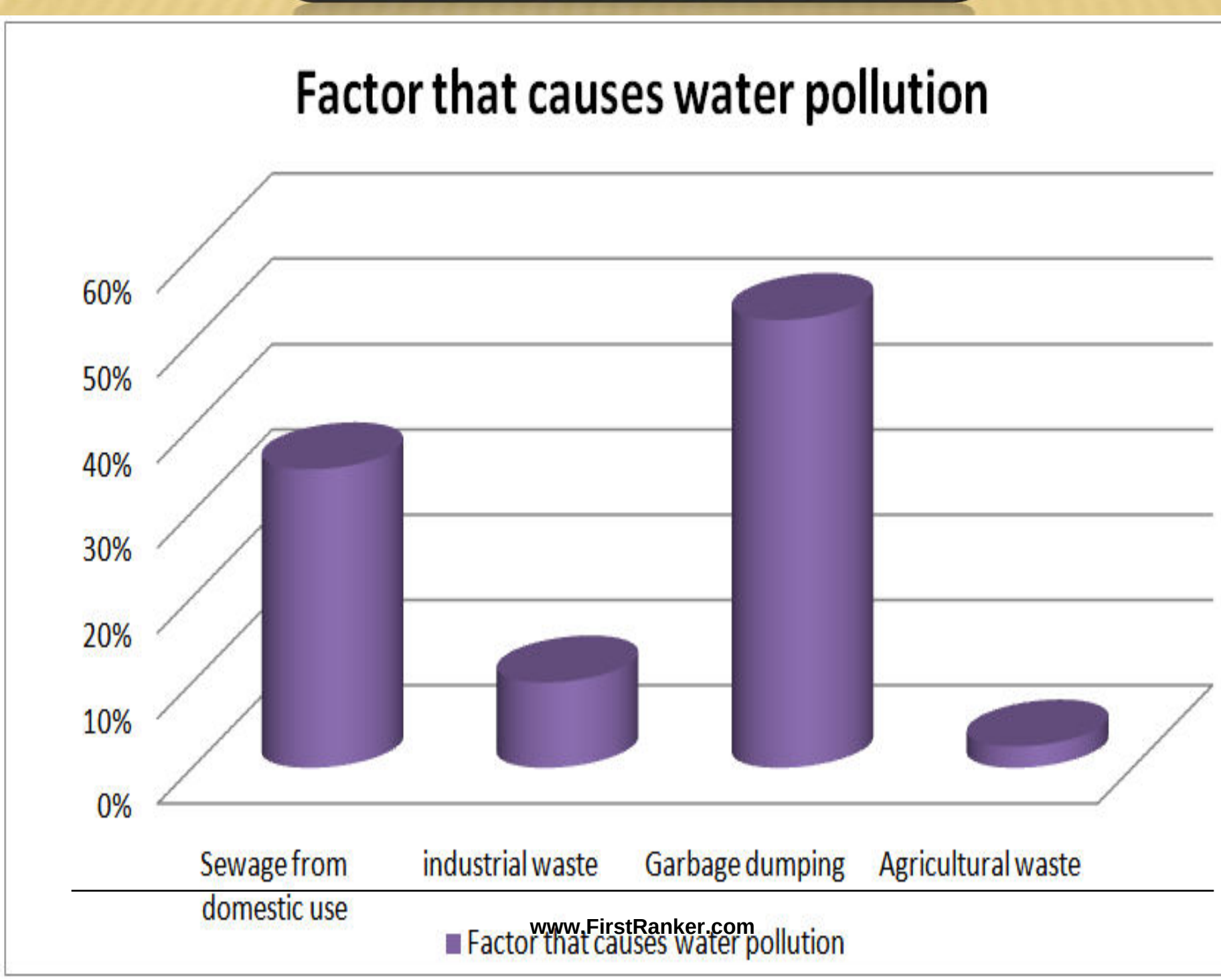
- Domestic waste: soaps, detergent, refectories etc
- Industries are major source for water pollution,
- Hazardous, toxic organic chemicals
- Heavy metals such as cadmium, mercury, nickel etc. All these metals are dangerous to human body.
- Pathogens: Disease causing microorganisms called pathogens and harmful bacteria
- Micro organism enter water from domestic sewage and animal excreta.

MARINE POLLUTION

- Ocean are the final sink of all natural and manmade pollutants. Rivers discharge their pollutants into the sea. The sewage and garbage of costal cities are also dumped into the sea. The other sources include, discharge of oils, grease, detergents, and radioactive wastes from ships.

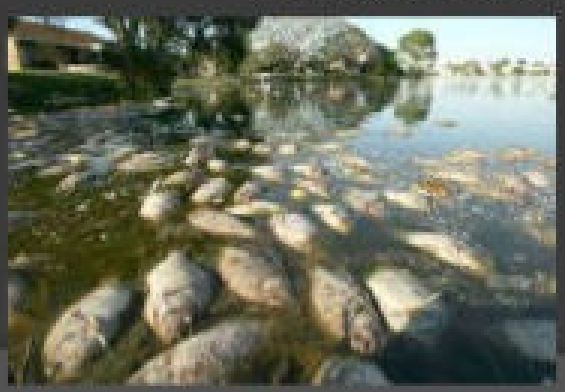
THERMAL POLLUTION

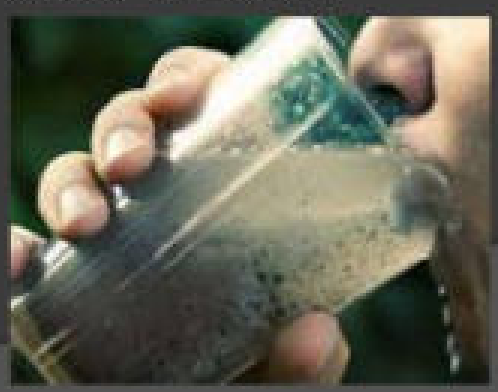
- Thermal Pollution of water is caused by the rise in temperature of water. The main source of thermal pollution are the thermal and nuclear power plants. The power generating plants use water as coolants and release hot water into the original source. Sudden rise in temperature kills fish and other aquatic animals.



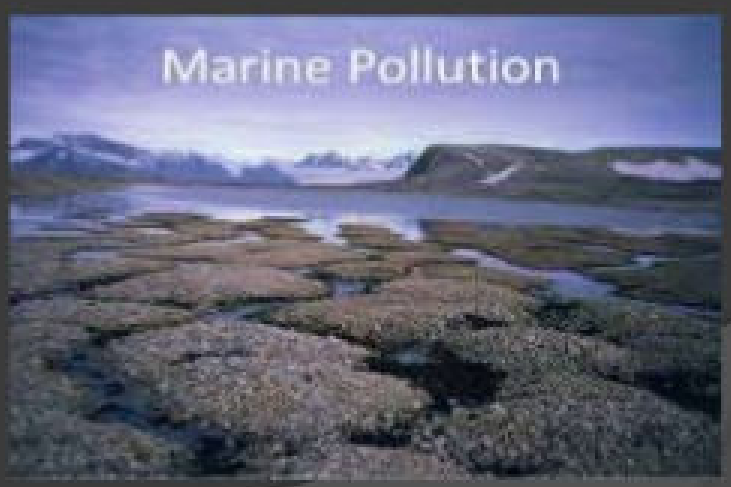
CONSEQUENCES OF WATER POLLUTION:-

- 40% of water animals are death world widely
- From plastic waste into water and coastal areas kills up to :-
  a. 1,00,000 marine animals
  b. 1 million sea birds
  c. countless fishes
- Industrial pollutants like (mercury, chromium, lead are poisonous.
- Some industrial effluents can cause changes in colour, odors, and taste of water change.





NAVEEN KUMAR H S



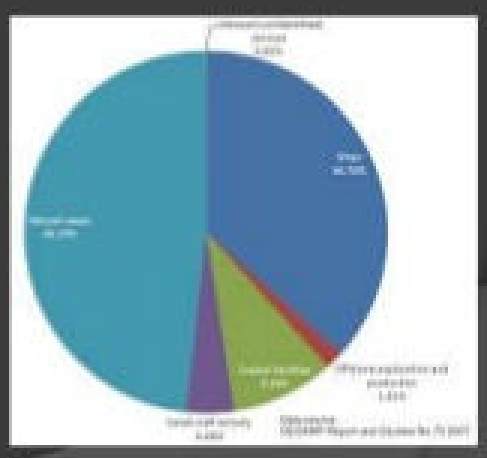
NAVEEN KUMAR H S

MARINE POLLUTION:- (À³ÀÄÄzÀæ ³ÀiÁ°£Àì)

Directly or indirectly of substance or energy to the marine environment resulting in deleterious effects such as hazards to human health, impairment of the quality of sea water for various use and reduction of amentias.

SOURCE OF MARINE POLLUTION:-

- From Land:-
  80% of non- biological marine pollution.
- From Air:-
  Global atmospheric inputs



CAUSES OF MARINE POLLUTION

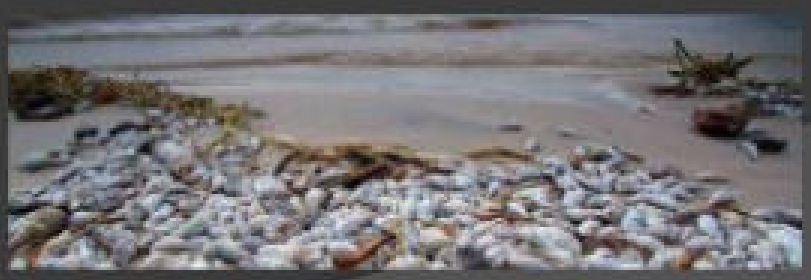
- MARITIME TRANSPORTATION
- AGRICULTURAL RUNOFF
- SEWAGE
- SOLID WASTE
- INDUSTRIAL WASTEWATER AND CHEMICALS
- LITTER
- OIL SPILL
- AIR POLLUTANTS

Causes

- Direct discharge of wastes into sea – sewage
- Washed off materials- fertilizers, pesticides
- Petroleum, oils washed off from roads
- Spill of Toxic substances from ships
- Offshore oil exploration and extraction

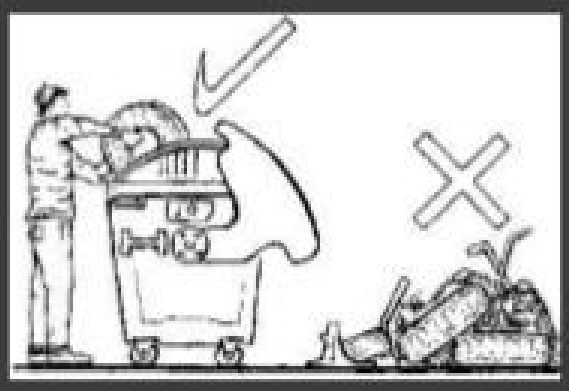
EFFECTS OF MARINE POLLUTION:-

- Effects for ecosystem, public health, recreational water quality.
- Effects for food chains directly.
- Dissolved oxygen, and light penetration.



HOW TO CONTROL MARINE POLLUTION:-

- Spills- direction and cleanup.
- Industrial waste water treatment.
- Domestic sewage.
- Urban runoff.



Effects Of Water Pollution

Diarrhea

Vomiting

Typhoid

Diphtheria

Hepatitis

Kidney Damage

Nerve Disorders

Skin Lesions

HOW TO CONTROLL WATER POLLUTION:-

- Rivers should not be used for washing clothes, bathing animals.
- Harvesting of rainwater to meet water requirements.
- Dams and embankments must be created.
- The rivers must not be contaminated.

Water pollution

- **Preventing Water Pollution:**
  - Conserve water by turning off the tap.
  - Don't throw paints and oils in water channels.
  - Use environment friendly household products, such as washing powder, household cleaning agents etc.
  - Take great care not to overuse pesticides and fertilizers.
  - Don't throw litter into rivers, lakes or oceans.
  - Help clean up any litter you see on beaches or in rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.
  - Suspended, solid particles and inorganic material can be removed by the use of filters.
  - Use of biological filters and processes can naturally degrade the organic waste material.
  - After above two steps chemical additives are supplied to get rid of any left-over impurities.

Soil pollution

Soil pollution/contamination is caused by chemicals from Waste dumping, Pesticides and Insecticides, Urbanization & Mining etc.

Waste dumping :

- Industrial solid wastes and sludge
- Industrial emissions such as fly ash from thermal power plants
- Radioactive materials affects the soil for long periods of time,

Mining :

- Mining also affects ground and surface waters, the aquatic life, vegetation, soils, animals, and the human health.
- Acid mine drainage can kill aquatic life.
- Toxic metals and chemicals released by mine

Soil pollution

Pesticides :

- Many of the chemicals used in pesticides are persistent soil contaminants, which adversely affect soil conservation.
- The use of pesticides decreases the biodiversity in the soil. reduced nitrogen fixation
- Animals may be poisoned by pesticide residues that remain on food after spraying
- Poisoning from pesticides can affects the food chain and bio-acculmulates

SOIL POLLUTION :

Soil pollution or soil contamination is caused by the presence of xenobiotic (human made) chemicals or other alterations in the natural soil and environment.

Causes :

- ❑ Waste Dumping
- ❑ Mining
- ❑ Pesticides and Insecticides
- ❑ Urbanization

CAUSES OF SOIL POLLUTION…..

USE OF CHEMICALS

- Use of chemicals include –

  Pesticides, insecticides, fertilizers.
- Excessive use of these chemicals increases salinity of the soil.
- It adversely affects the micro-organisms present in it causing soil to lose its fertility.
- Results in loss of minerals present in the soil.

CAUSES OF SOIL POLLUTION …

OIL & PETROLEUM SPILLS

- Petroleum spills from gas stations, fuel tanks or other activities can result in elevated levels of contaminants in the soil.
- Such as Benzene, Toluene, and Xylene.
- Oil spills cause poor grow of plants.

EFFECTS OF SOIL POLLUTION…

ORGAN DAMAGE

- Presence of heavy metals in the soil.
- High concentrations of lead and mercury.
- Leads to irreversible developmental damage in children.
- Causes damage to the developing brains of young children.
- Leads to neurological problems.
- May also suffer kidney or liver damage.

Land Pollution

- **Land Pollution:**
  - It is the destruction of Earth's land surfaces through misuse of land resources by human activities. Polluted land has deposits of liquid and solid waste such as rubbish, garbage, paper, glass and plastic objects.
- **Land Pollution Causes by:**
  - Accidental Spills
  - Industrial Accidents
  - Landfill and illegal dumpi
  - Agricultural practices
  - Mining and other industri
  - Oil and fuel dumping
  - Buried wastes
  - Drainage of contaminated surface water into the soil.




CAUSES OF LAND POLLUTION

- **Four Main causes of land pollution:**
  - **Construction**
  - **Agriculture**
  - **Domestic waste**
  - **Industrial Waste**

CONSTRUCTION

- Buildings take up resources and land, the trees are chopped down and used to make buildings.
- Takes away the places for animals and other organisms to live.

DOMESTIC WASTE

- Tons of domestic waste is dumped every day. Some waste from homes, offices and industries can be recycled or burnt in incinerators .
- There is still a lot of garbage, such as refrigerators and washing machines that are dumped in landfills simply because they cannot be reused in anyway, nor recycled .

AGRICULTURE

- As there are more and more people inhabiting the earth, food is in higher demand and so forests are chopped down and turned into farmland
- In addition, herbicides, pesticides, artificial fertilizers, animal manure are washed into the soil and pollute it.

INDUSTRIAL WASTE

- Plastics factories, chemical plants, oil refineries, nuclear waste disposal activity, large animal farms, coal-fired power plants, metals production factories and other heavy industry all contribute to land pollution.

WASTE DUMPING :

- Industrial solid wastes and sludge are the major sources of soil pollution.
- Industrial emissions such as fly ash from thermal power plants can contaminate the surrounding soil.
- Nuclear testing laboratories and the increased number of radioactive nuclear reactions can contaminate the soil. Radioactive materials are thriving in the soil for long periods of time, since they often have a long half-life. Strontium-90, for example, a half life of 28 years, and half-life of cesium-137 is 30 years.

Pesticides :

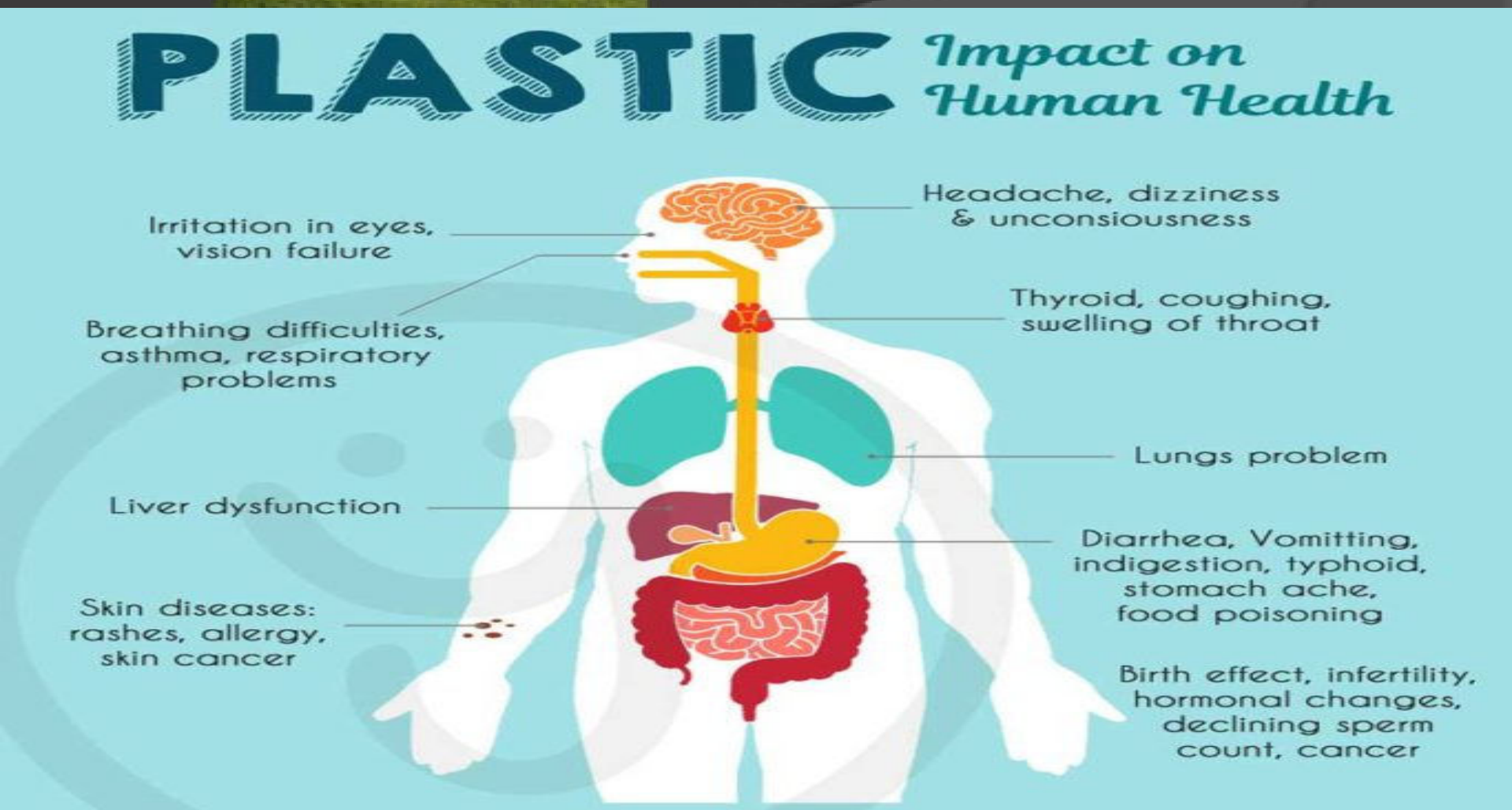
- Many of the chemicals used in pesticides are persistent soil contaminants, which adversely affect soil conservation.
- The use of pesticides decreases the general biodiversity in the soil.
- The insecticides DDT, methyl parathion and especially pentachlorophenol have been shown to interfere with legume-rhizobium chemical signaling. Reduction of this symbiotic chemical signaling results in reduced nitrogen fixation and thus reduced crop yields.
- Animals may be poisoned by pesticide residues that remain on food after spraying, for example when wild animals enter sprayed fields or nearby areas shortly after spraying
- Widespread application of pesticides can eliminate food sources that certain types of animals need, causing the animals to relocate, change their diet, or starve.
- Poisoning from pesticides can travel up the food chain and bioacculmulate.

Land Pollution

- **Land Pollution Effects:**
  - Cause problems in the human respiratory system.
  - Cause problems on the skin.
  - Cause various kinds of cancers.
  - The toxic materials that pollute the soil can get into the human body directly by into contact with the skin.
  - washed into water sources like reservoirs and rivers.
  - Eating fruits and vegetables that have been grown in polluted soil.
  - Breathing in polluted dust or particles.
- **Prevent Land pollution:**
  - More and more land should be brought under farming.
  - Trees should be planted everywhere.
  - Waste matter should be disposed immediately Avoid drilling lands for underground water.
  - Avoid using fertilizer and pesticides for farming.

CONTROL OF SAND OR SOIL POLLUTION:-

- More and more land should be brought under farming.
- Trees should be planted every where.
- Waste matter should be disposed immediately.
- Avoid drilling the land for more underground water.
- Avoid using more fertilizers.



SOIL POLLUTION

AIR POLLUTION

WATER POLLUTION

WHAT IS NOISE POLLUTION?

- Sound that is unwanted or disrupts one's quality of life is called as noise. When there is lot of noise in the environment, it is termed as noise pollution.

- Sound becomes undesirable when it disturbs the normal activities such as working, sleeping, and during conversations.
- It is an underrated environmental problem because of the fact that we can't see, smell, or taste it.
- World Health Organization stated that "Noise must be recognized as a major threat to human well-being"

5. NOISE POLLUTION

SOURCES OR NOISE POLLUTION

- Indoor noise pollution
- Outdoor noise pollution

EFFECTS

- Temporary or permanent hearing loss
- Emotional or psychological effects
- Increased rate of accidents

CONTROL MEASURES

- Reduce noise at the source
- Block the path of noise
- Increase the path-length
- Protect the recipient

Sources of Noise Pollution…

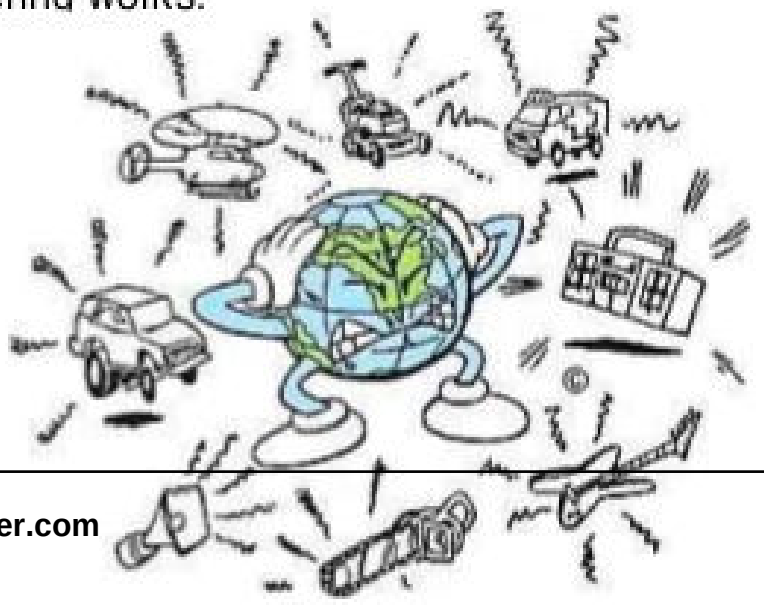
- Machines.
- Transportation systems.
- Motor vehicles.
- Aircrafts.
- Trains.
- Poor urban planning.

Effects of Noise Pollution

- Noise pollution affects both health and behavior.
- Unwanted sound (noise) can damage psychological health.
- Noise pollution can cause
- Annoyance
- Aggression .
- Hypertension .
- High stress levels .
- Hearing loss.
- sleep disturbances, and other harmful effects.

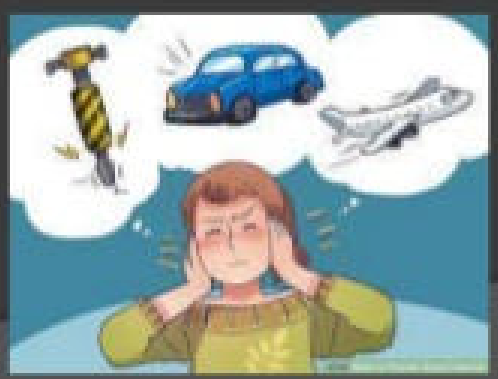
Noise Pollution

- **Definition**
  - Noise pollution is displeasing human, animal or machine-created sound that disrupts the activity or balance of human or animal life.
- **Noise Pollution Causes by…**
  - Traffic Noise
  - Air craft Noise
  - Noise from construction and civil engineering works.
  - Noise from the Industries.
  - Noise from other sources.
- **Noise Pollution Effects:**
  - Hearing Loss
  - High Blood Pressure
  - Stress
  - Sleep Disturbance
  - Color Blindness



CAUSES OF NOISE POLLUTION:-

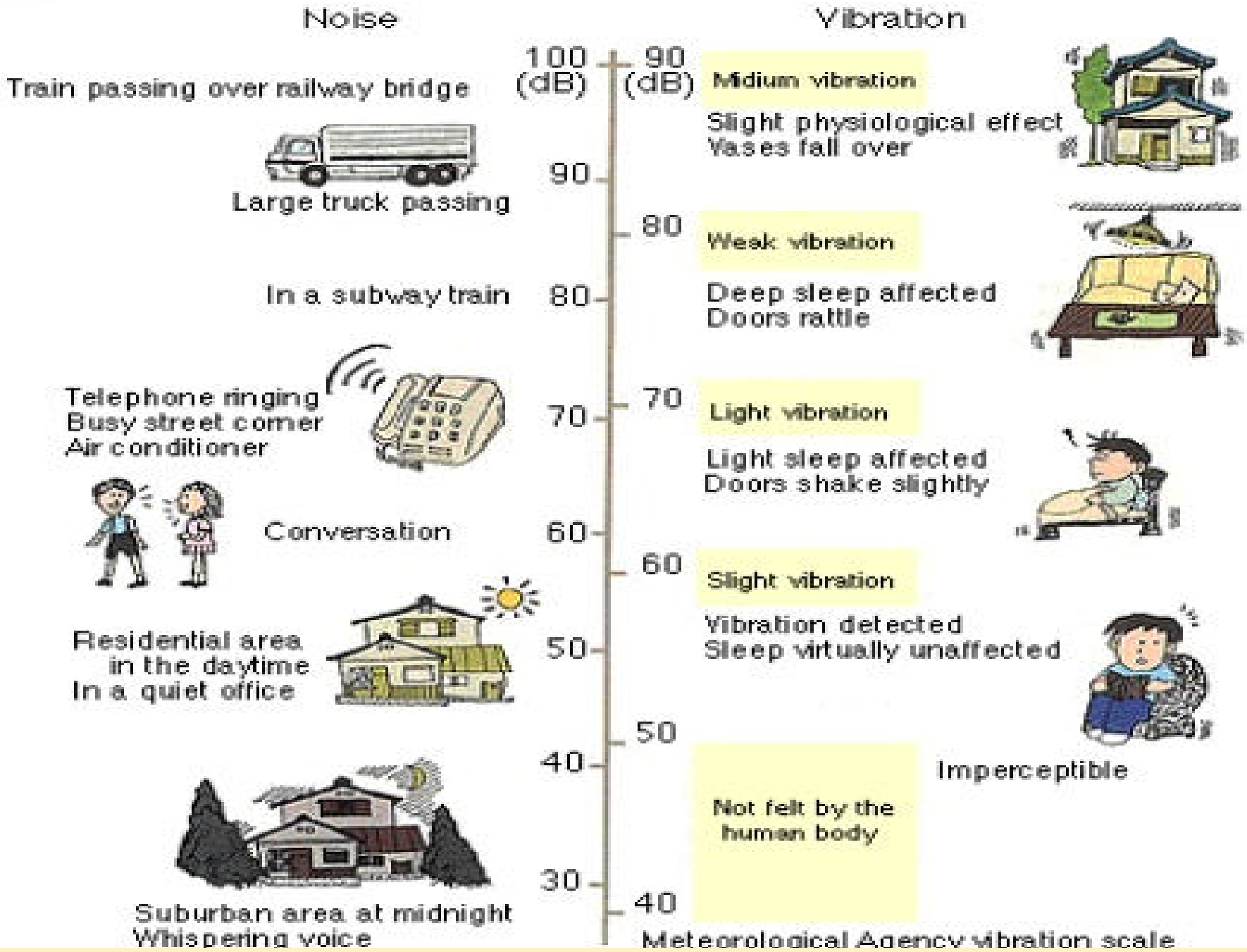
- Transportation system is the main cause in urban areas.
- Construction of the buildings, highways, due to the usage of air compressors, bulldozers, loaders, dump trucks.
- Industrial noise.
- Loud speakers, plumbing, boilers, generators are the existing noise pollution.
- Social events are also a major causes of sound pollution.



Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq *	
		Day Time	NightTime
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Levels of Noise and Vibration



EFFECTS OF NOISE POLLUTION

- According to the USEPA, there are direct links between noise and health. Also, noise pollution adversely affects the lives of millions of people.
- Noise pollution can damage physiological and psychological health.
- High blood pressure, stress related illness, sleep disruption, hearing loss, and productivity loss are the problems related to noise pollution.
- It can also cause memory loss, severe depression, and panic attacks.

Shocking side effects of Earphones To Brain and Ears!

- TINNITUS. [Noise in ear]. ...
- HYPERACUSIS. This is an increased sensitivity to normal environment sounds.
- SEVERE EAR INFECTION. It is usually unavoidable that people share earphones. ...
- LOSS OF HEARING. ...
- AFFECTS YOUR BRAIN. ...
- EAR PAIN. ...
- LOSS OF CONNECTION WITH REALITY. ...
- LEARNING DISABILITIES.

Research findings

Sound's **volume** by 6 to 9 decibels

- Loud music played on **earphones** causes hearing loss by having a similar **effect** on nerves as multiple sclerosis,
- Research shows noise levels above 110 decibels strip insulation from nerve fibers carrying signals from the ear to the **brain**.

SOLUTIONS FOR NOISE POLLUTION

- Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.
- Regular servicing and tuning of automobiles can effectively reduce the noise pollution
- Social awareness programs should be taken up to educate the public about the causes and effects of noise pollution.
- Workers should be provided with equipments such as ear plugs and earmuffs for hearing protection.

- Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation.
- Soundproof doors and windows can be installed to block unwanted noise from outside.
- Regulations should be imposed to restrict the usage of play loudspeakers in crowded areas and public places.
- Factories and industries should be located far from the residential areas.

Noise Pollution

- **Prevent Noise Pollution:**
  - The government should ensure the new machines are noise proof.
  - Airports should be away from residential areas.
  - 'No horn' boards should be put on/near school areas.
  - We should talk less and work more.

CONTROL OF NOISE POLLUTION:-

- Planting trees.
- Regular service and tuning automobiles.
- Using sound proof walls, windows, ceilings.
- Using ear plugs and ear muffs.

Solutions for Noise Pollution

- Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.
- Regular servicing and tuning of automobiles can effectively reduce the noise pollution.
- Buildings can be designed with suitable noise absorbing material for the walls, windows, and ceilings.
- Workers should be provided with equipments such as ear plugs and earmuffs for hearing protection.

Thermal Pollution

THERMAL POLLUTION

- Defined as presence of waste heat in the water which can cause undesirable changes in the natural environment.

- Sources of thermal pollution :
- Certain process like evaporation, convection, radiation , and use of equipment such as dryers, evaporators etc may sometimes lead to thermal pollution.

- Effects of thermal pollution :

- Thermal pollution inturn decreases the oxygen content in the atmosphere and whereby leads to ill effects of human beings

THERMAL POLLUTION:- (GµÀÚ ªÀiÁ°£Åå)

Thermal pollution is the degradation of water of water quality by any process that changes ambient water temperature.

CAUSES OF THERMAL POLLUTION:-

- Electrical power plants and Industrial factories.
- Plants used cool water as coolant returned into high temperature water.
- Fish and other organisms killed by “Thermal Shock”

C¥ÁAiÀÄUÀ¼ÀÄ)

Radioactive (nuclear) pollution is a special form of physical pollution related to all major life supporting system air. Water, soil.

RADIAOACTIVITY is the phenomenon of emission of energy from radio actives isotopes (unstable isotopes)

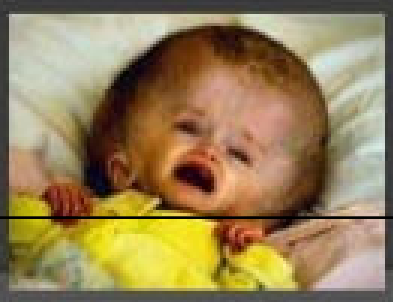
URANIUM – 235
URANIUM – 238
URANIUM – 239
CARBON – 14
RADIUM – 226

CAUSES OF NUCLEAR HAZARDS:-

- Cosmic rays from outer space.
- Mining and processing of radio active ores.
- Use of radioactive material in nuclear.
- Use of radioactive isotopes in medicals, industries and research applications.
- Use of radioactive materials in nuclear weapons.

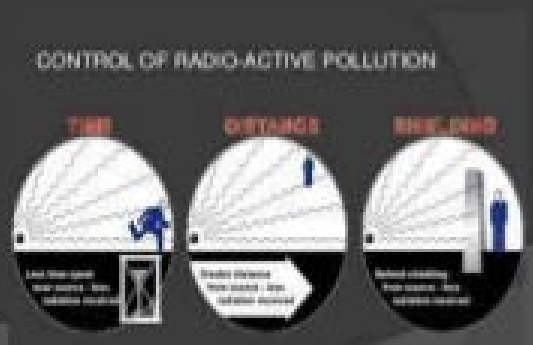
EFFECTS OF NUCLEAR HAZARDS:-

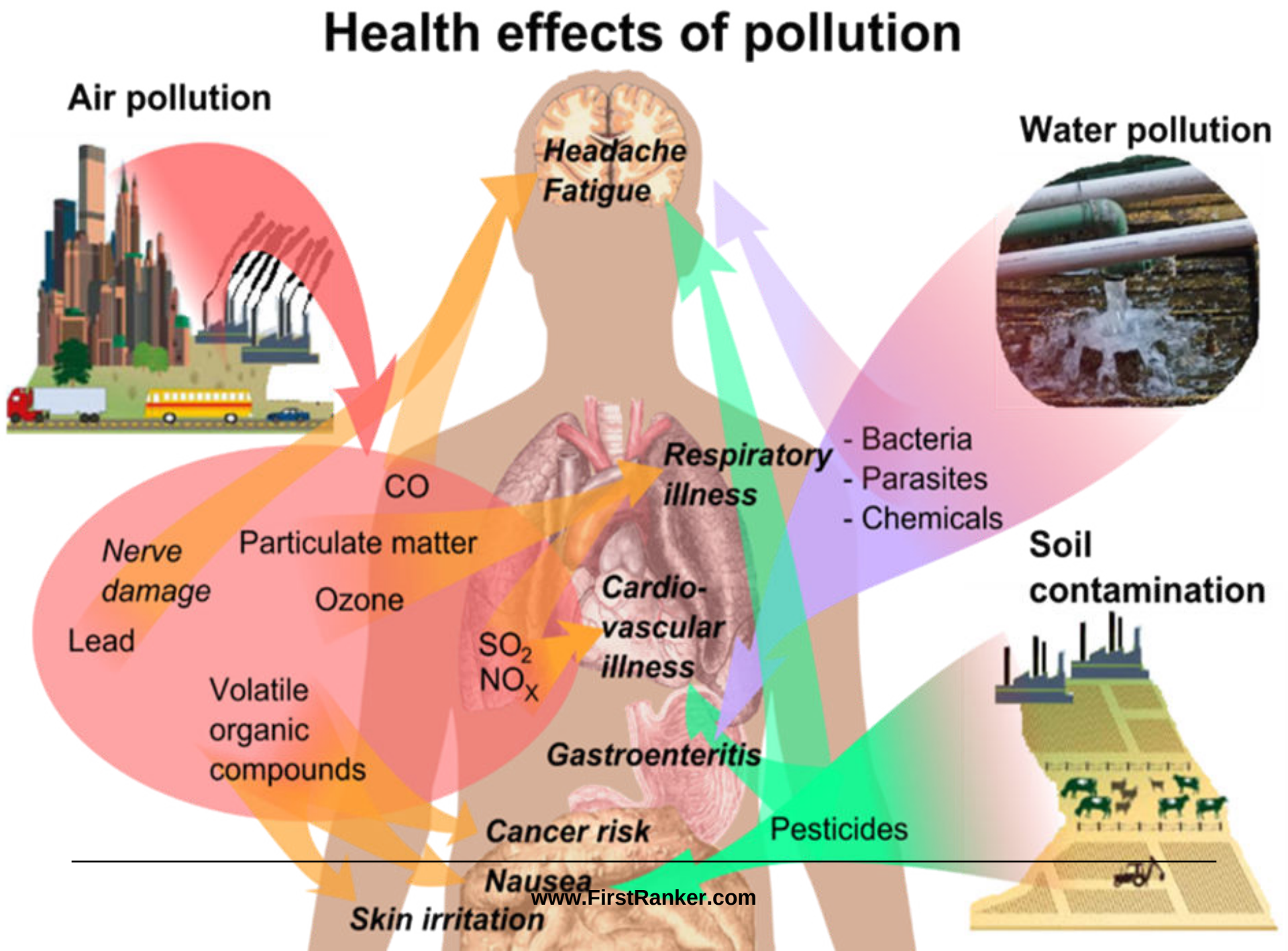
- Radiations may break chemical bonds such as DNA in cells.
- Exposure at LOW DOSES OF RADIATIONS (100-250 rads).
- Exposure at HIGHER DOSES OF RADIATIONS (400-500 rads).
- Exposure at HIGHER DOSES (10,000 rads).
- Workers handling radioactive wastes get course of time develop cancer of different types.



CONTROL OF NUCLEAR HAZARDS.

- Handling of nuclear reactors carefully.
- Safety measure should be enforced strictly.
- Waste disposal must be careful, efficient, and effective.
- There should be regular monitoring.
- Safety measures should be strengthened against nuclear accidents.





AVOIDANCE & REDUCTION METHODS:

- 3Rs: Removal, Reduction & Reuse/Recycle:
- An important method of waste management is the prevention of waste material being created.
- Efficient method to reduce the waste.
- Reuse or Recycle:
  - Repairing broken items instead of buying new –
  - Designing products to be refillable or reusable
  - Avoid using disposable products
  - Bio-decomposable eg Jute or cotton bags
  - Removing any food/liquid remains from cans

Green chemistry

- Green chemistry also called sustainable chemistry:
- Design or develop the products and processes that minimize the use and generation of hazardous substances.
- While environmental chemistry Green chemistry is the chemistry of the natural environment, and of pollutant chemicals in nature, green chemistry seeks to reduce and prevent pollution at its source.
- The focus is on minimizing the hazard and maximizing the efficiency of any chemical choice.
  - Use of supercritical carbon dioxide as green solvent
  - Aqueous hydrogen peroxide for clean oxidations –
  - Use of hydrogen in asymmetric synthesis

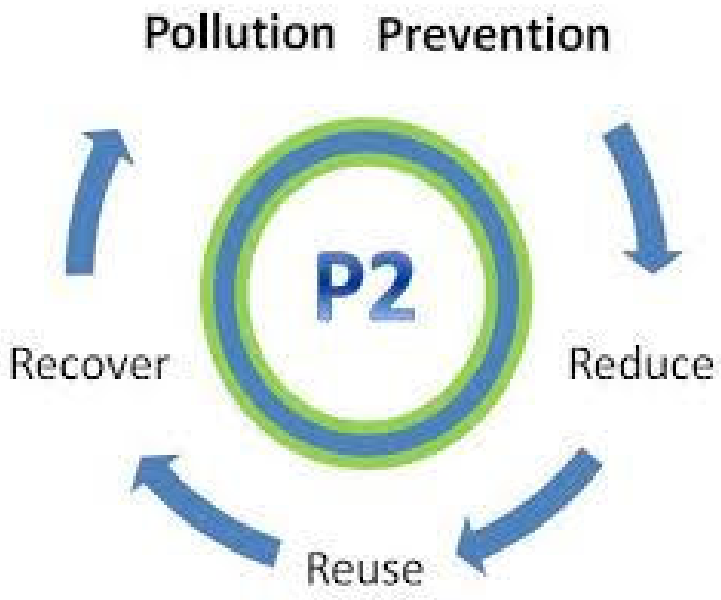
Green chemistry

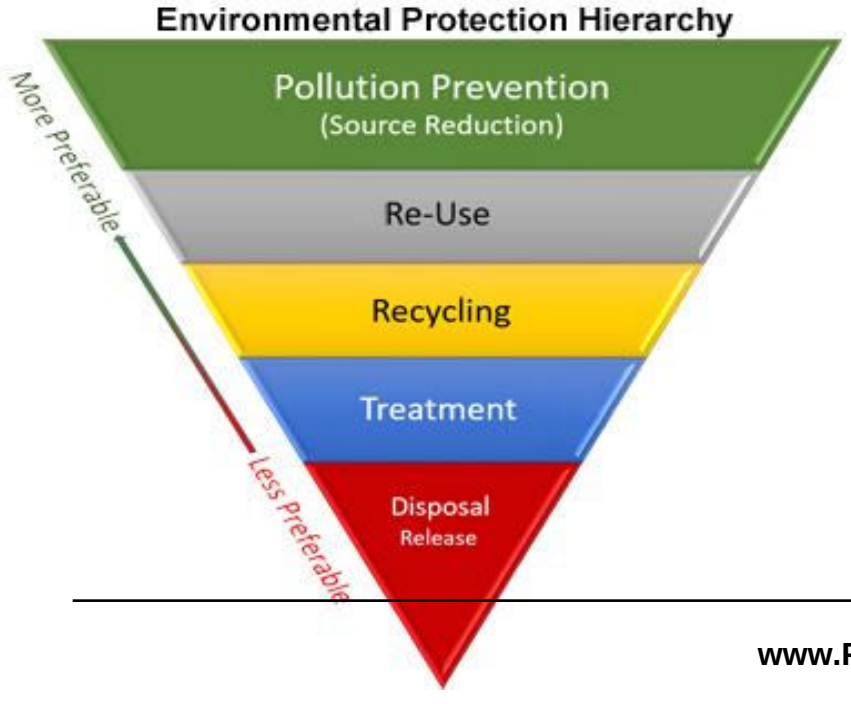
1. Rather than worry about waste disposal, it is better to avoid creating waste.
2. Try to generate as little waste as possible, and try to make waste that is nontoxic (convert toxic into non-toxic).
3. Be energy conscious in designing syntheses
4. Catalysts that allow the use of safe chemicals should be employed when possible.
5. Try to use renewable feed stocks as raw materials.
6. Try to reduce the amount of solvent used, and try to use environmentally friendly solvents.

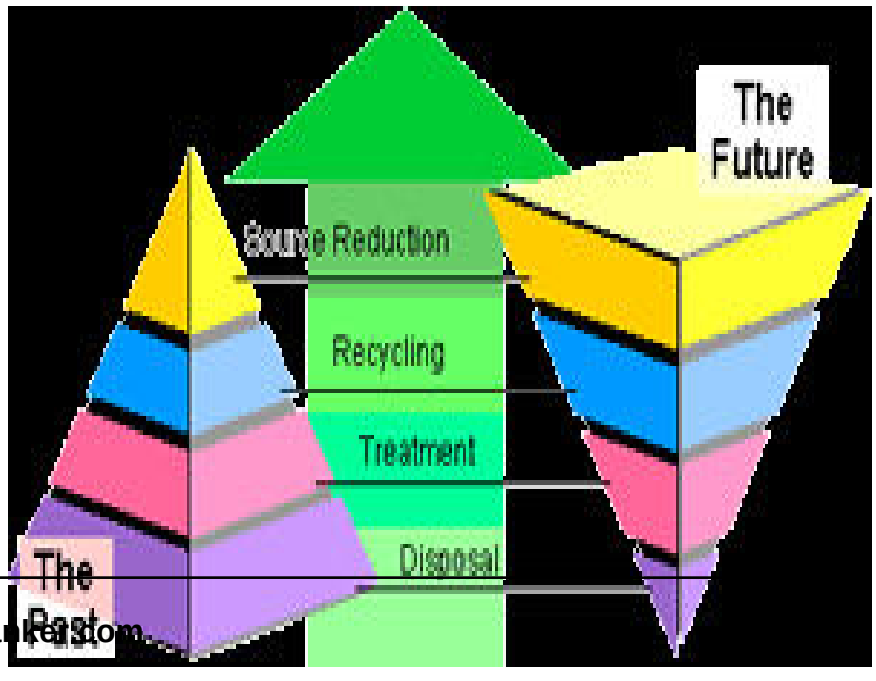
STRATEGIES TO CONTROL ENVIRONMENTAL DAMAGE :

The public is becoming increasingly aware that the natural environment is fragile. The recent reports by media have focused on –

- Deaths and population declines of birds and fish because of the large oil spills
- Deaths of porpoises and whales along the coasts as a result of pollutants and disease;
- Fish contaminated with polychlorinated biphenyls (PCBs)
- Contamination of rivers and lakes by dioxin and other pollutants that may cause cancer and reproductive disorders.







Human Responsibilities To Maintain Healthy Environment

- Use Sense, time and Energy for Significance and Health
- Be Monitor,maintainer,Constructor
- Never be Destructor
- Do sensible environmental friendly acts which control and prevent pollution

Role of an individual in prevention of pollution

- Develop respect to all forms of life
- Try to plant trees where ever you can
- Reduce the use of paper and wood products where ever possible – use recycled paper
- Do not buy furniture, doors etc., made from teak – forest based
- Help in restoring a degraded area
- Join in an aforestation program

- Advocate organic forming
- Avoid use of pesticides
- Reduce fossil fuel – coal, petrol etc. save petrol
- Shut of the lights and fans when not needed- save electricity
- Do not use aerosol spray products
- do not pour chemicals, paints pesticides in the drain

- Use rechargeable batteries
- Do not use cans, avoid plastics – plastic carry bags
- Recycle paper, aluminum, plastics
- Set up compost bin in your garden
- Start community composting
- Keep you and your place clean

Environmental Awareness

- As scientists, we are morally obliged to consider the consequences of our acts.
- We create a molecule for profit but must consider its harm when discarded.
  - plastic bottles now biodegrade and are no longer immortal.
  - non-chlorinated refrigerants now cool beer without sacrificing the Ozone Layer.
  - Engine exhaust components
  - Rich mix minimizes NO, maximizes CO, hc
    - Run a little rich and catalytically kill CO to CO_2

Factors For Quality Of Health

- **Intentions and Actions**= Behavior (Sleep Cycle)
- **Nutrition** (Food Cycle)
- **Environment**