

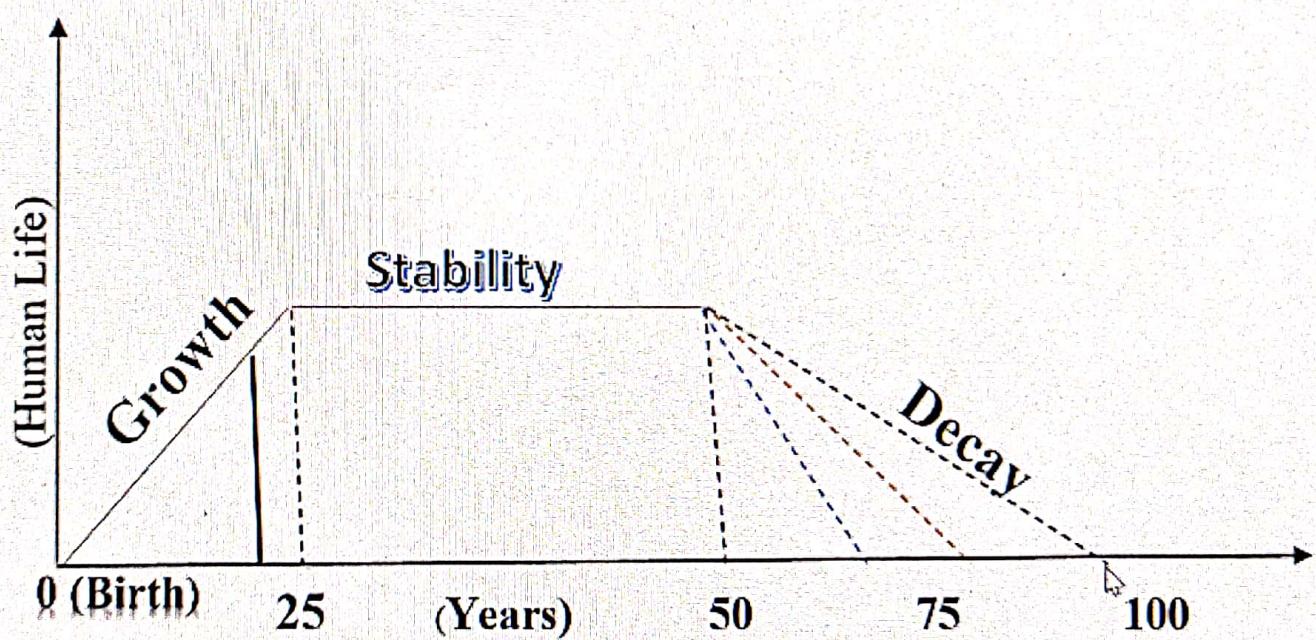
## ENVIRONMENT:

Environment can be defined as a system in which the biotic components perpetuate their living by depending upon abiotic components as their resources where the natural phenomenon of balance sustains.

What is the meaning of perpetuate?

Perpetuate is the process of production, acclimatization, growth, stable and decay.

# PERPETUATE



## POLLUTION:

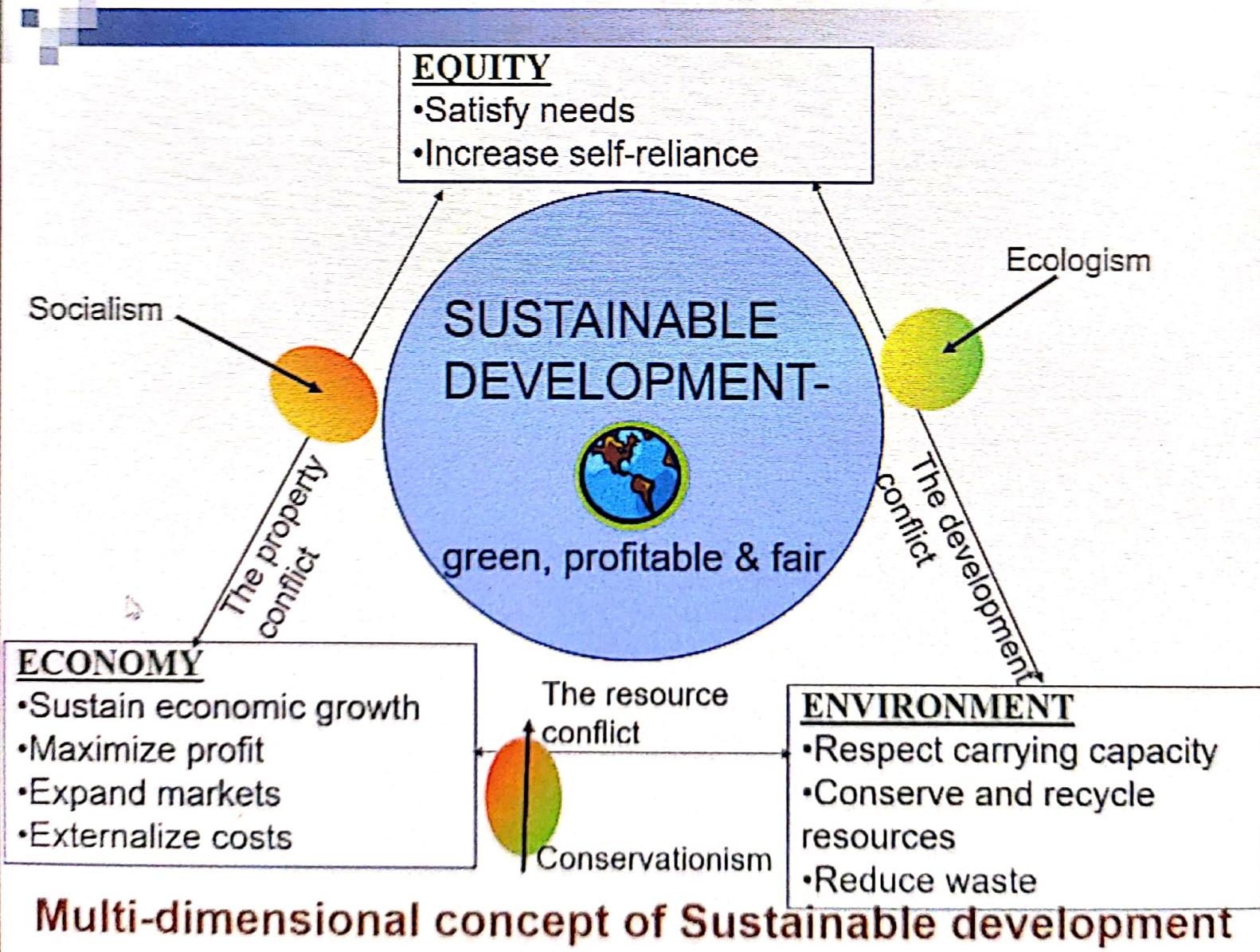
Pollution – of water, air or soil, may be defined as the human caused addition of any materials or energy, in amounts that cause undesired, temporary or permanent alterations.



## SUSTAINABLE DEVELOPMENT:

- Definition first given in 1984 by World Commission on Environment & Development. Sustainable development defined as – **“Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs”.**
- Another definition given by IUCN in 1991. Sustainable development as defined by IUCN – **“Improving the quality of life, while living within the carrying capacity of supporting ecosystems”**
- Sustainable development is a complex, multi-dimensional and dynamic concept which deals with a balanced and adaptive evolutionary process.





## MAN'S IMPACT ON ENVIRONMENT:

Eco-systems have been rapidly exploited by man, beyond the capacity of the Environment to adjust, thereby totally disrupting the balance of nature.

Man has aggravated this problem by his innumerable activities like: (**EXPLAIN EACH ACTIVITY IN DETAIL**)

- (a) Industrialization
- (b) Motorization (Automobiles)
- (c) Urbanization (Over population)
- (d) Deforestation
- (e) Nuclear explosions / radioactivity
- (f) Construction of large dams
- (g) Use of inorganic fertilizers / pesticides

## (SELF STUDY QUESTIONS)

- (a) Narmada Dam - +ve and –ve significant impacts  
(Explain each in detail)
- (b) Bhopal Gas tragedy – Source, reasons, chemical leaked, impacted area / region, health and environmental impacts, international / national litigation.
- (c) Proposed Vadodara-Mumbai expressway- +ve and –ve significant impacts (Explain each in detail)
- (d) Proposed High Speed Rail Corridor between Ahmedabad – Mumbai.

## PRINCIPLES OF SUSTAINABLE DEVELOPMENT:

- Natural ecosystems have the right to co-exist with human development.
- Natural resources are finite and human development shall not deplete nor degrade these resources.
- Technology, science, engineering, planning and design shall be used to create efficient and long lasting development.
- At all scales, the natural context shall be emphasized in human development.
- Nature cannot be controlled or evaded, therefore it is the ultimate regulator of human development.
- Maximum benefits are realized when development is sought within the existing built environment.



## POLLUTANT:

Pollutant can be defined as a natural or man made substance which is harmful to all the living and non-living components of the Environment by altering their original stage on a temporary or permanent basis.

## CLASSIFICATION / TYPES OF POLLUTANTS:

Broadly classified in three categories:

- (1) Depending upon their existence in nature.
- (2) Depending upon the form in which they persist after being released into the Environment.
- (3) Depending upon the type of disposal.

(1) Depending upon their existence in nature

(a) **QUANTITATIVE POLLUTANTS:**

Those substances which are normally occurring in the Environment and whose concentration gets increased due to human activities.

e.g. higher concentrations of CO<sub>2</sub> due to automobiles and industries.

(b) **QUALITATIVE POLLUTANTS:**

Those substances which do not normally occur in nature, but are added by humans.

e.g. pesticides



- (2) Depending upon the form in which they persist after being released into the Environment
- (a) **PRIMARY POLLUTANTS (1° pollutants):**  
Those substances which are emitted directly from the source and remain in the same form.  
e.g. dust, SO<sub>2</sub>, hydrocarbons.
- (b) **SECONDARY POLLUTANTS (2° pollutants)**  
Those substances which are formed by chemical interaction of primary pollutants with some constituents present in the atmosphere.  
e.g. SO<sub>3</sub>, O<sub>3</sub>, Aldehydes, Nitrogen di-oxide

(3) Depending upon the type of disposal

(a) **BIO-DEGRADABLE POLLUTANTS:**

Pollutants that are easily degraded by natural means.

e.g. domestic sewage, thermal / heat pollution

(b) **NON-DEGRADABLE POLLUTANTS:**

Substances that either do no degrade or degrade very slowly in the natural Environment.

e.g. DDT, phenolic compounds, plastics

## CLASSIFICATION / TYPES OF POLLUTION:

Broadly classified in five categories: →

- (1) Air pollution
- (2) Water pollution
- (3) Land / soil pollution
- (4) Noise pollution
- (5) Radioactive / Nuclear pollution

# NOISE POLLUTION:

# Introduction

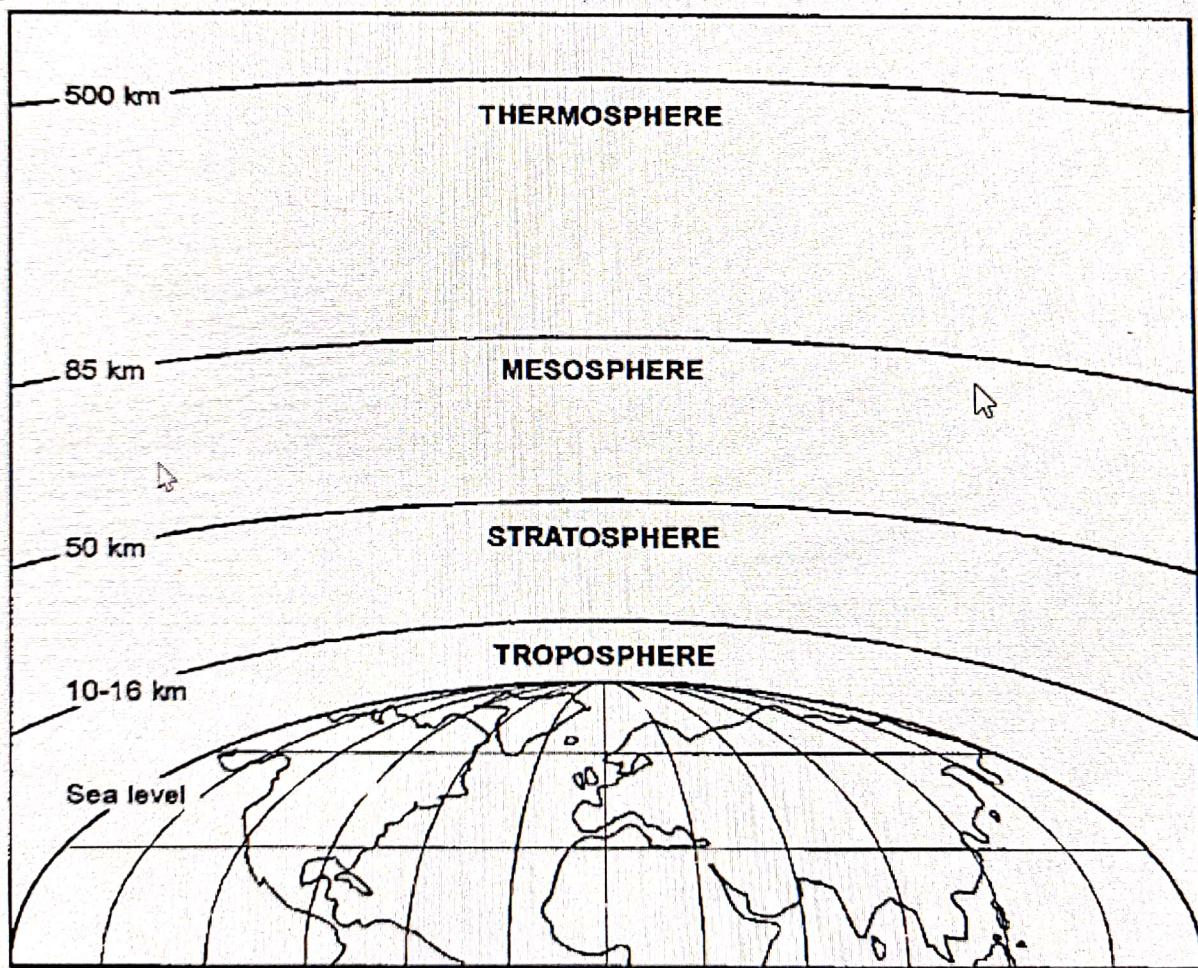
## ■ BIOSPHERE:

The layer around the earth where air (atmosphere), water (hydrosphere) and minerals-solids (lithosphere) interact with living beings is called the biosphere.

## ■ Functions of the atmosphere include:

- Protection from harmful radiation.
- Moderating the surface temperature.
- Providing a medium (air) that allows organisms to exchange gases in order to survive (breathing).

# The Atmosphere



## Importance / significance of Air pollution

- Air pollution is a major threat of the 21<sup>st</sup> century.
- Air pollution is woven throughout the fabric of modern life.
- Man has polluted air so much that clean air has become more than a luxury for him today.
- Since air pollution has been mainly caused by rapid industrialization in some western countries, some critics comment on air pollution as the “PRIZE OF INDUSTRIALIZATION”.
- Air pollution caused by automobiles has been described as the “DISEASE OF WEALTH”.

## Why is Air Pollution an issue ??

- Involuntary exposure.
- Affects large numbers of people.
- No threshold effect.
- The health costs are enormous.
- Affects the health of flora and fauna.
- Other health effects of air pollution:  
road trauma ↑, physical activity ↓



## Definitions of Air pollution

### As given by IS-4167

“Air pollution is the presence in ambient atmosphere of substances, generally resulting from the activities of man, in sufficient concentration, present for a sufficient time and under circumstances which interfere significantly with the comfort, health or welfare of persons or with the full use or enjoyment of property”

### As given by American Medical Association

“Air pollution is the excessive concentration of foreign matter in the air which adversely affects the well being of the individual or causes damage to property”



- As given by Engineers Joint Council, USA

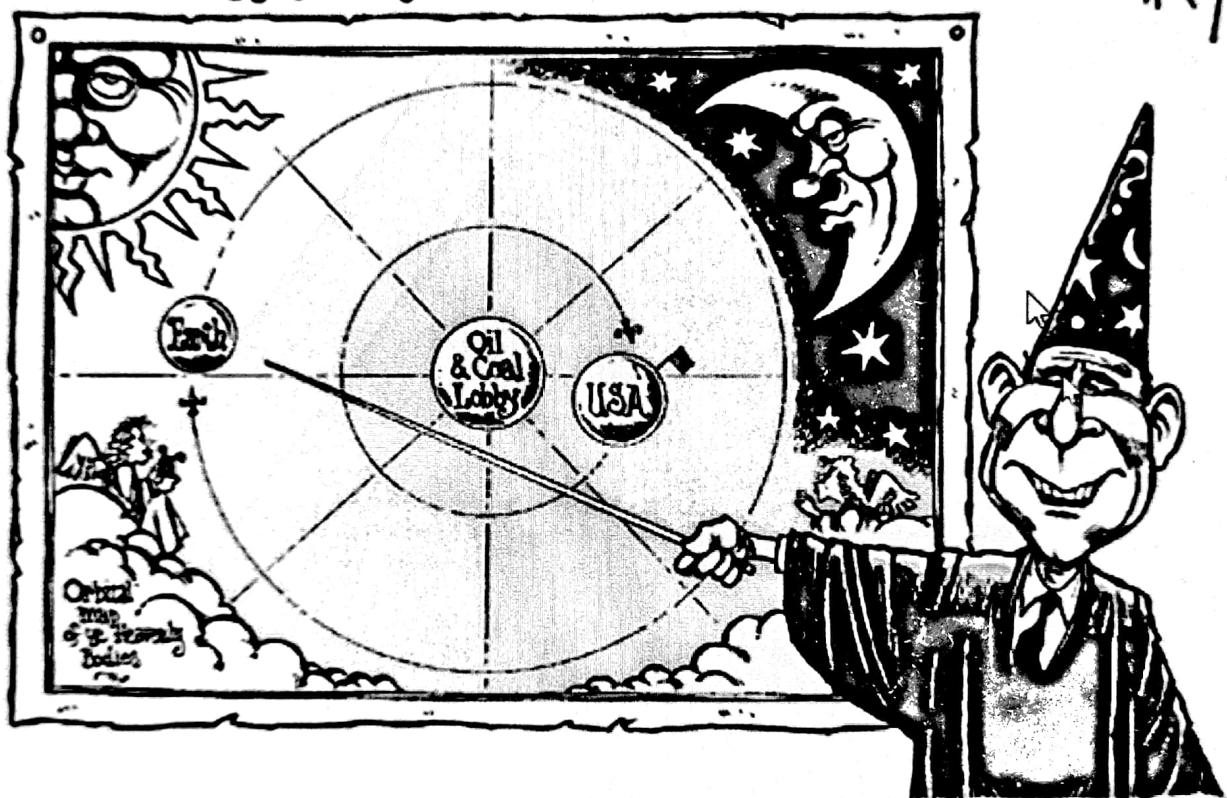
“Air pollution means the presence in the outdoor atmosphere of one or more contaminants, such as dust, fumes, gas, mist, odour, smoke or vapour, in quantities, with characteristics, and of durations such as to be injurious to human, plant or animal life or property, or which unreasonably interferes with the comfortable enjoyment of life and property”

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## The Cosmology of George W. Bush...

HARRY



"RELAX! IT'S THE EARTH THAT'S WARMING UP, NOT THE UNITED STATES!"



Chon Madden

## Sources of air pollution

Emission (air pollution) may be classified by source as stationary or mobile sources. The detailed classification is given as below:

- Stationary sources

Again sub-classified as

- > Point sources

- ✓ Industrial processing
    - ✓ Power plants
    - ✓ Industrial fuel combustion (coal, oil, gas)
    - ✓ Solid waste disposal incinerators
    - ✓ Open burning

## Industrial processing

- Chemical Processing
- Mineral Processing
- Petroleum Refining
- Solvent Evaporation



## Area sources

- ✓ Residential heating (coal, gas, oil)
- ✓ Institutional and commercial heating
- ✓ On site incineration
- ✓ Open burning
- ✓ Evaporative losses

## Mobile sources

Again sub-classified as

➤ Line sources

- ✓ Highway vehicles
- ✓ Rail-road locomotives
- ✓ Channel vessels

➤ Area sources

- ✓ Motor vehicles (light, medium, heavy)
- ✓ Rail yard locomotives
- ✓ Port vessels
- ✓ Aircrafts (airports)

## Classification of air pollutants:

Air pollutants can be classified as follows:

Primary pollutants:

Primary air pollutants are those emitted directly from identifiable sources. e.g. 

Coarser particles

(greater than 10  $\mu$  in dia - SPM)

Finer particles

(less than 10  $\mu$  in diameter-PM<sub>10</sub> and PM<sub>2.5</sub>)

Sulphur compounds

Oxides of nitrogen

Carbon monoxide

Halogen compounds

Organic compounds

Radioactive compounds

Secondary pollutants (2<sup>o</sup> air pollutants):

Secondary pollutants are those which are formed in the air due to interaction of primary pollutants among themselves or by reaction with normal atmospheric constituents like sunlight, water vapour etc. e.g.

Ozone

Formaldehyde

PAN (peroxy acetyl nitrate)

Photochemical smog

Formation of acid mists

Air pollutants can also be classified as follows:

Natural air pollutants:

Air borne natural pollutants are significant because of the allergic responses produced in sensitive individuals. Many people suffer from asthma, hay fever, bronchitis, dermatitis e.g.

Natural fog

Pollen grains

Bacteria

Products of volcanic eruptions

Forest fires

## Aerosols (particulates):

An aerosol can be defined as a colloidal system in which the dispersion medium is a gas and the dispersed phase is solid or liquid.

The term “aerosol” is used during the time it is suspended in the air. After it has settled, either by virtue of its self weight, by agglomeration or by impact on a solid or liquid surface, the term no longer implies.

However, it is a nuisance both as an aerosol (visibility reduction) and as settled or deposited matter (soiling of surfaces, corrosion etc.)

e.g.

The particulates consist of fine solids or liquid droplets suspended in air. These different types of particulates have definitive meanings, as follows:

- + Grit – solid particles suspended in air with a diameter over 500 µm;
- + Dust – solid particles suspended in air with a diameter between 0.25 and 500µm;
- + Smoke – gas borne solids with particles usually less than 2µm in diameter.
- + Fumes – suspended solids in air less than 1µm in diameter, normally released from chemical or metallurgical processes;
- + Mist – liquid droplets suspended in air with a diameter of less than 2 µm;
- + Aerosol – solid or liquid particles in suspension in air or some other gas, with a diameter of less than 1 µm.



## Gases:

Sulphur compounds

$\text{SO}_2$ ,  $\text{SO}_3$ ,  $\text{H}_2\text{S}$ , mercaptans

Nitrogen compounds

$\text{NO}$ ,  $\text{NO}_2$ ,  $\text{NH}_3$

Oxygen compounds

$\text{O}_3$ ,  $\text{CO}$ ,  $\text{CO}_2$

Halogen compounds

$\text{HF}$ ,  $\text{HCl}$

Organic compounds

Aldehydes, hydrocarbons

Radioactive compounds

Radioactive gases

