

**ENVIRONMENT & ECOLOGY**

**BAS104/204**

**UNIT-3**

**POWERPOINT PRESENTATION**

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# **BAS104 / BAS204: ENVIRONMENT AND ECOLOGY SYLLABUS**

## **Unit-3:**

**Pollution and their Effects; Public Health Aspects of Environmental;**  
Water Pollution, Air Pollution, Soil Pollution, Noise Pollution, Solid waste management.

**LECTURE-17: ENVIRONMENTAL POLLUTION,**  
**ITS TYPES AND TYPES OF POLLUTANTS**  
**(ENVIRONMENTAL POLLUTANTS)**

**Environmental pollution?**

The environmental pollution can be defined as:  
*“Any unwanted change in physical, chemical and biological properties of air, water or soil, which adversely affects living beings (various life forms) and property is called environmental pollution.”*

# LECTURE-17: ENVIRONMENTAL POLLUTION, ITS TYPES AND TYPES OF POLLUTANTS (=ENVIRONMENTAL POLLUTANTS).....

## Types of Environmental pollution?

- Air pollution: *“any unwanted change in physical, chemical and biological properties of air which adversely affects living beings (=various life forms) and property is called air pollution*
- Water pollution: *“any unwanted change in physical, chemical and biological properties of water which adversely affects living beings (=various life forms) and property is called water pollution.*
- Soil pollution: *“any unwanted change in physical, chemical and biological properties of soil which adversely affects living beings (=various life forms) and property is called soil pollution.*
- Noise pollution: unpleasant loud sound is called noise and disturbing level of noise is known as noise pollution.
- Radiation pollution: pollution of air, water and soil with radioactive materials is called radioactive pollution.

# LECTURE-17: ENVIRONMENTAL POLLUTION, ITS TYPES AND TYPES OF POLLUTANTS (ENVIRONMENTAL POLLUTANTS).....

## Types of Environmental pollutants?

The substances/agents that pollute the environment are termed as pollutants or environmental pollutants. Pollutants may be-

- **BIODEGRADABLE POLLUTANTS**: The pollutants which can be degraded (=decomposed) by microbial action are called biodegradable pollutants. For ex: sewage, plant and animal waste.
- **NON-BIODEGRADABLE POLLUTANTS**: The pollutants which cannot be degraded (decomposed) by microbial action are called non-biodegradable pollutants. For ex: glass, plastic, salts of heavy metals, pesticides (such as DDT), and radioactive materials.
- **PRIMARY POLLUTANTS**: The pollutants which enter in the environment directly from various sources are called primary pollutants. For ex: pesticides (DDT, BHC etc), Unburnt hydrocarbons,  $\text{NO}_2$ ,  $\text{SO}_2$ , particulate matter (dust), plastic ware etc.
- **SECONDARY POLLUTANTS**: These pollutants are formed by reaction between primary pollutants. These are more toxic than primary pollutants. For ex: photochemical smog, sulphurous smog, PAN (Peroxy Acetyl Nitrate),  $\text{O}_3$ , acid rain etc.

# LECTURE-18: CAUSES, IMPACTS AND CONTROL MEASURES OF AIR POLLUTION

**Air pollution:** *“Any unwanted change in physical, chemical and biological properties of air which adversely affects living beings (various life forms) and property is called air pollution.*

## CAUSES/SOURCE OF AIR POLLUTION OR AIR POLLUTANTS:

### NATURAL SOURCES

- *Forest fires*
- *Volcanic eruption*
- *Dust storms*
- *Pollen grains from flowers*
- *Gases from decaying plant and animal waste*
- *Spores from fungi*

### MAN MADE SOURCES (ANTHROPOGENIC SOURCES)

- *Burning of fossil fuels (coal, petroleum, natural gas)*
- *Burning of biomass (wood, plant waste, dung cakes)*
- *Burning of plastic/rubber/ other solid waste*
- *Mining activity*
- *Chemical accidents (for ex: Bhopal Gas Tragedy, Chernobyl Nuclear Accident)*
- *Dust (SPM) from various industries (ex: cement industry)*

# LECTURE-18: CAUSES, IMPACTS AND CONTROL MEASURES OF AIR POLLUTION.....

AIR POLLUTANTS	EFFECT ON ENVIRONMENT/ HUMAN HEALTH
Carbon-mono-oxide (CO)	It causes blood poisoning.
Carbon-di-oxide (CO <sub>2</sub> )	Greenhouse Effect (Global warming)
NO <sub>2</sub>	Acid rain, photochemical smog
N <sub>2</sub> O	Green house effect
SO <sub>2</sub>	Acid rain, sulphurous smog
CFCs	Ozone layer depletion, Green house effect
CH <sub>4</sub>	Green house effect
Dust (particulate matter) and pollen grains	Respiratory diseases such as Asthma, Bronchitis

# LECTURE-18: CAUSES, IMPACTS AND CONTROL MEASURES OF AIR POLLUTION.....

## CONTROL OF AIR POLLUTION OR ABATEMENT OF AIR POLLUTION:

- Environmental education and public awareness
- Plantation
- Use of alternative fuels of energy
- *Use of unleaded petrol*
- *Use of CNG*
- *Use of biofuels (biodiesel/biopetrol)*
- *Use of filters and catalytic convertors in engines*
- Large scale plantation around the factory (Green belt designing).
- Industries should be installed/setup away from the residence.
- Factories should have tall chimneys
- *Use of electrostatic precipitator (ESP) & wet scrubbers.*
- Rules/acts must be enacted to control air pollution.  
For ex: *Air (Prevention and Control of Pollution) Act, 1981.*

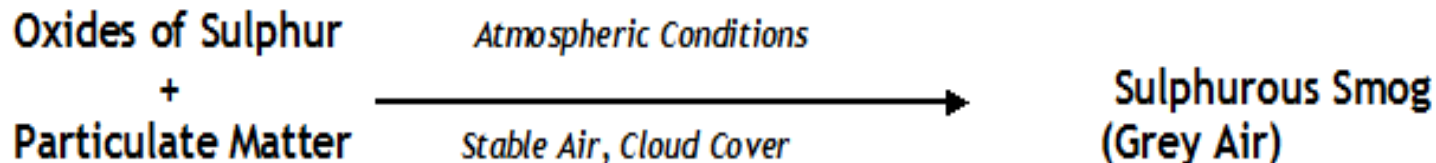


# LECTURE-18: CAUSES, IMPACTS AND CONTROL MEASURES OF AIR POLLUTION.....

## Coal induced smog or sulphurous smog or London smog or classical smog

The sulphurous smog is primarily produced by burning of coal or oil at large power plants. When coal or oil is burnt, oxides of sulphur are produced. In atmosphere, the oxides of sulphur react with suspended particulate matter (for ex: dust) under some atmospheric conditions and as a result sulphurous smog is formed.

The sulphurous smog formation occurred in London during December 5-9, 1952; hence it was named London smog.



# LECTURE-18: CAUSES, IMPACTS AND CONTROL MEASURES OF AIR POLLUTION.....

## Photochemical smog or Los Angeles smog

The photochemical smog is formed when in the atmosphere; oxides of nitrogen react with unburnt hydrocarbons in the presence of sunlight (UV solar radiation).

Oxides of Nitrogen

+

Unburnt Hydrocarbons

(From automobile exhaust)

UV Solar Radiation



$O_3 + \text{PAN} + \text{ALDEHYDES} + \text{H}_2\text{O}_2$   
+ O

WHERE-

[PAN=  
PEROXYACETYLNITRATE]

(PHOTOCHEMICAL SMOG)

(Yellowish Brown Air)

Photochemical smog was first observed in Los Angeles, USA in 1944; hence it was named as Los Angeles smog.

# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT

**Water pollution:** *“Any unwanted change in physical, chemical and biological properties of water which adversely affects living beings (various life forms) and property is called water pollution.*

## **Causes/sources of water pollution/ water pollutants:**

- **Sewage** (i.e., waste water from domestic activities)
- **Effluents** (i.e., waste water from factories/industries)
- **Agricultural waste** (such as chemical fertilizers, chemical pesticides, crop residue etc.)
- **Mining activity**
- **Dumping of solid waste into water bodies**
- **Radioactive waste** (i.e., waste from nuclear power plants)
- **Oil spills**
- **Thermal pollution** (i.e., hot waste water form oil refineries, thermal & nuclear power plants)

# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....

## EFFECT OF WATER POLLUTION/WATER POLLUTANTS ON ENVIRONMENT/HEALTH:

- Eutrophication
- Biomagnification
- Groundwater contamination
- Disturbance of aquatic habitat and aquatic food chain
- Destruction of aquatic life
- Loss of wildlife
- Loss of biodiversity
- Water borne diseases
- Water induced disease

# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....

## CONTROL OF WATER POLLUTION

- Sewage and effluents must be treated before discharging them in to water bodies.
- Dead bodies should not be thrown in to rivers. For ex: Ganga River
- Solid waste (for ex: temple waste) should not be dumped in to river water bodies.
- Thermal pollution can be reduced by using techniques such as cooling ponds, wet & dry cooling towers.
- Cattles should not be allowed to take bath in river/lakes and ponds.
- The washer man should not be allowed to wash clothes in the river.
- Rules/acts must be enacted to control water pollution.  
For ex: Water (Prevention and Control of Pollution) Act, 1974.

# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....

## EUTROPHICATION:

The surface runoff from agricultural fields carries a heavy load of chemical fertilizers (Nitrates and Phosphates) reach the nearby water body. These nitrates and phosphates act as nutrients for aquatic plants (algae and other unwanted plants). As a result algae and unwanted plants grow in excess, which is known as algal bloom.

## EFFECTS OF EUTROPHICATION:

- Algal blooms may totally cover the water surface and release toxic chemicals in water, which kill fish, birds and other aquatic plants.
- Decomposition of algal bloom leads to oxygen depletion in water. Due to lack of dissolved oxygen, water plants and animals die and their dead bodies get deposited at the bottom of the water body. This causes a disturbance in aquatic habitat and aquatic food chain.

# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....

## BIOMAGNIFICATION

We use several toxic chemicals like pesticides to protect our crop plants from various diseases. These chemicals are-

- These chemicals are taken up from the soil by the plants along with water and minerals and thus enter the food chain.

As these chemicals are not degradable, these harmful chemicals get concentrated at each trophic level in the food chain. This phenomenon is termed as biomagnifications or biological magnification.

For ex: In an aquatic ecosystem it was found that while the concentration of harmful chemicals (DDT) in water was only 0.02 ppm, it was 5 ppm in planktons (Phytoplanktons and zooplanktons), 240 ppm in fish that fed on them and 1600 ppm in the birds feeding on these fishes.

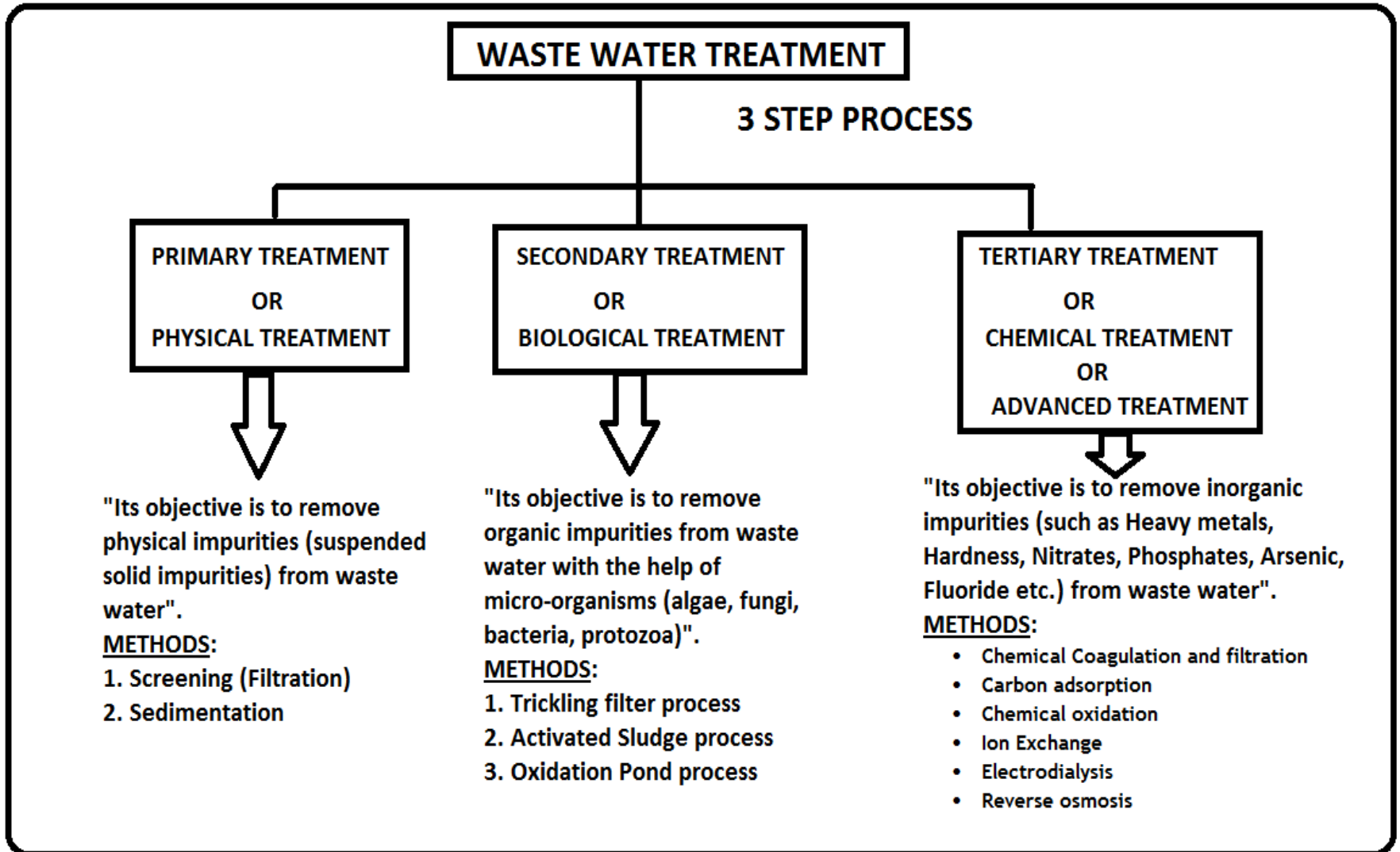
# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....

## **“Blue baby syndrome” (Methaemoglobinemia disease).**

- It is believed to be caused by high nitrate contamination in ground water.
- Excess fertilizers (nitrogenous fertilizers) may reach the underground water by leaching due to which ground water gets contaminated with nitrate.
- Nitrate contaminated ground water is used by human beings for drinking.
- In our body nitrate reacts with haemoglobin of blood to form methaemoglobin which stops the oxygen supply to the body parts (especially brain) leading to death.
- This disease is also known as blue baby syndrome because babies are born blue in colour and die soon.



# LECTURE-19: CAUSES, IMPACTS AND CONTROL MEASURES OF WATER POLLUTION, WASTE WATER TREATMENT PLANT .....



# LECTURE-20: CAUSES, IMPACTS AND CONTROL MEASURES OF THERMAL, SOIL AND NOISE POLLUTION

## THERMAL POLLUTION:

*“It is defined as the unwanted change in the properties of water due to waste heat in the water (waste hot water) which adversely affect life of aquatic organisms (aquatic plants and animals)”.*

## CAUSES/SOURCES OF THERMAL POLLUTION:

Waste heat or waste hot water is produced from the following industries:

- Thermal power plants
- Nuclear power plants
- Oil refineries etc.

## EFFECT OF THERMAL POLLUTION:

- When waste hot water is discharged in to river/lakes/sea, it adversely affects aquatic plants and animals.
- At higher temperature, the photosynthetic activity of aquatic plants stops.

# LECTURE-20: CAUSES, IMPACTS AND CONTROL MEASURES OF THERMAL, SOIL AND NOISE POLLUTION.....

**Soil pollution:** “Any unwanted change in physical, chemical and biological properties of soil (land) which adversely affect living beings (various life forms) and property is called soil pollution or landscape pollution.

## **CAUSES/SOURCES OF SOIL POLLUTION:**

- **Agricultural practices:** Use of chemical pesticides (for ex: DDT, BHC, PCB's) and chemical fertilizers (for ex: nitrate and phosphate fertilizers).
- **Farm waste:** Animal waste and crop waste are dumped in heap on the land, they attract pests and becomes breeding ground for microbes, flies, and rodents (for ex: rat) etc. and thus cause landscape pollution.
- **Mining activity:**
- **Industrial waste:**

## **Radioactive waste:**

## **IMPACT OF SOIL POLLUTION/SOIL POLLUTANTS ON ENVIRONMENT:**

- The toxic chemicals (=chemical pesticides) and toxic heavy metals present in the soil enter the food chain and get accumulated at each trophic level and affect biological system of living organisms (=animals and human beings).
- Excessive use of chemical fertilizers adversely affects soil fertility and soil quality.

# LECTURE-20: CAUSES, IMPACTS AND CONTROL MEASURES OF THERMAL, SOIL AND NOISE POLLUTION.....

## CONTROL OF SOIL POLLUTION:

- Excessive use of chemical pesticides and chemical fertilizers should be stopped.
- Chemical fertilizers and chemical pesticides should be replaced by bio-fertilizers and bio-pesticides.
- The farmers should use Bio-fertilizers, Compost, Vermi-compost, Manures and Biopesticides.
- Solid waste should not be disposed in open space. Sanitary land filling method should be adopted for disposal of solid waste.

# LECTURE-20: CAUSES, IMPACTS AND CONTROL MEASURES OF THERMAL, SOIL AND NOISE POLLUTION.....

## Noise pollution:

*“Unpleasant sound is called noise, and disturbing level of noise is called noise pollution”. Noise pollution is measured in decibel (dB).*

### Causes/sources of noise pollution:

- Natural sources: For ex- thunder and lightening
- Man-made sources:
  - Industries and machineries
  - Land and air transportation
  - Community activities such as: celebration parties, burning of crackers etc.
  - Indoor activities such as: loudly played music systems, televisions, radio etc.

# LECTURE-20: CAUSES, IMPACTS AND CONTROL MEASURES OF THERMAL, SOIL AND NOISE POLLUTION.....

## Effect of noise pollution:

- A decibel value above 80dB causes noise pollution.
- A sound more than 115 dB is harmful to ears.
- The first effect of noise is anxiety and stress.
- Noise pollution causes a rise in blood pressure and blood cholesterol level.

## Control of noise pollution:

- Ban on crackers which produce loud sound during festivals.
- Avoid using high sound producing musical instruments.
- Plantation of trees along highways to control noise pollution
- Plantation of trees around industries (green belt designing). This is called green muffler.
- The noisy industries should be setup away from residence.

# LECTURE-21: RADIOACTIVE POLLUTION, CASE STUDIES LIKE BHOPAL GAS TRAGEDY, CHERNOBYL NUCLEAR ACCIDENT, HIROSHIMA-NAGASAKI ATOMIC BOMB EXPLOSION, MINAMATA DISEASE

## Radioactive pollution:

“Pollution of air, water and land with radioactive material is called radioactive pollution”.

### SOURCES OR CAUSES OF RADIOACTIVE POLLUTION

- **Natural sources:** Cosmic rays from outer space, UV and gamma rays from sun.
- **Man-made sources:** Atomic explosion, atomic power plants, nuclear power plants, mining of nuclear fuels, nuclear accidents (for ex: Chernobyl nuclear accident)

### EFFECT/IMPACT OF RADIATION POLLUTION ON ENVIRONMENT/ HEALTH:

- It causes damage to cells and tissues which may lead to cancer (blood cancer and skin cancer) and death.
- The radiation may damage chromosomes, genes and DNA which may lead to mutation.
- Uranium causes skin cancer and tumors in mine workers.

## **LECTURE-21: RADIOACTIVE POLLUTION, CASE STUDIES LIKE BHOPAL GAS TRAGEDY, CHERNOBYL NUCLEAR ACCIDENT, HIROSHIMA-NAGASAKI ATOMIC BOMB EXPLOSION, MINAMATA DISEASE.....**

### **CONTROL OF RADIATION POLLUTION:**

- **Extreme care and precautions should be taken in transportation, storage and disposal of nuclear waste.**
- **Atomic power plants, nuclear power plants should be located far away from residence, forest area and biosphere reserves.**
- **Radioactive therapy and nuclear medicines should be advised to patients.**



# LECTURE-21: RADIOACTIVE POLLUTION, CASE STUDIES LIKE BHOPAL GAS TRAGEDY, CHERNOBYL NUCLEAR ACCIDENT, HIROSHIMA-NAGASAKI ATOMIC BOMB EXPLOSION, MINAMATA DISEASE.....

## BHOPAL GAS TRAGEDY

Date: 3 December, 1984

Venue (place): Bhopal (Madhya Pradesh), India

Source: Union Carbide Factory (manufacturer of carbamate pesticide using Methyl Iso-cyanate (MIC) [ $\text{CH}_3\text{-N=C=O}$ ])

Event/accident: Leakage of Methyl Iso-Cyanate gas (MIC) due to technical problem.

Effect: Death of approx 3200 people and more than 3 lakh people affected by the gas. This gas caused blindness and various lung diseases.

# LECTURE-21: RADIOACTIVE POLLUTION, CASE STUDIES LIKE BHOPAL GAS TRAGEDY, CHERNOBYL NUCLEAR ACCIDENT, HIROSHIMA-NAGASAKI ATOMIC BOMB EXPLOSION, MINAMATA DISEASE.....

## CHERNOBYL NUCLEAR ACCIDENT

Date: 28 April, 1986

Venue (place): Chernobyl in the Ukraine area of Soviet Union

Source: Nuclear Power Station (Atomic Reactor)

Event/accident: Explosion of radioactive dust and fire due to uncontrolled nuclear fission reaction in the Nuclear Power Station.

Effect: The radioactive dust spread over many kilometers and covered not only Europe but North America as well.

As per United State experts, the radioactive dust caused death of approx 30,000 people and approx 6.5 lakh people seriously affected. The radioactive dust caused *Cancer, Thyroid Problems, Tumors, Eye Diseases and Lowered Immune System* among People.

# LECTURE-21: RADIOACTIVE POLLUTION, CASE STUDIES LIKE BHOPAL GAS TRAGEDY, CHERNOBYL NUCLEAR ACCIDENT, HIROSHIMA-NAGASAKI ATOMIC BOMB EXPLOSION, MINAMATA DISEASE.....

## Hiroshima-Nagasaki Bombards

First of all Atom Bomb was used in World War-II by America. American bomber Enola Gay dropped first bomb on Hiroshima city of Japan on 6 August 1945. The name of this bomb was “a little boy”. Because of the bomb, 66,000 people were killed and 69,000 were injured.

After this, America dropped second bomb on 9 August, 1945 over Nagasaki (also a city of Japan). The name of this bomb was “fat man”. It killed 39,000 persons and injured more than 25,000 residents of Nagasaki.

# LECTURE-22: SOLID WASTE (INCLUDING E-WASTE), ITS TYPES AND SOLID WASTE MANAGEMENT PRACTICES

**Solid waste**: “Any unwanted or rejected or discarded material in solid form which causes environmental pollution is called solid waste.

## **TYPES/SOURCES OF SOLID WASTE**

- Municipal solid waste (Domestic, street, office, market waste)
- Industrial waste
- Biomedical waste
- Agricultural waste
- E-waste

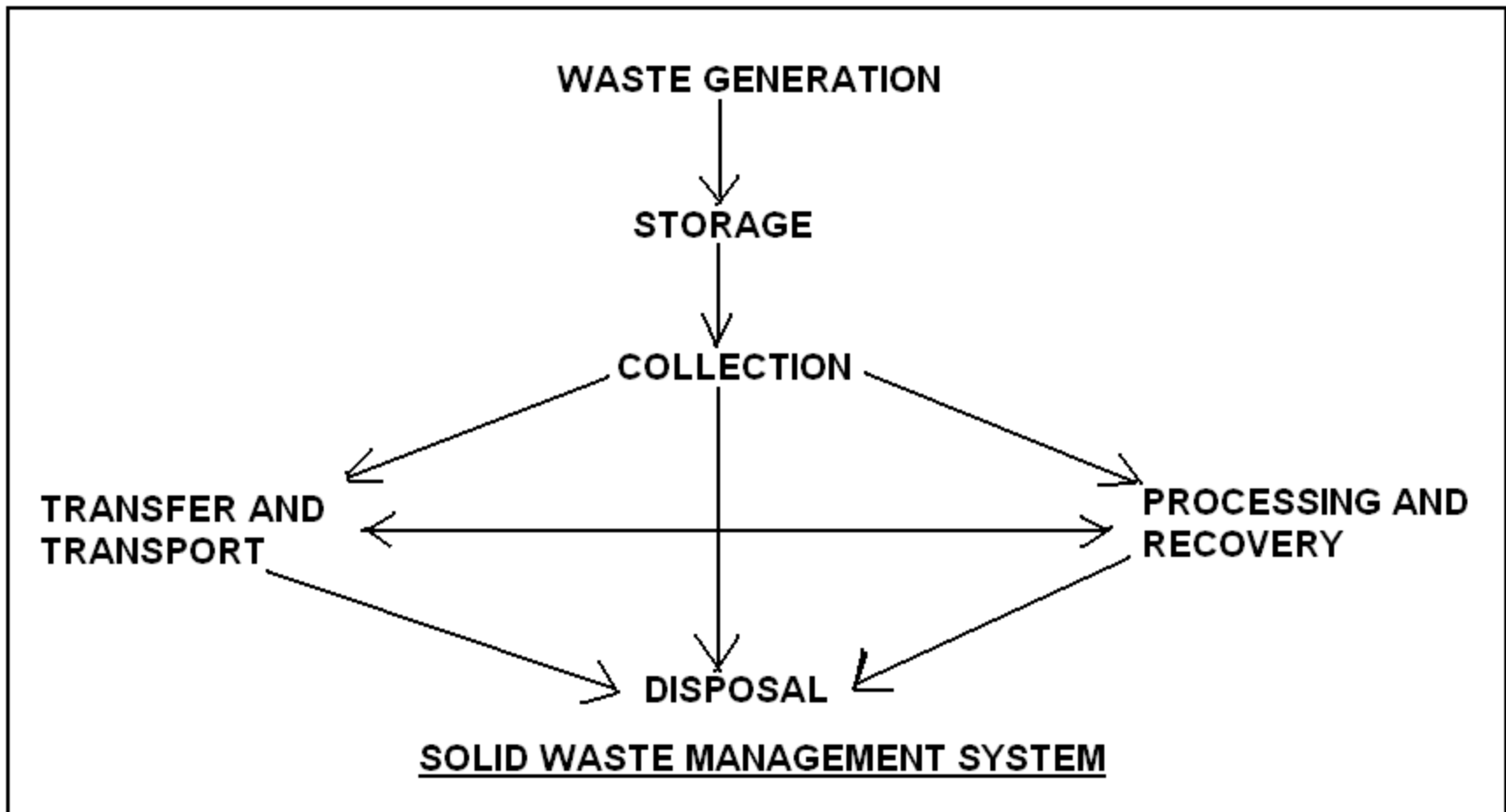
# LECTURE-22: SOLID WASTE (INCLUDING E-WASTE), ITS TYPES AND SOLID WASTE MANAGEMENT PRACTICES....

## EFFECT OF SOLID WASTE ON ENVIRONMENT

- ❑ On burning-----air pollution
- ❑ When thrown into water body-----water pollution
- ❑ When dumped onto land-----soil pollution, destroys greenery and the beauty of surrounding and *“It becomes a habitat of micro-organisms, mosquitoes, flies, rats etc, which spread infectious diseases and affect human health”*

# LECTURE-22: SOLID WASTE (INCLUDING E-WASTE), ITS TYPES AND SOLID WASTE MANAGEMENT PRACTICES....

## SOLID WASTE MANAGEMENT



# LECTURE-22: SOLID WASTE (INCLUDING E-WASTE), ITS TYPES AND SOLID WASTE MANAGEMENT PRACTICES....

## SOLID WASTE MANAGEMENT

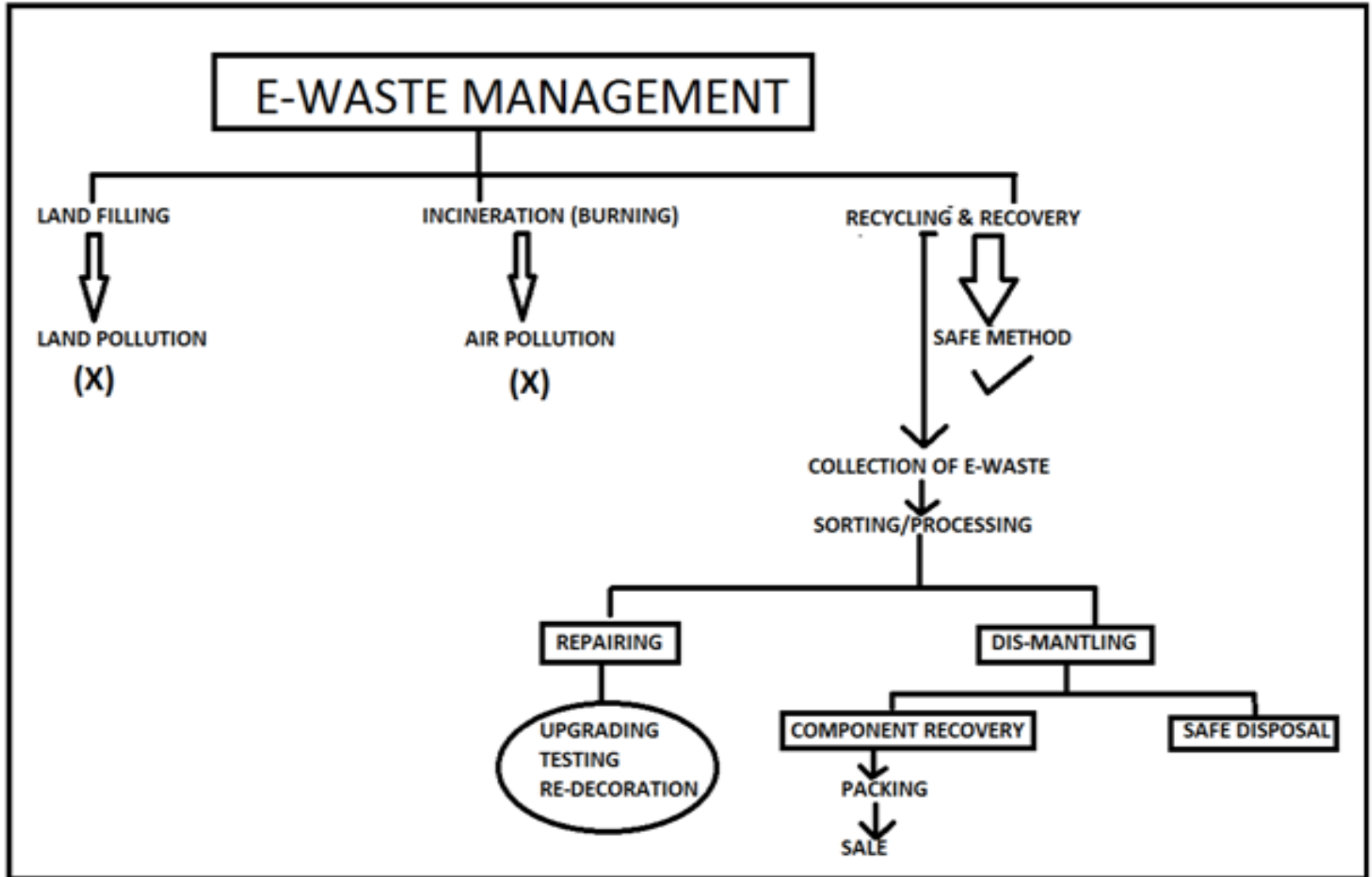
### METHODS OF SOLID WASTE MANAGEMENT:

1. FOUR “R” PRACTICE: Reduce, Reuse, Recycle and Recovery.

2. DISPOSAL OF SOLID WASTE:-

- \* Sanitary landfilling
- \* Incineration
- \* Pyrolysis
- \* Composting
- \* Vermi-composting

# LECTURE-22: SOLID WASTE (INCLUDING E-WASTE), ITS TYPES AND SOLID WASTE MANAGEMENT PRACTICES....





THANK YOU