

Chapter 9

Environmental management

Guide

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Table content :

- ▶ **Weather and climate**
- ▶ **Meteorology**
- ▶ **Solid waste management**
- ▶ **Disaster management**

The background is a collage of four distinct weather and seasonal scenes. The top-left quadrant shows a warm sunset with a large yellow sun, orange and yellow clouds, and silhouetted mountains. The top-right quadrant depicts a bright, sunny day with a clear blue sky, white clouds, and green rolling hills. The bottom-left quadrant illustrates a lush green landscape with rolling hills and numerous white dandelions in the foreground. The bottom-right quadrant shows a winter scene with snow-covered mountains and a dark blue sky filled with white snowflakes.

Weather & Climate

What is weather ?

- ▶ Weather is the condition of the atmospheric condition of particular time and place .
- ▶ It is day to day changes in :
 - ▶ Temperature
 - ▶ Wind
 - ▶ precipitation

Types of Weather



Sunny



Stormy



Snowy



Windy



Cloudy



Rainy

Precipitation

Rain



- Falling drops of liquid water.
- Most common type of precipitation.

Snow



- Falls when the temperature in the cloud is below freezing.

Sleet



- Rain that freeze as it falls.

Hail



- Forms when drop of rain freeze and strong wind carry them higher into a cloud.

Weather

- ▶ The study of weather is called weather .
- ▶ A scientist who study about weather and predict the weather is called meteorologist .
- ▶ Weather is placed change everyday .



CLIMATE



Climate

- Climate is the weather condition of a place over a long periods of time , say twenty to thirty years .
- Different parts of the climate for example :
- Hot and wet
- Hot and dry
- Cold
- Moderate

Factor affecting climate change

- Latitude
- Altitude
- Distance from the sea
- Pressure and wind system
- Ocean currents

Factors Affecting the Climate of a Region



Latitude

Temperature decreases with distance from equator



Distance from the Sea

Moderate climate near coast, extreme temps inland



Altitude

Temperature decreases with elevation



Ocean Currents

Warm and cold currents affect coastal climate



Wind and Air Masses

Move warm/cold, dry/moist air masses



Topography

Rain shadow effect: wet windward, dry leeward



Vegetation

Humid, moderate vs. drier, hotter areas



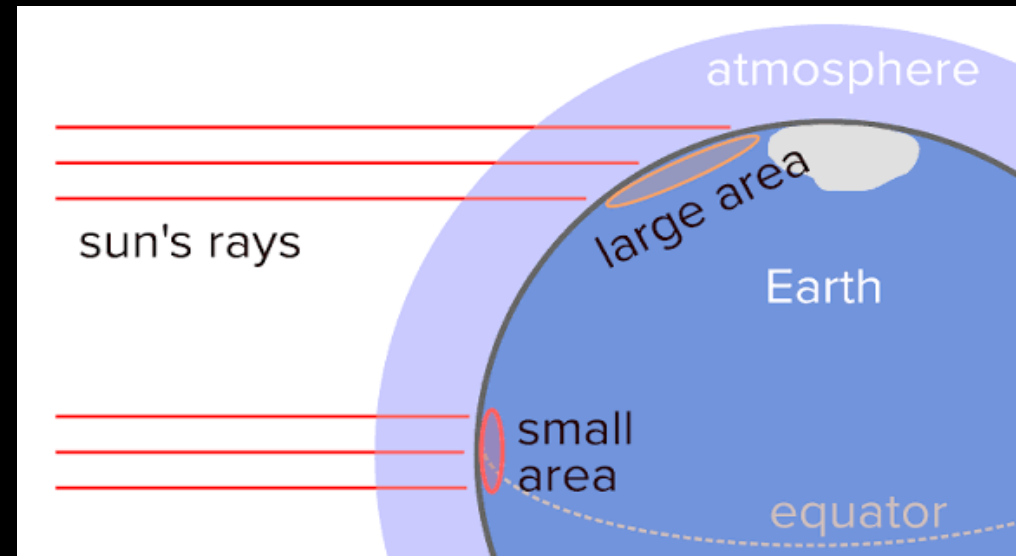
Human Activities

Urban heat island, deforestation.

Factor affecting climate

Latitude

- ❖ Places near the Equator are hotter, while places near the poles are colder because of the angle of the Sun's rays.
- ❖ The sun's rays fall directly on the place near the equator. So, these get maximum warmth of the sun and are hotter.
- ❖ The poles receive slanting rays of the sun which are scattered over a large area. So, these places remain cold.



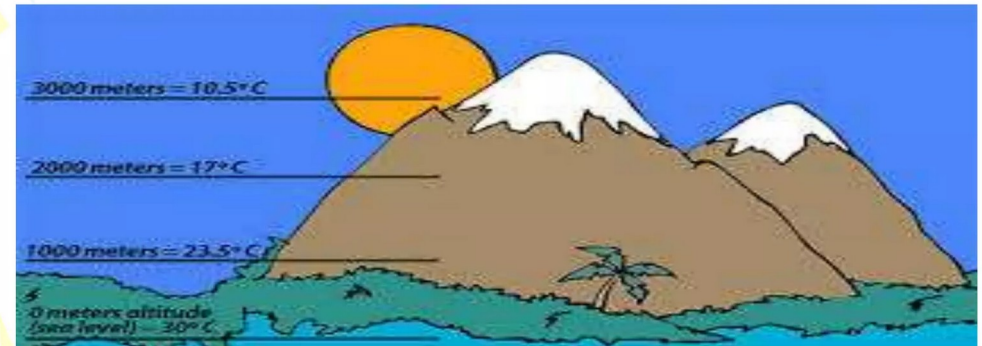
Factor affecting
climate

Altitude

Altitude (Height above sea level) – Higher places are cooler than lower places.

ALTITUDE

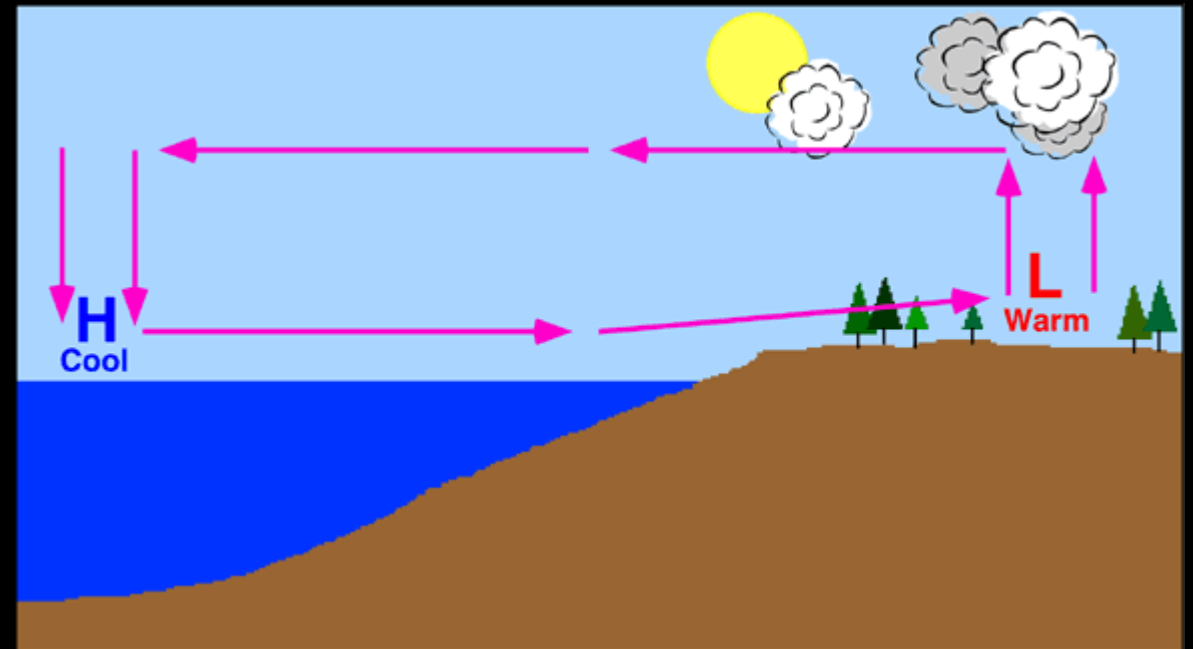
- AS WE GO FROM SURFACE OF THE EARTH TO HIGHER ELEVATIONS ATMOSPHERIC TEMPERATURE DECREASES.
- NORMAL LAPSE RATE $-1^{\circ}\text{C} / 165\text{m}$ HEIGHT
- ATMOSPHERE GET HEATED FROM BELOW



Factor affecting climate

Distance from the Sea

Coastal areas have moderate temperatures, while inland areas experience more extreme temperatures. Place located near or long the sea are called coastal area . Place located aways from the sea are called inland area Coastal area have a moderate climate throughout the year . Inland area are warmer compared to the coastal area .



climate



vs.

weather

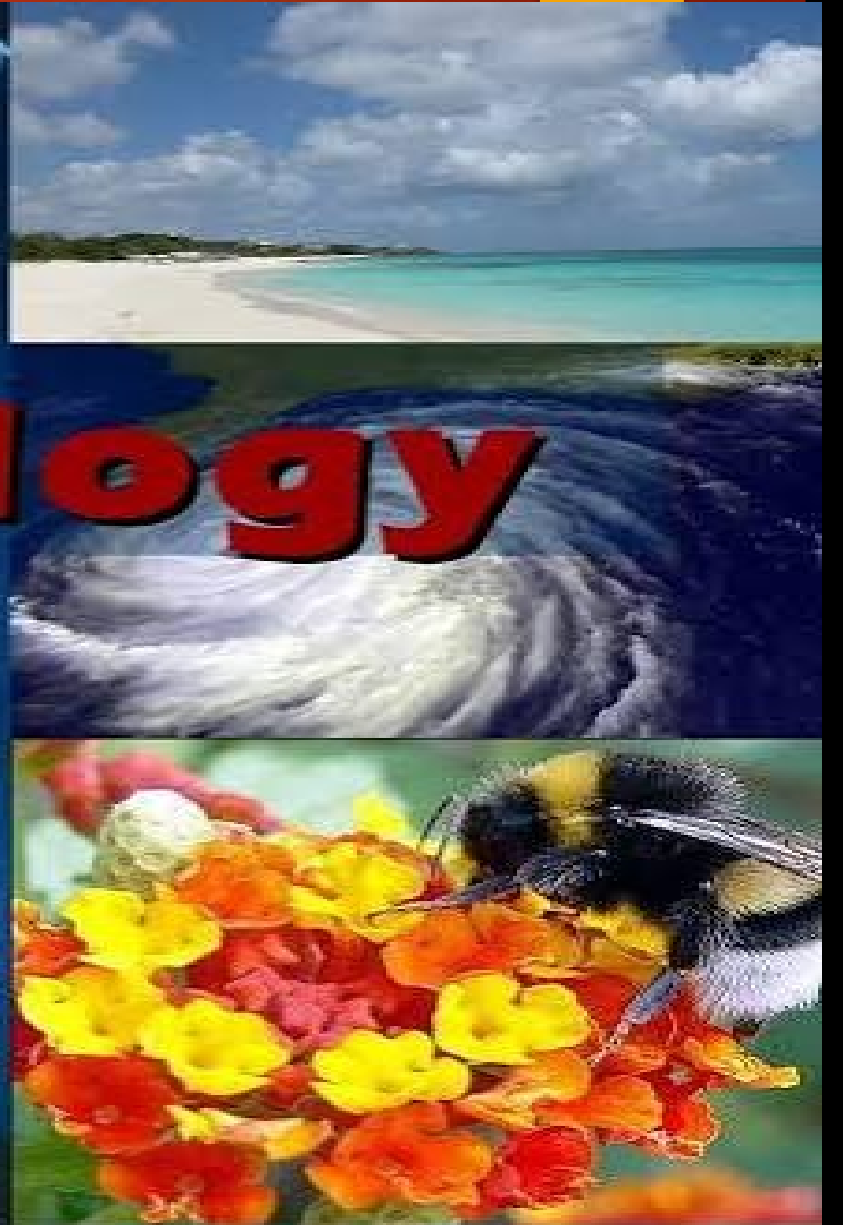


#ScienceUpFirst

Weather vs Climate

Weather	Climate
Weather is a short-term condition of the atmosphere.	Climate is a long-term effect of the atmosphere.
Weather conditions are being studied in a specific area at a particular time.	Climate is a result of the average of daily weather conditions at a place in a specific time.
It is studied daily for forecasting the upcoming weather.	The weather factors are studied daily to find the climate after 30 years.
The weather might be taken as one condition of the atmosphere at a time.	Climate comprises all the weather factors such as atmospheric pressure, temperature, humidity, cloudiness, wind, and precipitation for 30 years.
Weather is what you regularly expect over a season.	Climate is what the atmosphere behaves over a long period.
The study of weather is essential to know the upcoming condition of the atmosphere.	Study of climate is essential to know its harmful impact on the environment, and our ecosystem to take precautions earlier.
The scientists who study weather are known as meteorologists.	The scientists studying the climate are familiar as climatologists.
Meteorology is the study of weather.	Climatology is the study of climate.
Particular weather at a specific place and time remains for a shorter period.	Climate changes by the daily variations of weather and remains for a decade or century.

Meteorology



What is meterology ?

- ▶ Meterology is the science that studies atmospheric phenomena , especially those that relate to weather and climate .
- ▶ “meteor” is derived from ancient Greek word that means “high in the air ”
- ▶ Clouds , rain drop , dust , fog and rainbows are atmospheric meteors .

History of india meterological department

- ▶ Established in 1875, the India Meteorological Department (IMD) is completing 150 years of service to the nation on 15th January 2025.
- ▶ The administrative responsibilities of the Department are under the supervision of the Ministry of Earth Sciences of the Indian Government. The IMD is headquartered in New Delhi.
- ▶ A disastrous tropical cyclone struck Calcutta in 1864 and this was followed by failures of the monsoon rains in 1866 and 1871. In the year 1875, the Government of India established the India Meteorological Department, bringing all meteorological work in the country under a central authority.

History of meteorology department of india

- ▶ Mr. H. F. Blanford was appointed Meteorological Reporter to the Government of India
- ▶ he first Director General of Observatories was Sir John Eliot who was appointed in May 1889 at Calcutta headquarters.
- ▶ The headquarters of IMD were later shifted to Shimla, then to Poona (now Pune) and finally to New Delhi.



Task perform by the IMD

- ▶ MD undertakes observations, communications, forecasting and weather services. In collaboration with the Indian Space Research Organisation, the IMD also uses the IRS series and the Indian National Satellite System (INSAT)
- ▶ IMD was first weather bureau of a developing country to develop and maintain its own satellite system.
- ▶ Weather forecasting – Provides daily weather forecasts such as temperature, rainfall, wind, etc.
- ▶ Cyclone warnings – Tracks cyclones and gives early warnings to people and authorities.
- ▶ Monsoon prediction – Studies and forecasts the Indian monsoon. Rainfall information – Records and monitors rainfall across India.
- ▶ Agricultural support – Provides weather information useful for farmers and agriculture.
- ▶ Disaster warnings – Gives warnings about heavy rainfall, floods, heat waves, thunderstorms, and other severe weather.

Monsoon model and climate prediction

- ❖ The tradition of forecasting the monsoon in India is more than 100 years old .
- ❖ After the famine of 1887 more attention was given to predicting the monsoon .
- ❖ H.F. Blanford , the founder of IMD , used snowfall in the Himalaya as an important factor for predicting the monsoon .
- ❖ In the 1930s , Sir Gilbert Walker , the director of IMD , studied the relationship between the Indian monsoon and different climate factors .
- ❖ He used old weather records and observations to understand the nature of the Indian monsoon .
- ❖ In 1990 Dr. Vasant Rao Govarikar developed a new monsoon model .
- ❖ This model was based on different climate factors around the world .
- ❖ The model was used for monsoon prediction from 1990 to 2002
- ❖ New models are being developed by IITM , the main function of this model is based on the radar system and satellite technology .

Types of Monsoon Models

- ▶ Monsoon models are used to **predict how much rain the monsoon may bring**.
- ▶ In simple language, there are mainly these types:

1. **Dynamic Model**

- ▶ A **dynamic model** uses computers and scientific laws to study how the **atmosphere and ocean change over time**. It considers factors such as temperature, wind, air pressure and ocean temperature.
- ▶ **Example:**
A computer model studies current **ocean temperature, wind speed, air pressure and atmospheric conditions** to predict monsoon rainfall.
- ▶ **Easy to remember:**
Dynamic Model = Present conditions + Computer simulation

Types of Monsoon Models

▶ 2. Statistical Model

- ▶ A **statistical model** uses **past weather and rainfall data** to predict future monsoon conditions. It looks for relationships between previous weather conditions and monsoon rainfall.
- ▶ **Example:**
If past records show that certain ocean temperatures were followed by good monsoon rainfall, the model may use similar current conditions to predict a good monsoon.
- ▶ **Easy to remember:**
Statistical Model = Past data + Prediction

Types of Monsoon Models

▶ 3. Holistic Model

- ▶ A **holistic model** looks at the **whole system** by considering many factors together rather than depending on only one factor.
- ▶ **Example:**
For predicting the Indian monsoon, it may consider **ocean temperature, land temperature, wind patterns, air pressure, El Niño/La Niña, snow cover and past rainfall** together.
- ▶ **Easy to remember:**
Holistic Model = Many factors + Complete picture

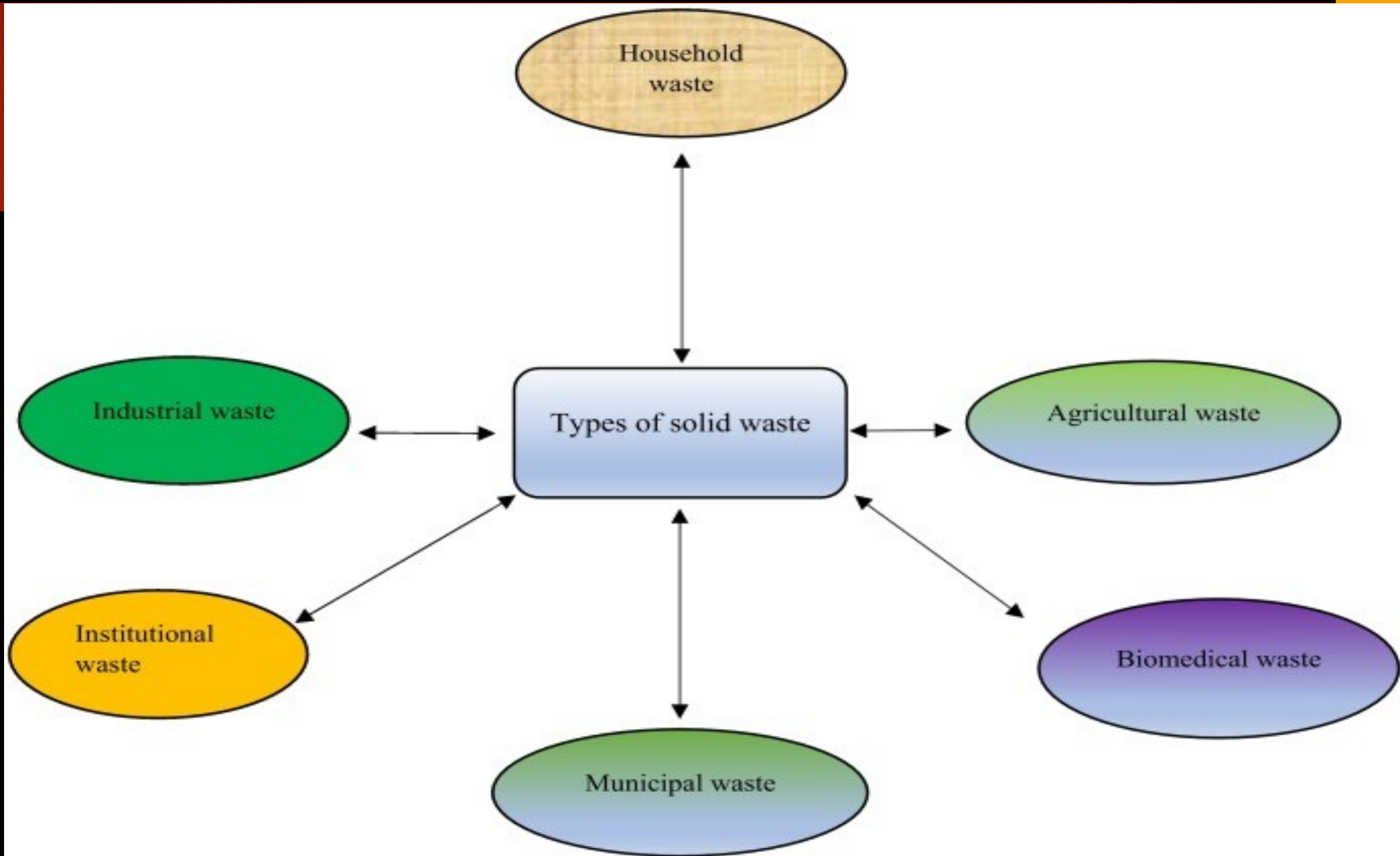
What is Solid Waste?

**Its Types & Methods
of Management**



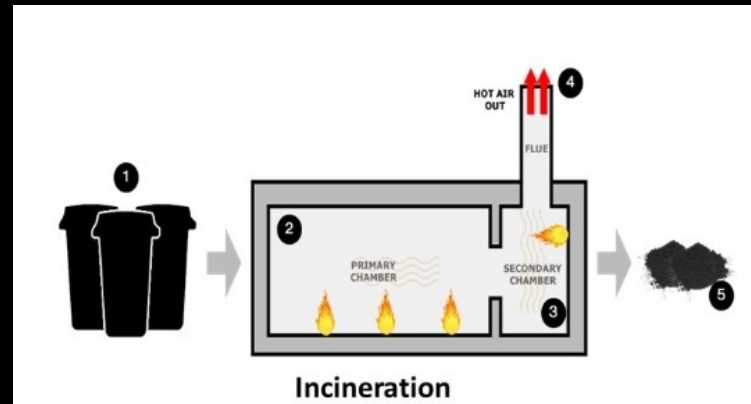
What is solid waste ?

- ▶ Solid waste is the unwanted or useless solid materials generated from human activities in residential, industrial or commercial areas
- ▶ In simple words : solid waste are any discarded or abandoned materials. Solid waste can be solid , liquid , semi-solid or containerized gaseous material .



Solid waste management

- ▶ **Sanitary landfill** – This method is one of the famous waste disposal methods which is used in the present time. In this basically garbage is scattered in the thin layers which are compressed and covered with foam made up of soil or plastic.



- ▶ **Incineration** – Incineration, also known as thermal treatment, involves burning waste at high temperatures, reducing it to ash, gas, and heat. The heat generated can be used to produce energy, making this method a form of waste-to-energy technology.

Solid waste management

- ▶ Composting : is the biological decomposition of organic waste, such as food scraps, leaves, and grass clippings, into nutrient-rich soil additives. This method promotes the natural breakdown of organic matter through the action of microorganisms, worms, and other decomposers.



Composting

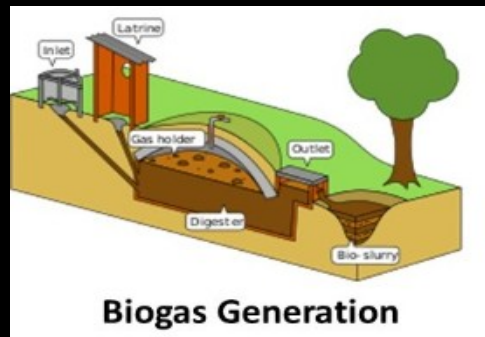


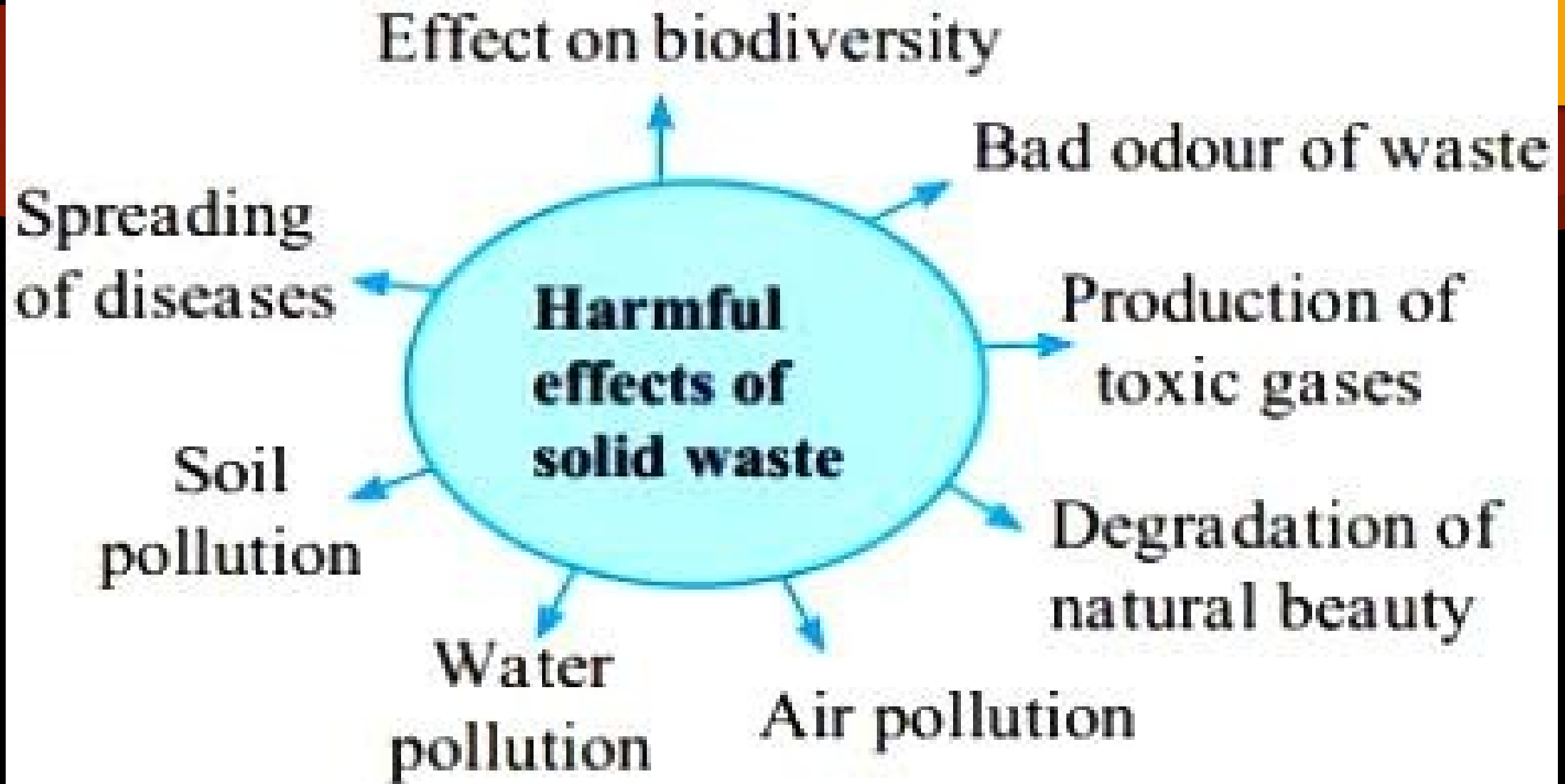
Vermi-Composting

- ▶ Vermiculture: vermicomposting, involves the use of earthworms to break down organic waste into compost. Earthworms digest the organic material and excrete nutrient-rich castings, which can be used as fertilizer. This method is particularly suitable for small-scale waste management in homes and gardens and is often integrated with other organic waste management techniques.

Solid waste management

- ▶ **Pyrolysis and Gasification** :Both pyrolysis and gasification are advanced thermal technologies that break down waste at high temperatures in the absence (pyrolysis) or limited presence (gasification) of oxygen. These processes convert waste into syngas (a mixture of hydrogen and carbon monoxide) and other byproducts, which can be used to generate energy. Pyrolysis and gasification are particularly effective for managing hazardous waste or materials that are difficult to recycle.





Harmful effects of solid waste

What Are the 7 R's of Waste Management?

- ▶ **Rethink – Change the Way We Consume**
- ▶ The first step to sustainable living is to rethink our lifestyle and consumption habits. Many people purchase products without considering their environmental impact. The process of reducing waste begins when we carefully examine our purchasing needs.
- ▶ **Refuse – Say No to Unnecessary Waste**
- ▶ The second principle is **refuse**, which means avoiding products that create waste or environmental harm. Many everyday items, such as plastic bags, disposable cutlery, and single-use packaging, contribute significantly to landfill waste.
- ▶ **Reduce – Minimize Waste Production**
- ▶ Reducing waste is one of the most effective ways to protect the environment. The **reduce principle** encourages people to use fewer resources and generate less waste.

What Are the 7 R's of Waste Management?

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- ▶ **Reuse – Extend Product Life**
- ▶ The concept of **reuse** focuses on using products multiple times instead of discarding them after a single use. Reusing items helps reduce the demand for new products and prevents unnecessary waste.
- ▶ **Repair – Fix Instead of Throwing Away**
- ▶ Nowadays, people throw away products that are beyond their useful life. The repair approach creates the expectation that people will fix their broken items rather than opt for replacement products.

What Are the 7 R's of Waste Management?

- ▶ **Recycle – Convert Waste into New Resources**
- ▶ Recycling is one of the most widely known waste management practices. It involves converting waste materials into new products, reducing the need for raw materials, and conserving natural resources .
- ▶ **Rot – Compost Organic Waste**
- ▶ The final “R” in the waste management hierarchy is **rot**, which refers to composting biodegradable waste. Organic waste such as food scraps, vegetable peels, and garden waste can be converted into compost.

THANK
YOU