Main topic: Climate

Lecturer : RUTAYISIRE Theoneste

Contents

Interactive questions

1. What is climate?
2. What is climate change?
3. What is the evidence that shows the climate is changing?
4. What causes climate change?
5. Why is climate change a serious problem?

Introduction

Climate

- The long-term pattern of weather in a particular area
- Overall average weather at a place over a period of time.

Climate, weather and type of climate

- Weather refers to a short-term state of atmosphere and climate refers to a long-term pattern of weather.
- Five main climate types on earth exist include tropical, dry, temperate, continental and polar.

Difference between weather and climate

Weather	Climate
Describes the atmospheric conditions of a place over short period of time.	Describes the atmospheric conditions of a region over long period of time.
Atmospheric conditions change with in a short span of time.	Climate is generally termed as the average of weather conditions of a region .
Weather cavers small area.	Climate cavers a large area comparatively.
Weather date is collected by weather instruments .	Climate date is calculated and recorded over a period of 35 years.

Types of Climate

Tropical: Characterized by hot and humid conditions with average temperatures exceeding 64°F (18°C) year-round and more than 59 inches of precipitation annually.

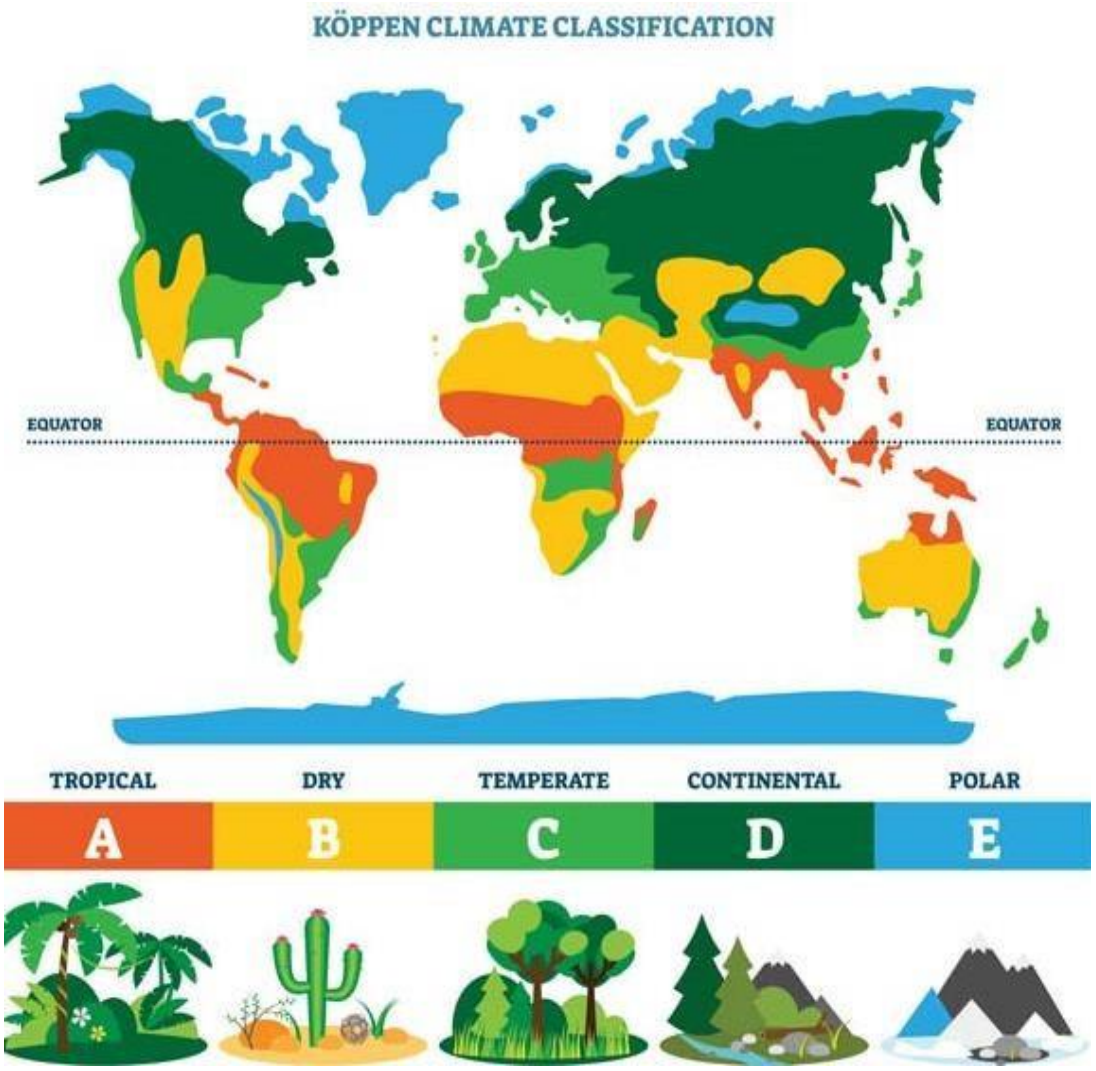
Dry: Areas with very little precipitation due evaporation of moisture from the air.

Temperate: Regions with warm and humid thunderstorms, and mild winters.

Types of Climate(cont'd)

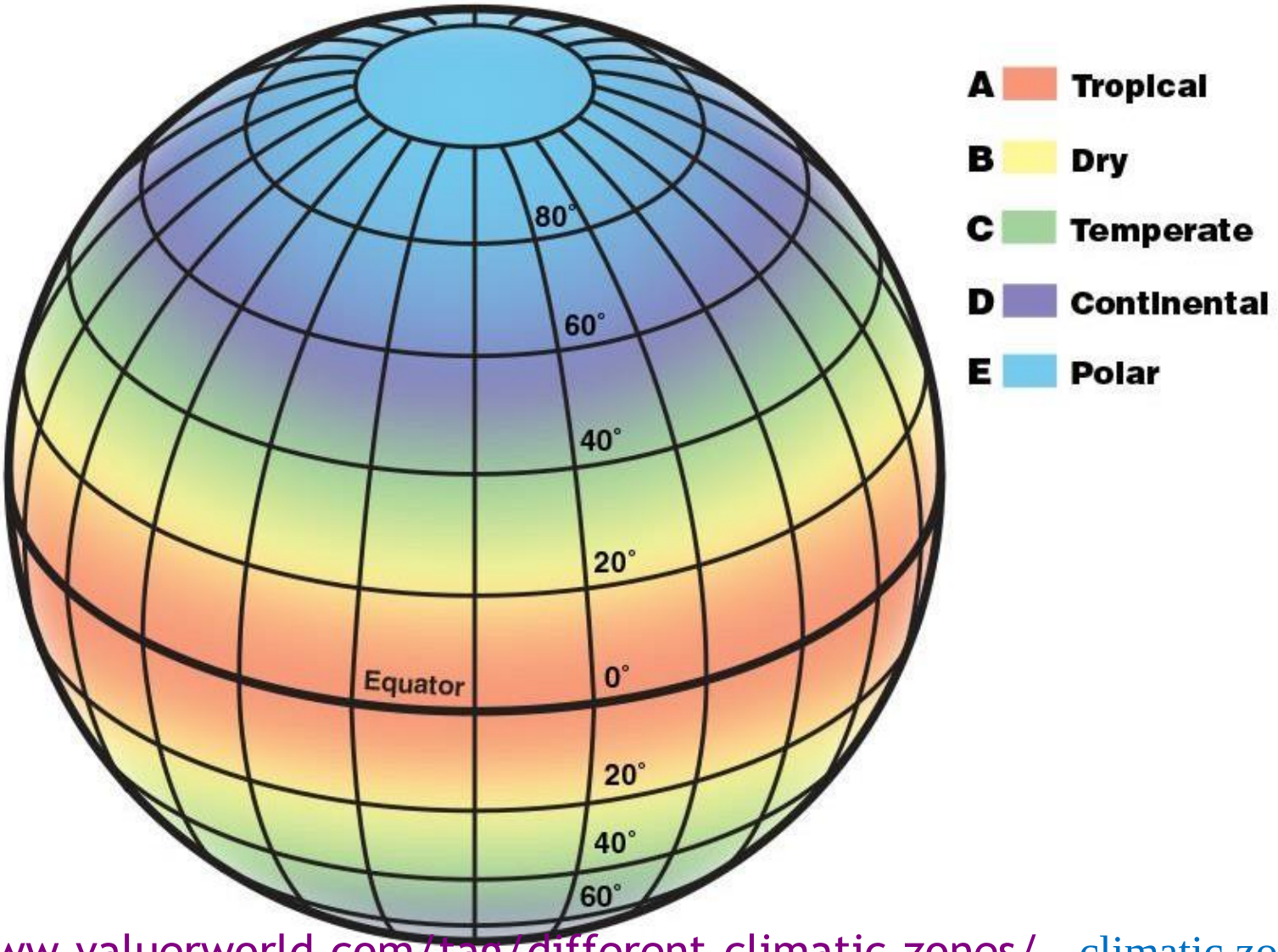
Continental: Featuring warm to cool summers and extremely cold winters with snowstorms and temperatures dropping below -22°F (-30°C).

Polar: Extremely cold climates where the temperatures never exceed 50°F (10°C) even in summer.



https://www.acurite.com/blog/what-is-the-difference-between-weather-and-climate.html

Types of Climate(cont'd)



https://www.valuerworld.com/tag/different-climatic-zones/ , climatic zones

Factors that Affect Climate

There are both natural and human-induced variables affect climate. The intricate interactions among these variables produce the general climate and weather patterns of a given area. Those includes;

- **Latitude**, influences how much sunshine a place receives. Temperatures are higher in areas nearer the equator because they receive more direct sunshine, and vice versa.
- **Altitude,** The air gets thinner and less able to hold heat as altitude rises. As a result, as one ascends higher into the atmosphere, temperatures drop by around 1°C for every 100 meters.

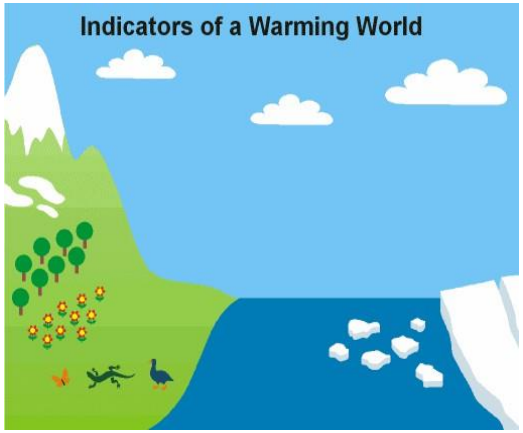
Factors that Affect Climate (cont'd)

- **Relief (Topography):** The distribution of precipitation and wind patterns in a region are influenced by the topography, which includes mountains, valleys, and slopes.
- **Human Activities**, Examples of these activities include deforestation, urbanization, industrialization, and greenhouse gas emissions. When greenhouse gases are released into the atmosphere, heat is trapped, which raises global temperatures and modifies weather patterns.

Environment Dynamic Climate Elements

Climate elements are the fundamental components that make up the climate system and contribute to its dynamics. These includes;

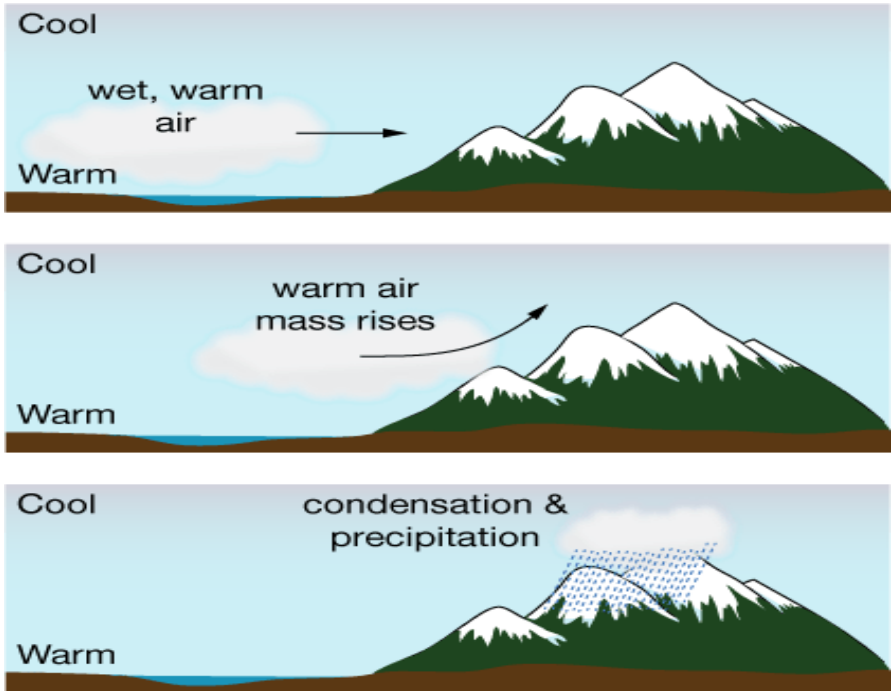
Temperature, Changes in temperature can have far-reaching effects on various aspects of the environment, such as precipitation patterns, sea level rise.



https://skepticalscience.com/print.php?n=554

Environment Dynamic Climate Elements(cont'd)

Precipitation: Precipitation refers to any form of water that falls from the atmosphere to the Earth's surface, including rain, snow, sleet, and hail.



https://xaktly.com/Precipitation.html

Environment Dynamic Climate Elements(cont'd)

- **Humidity** is a measure of the amount of water vapor present in the air. It indicates how much moisture the air holds relative to the maximum amount it could hold at a given temperature.

Types of humidity

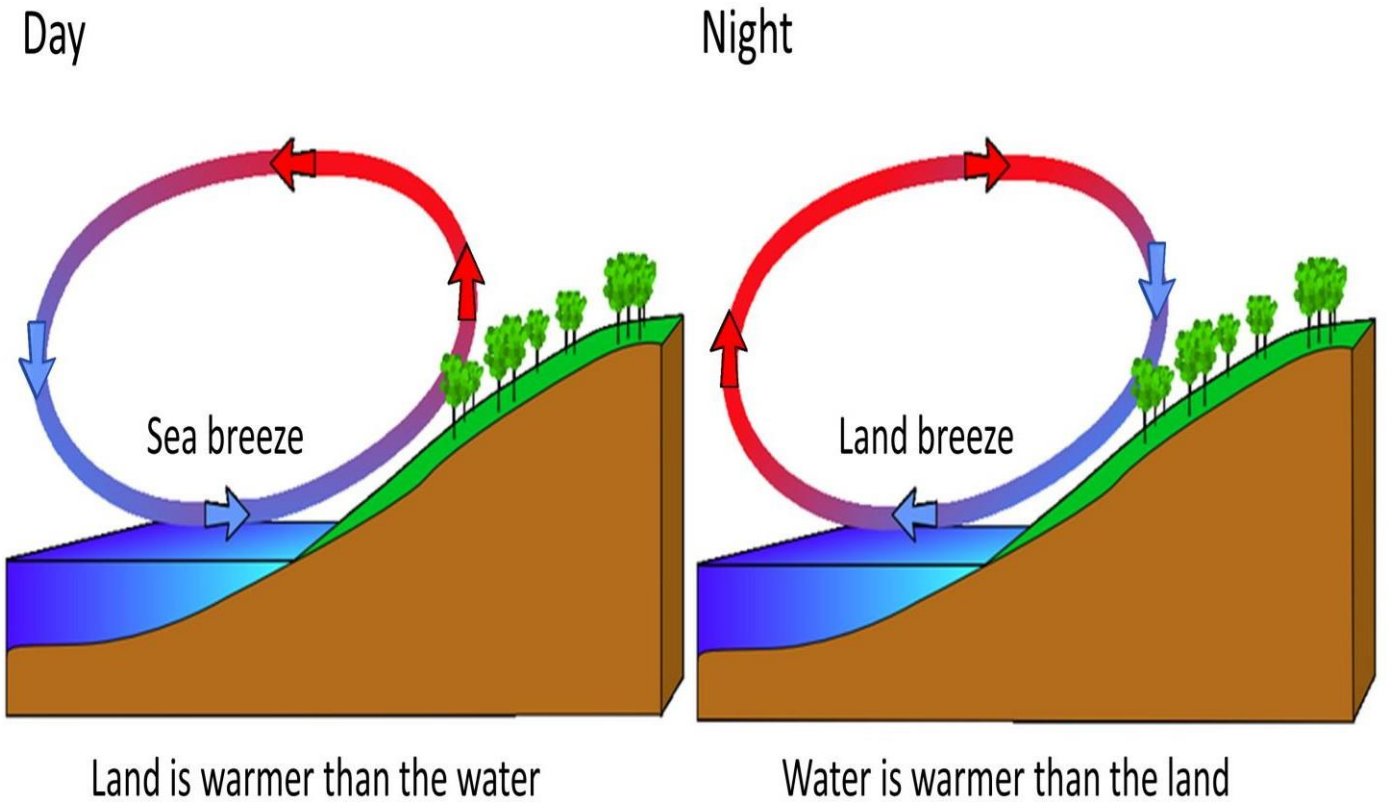
- **Absolute Humidity**: This refers to the actual amount of water vapor in the air, typically measured in grams per cubic meter.
- **Relative Humidity**: Relative humidity compares the current amount of water vapor in the air to the maximum it could hold at that temperature, expressed as a percentage.

Environment Dynamic Climate Elements(cont'd)

https://www.deviantart.com/doujineevee168/art/Extreme-Humidity-407344857, Extreme humidity

Environment Dynamic Climate Elements(cont'd)

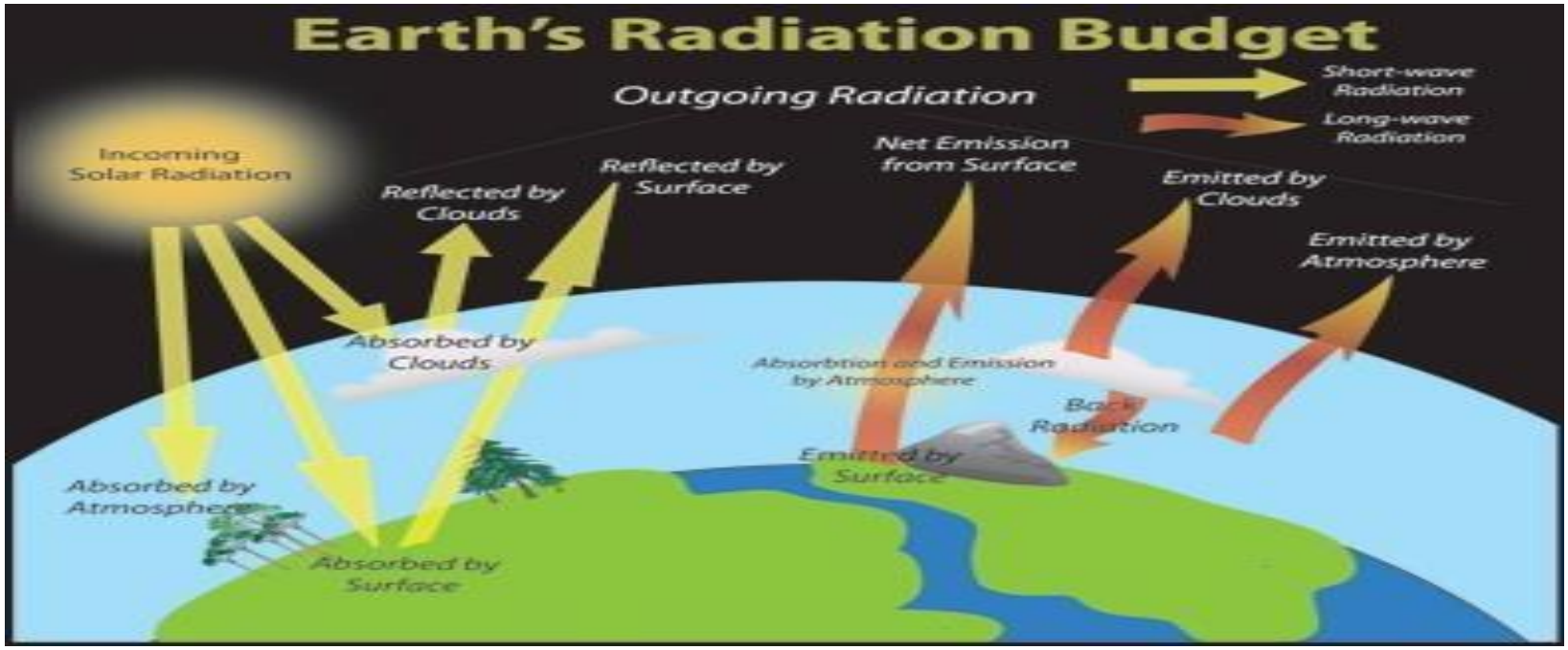
- **Wind** is the movement of air caused by pressure differences resulting from temperature variations on Earth's surface.



https://rwu.pressbooks.pub/webboceanography/chapter/8-3-winds-and-climate

Environment Dynamic Climate Elements(cont'd)

- **Solar Radiation**: The energy received from the Sun, which drives Earth's climate system. Or is the electromagnetic radiation emitted by the sun.



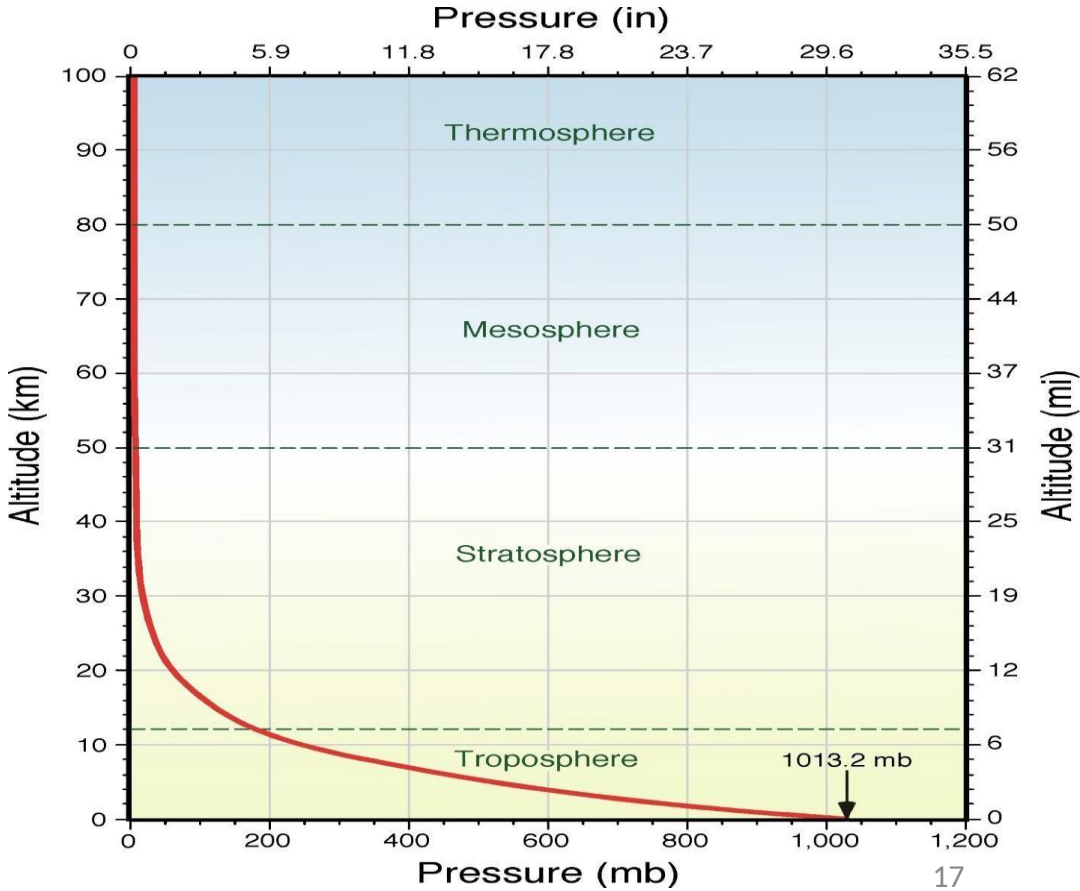
https://learningcenter.unc.edu/tips-and-tools/understanding-diagrams-and-graphs

Environment Dynamic Climate Elements(cont'd)

Atmospheric pressure, also known as air pressure or barometric pressure, is the force per unit area exerted on a surface by the weight of the air above that surface.

The standard atmospheric pressure at sea level is approximately 101,325 pascals (Pa) or 1 atmosphere (atm)

or 760 mmHg.



h/ttps://pressbooks.bccampus.ca/physgeoglabmanual1/chapter/lab3

Causes of Climate Change

- Climate change is primarily caused by a combination of human activities and natural processes.
- **Greenhouse Gas Emissions;** The burning of fossil fuels, such as coal, oil, and gas, releases significant amounts of carbon dioxide (CO2) into the atmosphere. This enhances the greenhouse effect, leading to a rise in global temperatures of the earth both (land and water).
- **Power Generation:** The generation of electricity and heat by burning fossil fuels.

Causes of Climate Change (cont'd)

- **Manufacturing and Industry:** Industrial processes, including manufacturing goods like cement, steel, plastics, and electronics, also produce greenhouse gas emissions.
- **Deforestation:** Clearing forests for agriculture or other purposes releases stored carbon into the atmosphere and reduces the Earth's capacity to absorb CO2.
- **Transportation:** Vehicles powered by fossil fuels emit carbon dioxide and other pollutants, contributing significantly to greenhouse gas emissions.

Causes of Climate Change (cont'd)

- **Food Production:** Agriculture-related activities release greenhouse gases through land use changes, livestock digestion, fertilizer use, and energy consumption in farming.
- **Energy Consumption**: For example charcoals ,petroleum and also peat cools contributes to formations of green house gases.

Causes of Climate Change (cont'd)

- **Natural causes**
- **Volcanic Eruptions:** Volcanic eruptions release large amounts of gases and ash into the atmosphere, which can affect the Earth's climate by blocking sunlight **.**
- **Tectonic Shifts;** Such as the shifting of continents and mountain-building processes, can impact regional climates by altering ocean currents and atmospheric circulation patterns
- **Orbital Changes:** Changes in the Earth's orbit around the Sun, known as Milankovitch cycles, can lead to variations in seasonal distribution of sunlight reaching the Earth's surface.

Summary of climate change causes

https://climate.ec.europa.eu/climate-change/causes-climate-change_en

Effects of climate changes

- **<u>On ecosystems and biodiversity</u>**:

- **Ocean Acidification**: Increased carbon dioxide in the atmosphere leads to more acidic oceans, harming marine biodiversity.
- **Melting Glaciers and Ice Sheets**: This affects impacts ecosystems that rely on ice, like artic marine ecosystem and polar regions where(Polar Bear).
- **Shifts in Plant and Animal Ranges**: As species move to higher altitudes or latitudes due to changing temperatures, ecosystems experience shifts in their composition and dynamics.

Effects of climate changes (cont'd)

- **On agriculture and food security**
- **Droughts and Water Scarcity**: Changes in precipitation patterns affect water availability for agriculture.
- **Increased Wildfires**: as the results of high temperature of the earth surface .this same times affects crops located in that areas.
- **Rising Sea Levels**: Coastal agriculture faces threats from rising seas, leading to soil salinization and loss of arable land

Effects of climate changes (cont'd)

- **<u>On human health</u>**

- **Heat-Related illnesses;** Example skin cancel.
- **Respiratory problems;** due to Poor air quality generated from pollutant atmosphere (green house gases).
- **Mental and Physical Health**: Changes in ecosystems impact overall well-being

Effects of climate changes (cont'd)

- **On human health**

- **Heat-Related illnesses;** Example skin cancel.
- **Respiratory problems;** due to Poor air quality generated from pollutant atmosphere (green house gases).
- **Mental and Physical Health**: Changes in ecosystems impact overall well-being

Solutions for climate changes

- **Reduce Carbon Emissions**

- Transition to **renewable energy sources** like solar, wind, and hydroelectric power.
- Promote **electric vehicles** and public transportation to reduce reliance on fossil fuels.

- **Protect and Restore Ecosystems**

- **Afforestation and reforestation**: Plant more trees to absorb carbon dioxide**.**
- **Preserve wetlands and mangroves**: These ecosystems store carbon and protect against rising sea levels**.**

Solutions for climate changes (cont'd)

- **Promote Sustainable Agriculture**
  - **Implement regenerative farming practices**: Enhance soil health and sequester carbon.
- **Support Climate-Friendly Policies**
  - Advocate for **stronger regulations** on emissions, pollution, and deforestation.
  - Encourage businesses and governments to adopt **green practices** such as energy conservation, waste reduction, water efficiency, and the use of renewable resources.

Solutions for climate changes (cont'd)

- **Raise Awareness and Educate.**

❖ Educate yourself and others about climate change.

❖ Participate in **climate action campaigns** and spread awareness in your community.

- **Adapt to Changing Climate.**

❖ Invest in climate research and technology to develop innovative solutions.

❖ Build resilient infrastructure for Preparing extreme weather events.

Solutions for climate changes (cont'd)

1. What is climate?

Climate refers to average weather conditions over many years.

2. What is climate change?

Climate change involves significant changes, over several decades or longer, in temperature, precipitation, wind patterns, and other aspects of climate.

3. What is the evidence that shows the climate is changing?

Scientists have documented long-term changes globally in temperature, precipitation, sea level rise, and Arctic warming. Reductions in sea ice, snow cover, and thawing permafrost are among the profound impacts observed.

Solutions for climate changes (cont'd)

1. What causes climate change?

✓ burning fossil fuels for energy,

✓ agriculture practices,

✓ deforestation

✓Volcanic eruption (nature cause)

5. Why is climate change a serious problem?

Because Climate change poses risks to human health, infrastructure, economies, and ecosystems due to rising temperatures.

References

1. Acurite,https://www.acurite.com/blog/what-is-the-difference-between-weather-and-climate.html
2. Value world, https://www.valuerworld.com/tag/different-climatic-zones/ , climatic zones
3. Skeptical Science, https://skepticalscience.com/print.php?n=554
4. xaktly, https://xaktly.com/Precipitation.html
5. Deviantart, https://www.deviantart.com/doujineevee168/art/Extreme-Humidity-407344857
6. Roger William University, https://rwu.pressbooks.pub/webboceanography/chapter/8-3-winds-and-climate
7. The University of North Carolina at Chapel Hill, https://learningcenter.unc.edu/tips-and- tools/understanding-diagrams-and-graphs
8. BC campus, https://pressbooks.bccampus.ca/physgeoglabmanual1/chapter/lab3/
9. European commission, https://climate.ec.europa.eu/climate-change/causes-climate-change_en