

Course: Basics of Environmental Engineering (Climatology)



Main topic: Disasters and Climate

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Quiz

Q1. what is disasters

Q2. what is types of disasters

Q3. list the effect of disasters

Q4. list the element of climate

Q5. list the factor affecting climate change

Introduction

Disasters are severe disruptions that exceed a community's coping abilities, caused by natural, man-made, or technological hazards, and influenced by factors affecting a community's vulnerability. They lead to significant human, material, economic, and environmental losses.



Category of disasters

- 1. Tornadoes:** Tornadoes are violent storms with rotating winds surpassing 200 mph. They strike suddenly, often without warning, causing extensive destruction within a brief timeframe.



Photo provided courtesy of Erin Maxwell.

https://commons.wikimedia.org/w/index.php?title=File:Bridge_Creek,_OK_tornado_1999-05-03.png&oldid=833004795.

2. Earthquakes

Earthquakes: Sudden and intense shaking of the ground caused by movements in the Earth's crust. Earthquakes can result in structural damage, landslides, and tsunamis, leading to casualties and displacement



3. Flooding

Flooding: The most common natural hazard, floods occur when water overflows onto land that is usually dry. Floods can be caused by heavy rainfall, melting snow, or dam failures, impacting communities near rivers or coastal areas



Wildfires

4. Wildfires: Uncontrolled fires that spread rapidly through vegetation in forests, grasslands, or urban areas. Wildfires are more prevalent during drought conditions and can destroy homes, wildlife habitats, and natural resources



Man-Made and Technological Types of Disasters



Hazardous Materials Emergencies: Chemical spills or contamination risks pose health and environmental risks, necessitating specialized response teams to safely contain hazardous materials in such emergencies.



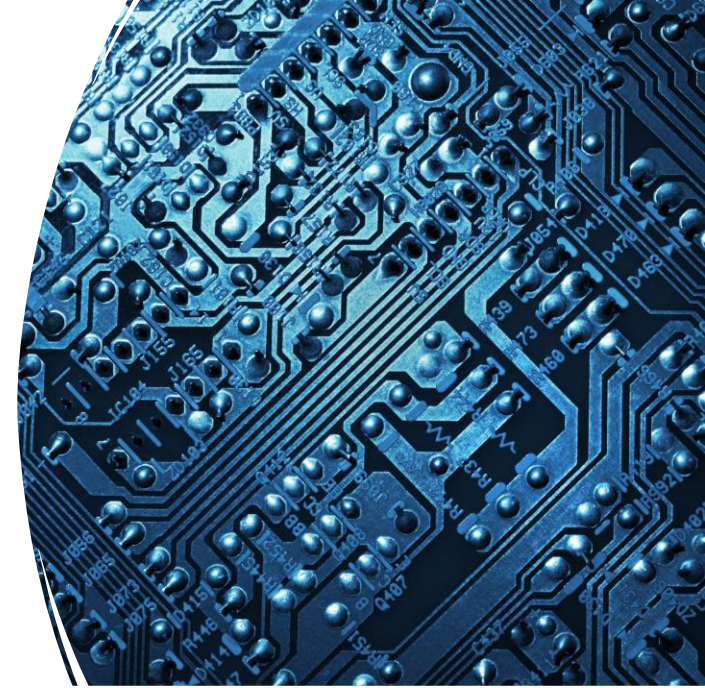
Workplace Fires: Industrial or commercial fires can cause property damage, injuries, and potential loss of life due to equipment malfunctions, electrical faults, or human error.



Man-Made and Technological Types of Disasters

1. Extremist Violence: Acts of terrorism or violence perpetrated by extremist groups targeting civilians or critical infrastructure. These incidents can cause widespread fear, disrupt societal functions, and require coordinated security responses.

Man-Made and Technological Types of Disasters:



Cyber-Terrorism: Attacks on computer systems

and networks with the intent to disrupt operations or steal sensitive information for political or social motives. Cyber-terrorism poses threats to national security and critical services reliant on digital infrastructure. **Increased Frequency and**

Intensity of Hurricanes and Cyclones: Warmer ocean temperatures due to climate change can fuel more powerful hurricanes and cyclones, leading to increased wind speeds and heavier rainfall during these storms.

Climate change and how it affects and more redistribution of disasters

- **1. Sea Levels:** As global temperatures rise, glaciers and ice caps melt, causing sea levels to rise. This can exacerbate the impact of storm surges during hurricanes and cyclones, leading to more extensive flooding in coastal areas.
- **2. More Intense Heatwaves:** Climate change can result in more frequent and severe heatwaves, which can increase the risk of wildfires due to drier vegetation and soil conditions.



Climate change and how it affects and more redistribution of disasters

Droughts: Higher temperatures and changes in precipitation patterns can lead to prolonged droughts in certain regions, making them more susceptible to wildfires and crop failures.



Climate change and how it affects and more redistribution of disasters



WILDFIRES: hotter and drier conditions resulting from climate change can create ideal environments for wildfires to spread quickly and become more difficult to contain.



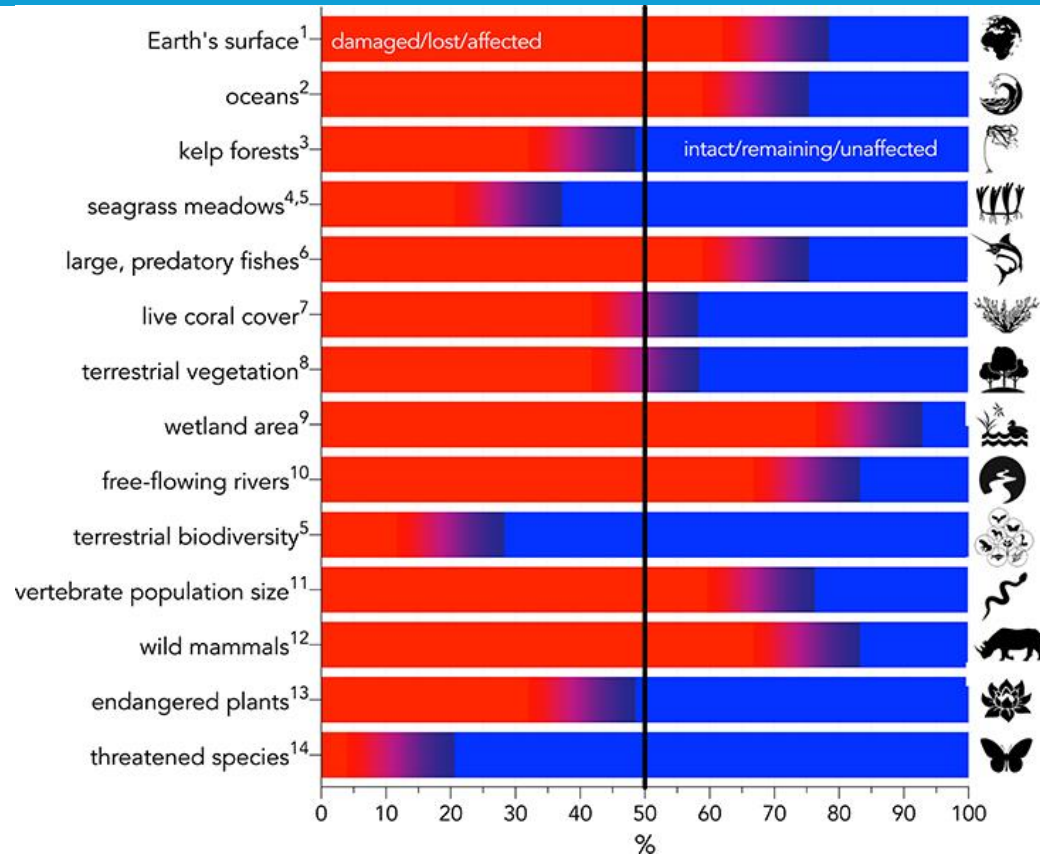
HEAVY PRECIPITATION EVENTS: climate change can cause an increase in heavy precipitation events, leading to more frequent and severe flooding in various parts of the world.

Climate change and how it affects and more redistribution of disasters

Changes in Weather Patterns: Climate change can disrupt traditional weather patterns, making it harder to predict when and where natural disasters like hurricanes, floods, or droughts may occur.

Impact on Ecosystems: Changes in temperature and precipitation patterns can disrupt ecosystems, making them more vulnerable to natural disasters such as landslides or habitat destruction.

Climate change and how it affects and more redistribution of disasters



Loss of Biodiversity: Natural disasters exacerbated by climate change can lead to the loss of biodiversity as habitats are destroyed or altered beyond recognition.

Climate change and how it affects and more redistribution of disasters

- **Food Insecurity:** Climate-related natural disasters like droughts or floods can impact agricultural productivity, leading to food shortages and insecurity for communities reliant on local crops.
- **Water Scarcity:** Droughts caused by climate change can lead to water scarcity issues, affecting both human populations and ecosystems that depend on consistent water sources



Climate change and how it affects and more redistribution of disasters

- **Health Risks:** Natural disasters influenced by climate change can pose significant health risks due to factors like contaminated water sources, air pollution from wildfires, or the spread of diseases in disaster-affected areas.
- **Infrastructure Damage:** More intense natural disasters can cause widespread damage to infrastructure such as roads, bridges, buildings, and utilities, disrupting essential services for affected communities.




Climate change and how it affects and more redistribution of disasters

Displacement of Communities: Climate-related natural disasters can cause communities to evacuate or relocate due to the destruction of their homes or livelihoods, resulting in displacement issues.

Economic Impact: The increasing frequency and severity of natural disasters driven by climate change can have significant economic repercussions on affected regions through property damage, loss of income, and recovery costs.

Social Vulnerability: Certain populations may be disproportionately affected by climate-related natural disasters due to factors like poverty, lack of access to resources, or inadequate infrastructure resilience

Climate change and how it affects and more redistribution of disasters

- Climate change-induced natural disasters can lead to conflicts over scarce resources,
 - loss of cultural heritage, and lasting psychological effects on individuals, as they may experience
 - trauma or loss of loved ones, highlighting the need for sustainable solutions.
- 

Climate change and how it affects and more redistribution of disasters

Global Migration Patterns: Climate-related natural disasters could alter global migration patterns as people seek refuge from increasingly uninhabitable regions due to extreme weather events linked to climate change.



Signs of Climate Change

Air temperatures over land are increasing Weather stations on land show a clear trend of rising average air temperatures, leading to more frequent and severe droughts, heatwaves, and wildfires.





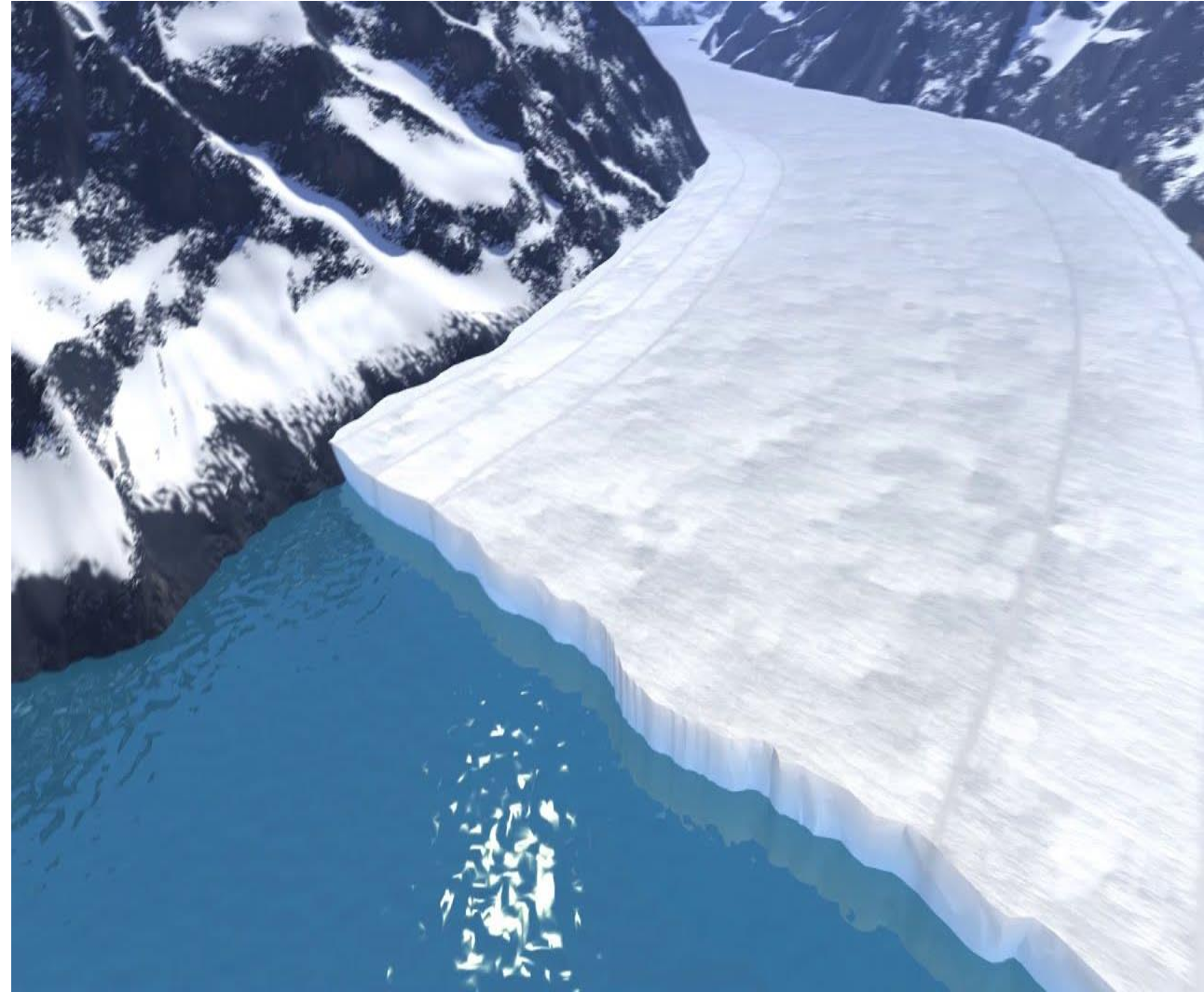
Signs of Climate Change

Arctic Sea ice is decreasing: Satellite images have shown a consistent decline in the area covered by sea ice in the Arctic over the past 30 years, with projections indicating potential complete summer ice loss by 2100.

Air temperatures over oceans are increasing: With approximately 70% of the Earth's surface covered by oceans, the warming of air over oceans results in increased evaporation, leading to more floods, hurricanes, and extreme precipitation events.

Signs of Climate Change

Glaciers are melting: The disappearance of glaciers due to climate change has led to water shortages for communities relying on glacier meltwater for various needs like agriculture and drinking water



Signs of Climate Change

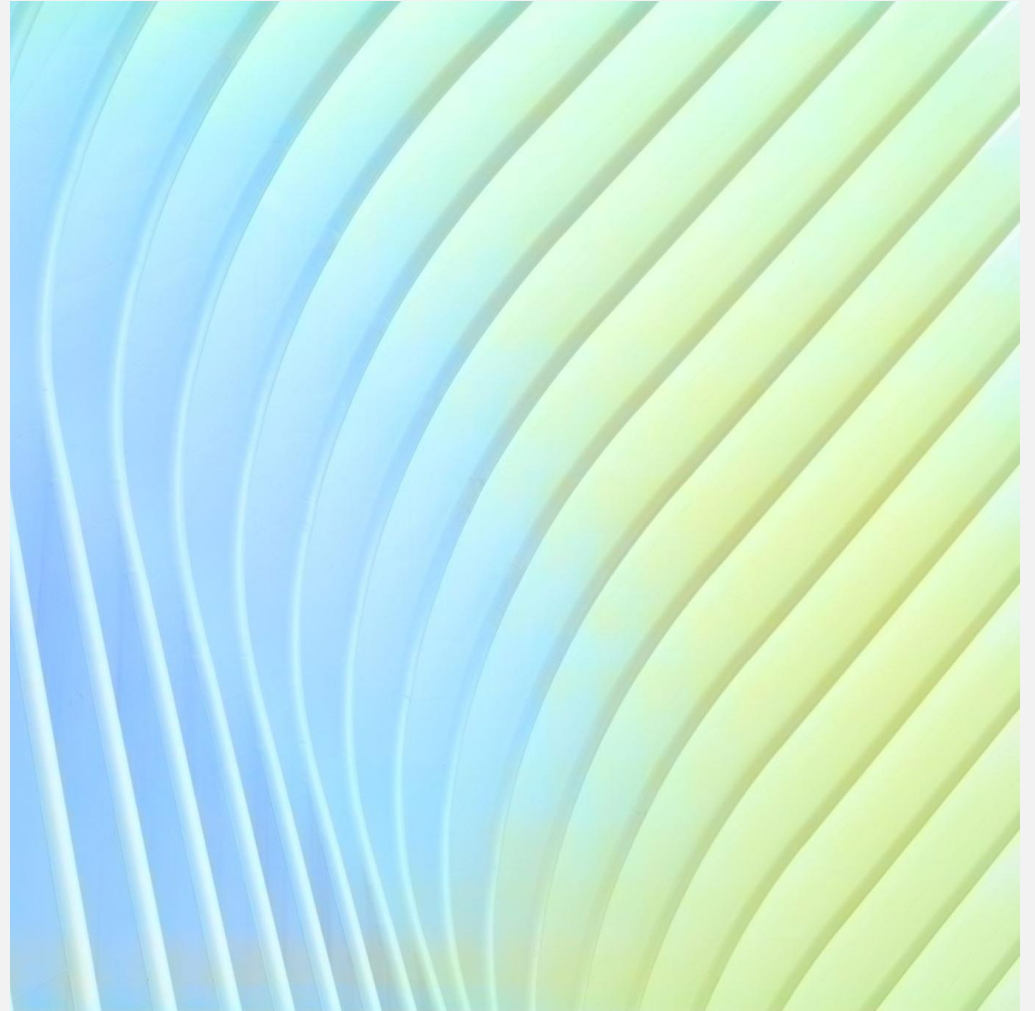
Sea levels are rising Sea levels have been steadily increasing over the past century due to factors such as melting glaciers and expanding ocean waters from higher temperatures, posing risks to coastal populations and ecosystems



Signs of Climate Change

Humidity is increasing: Rising temperatures lead to more water vapor in the air, resulting in increased humidity levels that can exacerbate heat-related discomfort and energy consumption.

Ocean heat content is increasing: The absorption of heat by oceans has risen significantly over the past two decades, impacting marine ecosystems, and ocean circulation patterns, and influencing global climate conditions.



Signs of Climate Change

- **Sea surface temperature is increasing:** Measurements indicate that ocean surface temperatures have been consistently rising since 1880, with warmer seas contributing to coral reef damage and intensifying tropical storms like hurricanes.
- **Global Sea level is rising:** Records show a steady rise in global sea levels since 1900 due to thermal expansion from warmer waters and melting land ice, threatening coastal areas with flooding and storm surges.



Natural Hazards

Natural hazards are environmental phenomena that have the potential to impact societies and the human environment. These hazards are characterized by their harmful effects on humans and their activities, caused by forces extraneous to man



Natural Hazards

Role of Humans in Mitigating Natural Hazards

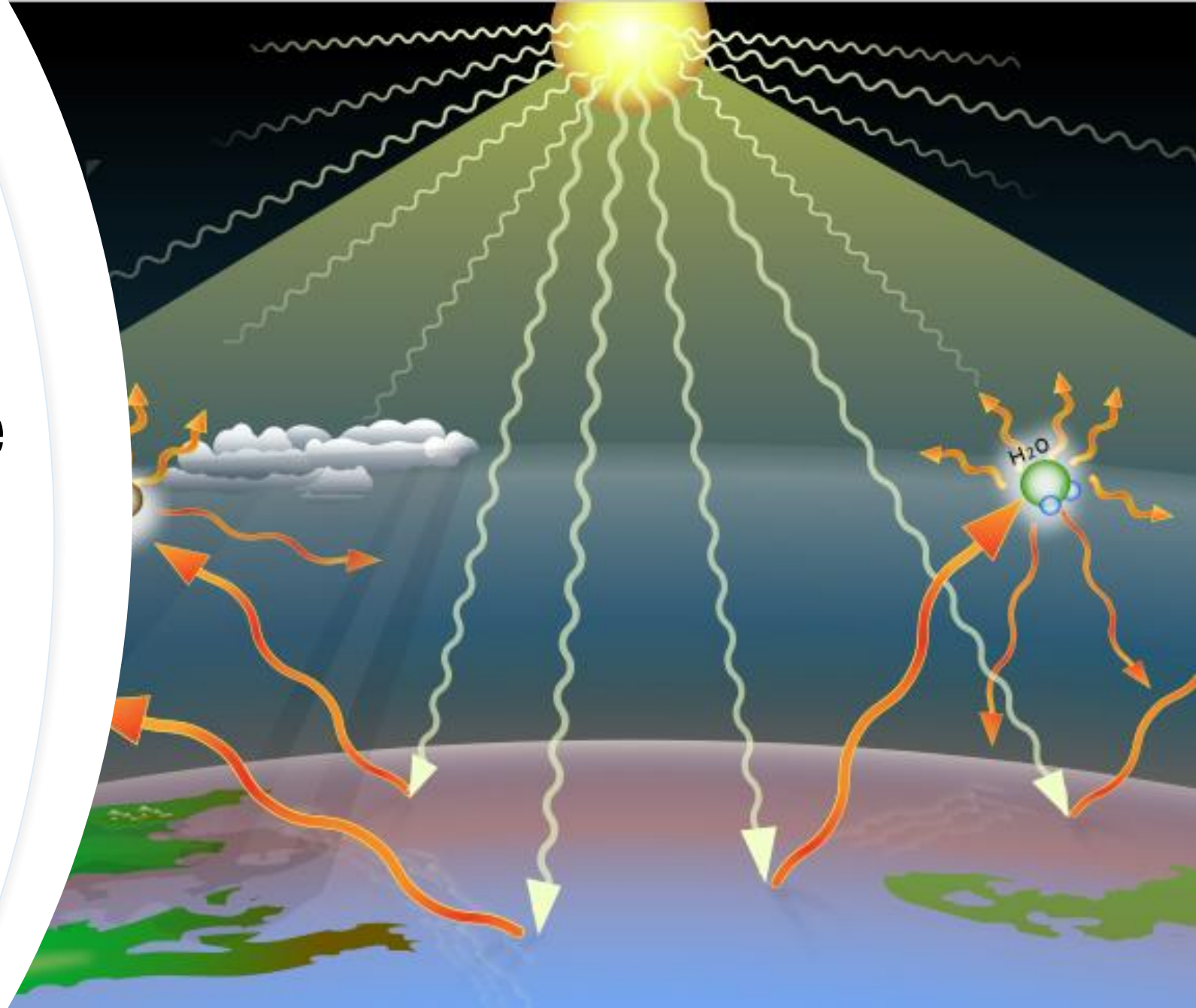
Human activities significantly impact natural phenomena, preventing their escalating into disasters. Understanding their interaction with natural hazards is crucial for developing effective vulnerability reduction measures and reducing environmental risks.

Natural Hazards

Relationship Between Natural Hazards and Disasters

Natural hazards and disasters are distinct concepts, with hazards threatening communities or ecosystems and disasters causing significant damage, influenced by physical nature and human development decisions.

Greenhouse Gases



Greenhouse Gases

Greenhouse gases (GHGs) are gases in the earth's atmosphere that trap heat, leading to the greenhouse effect. These gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases like hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). The increasing concentration of these gases due to human activities is a significant contributor to global warming and climate change.

Answer to Quiz

Q1. **Disasters** are events or occurrences that result in significant disruptions damage and loss of life, property and livelihoods.

Q2. Natural disasters and human made disasters

Q3.

- Emotional Distress
- Loss of Property
- Disruption of Communities
- Health Consequences
- Economic Losses
- Environmental Damage
- Displacement and Homelessness

CONT'

Q4.

- Temperature
- Precipitation
- Atmospheric Pressure
- Humidity
- Wind

Q5.

- Distance from the Sea
- Ocean Currents
- Distance from the Equator
- Direction of Prevailing Winds
- Shape of the Land (Relief/Topography)

Conclusion

Climate change is driving an increase in disaster risk across the globe. The frequency and intensity of weather-related hazards are being altered, vulnerability to these hazards is rising, and exposure patterns are changing. As temperatures continue to rise due to climate change, the likelihood of various natural disasters such as droughts, sea-level rise, infectious diseases, wildfires, and cyclones is expected to increase.

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