



Climate change and Global Warming

By Hana Taha



Definitions of weather and climate

Weather: The state of the atmosphere at a place and time in terms of precipitation, temperature, humidity, wind, and pressure.

Climate: The prevailing or long-term general weather conditions in a particular area over a long period of time.



KEY DEFINITIONS

- Climate change: A change in climate that is measured over several decades or longer. The change may be due to natural causes (example: a volcanic eruption) or human causes (example; factories fumes, car exhausts ...etc).
- Adaptation: A response or action we take to cope with the actual or anticipated impacts of climate change. Example: cooling of public transportation.
- Mitigation: An effort to stop or slow climate change (example: buying an electric car).
- Resilience: The combination of mitigation and adaptation strategies that allow us to minimize or avoid the bad effects from climate change.



WATER CYCLE

- **Evaporation** – The transformation of water from liquid to gas (water vapor) as it moves from land or bodies of water into the atmosphere. Water vapor is a gas that cannot be seen.
- **Transpiration** – The release of water vapor from plants into the air.
- **Condensation** – The transformation of water vapor into liquid water droplets in the air, creating clouds and fog.
- **Precipitation** – Condensed water vapor that falls to the Earth's surface. Forms include rain, snow, hail, fog drip, and sleet.
- **Freshwater Storage** – Sources of freshwater like wetlands, lakes, ponds, and large rivers. There is also **freshwater storage** in ice and snow.
- **Snowmelt Runoff** – Snow melts into streams.
- **Ground Water Storage** – The water present beneath the Earth's surface in soil pore spaces and fractures in rock formations.



FACTS ABOUT THE WATER CYCLE

Really old ground water
is called fossil water!

Did you know the sun causes
the water cycle to move?

The water cycle has
no starting point!



GREENHOUS EFFECT

- Short wave solar (radiant) energy enters the atmosphere from the sun
- Some waves reflect off of clouds and greenhouse gasses (GHGs) and return to space
- Other solar energy waves make it to the earth's surface
- When they hit the earth, they slow down and form longer heat (thermal) energy waves.
- These longer heat energy waves have trouble getting back out into space through the GHGs. Trapped heat warms the planet.



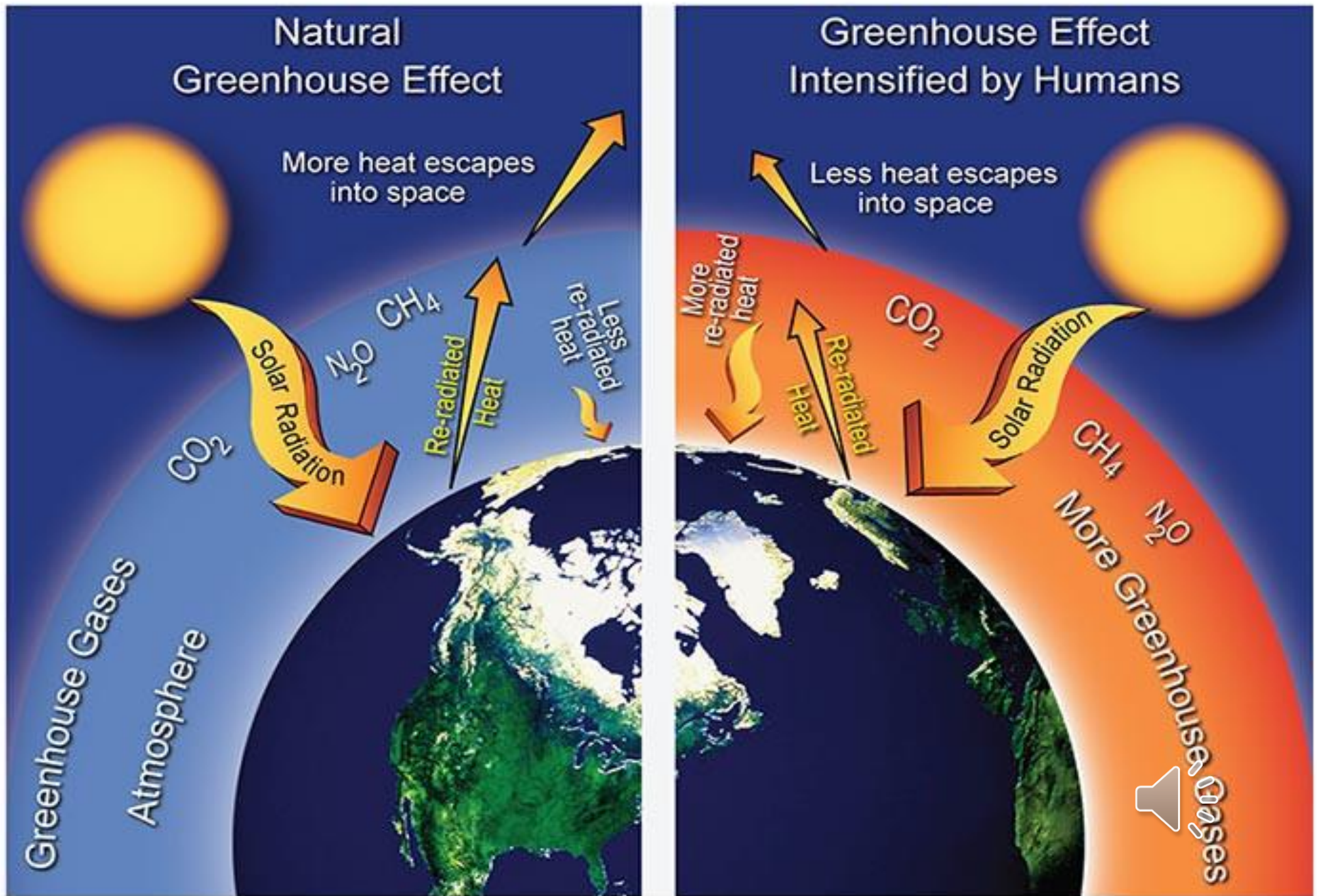
GREENHOUS EFFECT

As human activity and natural sources put more GHGs into the atmosphere, it becomes even harder for the heat waves to escape into space, warming the planet more.

The GHGs act like a glass or plastic covering of a “greenhouse” as they trap heat.



Human Influence on the Greenhouse Effect



Gasses that increase the greenhouse effect as they increase in the atmosphere

- 1. Carbon Dioxide Gas (CO₂) is given off by:**
 - a. The burning of organic matter like wood, coal, and gasoline in the presence of oxygen**
 - b. Destroying of forests (deforestation)**
 - c. Living things (respiration)**



Gasses that increase the greenhouse effect as they increase in the atmosphere

2. Methane Gas (CH₄). Its three main sources are:

- a. Fossil fuel production, distribution, and use (26%)**
- b. Natural release from plant decomposition, wetlands, and oceans (22%)**
- c. Livestock farming (21%)**



Gasses that increase the greenhouse effect as they increase in the atmosphere

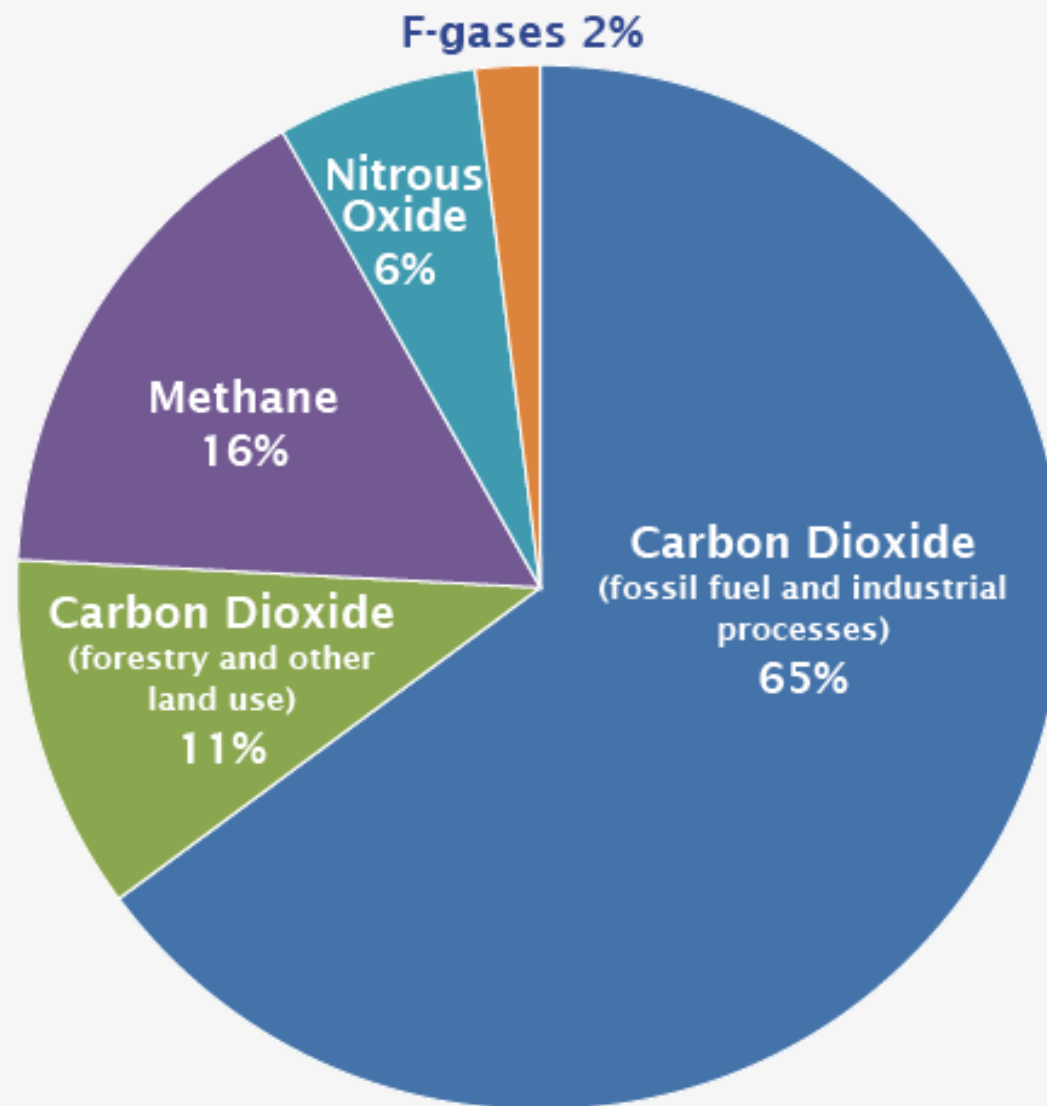
3. Nitrous Oxide Gas (N_2O). Its two main sources are:

- a. Natural release by soil bacteria and oceans**
- b. Agricultural sources like livestock waste and fertilizing crops**

4. Water Vapor (H_2O): Is produced naturally by evaporation, sublimation, and transpiration



Global Greenhouse Gas Emissions by Gas



FACTS ABOUT THE GREENHOUSE EFFECT

The right amounts of greenhouse gasses keeps us from freezing to death and getting skin cancer!

Greenhouse gasses come from natural and man-made sources!

N_2O is 300 times more efficient at trapping heat than an equal weight of CO_2 !



GLOBAL SEA SURFACE TEMPERATURE

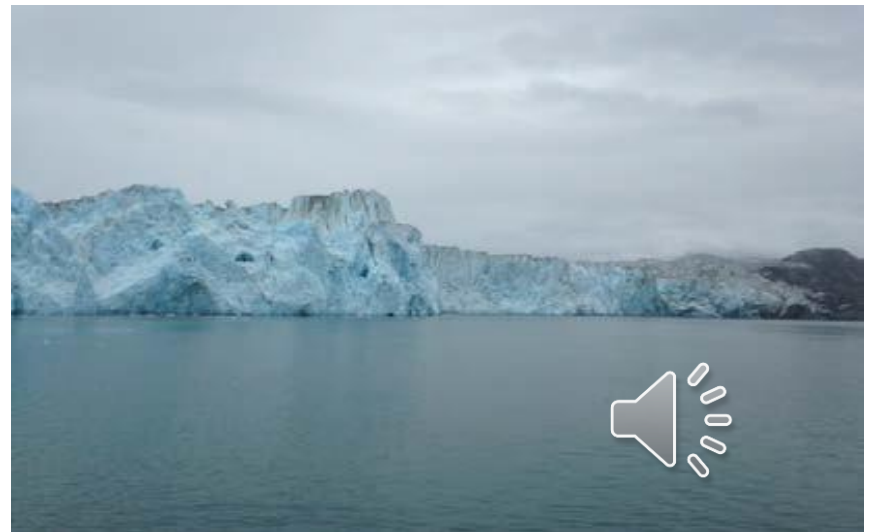
- 1. Our oceans cover about 70% of the Earth's surface and absorb about 90% of the excess heat caused by the intensifying greenhouse effect**
- 2. The global sea surface temperature is increasing and this is causing:**
 - a. Rising sea levels because water expands as it warms and warmer water speeds up melting of sea ice**
 - b. Threatened marine ecosystems (examples: Bleaching of coral reefs and low oxygen for fish in parts of the ocean)**
 - c. More water vapor over the oceans leading to disruptive weather patterns (examples: heavier rains and snows in some places and drought in others)**
 - d. Threatened human livelihoods**



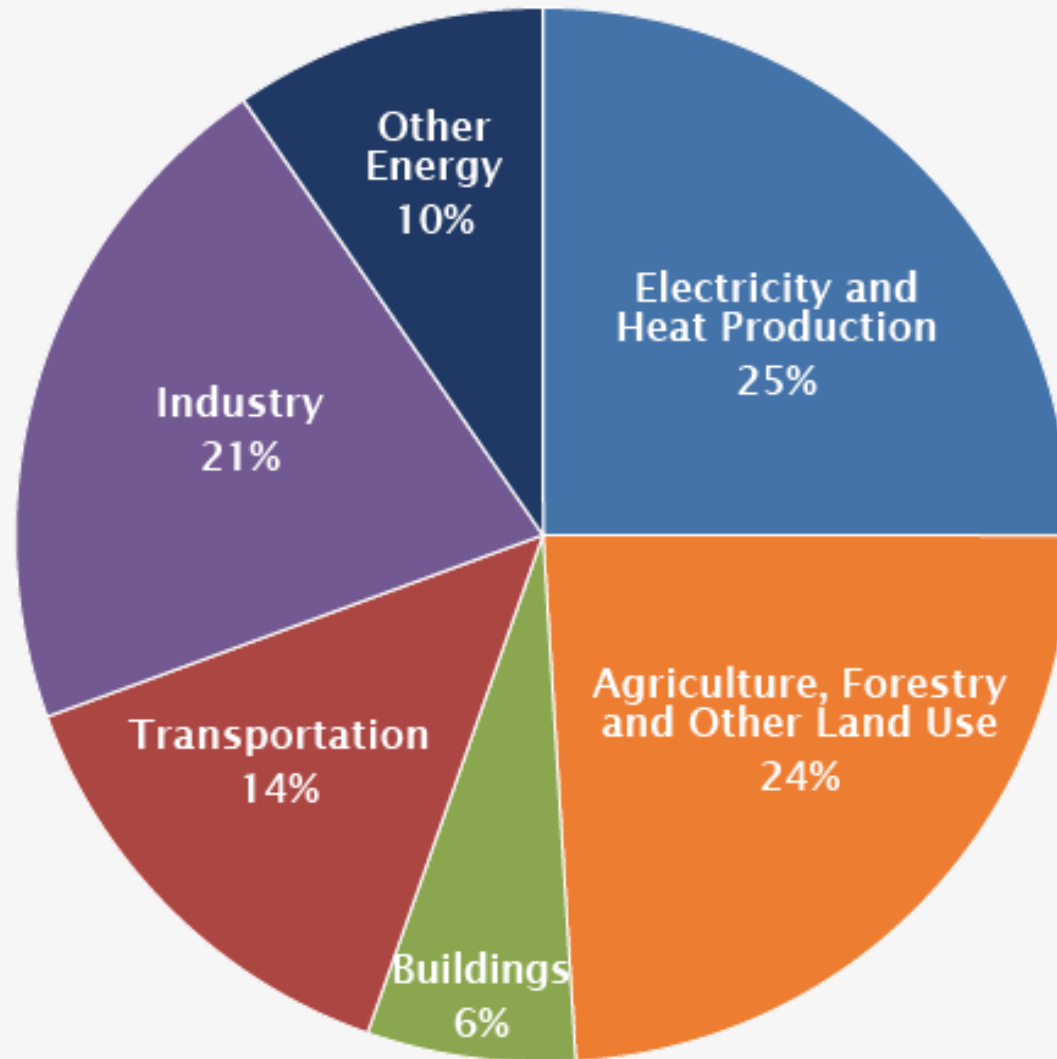
Economic, environmental, and health concerns with a changing climate

What are some concerns we should have with a changing climate?

- Economic?
- Environmental?
- Health?



Global Greenhouse Gas Emissions by Economic Sector



WAYS TO MITIGATE HUMAN EMISSIONS OF GREENHOUSE GASSES

- Reduce energy consumption (conserve energy).
 - Electricity production is the #1 source of greenhouse gases (GHGs)
 - Transportation is the 4th source of GHGs
- Reduce emissions from existing processes
- Switch to renewable energy sources that don't produce GHGs. Example: Solar panels



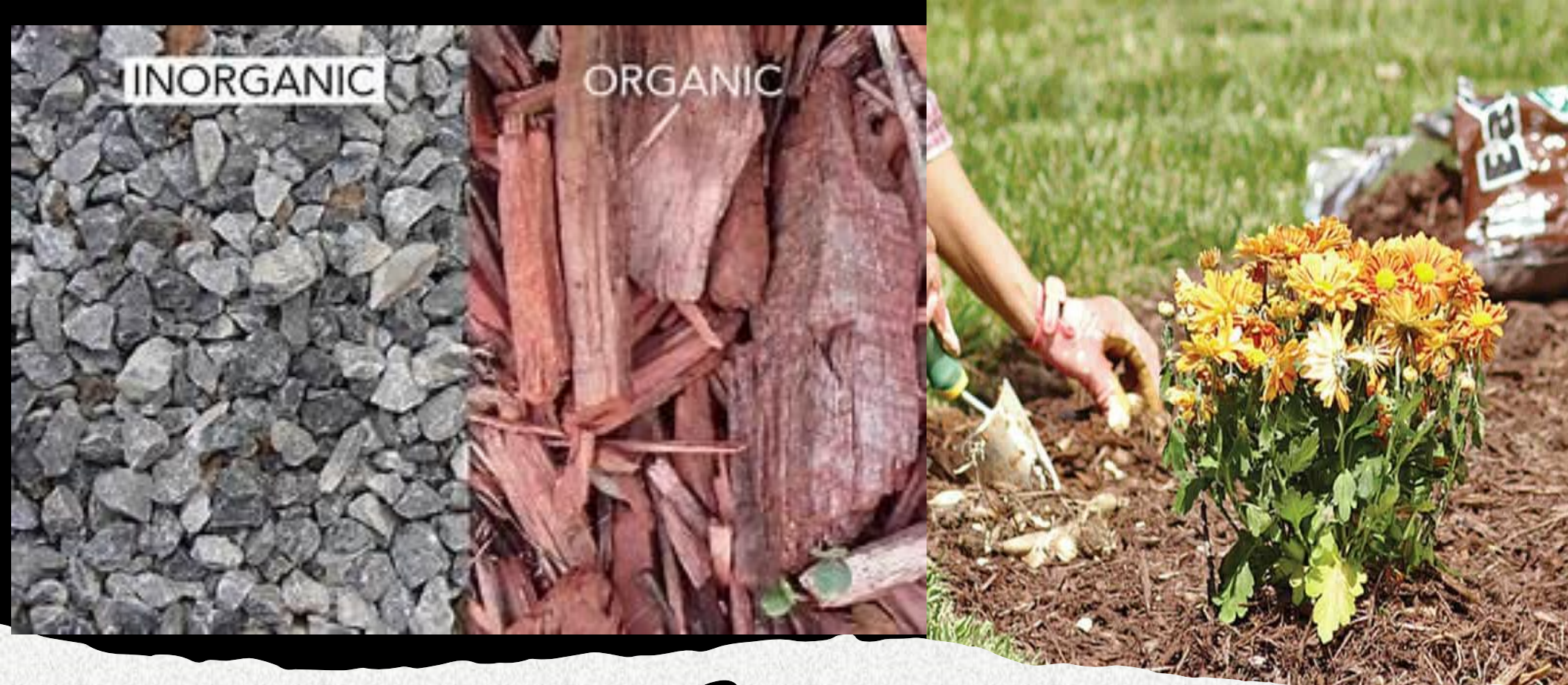
Ways to adapt to climate change in agriculture and natural resources

- Increase shade and improve ventilation in barns for livestock
- Breed crops that are drought tolerant or can thrive in more variable temperatures
- Breed disease resistant crop and livestock species
- Change the crops grown in an area to ones that can thrive in changing climate conditions
- Harvest and plant seeds from forest trees that are doing well in the changing climate conditions
- Use only the water and fertilizers needed by the crop
 - Precision agriculture
- Use cultural practices like mulching to conserve water and improve soil temperatures



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Thank you

