# **Climate Change**













BECAUSE IT IS COLD. TODAY. WHERE I LIVE.

# Weather vs. Climate

<u>Weather</u>: temperature, precipitation, wind & humidity, in a location over a **short period** of time (such as a **day or a week**)



<u>Climate</u>: the average of the weather in a region over a long period of time

# **Climate Regions**

• Many factors determine global climates.



# **Solar Energy**

- The **SUN** provides the earth with most of its energy.
  - Warms the Earth
  - Used by plants to produce chemical energy (sugar) and oxygen.





### **The Greenhouse Effect**



# Latitude

- Because of the curvature of the Earth, the highest amounts of solar energy are received in the region of the equator.
- Moving toward the poles there is less solar energy.



# **Global Currants & Winds**

- Warm air/water expands- less dense.
- Cold air/water contracts- more dense.

**Convection Current** 



Uneven heating of the planet drives the ocean currents and winds.



### **Interaction Between Land & Water**

- Arrangement of continents and oceans are a major influence on Earth's climates.
- Land areas heat and cool faster than water.
- So temperature extremes are found AWAY from coasts.





# Interaction Between Land and

Water

- During the summer, large bodies of water
   absorb a lot of heat
  - So the climate will be more moderate near the coast.
- In winter, the water near the coast will slowly release this energy,
  - So the coastal areas will be less cold than inland areas in the winter.



# **Climate Change**

- Human activities connected with industrialization and economic growth are changing the world's climate.
- These changes are significantly affecting all life on Earth.







#### **Enhanced Greenhouse Effect**

- Humans are increasing the concentrations of greenhouse gases.
- These gases trap heat energy from the sun.





# **Greenhouse Gases**

- The most common greenhouse gases are:
  - H<sub>2</sub>O vapor
  - carbon dioxide- CO<sub>2</sub>
- Others in lesser amounts are:
  - methane CH<sub>4</sub>
  - nitrous oxide- N<sub>2</sub>O
  - ozone O<sub>3</sub>
  - CFC's



# Water Vapor (H<sub>2</sub>O)

- Most **abundant** greenhouse gas.
  - part of the "natural greenhouse effect"
  - naturally produced by evaporation of water, transpiration from plants and burning fuels.



# **Carbon Dioxide (CO<sub>2</sub>)**

- Released when fossil fuels- coal, oil and natural gas- are burned
- Increases due to the removal and burning of forests and fossil fuels.
- Accounts for more than ½ of human-generated greenhouse gases.





# **CO<sub>2</sub> and Temperature**



# Deforestation

- Reduces the amount of CO<sub>2</sub> absorbed from the atmosphere. (photosynthesis)
- Trees also absorb incoming solar energy and moderate temperatures.
- Trees reduce flooding, keep soil stable and create **habitats** for other life.



# Methane (CH<sub>4</sub>)

- Released by bacteria in livestock, decaying materials in landfills & melting ice.
- Also by leaks in gas pipes.
- Each molecule of CH<sub>4</sub> is 23 times more effective at trapping heat than 1 molecule of
  - CO<sub>2.</sub>



# Nitrous Oxide (N<sub>2</sub>O)

 Released by bacteria from fertilizers used in crop growing.



Human sources of nitrous oxide



# Ozone (O<sub>3</sub>)

- Ground level ozone.
- Emitted from industries and vehicles.



# The Ozone Layer





- The Ozone (O<sub>3</sub>) Layer is located between the stratosphere and the troposphere and helps protect us from UV light from the sun.
- Ozone depletion is caused by human-made compounds called chlorofluorocarbons (CFC's)

# Chlorofluorocarbons (CFC's)

- From aerosol sprays and refrigeration. (including air conditioners)
- Although they have been banned in North America & Europe, they are very stable.
- Can remain in the atmosphere for 100 years.



# **Effects of Climate Change**

- The impacts of climate change are predicted to be serious and widespread:
- More violent weather
- Increases in global temperatures: melting glaciers, increase in sea levels, flooding.
- Creates unsuitable habitats
- **Shifting** patterns of precipitation and drought.
- Humans food, diseases, coastline.





# Has abrupt climate change happened before?

# **Long-Term Cycles in Climate**

- Over the last 800,000 years or more, Earth's climate has cycled between freezing ice ages and warmer interglacial periods
- We experience an Ice Age approximately every 100,000 years



# **Evidence of Climate Change**

• Earth's average temperature has generally **increased** from 1880 to 2006.



### **Glacier Melting**

• 1875 compared to 2004



### **Rise in Sea Levels**





INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

IPCC

# Is it Real?

- In 1988 the United Nations asked 1300 scientists from 50 countries.
- Created the Intergovernmental Panel on Climate Change (IPCC).
- Overwhelming **majority** confirmed-it is real.



### What Next?

- Debate among scientists is what to do!
- Must be a cooperative effort globally.





# What can you do?

- Choose reusable products
- Use less heat and air conditioning
- Buy energy-efficient products
- Drive less
- Turn lights off
- Buy local products
- Plant a tree
- Eat less animals!









### **Energy Resources**

• Renewable-

# **Renews itself** over the span of a normal human lifetime.



• Non-renewable-

Not able to **replenish** itself within a human lifespan. **Will run out!** 

# Solar

• Solar cells convert sunlight

into electricity.

PV=photovoltaic or "photoelectric" cells



https://www.youtube.com/watch?v=u-



# Wind

• Kinetic energy of wind can be converted to electricity.

<u>https://www.youtube.com/watch?v=niZ\_cvu9</u> <u>Fts</u>



### Geothermal

 Heat energy from beneath the earth's crust. <u>https://www.youtube.com/watch?v=mCRDf7</u> <u>QxjDk</u>



### Hydropower

 The motion of water as it flows through a turbine to produce electricity.
 <u>https://www.youtube.com/watch?v=q8HmRL</u> CgDAI



### Nuclear

- Energy involving the nucleus of the atom.
- <u>https://www.youtube.com/watch?v=44ovdxO</u>
  <u>vP\_Ao</u>



### Natural Gas

- Fossil fuel composed mostly of methane CH<sub>4</sub>
- Found in underground reservoirs.
- <u>https://www.youtube.com/watch?v=PUr1YYU</u>
  <u>r7ug</u>



# Coal

 Fossil fuel which is a main source of energy for the planet.





### Currently...

"If greenhouse-gas emissions continue at the current rate, the atmosphere will warm up by as much as 2.7 degrees Fahrenheit above preindustrial levels by 2040, a level scientists say will bring the worst effects of climate change, including food shortages and wildfires." Intergovernmental Panel on Climate Change

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# **Energy Sources Questions**

- Which energy sources appear to be the best, when taking into account environmental and economic factors? Explain!
- 2. Why do you think energy sources that are linked to global warming are used all over the world?
- 3. Do you think people know which energy source is used to generate the electricity they use? What is it for Kentucky?