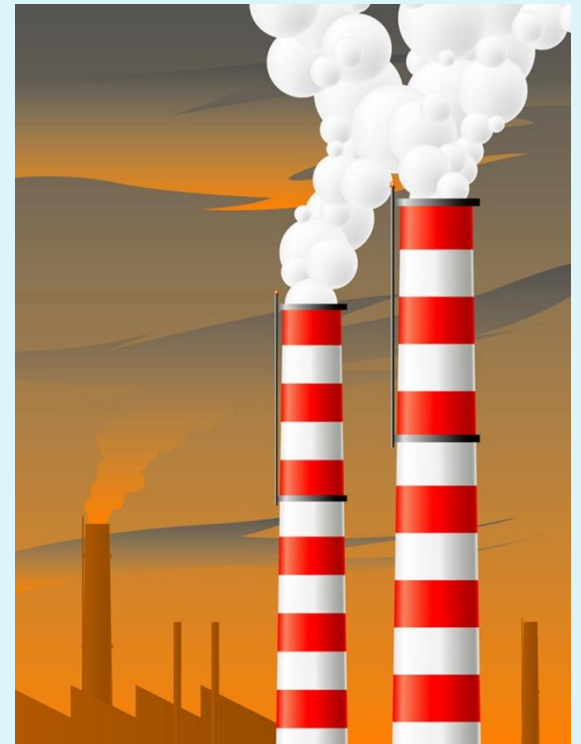


# Global Warming – Climate Change

- **What do I need to know?**
- **What do I need to do?**



# Key Questions- ??????

- Is the earth's atmosphere warming?
- Is this warming causing climate change?
- Are humans impacting on this warming?
- If so, what can I do about it?



# Is the Earth's Atmosphere Warming?

- Review global temps for last 150 years
- Variations in last 150
  - 19<sup>th</sup> century – constant; Rise in early 20<sup>th</sup>;  
Level off in mid 20<sup>th</sup>;  
Rapid rise 1990-2009 - Why?
- What causes this pattern?
  - Early – volcanoes, sun; Later – Burning fossil fuels
- Variations on global average temps
  - Land warmer than ocean; More increase towards poles
- Average temps have risen about 1.5 degrees since start of 20<sup>th</sup> century. Is this significant?



# Indicators - Butterflies, Glaciers, and Hurricanes



- **Surface temps are not only indicators of warming**
  - Earths' inner temps; Upper levels of oceans; Lower levels of atmosphere warming - upper levels cooling
- **Earth's cryosphere (snow & ice cover) is decreasing**
  - Glaciers, Arctic ice, Ice caps, Ice sheets - Reflections
- **Weather patterns over decades show changes**
  - More extreme hot and cold; Precipitation changes, Night temps; Increase in hurricanes
- **Plants and animal species are moving**
  - NH moving northward and upward – 6 miles – 6 feet; Springtime events earlier : 2-3 days (per decade)



# What Determines a Planet's Temperature?

- **Energy balance – between incoming sunlight and radiated heat loss**
- **Sun sends in ultraviolet rays; Planet sends out infrared rays – Earth balances out at zero (0) degrees**
- **Earth's atmosphere causes “greenhouse effect”**
  - Atmosphere is 80% nitrogen, 20% oxygen – transparent to sun's incoming rays and Earth's outgoing rays
  - Water vapor and CO<sub>2</sub> is transparent to sun's incoming ultraviolet rays BUT opaque to Earth's outgoing infrared rays – Result – increase in Earth's temp to 60 degrees



# A Tale of Three Planets

- **Neighboring planets (Mars, Venus) can provide us with a “greenhouse experiment”**
- **Comparison of Temps – No Atmosphere**
  - Mars: -90 F; Earth: 0 F; Venus: 110 F
- **Comparison of Temps – With Atmosphere**
  - Mars: -120 F; Earth: 60 F; Venus: 500 F (melt lead)
- **Comparison of Atmospheres**
  - Mars: 1% (.01) of Earth’s density; Cooler – reflects heat
  - Earth: 1.0 density – provides normal greenhouse effect
  - Venus: 100 times Earth’s density – 96% is CO<sub>2</sub>; All water is evaporated – powers greenhouse effect; CO<sub>2</sub> - permanent

# The Human Factor

- **Three factors affect temps – two are natural, one is us**
- **1. Volcanoes**
  - Throws dust into air; forms clouds; decreases temps
- **2. Sun**
  - Burn rate varies; distance from Earth; tilt of Earth axis
- **3. Anthropogenic – caused by humans**
  - Burn fossil fuels – increases CO<sub>2</sub> in atmosphere
- **Other factors**
  - Methane (minor); Aerosols – particles in air
- **Why blame us?**
  - Strong correlation – CO<sub>2</sub> , higher temps; Natural causes - varying effects; Dominant correlation in recent decades has been anthropogenic



# Projected Impact of Climate Change - 2100

- **There will be a steady rise in global temps**
  - Most likely 3-8 degrees; Drop of 11 degrees would bring new Ice Age; Increase of 9 degrees – tropics in NH
- **Extreme weather events will increase – greater fluctuation in weather**
  - Heat waves; Intense precipitation; Droughts; Intense tropical storms
- **Sea levels will rise**
  - Average will be 6”- 18” (maybe 20); Caused by warmer water, not melting ice; Salt water will encroach on fresh
- **Polar advances of species will accelerate**





# What to Do? – Replace Fossil Fuels

- **Two questions:** 1. Do we have it? 2. Can we get it?

- **Three main sources of energy:**

- **1. Sun**

- Solar, Wind – Expensive; Limited; Variable availability – cloud cover, no air moving



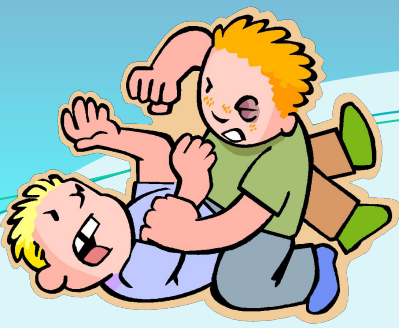
- **2. Fossil Fuels**

- Natural gas – burns cleaner; Oil – running out (decades left); Coal – dirtiest, but most abundant (300 years left); Nuclear – cleanest, but most dangerous

- **3. Tidal waves**

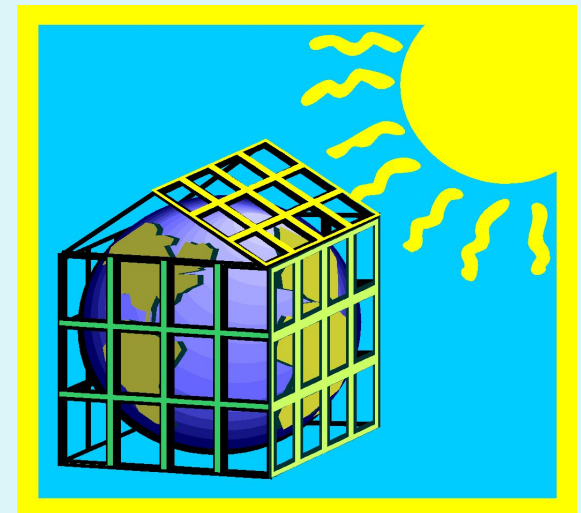
- Rivers, dams, ocean waves – limited, most being used already





# Why is Global Warming So Controversial?

- Some people insist this is just an unproven theory
- Scientists have trouble communicating this to the general public
- Climate change can be confusing and upsetting to people
- Solutions will have serious economic and lifestyle impacts
- Political differences among government leaders impacts progress towards solutions



# What to Teach Students?



- 1. There is a difference between weather and climate
- 2. Global warming is accelerating and is caused mainly by humans burning fossil fuels
- 3. Global warming is causing climate change and will have a significant impact on people and nature
- 4. Earth's temperatures will most likely rise 3-8 degrees by the year 2100.
- 5. Sea levels have already risen and are projected to rise much more
- 6. There is scientific consensus that global warming is causing climate change and presents us with some serious challenges

# What to Teach Students? (2)

- 7. Governmental leaders from many countries are working on international agreements to deal with climate change
- 8. New technologies must be developed to stabilize and reduce greenhouse gases
- 9. Saving energy and developing alternative energy sources will help
- 10. Every individual person can take actions daily to help with this situation



# What can Students and their Families Do?

1. Turn off electrical devices when not in use
2. Take shorter showers
3. Close blinds/drapes on hot, sunny days
4. Turn off lights when you leave a room
5. Switch to fluorescent light bulbs
6. Plant trees
7. Combine and reduce trips in cars
8. Recycle whenever possible
9. Purchase recycled products
10. Spread the word – encourage wise energy consumption



# Global Warming Websites

## ● List of Websites

- [www.Knowledge.Allianz.com](http://www.Knowledge.Allianz.com)
- [En.wikipedia.org/wiki/Global\\_warming](http://En.wikipedia.org/wiki/Global_warming)
- [www.epa.gov/climatechange](http://www.epa.gov/climatechange)
- [www.gobalwarming.org](http://www.gobalwarming.org)
- [www.climatehotmap.org/](http://www.climatehotmap.org/)
- [NationalGeographic.com](http://NationalGeographic.com)
- [www.nwf.org/globalwarming](http://www.nwf.org/globalwarming)
- [www.sierraclub.org](http://www.sierraclub.org)
- [kanewd@earthlink.net](mailto:kanewd@earthlink.net) (North Carolina information)

