**Climate Change Feedback Loops**

**Directions:** With a partner, you will be assigned one of the following feedback loops to diagram and investigate. On a whiteboard you will:

* Draw a diagram of the situation described that includes a feedback cycle.
* Determine if your cycle is positive or negative. Describe if it will enhance or dampen the effects of global climate change.
* Research - find one real world example of your cycle. Summarize where it is occurring and what the effect is. Make a prediction about what will happen if this is allowed to continue.

**Feedback Loops:**

1. As CO2 levels in the atmosphere rise the temperature of the Earth rises. As the Earth warms the rate of photosynthesis in plants increases, more CO2 is therefore removed from the atmosphere by plants, reducing the greenhouse effect and reducing global temperatures.
2. As the Earth warms: Ice cover melts exposing soil or water. Albedo decreases. More energy is absorbed by Earth’s surface. Global temperature rises. More ice melts.
3. As Earth warms, upper layers of permafrost melt, producing waterlogged soil above frozen ground. Methane gas is released in an anoxic environment. The greenhouse effect is enhanced. Earth warms, melting more permafrost.
4. As Earth warms, increased evaporation produces more clouds. Clouds increase albedo, reflecting more light away from Earth. Temperature falls. Rates of evaporation fall.
5. As Earth warms, evaporation increases. More CO2 is released. Enhanced greenhouse effect occurs. Earth warms further. Rates of decomposition increase.
6. As Earth warms, evaporation increases. Snowfall at high latitudes increases. Icecaps enlarge. More energy is reflected by increased albedo of ice cover. Earth cools. Rates of evaporation fall.
7. As Earth warms, polar icecaps melt releasing large numbers of icebergs into oceans. Warm ocean currents such as the Gulf Stream are disrupted by additional freshwater input into oceans. Reduced transfer of energy to poles reduces temperature at high latitudes. Ice sheets reform and icebergs retreat. Warm currents are re-established.
8. Oceans are a carbon sink containing 50 times the amount of carbon as the atmosphere. They release more carbon dioxide to the atmosphere as they warm up as warm liquids hold less gas.
9. Stalling of the North Atlantic Drift could reduce transfer of heat to the north and increase temperature dramatically.
10. Huge amounts of methane are frozen in methane clathrates in the ocean sediments. If these are released, the volume of methane in the atmosphere will increase dramatically.
11. Oceans absorb more CO2 in warmer water as phytoplankton photosynthesize faster, producing more phytoplankton that absorb more CO2.
12. At night, cloud formation increased by aerosols acts as insulation, trapping heat. More clouds lead to more trapped heat.
13. Forests are cut down and burned. Less carbon is absorbed. More CO2 in the atmosphere so higher temperatures. Forests die due to high temperature and may catch fire, more CO2 released, temperatures rise.
14. Warmer air carries more water vapour so more rainfall, some of which will be snow so more snow, more reflection, lower temperatures, more snow and ice. Possibly the next ice age.