**Leaking Lakes** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_ Binder Page #\_\_\_\_

**Reading Guide**

**What is a climate feedback?**

This happens when a change in our climate causes an impact which changes our climate further — a knock-on effect which feeds back into our climate. There can be both negative and positive feedbacks:

**Negative feedback** — this is an impact which offsets the prevailing change in climate. Under global warming, this would create a cooling effect, balancing out the changes. If the climate was getting colder, it would create a heating effect.

**Positive feedback** — this is an impact that increases the change in the climate. It would add to global warming by creating further heating or, if our climate was cooling, would cool the climate further.



**Examples of Climate Feedbacks:**

**Water vapor (positive feedback)**

As air gets warmer, its capacity to hold moisture increases. Our atmosphere is getting warmer because of climate change and, as a result, is holding more water vapor. This is a potent greenhouse gas — when in the atmosphere, water vapor helps the Earth hold on to more energy from the sun. So a warming climate means more water vapor, which in turn warms the climate further — a classic positive feedback.

**Land carbon cycle (currently negative feedback)**

For every ton of carbon dioxide (CO2) released into the atmosphere, within a year about half of that will be absorbed by the ocean and land, e.g. through trees and plants. This important process helps mask the true extent of our CO2 emissions.

**How does Global Warming impact climate feedbacks?**

Use the article “Leaking Lakes”, podcast notes, and the internet to research the following questions:

1. What are the 4 most abundant gases in our atmosphere? What % is each? Which are greenhouse gases?
2. How does methane (CH4) compare to carbon in strength as a greenhouse gas?
3. How has climate change impacted Arctic lakes? What is the result of the climate change?
4. Describe in detail the two methods that scientists use to measure methane emissions from lakes.
5. Are the leaking lakes (methane emissions) an example of a positive or negative feedback? Explain your reasoning.

6. For each of the feedbacks below, label them **positive** or **negative** in the space provided.

**Albedo (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

Albedo is the amount of light reflected by a surface, which is very important in climate science. A surface with a high albedo, such as snow or sand, will reflect more sunlight back out to space. The lower the albedo, the more energy and heat is absorbed. Global warming is causing ice and snow to melt, revealing the land or ocean underneath. Ice and snow reflect a lot of sunlight — certainly more than land and the oceans. So as the ice melts, more of the sun's energy is absorbed— which in turn melts even more snow and ice.

**Ocean Temperatures (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

As the ocean absorbs CO2 it becomes more acidic, reducing the amount of CO2 it can further absorb. As the temperature of the ocean increases this reduces its capacity to absorb CO2.

**Methane Hydrates (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

These are potentially a very big deal which could change our whole understanding of climate change, but it's very uncertain. There are very large stores of methane locked away at depth in the ocean. We know the stability of these stores is dependent on temperature. As the oceans get warmer it's possible this balance could be upset and the stores released — which would be very serious. Methane is more than 20 times as potent as CO2 as a greenhouse gas.

**Land Carbon Cycle: Northern Latitudes(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

As temperatures increase the areas in which trees can grow will extend north to higher latitudes. New trees will absorb CO2, taking it out of the atmosphere.

**Land Carbon Cycle: Tropical Zones (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

As temperatures increase, soils, plants and trees in these areas will become more heat stressed — potentially releasing the huge amounts of carbon they store and even threatening the future of important areas such as the Amazon rainforest.

**Low Altitude Clouds (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

Composed of water droplets (i.e., not ice) typically reflect solar radiation and cool the atmosphere.

**\*High Altitude Clouds (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feedback)**

Icy, cirrus clouds typically trap outgoing infrared radiation and creating additional warming.

\*Early research by NASA has found about 80 percent likelihood that from 2000 to 2010 the global cloud cover created a positive feedback -- which means that on the whole, clouds created an additional warming effect on the planet.