

Positive Feedback Loops: Not Always "Positive" (Good) for Climate

Presented by Marissa Kopp

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Photo by Jeff Vanuga. Permafrost in Svalbard, Norway.



Objectives:

By the end of this lesson, participants should be able to...

- Define a positive feedback loop in ~1-2 sentences
- Connect positive feedback loops to one real-life example

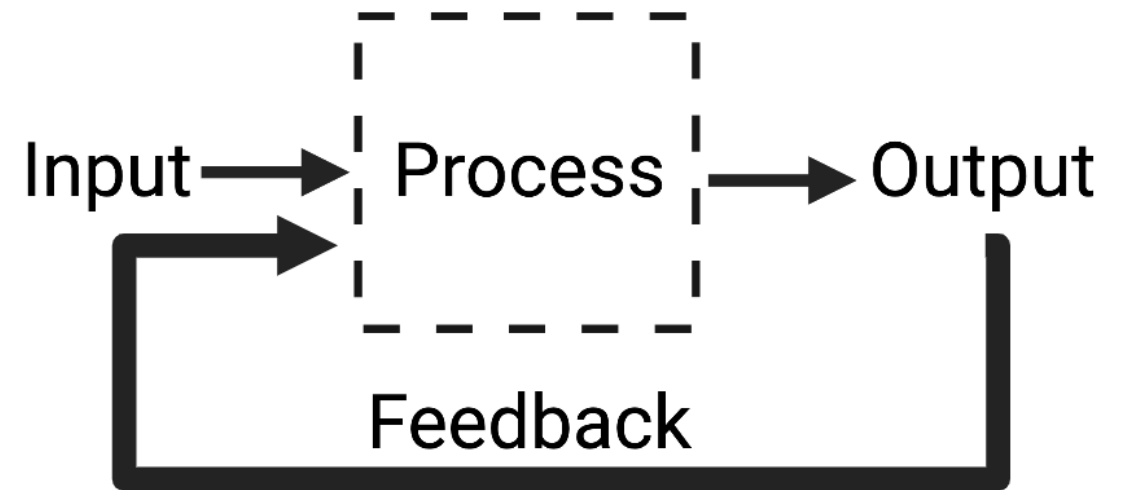
Prior Knowledge Check

On a scale of 1 to 5, how familiar are you with the term "feedback loop"?

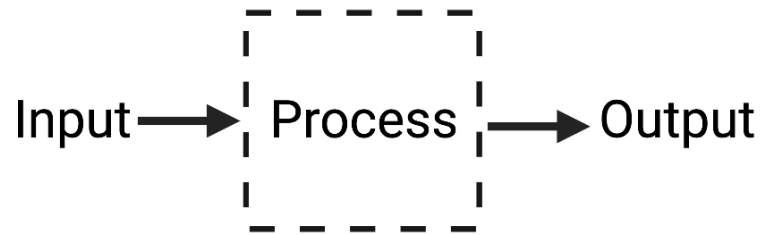
1 = never heard of it

5 = extremely familiar

Enter your answer in the Zoom chat or hold up the number of fingers on your camera

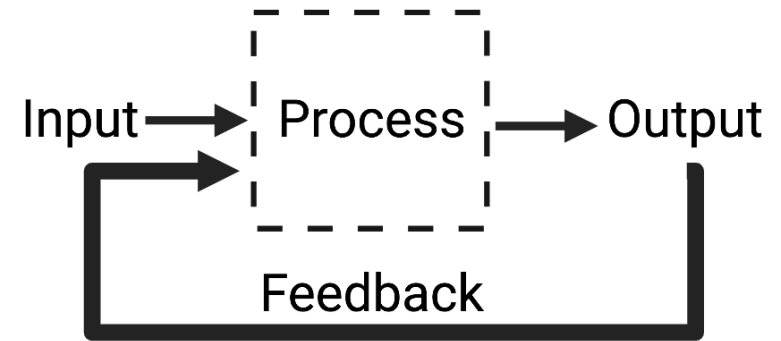
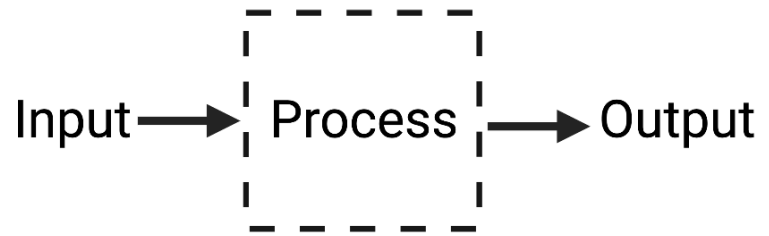


Some systems have **feedback loops**, where the outputs change the inputs



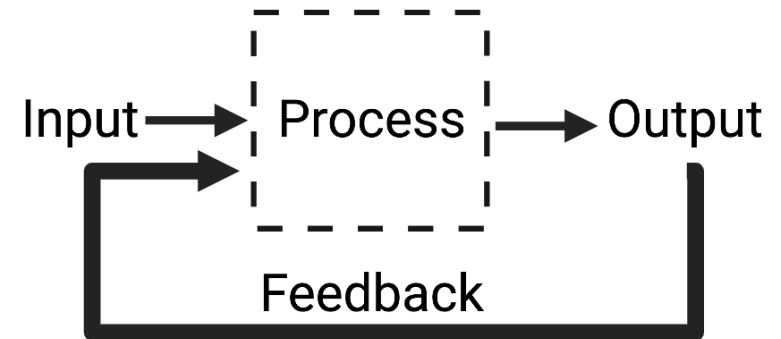
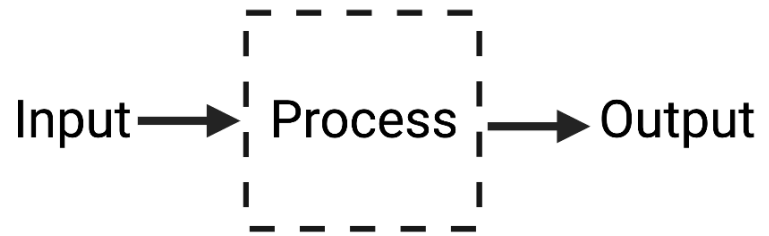
In a basic **system**, something goes into a process, then something comes out

Some systems have **feedback loops**, where the outputs change the inputs

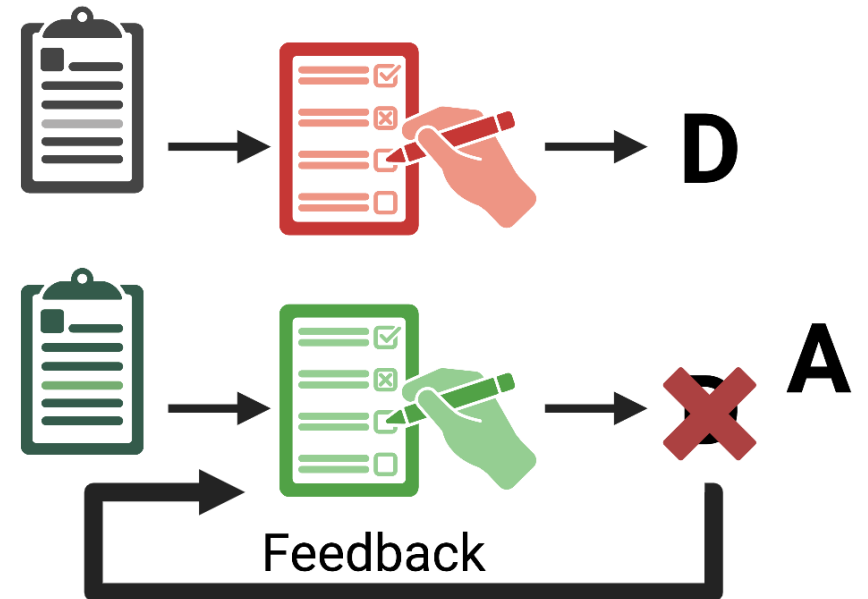


In a basic system, something goes into a process, then something comes out...
But **some systems have feedbacks**

Some systems have **feedback loops**, where the outputs change the inputs

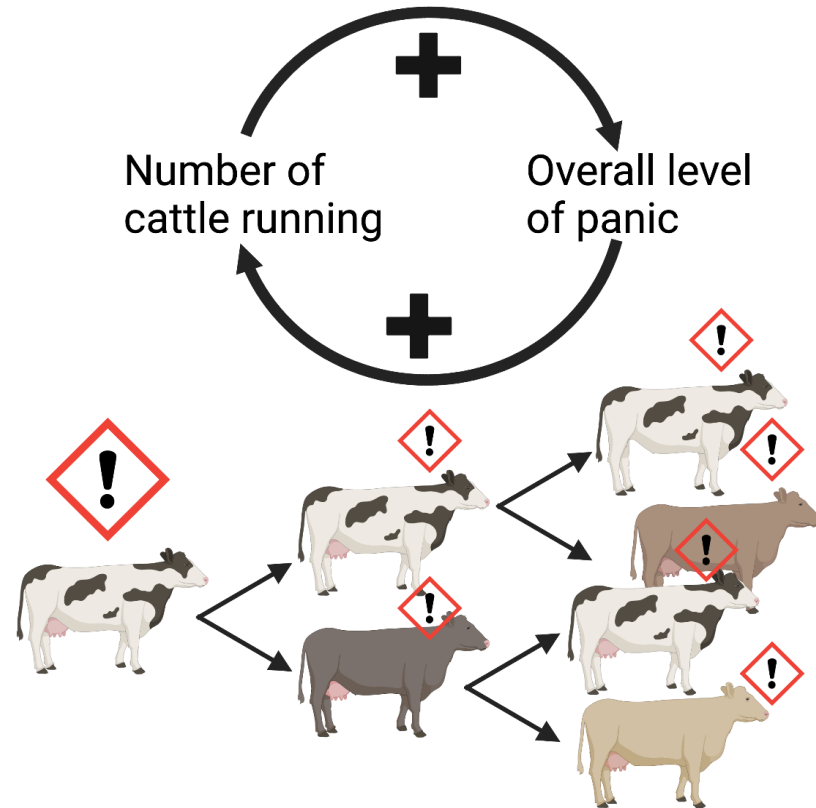


In a basic system, something goes into a process, then something comes out...
But **some systems have feedbacks**



Positive feedback loops have outputs that exacerbate change in the system

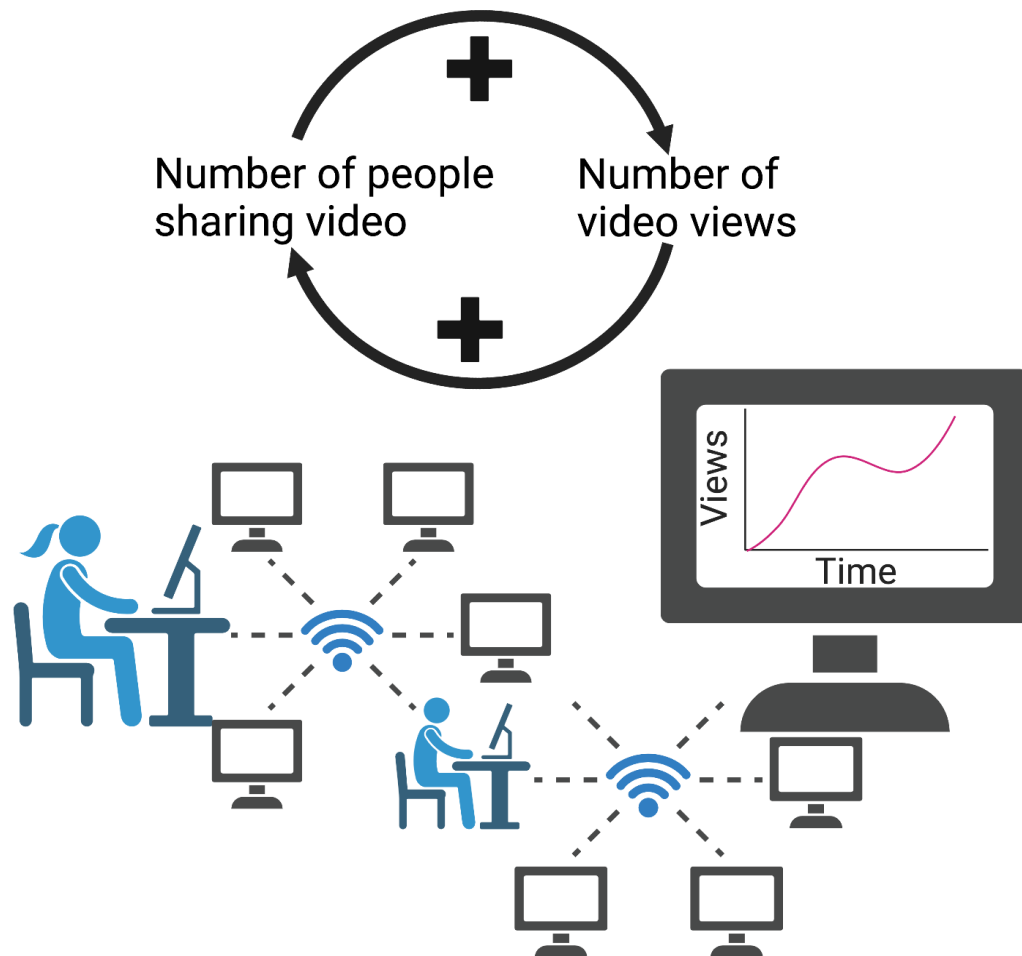
Stampede



- Put one panicked cow into the system
- One cow scared more cows
- More cows panic
- More cows scare many cows
- Many cows panic...

Positive feedback loops have outputs that exacerbate change in the system

Viral Video



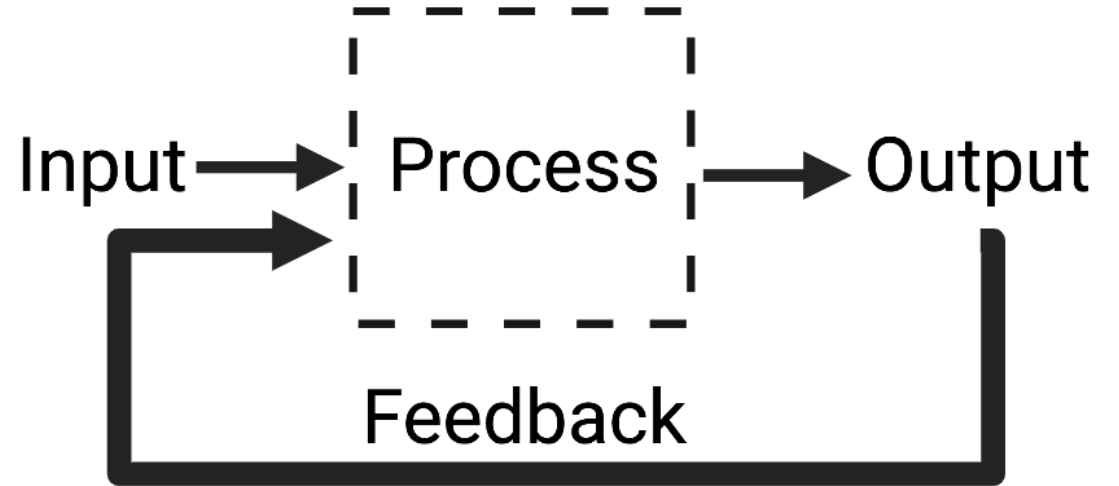
- One person shares a video
- Their friends view and share the video
- Friends' friends view and share the video...

Question & Connect

What questions do you have about feedback loops?

Where have you seen positive feedback loops in your life or work?

Take a minute to type your thoughts in the Zoom chat

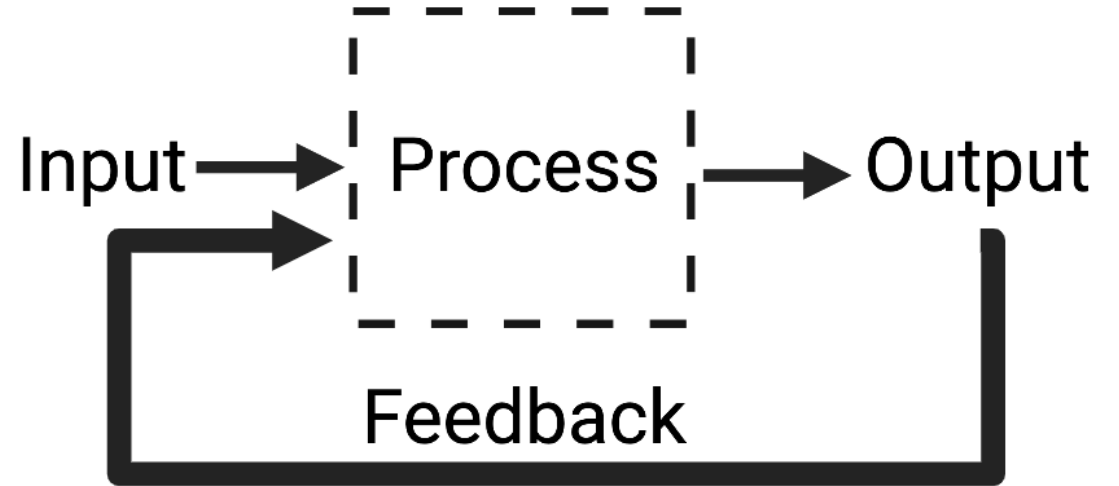


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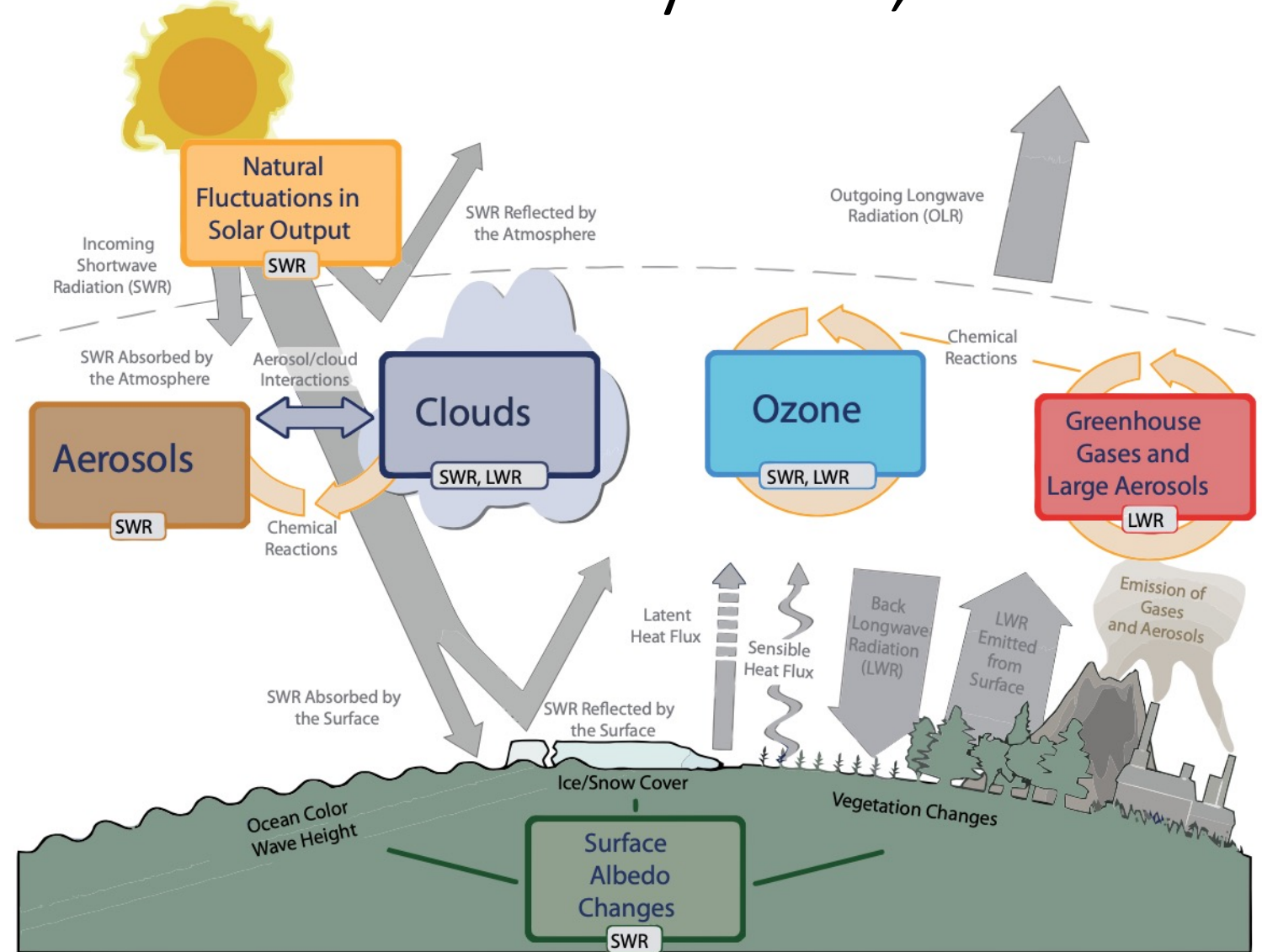


In ecology, we often think about the effect of feedbacks on the **climate system**

Real systems, like the climate system, are complicated

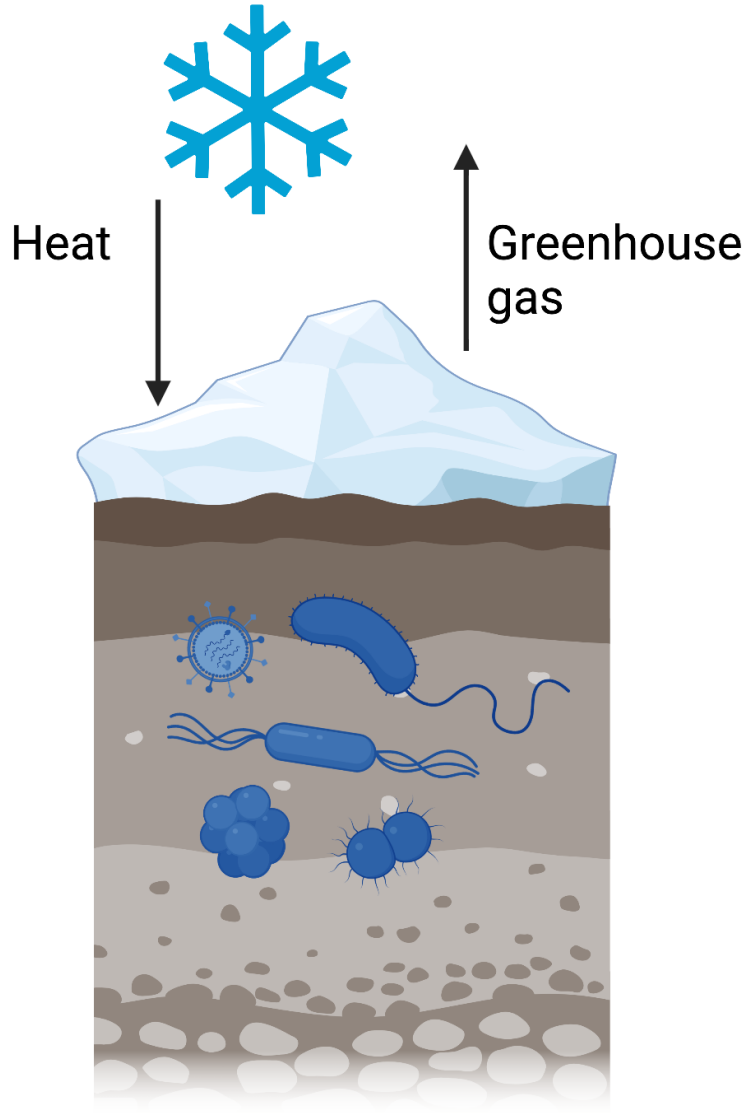
Most systems have many inputs, internal processes, and outputs

There may be many feedbacks and interacting processes



Intergovernmental Panel on Climate Change (AR5 Fig 1.1)

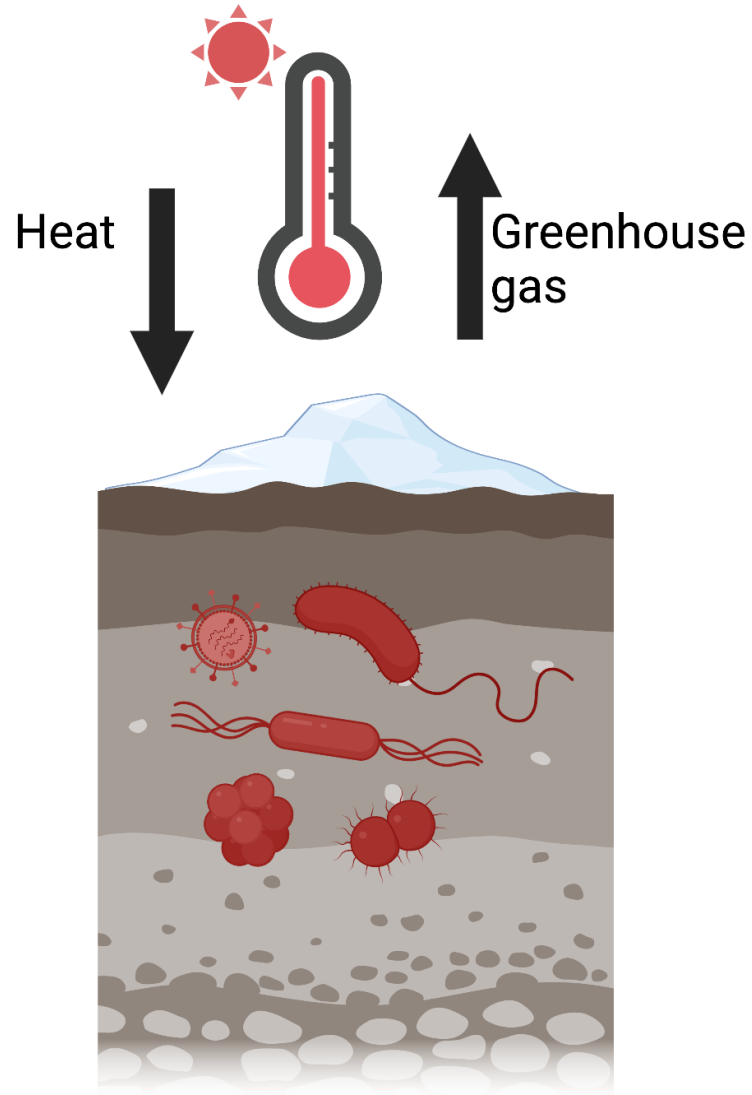
"Positive" feedback does not equal good—
consider the case of melting permafrost



Permafrost is ground that remains frozen "permanently," covering ~25% of the Northern Hemisphere's land

Frozen soils are not active, so they store more carbon than they release

"Positive" feedback does not equal good—
consider the case of melting permafrost



As climate grows warmer,
permafrost melts

Warm soils are more active,
so carbon is released to the
atmosphere

More atmospheric carbon
warms the Earth's surface

Wrap up: In your own words, what's the most important point from today's lesson?

Take a minute to write your key take away from this lesson in the Zoom chat

Acknowledgements

All figures not cited were created with [BioRender.com](https://www.biorender.com)



Photo from NASA Climate Kids. Permafrost melting.

