

REFLECTED IN WATER

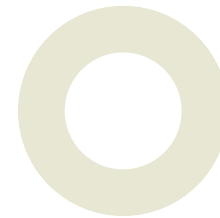


GrACE
Green Europe:
Active Citizenship
and the Environment



How Climate Change Threatens Water Resources

A lesson offered by sbrb.eu



EPOCH DETECTIVES

Imagine you are geologists 10,000 years in the future. You study rocks and sediments and you try to understand what happened in our time. Scan your QR code to see a landscape from the human epoch. Decide what future scientists would see in the geological records.



Edward Burtynsky, *Uralkali Potash Mine, #4*, Berezniki, Russia, 2017



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EPOCH DETECTIVES

1. What human activity do you see?
2. Could this leave a geological trace in 10,000 years?
3. What evidence would future geologists find? For example, layers of concrete, plastic, metal; strange sediments; erosion; animal bones; chemicals, etc.



<https://www.freepik.com/author/wirestock>

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Photo by [Hat Trick](#) on [Unsplash](#)

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Photo by [Francisco Kemeny](#) on [Unsplash](#)

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Photo by [James Baltz](#) on [Unsplash](#)

From the Holocene to the Anthropocene

What has changed from the Holocene to the Anthropocene?

human activity

speed

scale



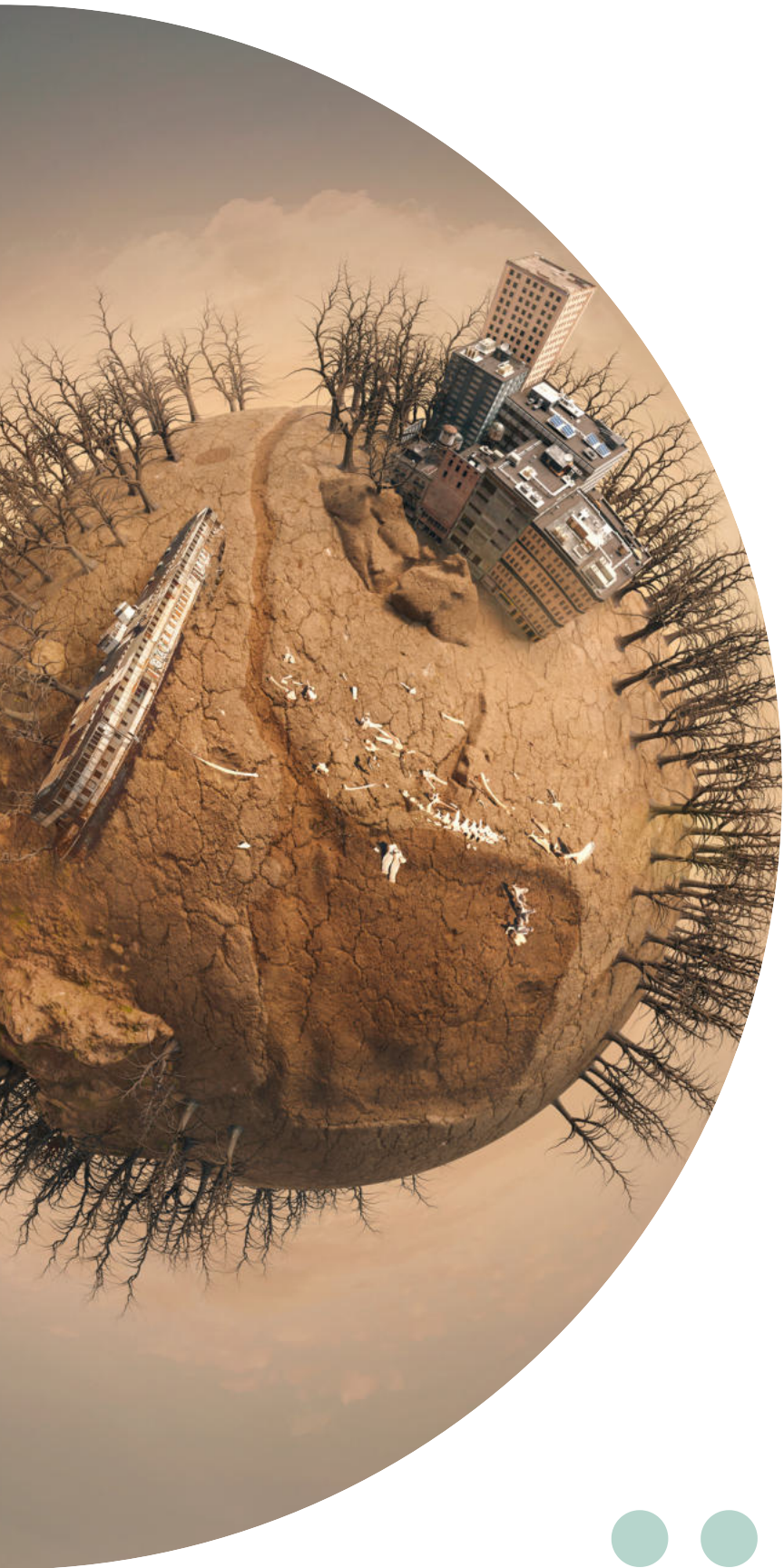
Holocene

The last 11,700 years since the end of the last ice age, with a warm and stable climate that allowed agriculture and complex societies to grow. Human impacts were mostly local and slow.

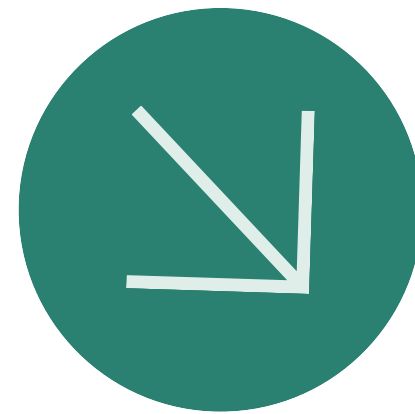


Anthropocene

A proposed epoch when human activity reshapes Earth's climate and ecosystems. Since 1950, rapid growth in energy and population has changed the planet on a global scale.

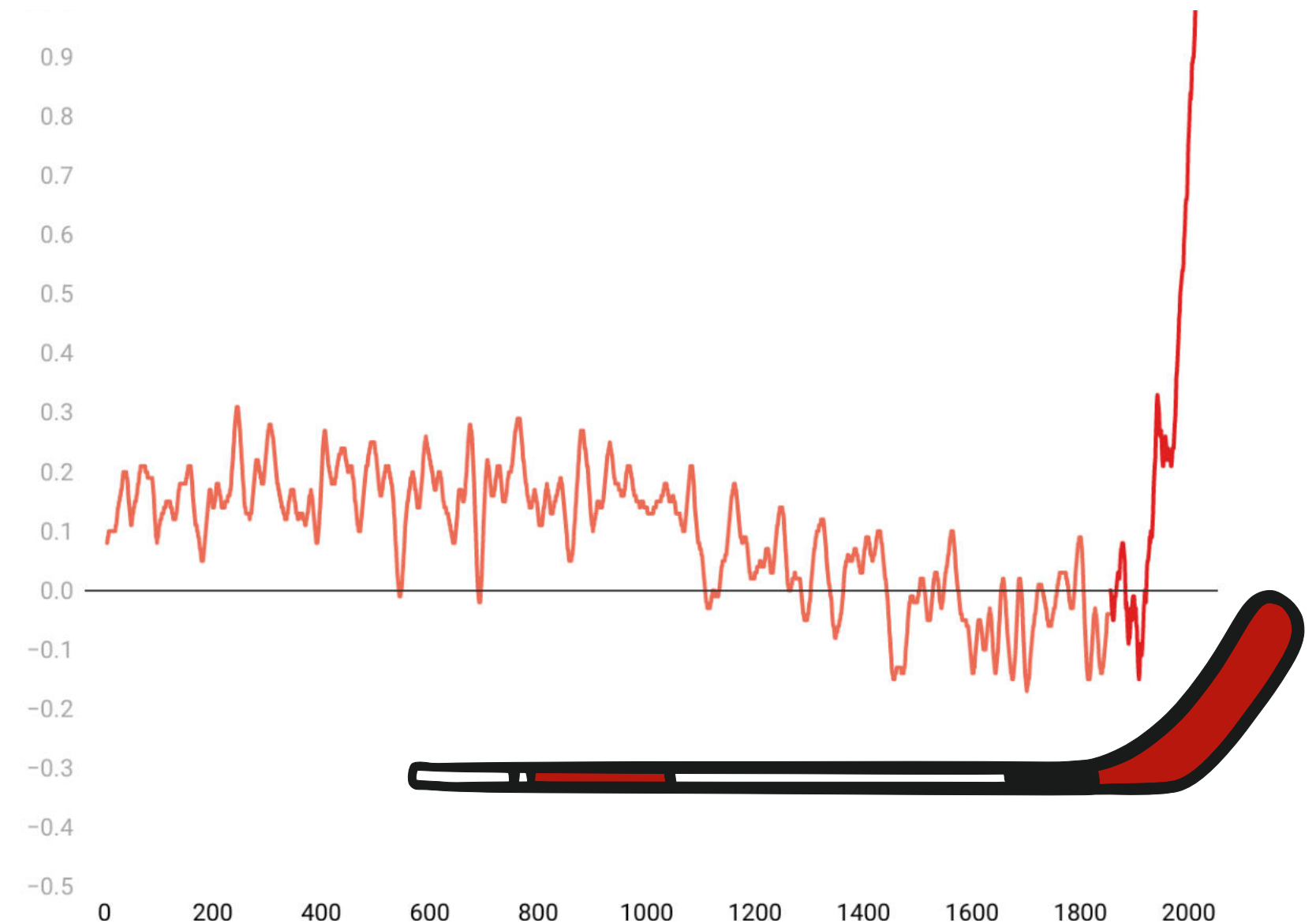


The Great Acceleration



Look at the graph.

Which things in our world do you think have followed the 'hockey stick' pattern since around 1950?



Source: Time

The Great Acceleration

The Great Acceleration is the rapid increase in human activities - like energy use, pollution, and resource extraction - that started around 1950 and accelerated sharply towards the end of the 20th century. This was unprecedented in human history because so many activities grew so fast at the same time.

Adapted from: <https://www.ipbes.net/glossary-tag/great-acceleration>



Photo by Tian Li on Unsplash

Key features:



Timing

Started around 1950



Scale

Affects many different human systems simultaneously



Speed

The growth is not gradual - it is rapid and accelerating



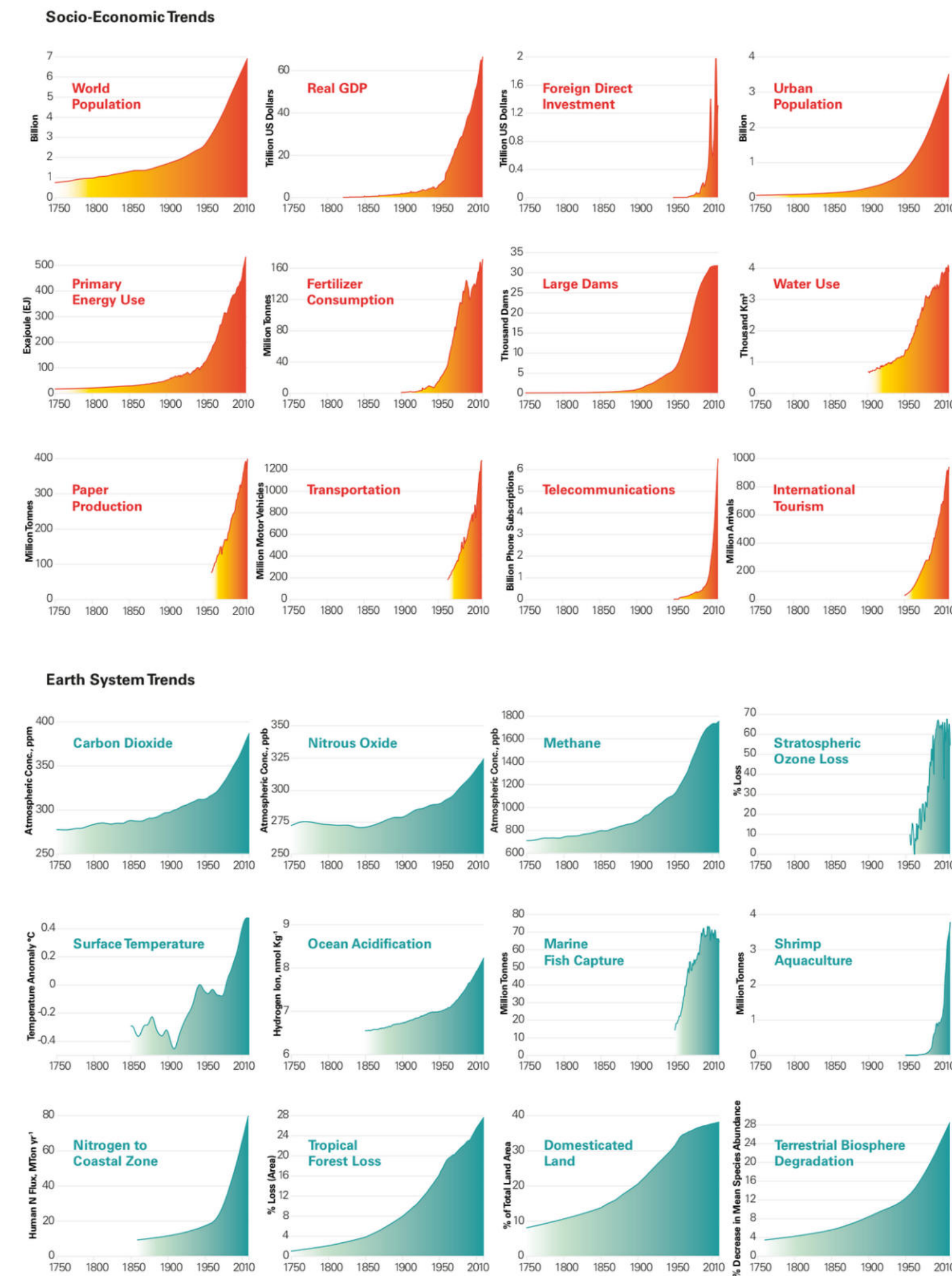
Impact

It changes the Earth's main systems at a planetary scale

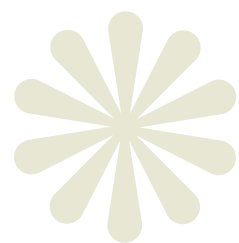


The Great Acceleration

The Great Acceleration means that _____
_____ has increased very fast
since _____ around 1950, and this affects
_____.



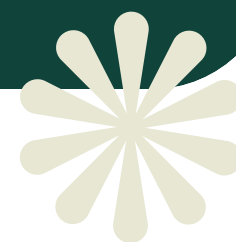
Source: <http://www.igbp.net/>



THE CLIMATE MYSTERY

How can global warming cause both
droughts AND floods?

**You are investigators.
Your job is to explain this paradox.**





The Climate Paradox



Warmer air increases evaporation from soil and oceans



Warm air can hold more water vapour than cold air



When warm, humid air cools quickly, large amounts of rain can fall

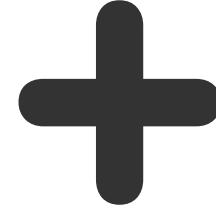


Higher temperatures dry out soil faster



Photo by [Axel Bonniot](#) on Unsplash

The Draught Chain

 Warmer air increases evaporation from soil and oceans 

 Higher temperatures dry out soil faster 

 **DRIER SOILS AND DROUGHT**



Foto di redcharlie su Unsplash

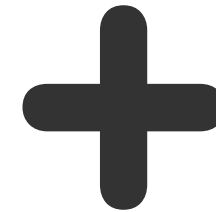




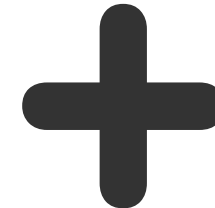
The Flood Chain



Warmer air increases evaporation from soil and oceans



Warm air can hold more water vapour than cold air



When warm, humid air cools quickly, large amounts of rain can fall



HEAVY RAINFALL AND POSSIBLE FLOODS



Foto di Andrey Kukhareenko su Unsplash

CASE FILE ANALYSIS AND PRESENTATION



Photo by RO Kazui on Unsplash

GROUP 1

- Which cards are most important?
- How does warming play a role in this case?
- Impact increased by human vulnerability

GROUP 2

- Which cards are most important?
- How does warming play a role in this case?
- Impact increased by human vulnerability

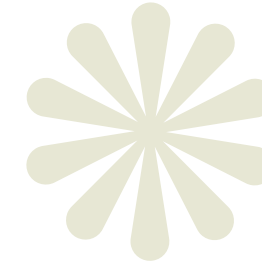
GROUP 3

- Which cards are most important?
- How does warming play a role in this case?
- Impact increased by human vulnerability

GROUP 4

- Which cards are most important?
- How does warming play a role in this case?
- Impact increased by human vulnerability

MINI-PRESENTATIONS



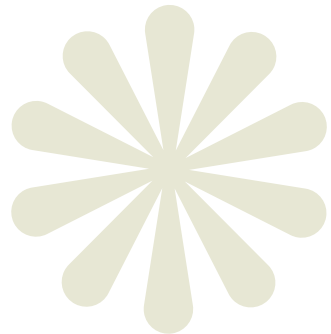
Prepare a 1-minute explanation as if you were scientists on the news.

"In [place], we see [drought / floods / both].

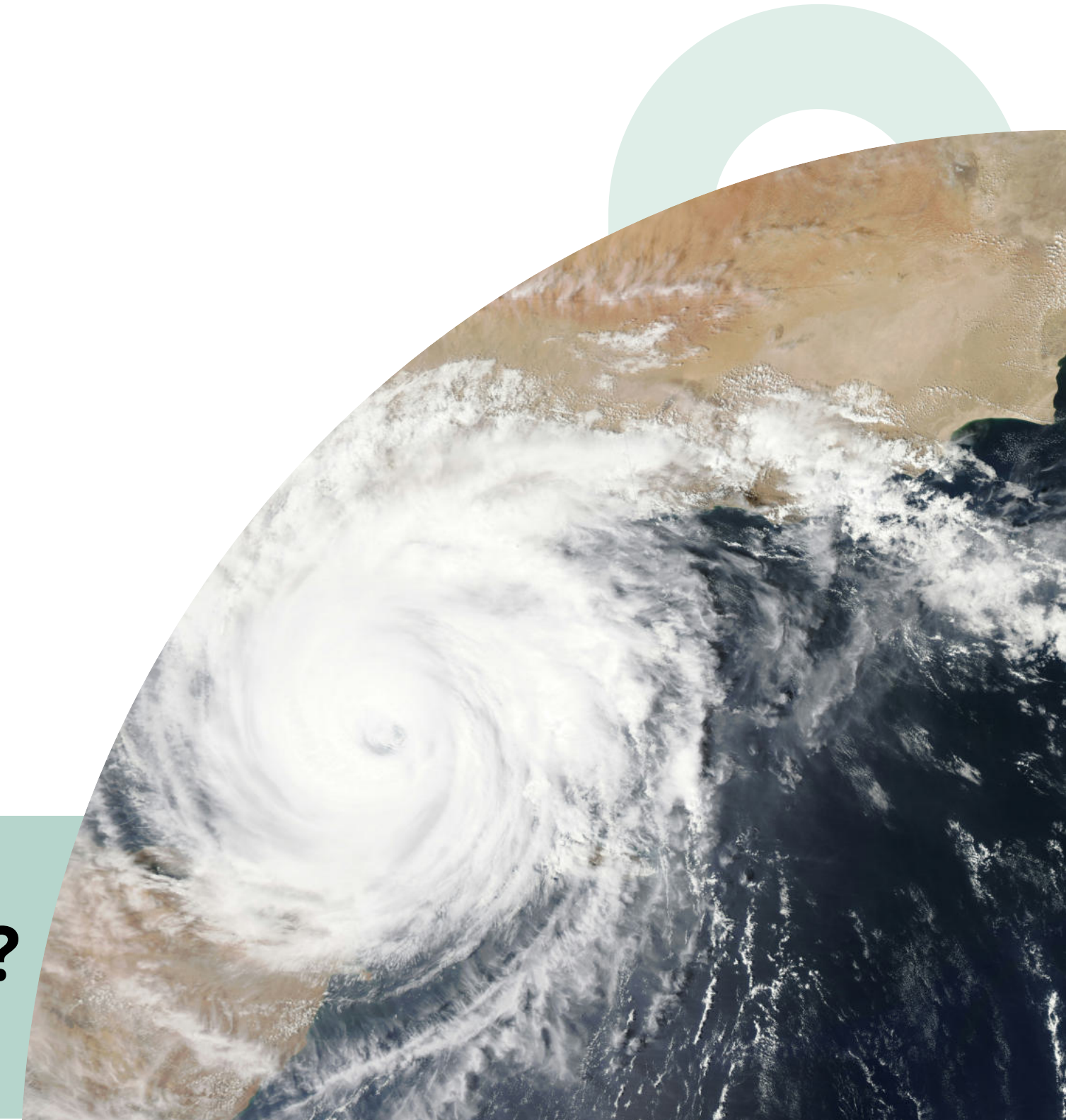
Warmer air [card(s) A/B/C/D explanation].

This leads to [drought / heavy rain / floods / landslides].

The impact is worse because [human vulnerability: city design / dry soil / burned land / low-lying areas]."



Are there any similarities in these cases?



LET'S THINK...

If rainfall patterns are changing this much, what happens to cities, dams, water systems and other infrastructure built using old data?

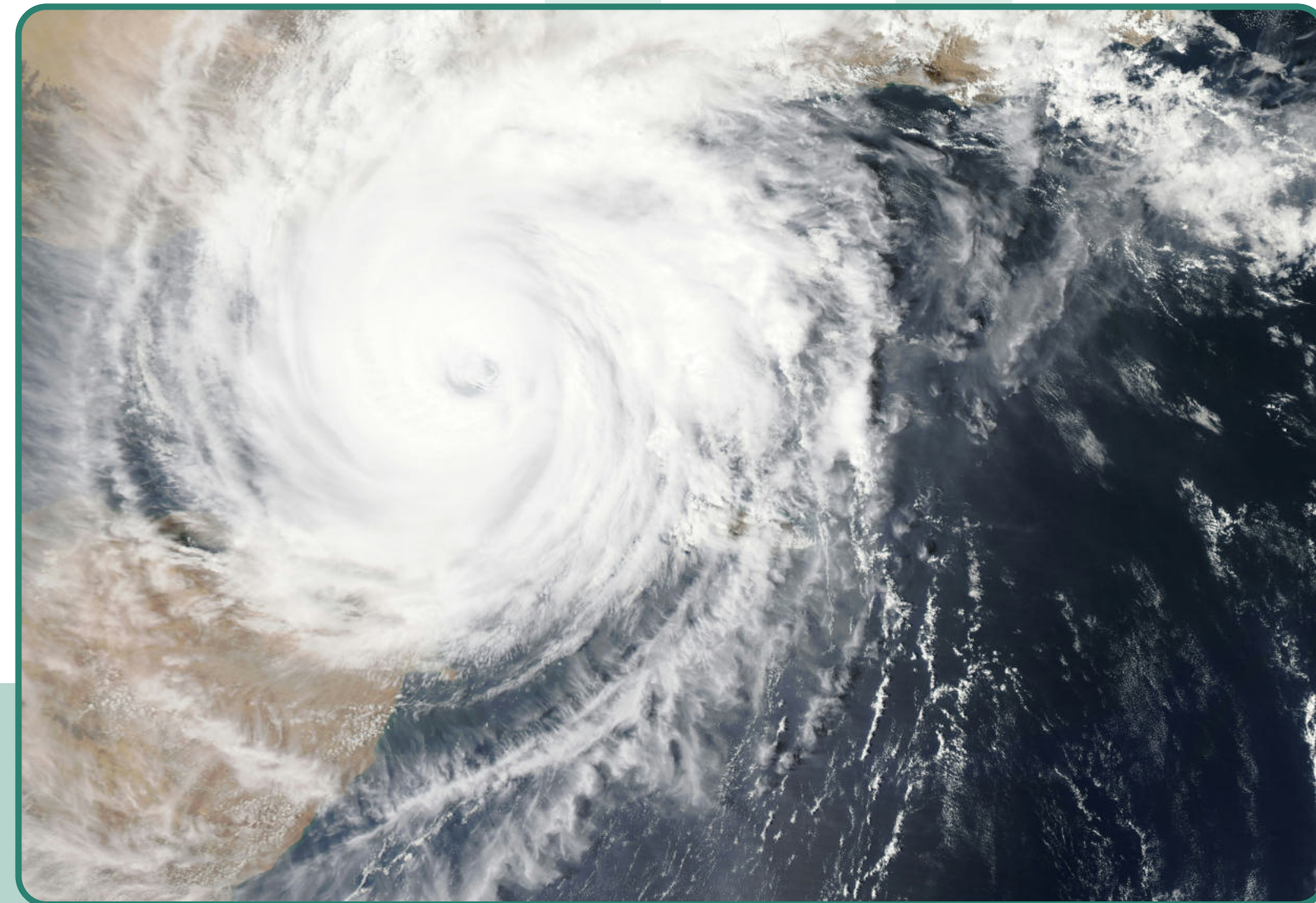


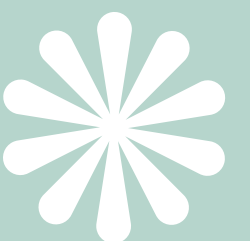
Photo by [NASA](#) on Unsplash

UNPREDICTABILITY: WHO'S MOST AT RISK?

Climate unpredictability (droughts, floods, weird seasons) can affect many parts of society. Rank the following risks from 1 (most affected by climate unpredictability) to 6 (least affected).

Which systems influence each other?

- | | |
|--|--|
|  flood barriers |  insurance system |
|  agricultural planning |  drinking water supply |
|  tourism |  emergency service |



Climate unpredictability as a system

In real life, things are connected in circles (or loops), not just straight lines.
Example:

Rainfall unpredictability > Crop failure > Higher food prices >

Higher food prices > more social tension > etc.



Can you think of another example where one problem makes another worse, and that new problem makes the first one worse again?

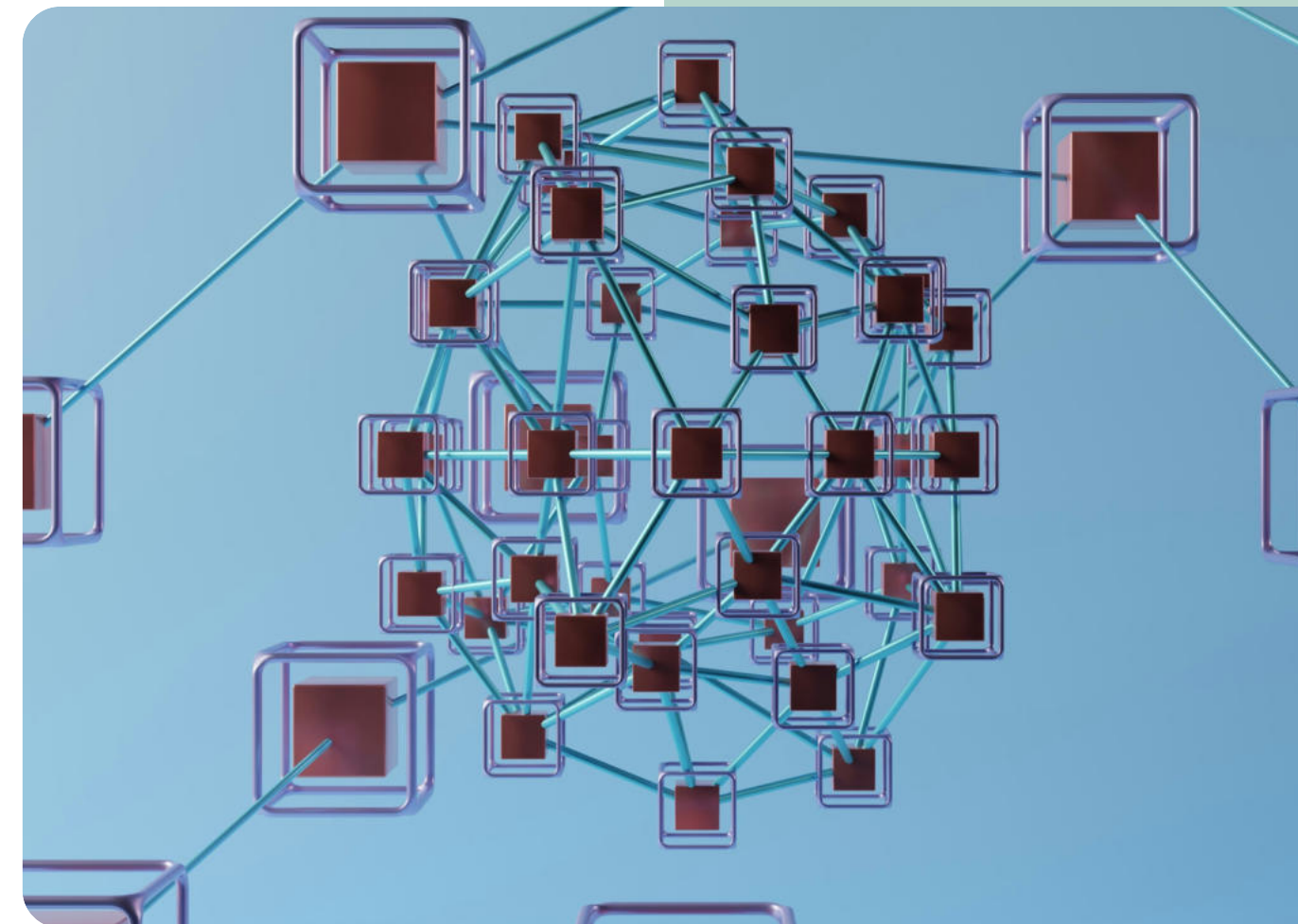
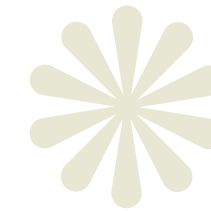


Photo by GuerrillaBuzz on Unsplash

UNPREDICTABILITY AS A SYSTEM: LOOPY



You're going to visualize unpredictability as a system with Loopy.
In your group, choose ONE system from your ranking activity:



flood barriers



insurance system



agricultural planning



drinking water supply



tourism



emergency service

You will explore how unpredictability affects your chosen system



LOOPY! A tool for thinking in systems

LOOPY!

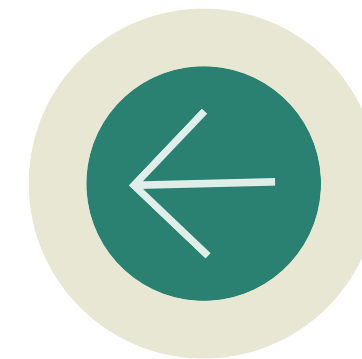
a tool for thinking in systems



A feedback loop happens when:

- A affects B →
- B affects C →
- C affects A again

There are two types:



-  reinforcing loops
-  stabilising loops

Unpredictability as a system

Now draw a simple “system map” or create a simple Loopy diagram (if available). Include at least the following required four elements (nodes):

- climate unpredictability (e.g. strange rainfall, heatwaves, sudden floods)
- one system from your ranking (e.g. agriculture, tourism, or drinking water)
- one social or economic effect (e.g. prices, jobs, migration, health)
- a feedback effect (something that makes the situation better or worse)

EXAMPLE:

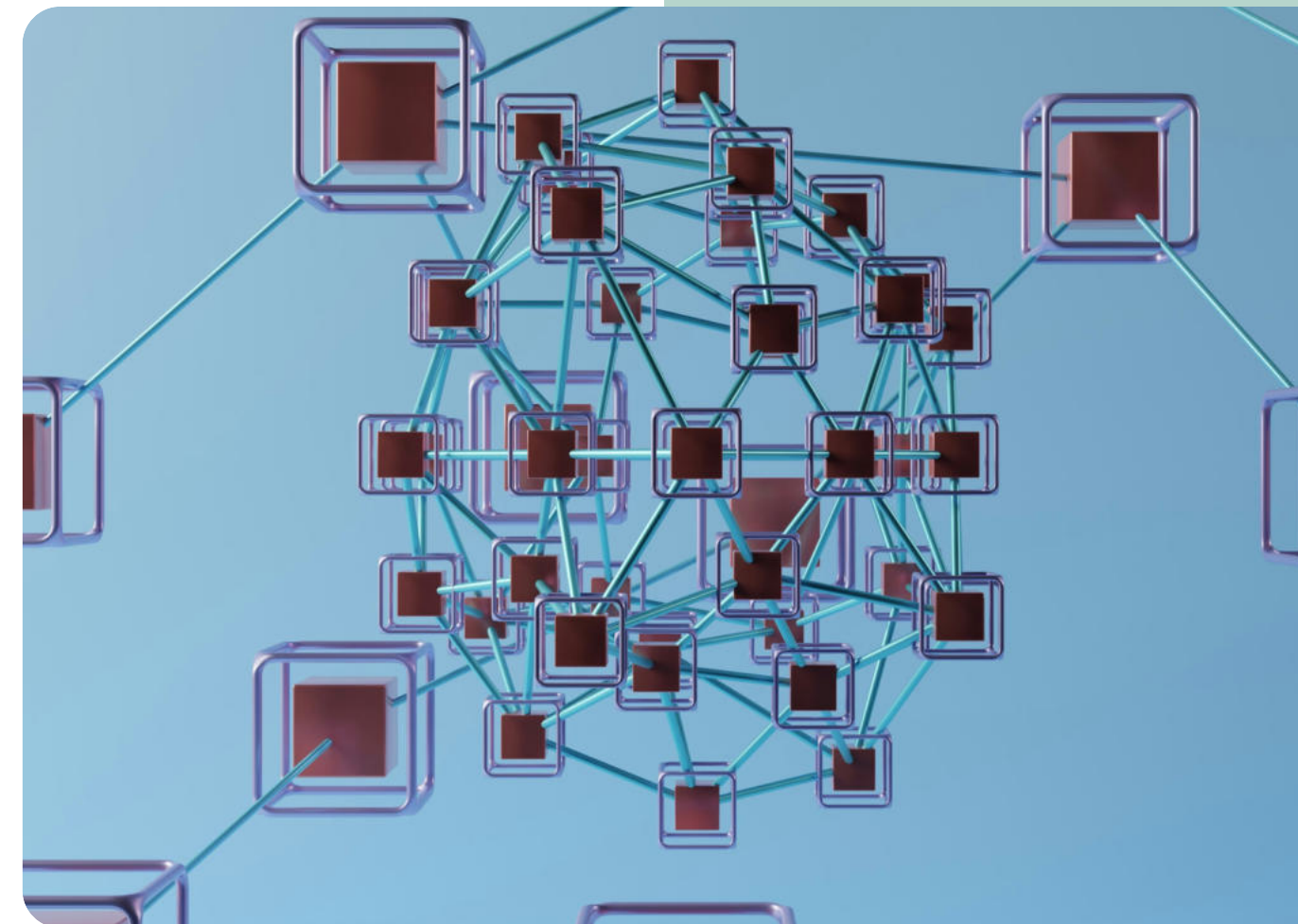
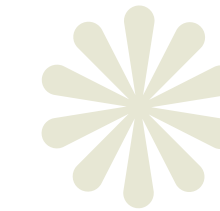
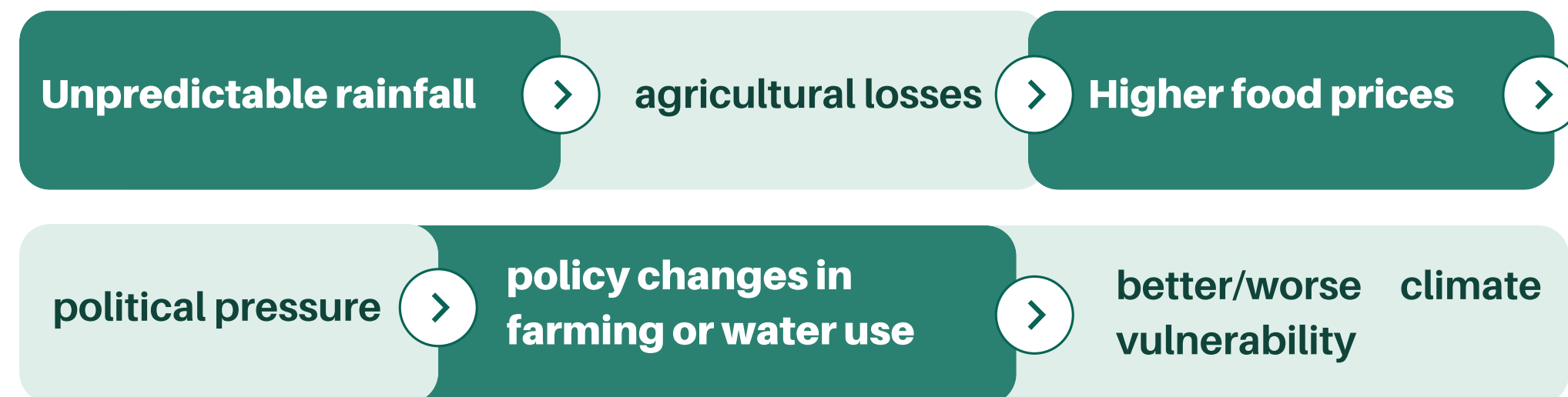


Photo by GuerrillaBuzz on Unsplash

THINKING IN SYSTEMS

Look at the system map you drew. Answer these questions:

- Describe **one reinforcing loop** in your system that makes the problem worse. What are the steps?
- Are there any **loops that stabilise** the system?
- If feedback loops can amplify problems, **what small change today could prevent a reinforcing loop from becoming dangerous?** Explain how your change would weaken or break the loop.

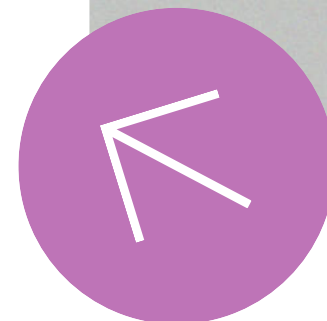
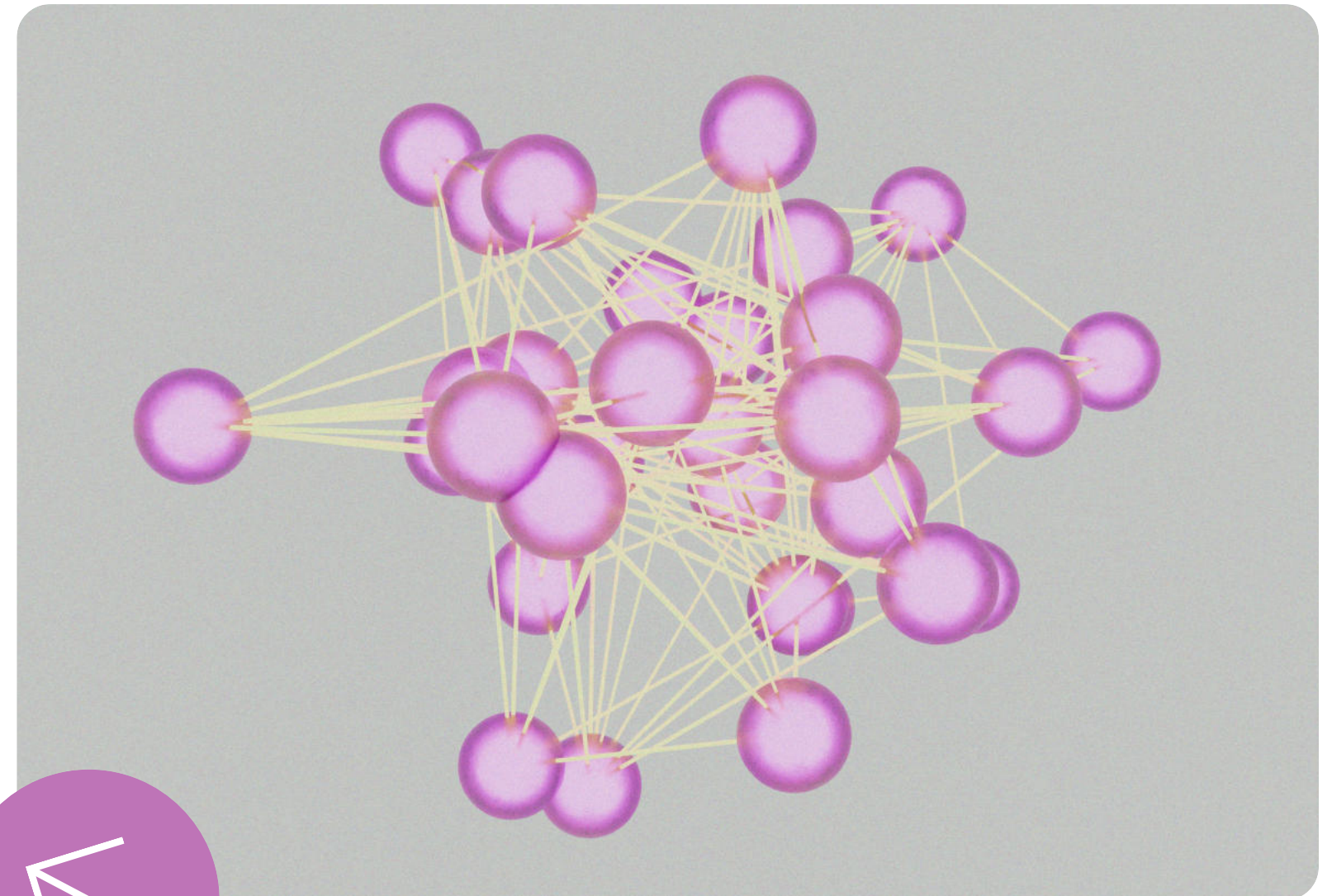


Photo by Logan Voss on Unsplash