

## REFLECTED IN WATER

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This lesson is designed to understand how climate change is 'reflected in water'. Through activities like jigsaw reading, data interpretation, cause-effect chains, real case analysis, and simple systems mapping, students explore how the transition from the Holocene to the Anthropocene, the Great Acceleration of human activities, and basic physical processes in the climate system lead to both droughts and floods and to cascading societal impacts. The lesson emphasizes inquiry, collaboration, and systems thinking so students can move from diagnosis of problems to a sense of agency in identifying possible interventions.

#### Subjects

Civic education, Geography, Natural Sciences, Global Citizenship, English (EFL/CLIC context)

#### Time needed

90 minutes (can be adapted to 60-120 minutes depending on class length and depth):

1a-1d: ca. 30 minutes

2a-2c: ca. 30 minutes

3a-3c: ca. 30 minutes

### Learning Objective(s)

By the end of the lesson , students will be able to:

- explain in simple terms the difference between the Holocene and the Anthropocene and why some scientists argue we live in a new 'human epoch'
- describe what is meant by the Great Acceleration and identify examples of human activities that have rapidly increased since around 1950
- create cause-effect chains that show how global warming can lead to both droughts and floods
- analyse real climate case files to connect abstract mechanisms to concrete extreme events
- explore how climate unpredictability can affect different social systems (agriculture, tourism, etc.)
- develop systems thinking by identifying feedback loops and drawing simple system maps that show how climate effects can be amplified or stabilised
- develop communication skills in English through jigsaw reading, small-group discussion, and short 'scientist' presentations



## Success criteria

- I can explain the difference between the Holocene and the Anthropocene
- I can identify some human activities that have followed a 'hockey stick' pattern since around 1950 and explain how they affect water systems
- I can build clear cause-effect chains that explain how global warming can lead to drought or to floods
- I can analyse a real climate case and link it to my drought/flood chains
- I can draw a system map showing how climate unpredictability, one social system, and feedback loops are connected
- I can work collaboratively to build and present an argument

## Skills Development

**Critical thinking:** interpreting graphs, evaluating evidence from multiple sources

**Speaking skills:** group discussion, expert-group reporting, plenary debates

**Reflective thinking:** answering reflective questions, reflecting on how climate impacts are linked to infrastructure built using historical data, connecting global water crises to personal responsibility and citizenship

**Discussion and debate skills:** ranking societal systems in terms of vulnerability to climate unpredictability, justifying choice, comparing similarities across different climate case files, negotiating interpretations of cause-effect and feedback in group work

**Collaborative problem-solving:** working in groups during the warm-up activity, cooperating in jigsaw reading and peer-teaching of Holocene/Anthropocene, building shared drought/flood chains and system maps, co-designing a small intervention to weaken a reinforcing loop

**Academic language development:** using scientific terms such as Anthropocene, epoch, tipping point, etc.

## Approach and/or method

communicative approach; cooperative learning ([jigsaw classroom](#)); inquiry-based learning; problem-based learning; systems thinking

## Key Concepts & Terms

Holocene, Anthropocene, Great Acceleration, evaporation, humidity, water vapour, soil moisture, heatwaves, floods, landslides, wildfires, droughts, climate unpredictability, feedback loop

## Materials Needed

Presentation, handouts, projector/board, access to [Loopy](#) with at least one tablet per group; alternatively, poster and felt-tip pens

## Assessment

**Formative:** teacher observation during pair and group work, quality of contributions during plenary discussions, 'scientist' presentations

**Summative:** system maps and short reflective writing as homework

## Resources

Rinaldo, A. (2023). *Il governo dell'acqua. Ambiente naturale e ambiente costruito*, Marsilio Editori: Venezia

Rinaldo, A. (2021). *Reflected in Water. Development, Resilience, Inequalities*. (Keynote speech) <https://youtu.be/fJCxS7MPW2Y>

Anthropocene

<https://education.nationalgeographic.org/resource/anthropocene/>

Hockey stick pattern:

<https://time.com/6088531/ipcc-climate-report-hockey-stick-curve>

The Holocene epoch:

<https://ucmp.berkeley.edu/quaternary/holocene.php>

### Further resources:

Crutzen, P.J., and Stoermer, E.F. (2000). The Anthropocene. *Global Change Newsletter*, 41, 17-18

Meadows, D. H. (2008). *Thinking in Systems*. Chelsea Green Publishing

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F.S., Lambin, E., et al. (2009).

Planetary Boundaries: Exploring the Safe Operating Space for Humanity. Retrieved February 16, 2026, from <https://www.ecologyandsociety.org/vol14/iss2/art32/>

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, 2(1), 81-98.

### Online resources:

IPCC reports: <https://www.ipcc.ch/reports/> (in particular, Working Group I and II reports)

Loopy: <https://ncase.me/loopy/>

Stockholm International Water Institute: <https://siwi.org/>

UN Sustainable Development Goals – Goal 6: Ensure access to water and sanitation for all: <https://www.un.org/sustainabledevelopment/water-and-sanitation/>

UN World Water Development Reports

<https://www.unesco.org/reports/wwdr/en/reports>

### Teaching resources on Systems thinking:

6 Resources for Teaching Systems Thinking – Institute for Humane Education

<https://humaneeducation.org/6-resources-for-teaching-systems-thinking/>

RISE programme - Systems thinking

<https://riseprogramme.org/systems-thinking.html>



Systems thinking: teaching resources (University of Liverpool)

<https://www.liverpool.ac.uk/media/livacuk/centre-for-innovation-in-education/diy-guides/systems-thinking-teaching-resources/systems-thinking-teaching-resources.pdf>

## Preparation:

Print handouts, prepare presentation to project, plan groups for the following activities: Epoch Detectives, Case analysis, and systems thinking maps; test QR codes from the Epoch Detective Cards; if using Loopy, familiarize with it and check that it loads on device

**Handout 1:** Handout for students

**Handout 2:** Epoch Detective Cards

**Handout 3:** Jigsaw Task - Holocene vs Anthropocene

**Handout 4:** Evidence Cards

**Handout 5:** Case File Analysis

**Presentation:** to be projected by teacher

**Homework:** ?

## Procedure:

### 1a WARM-UP: Epoch Detectives (15 min)

Introduce the idea: students are geologists 10,000 years in the future, investigating the 'human epoch'. In groups, one student scans the QR code on their Epoch Detective Card.

Groups answer:

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.

Each group chooses a speaker and briefly shares their main ideas.

Raise the idea that our time might be visible in rocks and sediments as a distinct epoch.

### 1b JIGSAW READING: Holocene vs Anthropocene (ca. 15 min)

Distribute Text A (Holocene) to Students A and Text B (Anthropocene) to Students B. Students work in pairs.

Students:

- read silently
- choose 8 key words/phrases and write them on a piece of paper
- turn texts over and explain their period to their partner using only their 8 words as prompts

Reflective question (class):

What has changed from the Holocene to the Anthropocene? (human activity, speed, scale)

### 1c and 1d The Great Acceleration (10-15 min)

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Show the hockey stick graph from your presentation. In pairs, students brainstorm examples of things that have followed a hockey stick pattern (e.g. plastic production, energy use, can numbers, water use, etc.). Connect to water where possible.

Students read the short text on the Great Acceleration (1d).

In pairs, they complete the sentence:

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

Encourage at least two examples each, ideally with a water connection.

Model answers:

*The Great Acceleration means that **global water consumption** has increased very fast since around 1950, and this affects **rivers, groundwater, and freshwater ecosystems**.*

*The Great Acceleration means that **dam consumption and river engineering** has increased very fast since around 1950, and this affects **natural river flows and biodiversity**.*

## 2a The Climate Paradox: droughts and floods (ca. 15 min)

Put students into small groups (or keep existing groups). Give each group a full set of Evidence Cards.

Explain the task: How can global warming cause both droughts AND floods?

Groups construct:

- one cause-effect chain for drought
- one cause-effect chain for heavy rainfall/floods

They copy their final chains into their handouts, drawing arrows. Optionally take 1-2 examples in plenary to check understanding.

## 2b and 2c Case File Analysis and 'scientist' presentations (ca. 20 min)

Assign each group one Climate Case File. Groups read their case and use their drought/flood chains to answer:

- Which card(s) (A, B, C, or D) are most important? Why?
- How does warming play a role in this case?
- Where does human vulnerability increase the impact? (e.g. city design, infrastructure, dry soils, burned land, living in low areas, etc.)

Groups prepare a 1-minute 'scientist explanation':

- the name of your place
- which chain(s) you used (drought/flood/both)
- which card(s) are more relevant (A,B,C, or D)
- one sentence on human vulnerability (why the impacts are so bad there)

They present briefly to the class.

**Reflective questions (whole class):**



Are there any similarities in these cases?

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

### 3a UNPREDICTABILITY: Who is most at risk?

Introduce the idea of climate unpredictability (droughts, floods, and weird seasons)

Students rank the list in groups from 1 (most affected by climate unpredictability) to 6 (least affected). They justify their top 2 with one sentence each.

Brief plenary: collect rankings and discuss differences, then ask “Which systems influence each other?”

### 3b and 3c SYSTEMS THINKING AND FEEDBACK LOOPS (ca. 15-20 minutes)

Explain that real life works in loops, not just straight lines.

Show the example loop from the handout:

Rainfall unpredictability → crop failure → higher food prices → more social tension

Ask students for another example where one problem makes another worse and the new problem worsens the first.

In small groups, students create a system map (or simple Loopy diagram if technology allows), including:

- 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 again)

They draw arrows with simple phrases (“increases”, “worsens”, etc.)

Group reflection 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.

### HOMEWORK

Consider assigning this activity as homework:

Students think about their own region/country and write a short reflection (150–200 words):

**Think about the climate in your region:**



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1. What extreme weather have you noticed (or heard about) in recent years? (floods, droughts, heatwaves, storms, etc.)
2. Can you connect it to the "warmer air holds more water" rule we learned, OR to the drought chain?
3. Who in your community is most vulnerable to these changes? Why?
4. What would be dangerous about planning water systems or cities using only old climate data?

Designed in collaboration with:



Name: \_\_\_\_\_