



TEACHER GUIDE | 45 MINUTES

Glaciers climate change and water access

English B2–C1 | Ages 15–18 | EU4Blue

Students investigate the relationship between glacier retreat and water security, evaluate a claim and negotiate a response to a fictional water shortage. They use evidence while acknowledging uncertainty and competing interests.

Learning outcomes

Students can explain peak water, distinguish evidence from assumptions, and justify a policy recommendation. They can qualify claims, respond to a counterargument and distinguish adaptation from mitigation.

Lesson sequence

Time	Activity	Outcome
0–5 min	Discuss: “More melting means more available water.” What does this claim overlook?	Initial interpretation
5–17 min	Read p. 2. In pairs, complete task 1 and make notes for task 2. Discuss the author’s reasoning.	Critical reading
17–23 min	Analyse the fictional case on p. 3. Calculate the shortfall and identify missing evidence.	Evidence and inference
23–36 min	In groups of three, compare packages and prepare a council recommendation.	Reasoned negotiation
36–42 min	Two or three groups deliver a 60-second pitch. Each answers one challenge from peers.	Argument and response
42–45 min	Revisit the opening claim. Agree on a qualified conclusion and distinguish adaptation from mitigation.	Shared conclusion

Preparation and differentiation

Print pp. 2–3. Keep p. 4 as the answer key. Students need pens, paper for notes and, if useful, calculators. No internet access is required.

B2 support: allow paired reading, the glossary and the language prompts. Accept concise notes before speaking. B2–C1 extension: probe the difference between a necessary and a sufficient condition; challenge the reliability of projected savings. Extensions replace rehearsal time rather than adding another lesson phase.

Ocean Literacy: climate–ocean interactions and the relationship between people and the ocean (principles 3 and 6). EU4Blue themes: Climate Change & Water; Water, Health & Society.



STUDENT WORKSHEET 1

Glacier retreat and water security

Name _____ Date _____

Read and evaluate

Mountain regions supply water far beyond their immediate surroundings. Rainfall, seasonal snow and glaciers all contribute to downstream flows, although their relative importance varies considerably between catchments. Glaciers store water over long periods and can release meltwater when conditions are warm and dry. Their retreat therefore raises a question that seems contradictory: how can increasing melt eventually leave communities with less water? [1, 2]

The distinction is between a flow of water and the store that sustains it. Initially, accelerated melting may increase glacier runoff. If ice losses persistently exceed accumulation, however, the glacier's reserves diminish. Beyond a turning point known as peak water, a shrinking glacier can produce less annual runoff, despite continued warming. This transition does not occur everywhere at the same time. Nor does a decline in glacier runoff automatically imply an identical decline in total river discharge: rainfall and seasonal snowmelt also shape the outcome. [2]

Water security is consequently more complex than the amount of ice remaining. The timing of supply, the condition of infrastructure and patterns of demand influence who experiences a shortage. Reduced flows may affect irrigation, hydropower and aquatic ecosystems, while communities with limited resources may find adaptation particularly difficult. Continued loss of land ice also contributes to sea-level rise, connecting changes in mountain environments to risks along distant coastlines. [1, 2]

A council faced with scarcity must decide not only how to reduce consumption, but also whose needs take priority. Repairing leaks and improving irrigation may reduce pressure on supplies; restrictions can distribute the burden unevenly. Such measures are forms of adaptation. Mitigation, by contrast, addresses the causes of warming through reductions in greenhouse gas emissions. Local water management is necessary to address shortages, but it is not sufficient to halt global glacier loss. Policy therefore requires both practical action and a realistic account of its limitations.

Glossary: catchment = area draining to a river; discharge = volume of river flow per unit of time; accumulation = addition of snow and ice; water security = reliable access to adequate water of suitable quality.

1 Explain and qualify a claim

Evaluate: "Glacier retreat will inevitably reduce every river's flow immediately." Identify two overstatements and explain the peak-water mechanism. Write 50–70 words on separate paper.

2 Examine the argument

What does "necessary, but ... not sufficient" mean in the final paragraph? Explain the distinction using one adaptation and one mitigation measure. Identify two expressions that qualify scientific claims and explain their purpose.

Language support: Although ..., this does not necessarily imply The outcome depends partly on C1 extension: distinguish uncertainty about timing from uncertainty about the underlying mechanism.



STUDENT WORKSHEET 2

The valley water council

A fictional valley's usable water supply falls from 100 to 70 units per week during a dry summer. Demand remains 100 units. A minimum ecological river flow has already been reserved and cannot be reassigned. All figures below are invented for this classroom scenario.

3 Separate evidence from inference

Calculate the weekly shortfall and percentage reduction in supply. A councillor blames the entire decline on glacier retreat. Explain why the figures alone cannot establish this, and identify two types of evidence needed to investigate the claim.

4 Negotiate a recommendation

Your budget is 8 tokens. Compare at least two packages that save 30 or more units per week. Each measure may be selected once. For the initial calculation, treat projected savings as independent and additive.

Measure	Cost	Saving	Limitation
A Repair leaking pipes	5	20 units	Disruption during repairs; trained staff required.
B Improve irrigation	4	15 units	Equipment and training costs fall on farmers.
C Restrict non-essential use	2	10 units	Some businesses and households bear more of the burden.
D Information campaign	1	5 units	Participation and savings are uncertain.

Roles: water officer tests feasibility; community representative considers livelihoods and access; ecosystem adviser safeguards river flows.

Prepare a 60-second recommendation. Include your figures, one comparison with an alternative, a fairness safeguard and a response to a likely objection. Specify what the council should monitor. Add one mitigation measure and name the actor responsible.

Before presenting: if D delivers only 2 units, would your package still close the gap? If not, explain how you would revise your recommendation within the budget.

B2 support: We favour ... over ... because Admittedly ...; nevertheless Our recommendation depends on C1 extension: question whether technical efficiency necessarily reduces total consumption.



TEACHER ANSWERS AND SOURCES

Solutions and assessment

Reading tasks

1 “Inevitably/every” ignores differences between catchments; “immediately” ignores the initial increase before peak water. Model: Glacier retreat may initially increase runoff as melting accelerates. Continued net ice loss nevertheless depletes the stored reserve, so runoff can decline after peak water. The timing varies, and total river flow also depends on rainfall and seasonal snowmelt. An immediate reduction in every river therefore cannot be inferred.

2 Necessary means required; sufficient means enough on its own. Leak repairs help communities adapt, but do not by themselves halt glacier loss. Replacing fossil-fuel heating with a lower-emission system is mitigation. Accept “may”, “can”, “varies” or “does not automatically imply”: these avoid unwarranted generalisations. Extension: timing varies locally even when the mechanism of reserve depletion is understood.

Council task

3 Shortfall: 30 units/week. Reduction: $(100 - 70) \div 100 \times 100 = 30\%$. These figures describe a change, not its cause. Useful evidence includes precipitation and snowmelt records, glacier mass/runoff measurements, and records of abstraction or infrastructure failures. Demand affects scarcity but does not alone explain a measured fall in natural supply.

4 Feasible initial packages: A + C costs 7, saves 30; A + C + D costs 8, saves 35; B + C + D costs 7, saves 30. With D saving only 2, the totals become 30, 32 and 27 respectively. B + C + D would leave a 3-unit gap; switching to either A + C or A + C + D remains within budget. No package is automatically fairest.

Model recommendation: We favour A + C + D: at eight tokens, its projected saving of 35 units exceeds the shortfall. Unlike B + C + D, it still meets the target if the campaign saves only two units. Admittedly, restrictions may harm some businesses. We would protect essential household needs and consult affected users. The water officer should monitor weekly consumption and actual savings. Separately, the council should reduce emissions from public-building heating. Our recommendation remains conditional on repairs delivering their projected saving.

C1 extension: efficiency gains may be offset if users expand the irrigated area or increase consumption elsewhere. Real savings may overlap; verify the baseline, implementation time and actual outcomes.

Assessment

Score each criterion 0–2: scientific reasoning; use of figures and evidence; comparison and response to objections; language and coherence. 0 = absent or substantially inaccurate; 1 = partly effective; 2 = accurate and developed. B2: clear reasons and appropriate linking. C1: precise qualification, synthesis and flexible responses. This is a classroom rubric, not a formal CEFR assessment.

Sources

[1] UNESCO. UN World Water Development Report 2025: Mountains and Glaciers, Water Towers.
<https://www.unesco.org/en/reports/wwdr/2025>

[2] WMO. Glacier melt will unleash avalanche of cascading impacts (2025).
<https://wmo.int/news/media-centre/glacier-melt-will-unleash-avalanche-of-cascading-impacts>

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