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CLIMATE IMPACT MAP · CLASSROOM EDITION · BRITISH COLUMBIA 🍁

LESSON PLAN · POST-SECONDARY · BRITISH COLUMBIA

Ice Sheet Collapse & Global Sea Level: A Vancouver-Centred Investigation

📚 Post-Secondary (university/college) ⏱ 90 minutes 📍 British Columbia

🌐 theclimateimpactmap.com 🗓 [Date]

🌍 Required Tool: Climate Impact Map

This lesson is built around hands-on use of Climate Impact Map (theclimateimpactmap.com). Students should spend the majority of class time actively exploring the map. Ensure all students have device access before the lesson begins. Classroom licence unlocks all IPCC AR6 scenarios, storm surge, and infrastructure overlays.

Learning Objectives

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

1. Describe the key IPCC AR6 sea level rise scenarios and explain the difference between SSP pathways.
2. Use Climate Impact Map to identify flood risk for communities in British Columbia, including Vancouver.
3. Explain how ice sheet collapse & global sea level affects people, infrastructure, and ecosystems differently based on location and socioeconomic status.
4. Connect global climate data to local risk in British Columbia using real NASA and IPCC datasets.

5. Reflect on the relationship between climate science and Indigenous knowledge traditions in this region.

Materials & Setup

- **Climate Impact Map** — theclimateimpactmap.com (Classroom licence required for full access)
- Device per student or per pair (tablet, laptop, or desktop)
- Student observation worksheet (create or adapt from this lesson plan)
- Whiteboard or shared digital document for class discussion
- Optional: printed map of Vancouver and surrounding region for reference

Teacher prep: Before class, navigate to theclimateimpactmap.com and confirm Classroom access is active. Pre-load the map centred on Vancouver and test all scenario buttons referenced in the Main Activity.

Background for Teachers

> 🛰️ **Live NASA Data Integration:** Climate Impact Map displays live Arctic and Antarctic sea ice extent from NSIDC (updated weekly) and active fire detections from NASA FIRMS VIIRS (updated every 24 hours). The Stats panel in the app shows current anomalies versus the 1981–2010 baseline. Reference this data during your introduction to ground the lesson in current conditions.

The world's major ice sheets — Greenland and Antarctica — together hold enough water to raise global sea levels by approximately 70 metres if fully melted. While complete melting would take centuries to millennia, even partial collapse of key ice sheet sectors could dramatically accelerate sea level rise beyond IPCC median projections. The West Antarctic Ice Sheet alone contains enough ice to raise global sea levels by 3.3 metres, and recent research suggests portions of it may have passed tipping points.

Greenland's ice sheet is losing mass at an accelerating rate. Between 2002 and 2020, Greenland lost an average of 280 billion tonnes of ice per year, contributing approximately 0.8 mm per year to global sea level rise. Ice sheet models suggest that if global warming exceeds 1.5–2°C above pre-industrial levels, self-reinforcing feedback loops could make significant Greenland ice loss essentially irreversible on human timescales.

Climate Impact Map includes dedicated ice sheet collapse scenarios: Greenland (+7 m), West Antarctica (+3.3 m), and full theoretical melt (+70 m). These scenarios are not projections for this century but representations of long-term committed sea level rise — the level of rise that is locked in by warming already experienced, even if emissions ceased today.

Local context — British Columbia: Metro Vancouver's Fraser River delta and Richmond sit at or below sea level, making them among Canada's most flood-vulnerable urban areas.

Lesson Plan

Introduction (14 min)

Begin by asking students: *"What would happen to Vancouver if sea levels rose by 1 metre? By 7 metres?"* Allow 2–3 minutes of discussion. Do not correct or confirm answers yet — capture predictions on the board.

Briefly introduce Climate Impact Map: explain that it uses real GEBCO terrain elevation data, IPCC AR6 projections, and live NASA satellite data. Show the Stats panel briefly to demonstrate that the tool connects to real-time observations.

Frame the lesson: today students will use the same data that climate scientists and emergency managers use to assess flood risk — and they will ground it in the specific geography of British Columbia.

Main Activity — Climate Impact Map Exploration (50 min)

Have students open Climate Impact Map on their devices. Walk through the interface briefly (scenario panel, overlays, Cities tab, click-to-explore). Then proceed through the following steps:

1. **Set baseline scenario**

   On Climate Impact Map, start with **SSP2-4.5 (+0.6 m)**. This represents roughly current policy trajectories. Record the flood extent near your study region.

2. **Activate Greenland collapse**

   Select **Greenland Melt (+7 m)**. This represents full Greenland ice sheet loss over centuries. Record: what changes in your region? Which major cities are now partially or fully flooded?

3 **Activate West Antarctica**

Switch to **W. Antarctica (+3.3 m)**. Compare the geographic pattern of flooding with Greenland. Why might the patterns differ?

4 **Full ice melt scenario**

Select **Full Ice Melt (+70 m)**. Use the custom slider to explore intermediate values between 7 m and 70 m. Record observations at 10 m, 30 m, and 50 m.

5 **Infrastructure at risk**

With full melt active, enable the **Airports** and **UNESCO Sites** overlays. How many of each would be affected? Click individual sites for details.

6 **Live sea ice stats**

Open the **Stats panel**. Review current Arctic and Antarctic sea ice extent versus the 1981–2010 baseline. How does observed sea ice loss connect to the ice sheet scenarios you just modelled?

Discussion & Analysis (18 min)

Bring the class together. Use the following discussion questions to deepen analysis and connect data to broader themes:

- What is the difference between sea ice loss and ice sheet loss in terms of sea level impact?
- The +70 m scenario represents committed long-term rise. What does "committed" mean in climate science? Why is it significant?
- Which regions of the world would be most affected by full ice sheet collapse? Is this distributed fairly?
- If Greenland melting is potentially irreversible above 2°C, what does this mean for intergenerational justice?

Closing & Exit Ticket (9 min)

Ask students to complete a brief exit ticket (written or verbal) responding to: *"What is one thing you learned today that surprised you, and one question you still have?"*

Collect responses to inform follow-up instruction. Consider sharing standout observations in the next class as a warm-up.

Indigenous Knowledge & Ice Sheet Collapse & Global Sea Level

The land on which Vancouver stands is the traditional territory of the Musqueam, Squamish, Tsleil-Waututh, and other Coast Salish peoples. Climate change is not an abstract future threat to Indigenous peoples — it is a present reality reshaping relationships with land, water, and community that have been sustained for thousands of years.

Traditional ecological knowledge held by Indigenous peoples in this region provides a long-term record of environmental change that predates Western scientific instrumentation by centuries. Changes in seasonal timing, species behaviour, water levels, and weather patterns observed by knowledge keepers offer invaluable context for interpreting Climate Impact Map data.

When using Climate Impact Map to explore ice sheet collapse & global sea level scenarios, consider: whose land are you mapping? Whose communities appear in the flood zones? How does Indigenous land stewardship — including practices like cultural burning, salmon habitat management, and coastal resource governance — relate to climate resilience?

Reflection Prompt

How can Western scientific data (like IPCC AR6 projections and NASA satellite data) and Indigenous traditional ecological knowledge complement each other in understanding and responding to climate change? What would it look like to genuinely centre Indigenous voices in climate adaptation planning for this region?

Suggested resource: Consult the First Peoples' Cultural Council (BC), Ontario Native Education Counselling Association, or your region's tribal nation websites for climate-related traditional knowledge resources.

Assessment Rubric

Criteria	Beginning (1)	Developing (2)	Applying (3)	Extending (4)
Critically engages with IPCC AR6 primary sources	Shows limited understanding; requires significant support to complete tasks.	Shows basic understanding; completes tasks with some guidance and occasional errors.	Demonstrates solid understanding; completes tasks independently with minor errors.	Demonstrates thorough understanding; extends thinking beyond task requirements with insight.
Constructs evidence-based regional risk analysis	Shows limited understanding; requires significant support to complete tasks.	Shows basic understanding; completes tasks with some guidance and occasional errors.	Demonstrates solid understanding; completes tasks independently with minor errors.	Demonstrates thorough understanding; extends thinking beyond task requirements with insight.
Integrates multiple data sources coherently	Shows limited understanding; requires significant support to complete tasks.	Shows basic understanding; completes tasks with some guidance and occasional errors.	Demonstrates solid understanding; completes tasks independently with minor errors.	Demonstrates thorough understanding; extends thinking beyond task requirements with insight.
Demonstrates awareness of policy and justice dimensions	Shows limited understanding; requires significant support to complete tasks.	Shows basic understanding; completes tasks with some guidance and occasional errors.	Demonstrates solid understanding; completes tasks independently with minor errors.	Demonstrates thorough understanding; extends thinking beyond task requirements with insight.

Extension Activities

1. Research the IPCC AR6 Chapter 9 (Ocean, Cryosphere, and Sea Level Change). Summarize the key findings on ice sheet contributions to sea level rise in a 500-word brief aimed at a general audience.

2. Using Climate Impact Map, identify 10 major world cities that would be fully submerged under the +70 m scenario. Research their current populations, GDP contributions, and cultural significance. What would their loss mean for humanity?
3. Investigate the concept of "tipping points" in the climate system. Identify three tipping points related to ice and sea level, and explain how they interact with each other.

Curriculum Connections

Curriculum Standard: British Columbia Ministry of Education — Science, Social Studies, Environmental Learning

This lesson addresses outcomes related to: Earth and environmental science; climate systems and human impact; geographic inquiry and spatial thinking; data literacy and scientific reasoning; social justice and equity in environmental contexts; Indigenous perspectives and land relationships.

Cross-curricular connections: Social Studies (geopolitics of climate change), Mathematics (data interpretation, percentages, scale), Language Arts (persuasive writing, research), Indigenous Education.