

From Greenland to our Coasts: Exploring Sea Level Change with QGreenland - Instructor Guide

Source: QGreenland

Activity Summary

An understanding of Arctic regions, which are warming faster than the rest of the world, is crucial for understanding the global climate system. Greenland with its large ice sheet is of particular global importance and vulnerable to a changing climate, but the scale of the landforms can be difficult to grasp. Geographic Information Systems (GIS) can help students visualize and engage with Greenland data to answer questions about its influence on global climate systems in a concrete way. In this unit, students will explore how the Greenland Ice Sheet is changing and why that affects coastal communities worldwide. Students will read about the effects of sea-level change on two different Alaskan communities and recognize the difference between regional and global average sea change. Students then choose a coastal community and create a flood map in QGIS, highlighting the risks of sea-level rise to infrastructure, community, economics, housing, and freshwater supply.

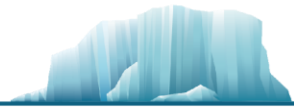
Learning Goals and Outcomes

Students will...

- Explore how sea level change has different effects around the world.
- Evaluate the risks associated with sea-level rise by creating a flood map.

Context for Use

Topic	Sea-Level Change
Course Type	Lesson
Audience	Upper high school or introductory level university
Instructional Time	Two 60-minute class periods (120-minutes total)
Context	This lesson spans two 60-minute class periods, or two hours. In the first class period, students read and discuss two Alaskan case studies of sea level change, and in the second class period, students create a flood risk map to assess their understanding of sea-level rise. This lesson is part of a longer unit connecting the Greenland Ice Sheet and sea-level change. If using this lesson as a stand-alone activity, students will need additional background on sea-level change.
Materials	Computers that have QGIS and QGreenland installed. See requirements at www.qgis.org . Student Guides printed or distributed digitally to students.

**Materials Prep**

Instructors should be familiar with how to complete the QGIS exercises in the lab.

Print Student guides for individuals or groups of students. Or make copies of the student guide digitally to distribute virtually to students.

Description and Materials

This lesson seeks to answer the driving questions, “What challenge(s) does changing sea-level rise pose? How can we mitigate the effects of sea-level rise?”.

Part 1: Case Study (45 minutes)

Students read about the effects of sea-level change on two different Alaskan communities and recognize the difference between regional and global average sea change.

- Start with a warm-up question asking students, “What do you think are the challenges a changing sea level poses to communities?”
- Then have students partner up and each read one of the passages on Alaska. Have them highlight in different colors what are affecting people, the economy, and infrastructure
 - o Alternatively (if you don't have that many highlight colors), have students underline, star, and circle
- Then have students share with their partner, the name of the community they read about, the recent and expected sea-level change, and the biggest challenge to the community posed by the sea-level change
- Create a Venn diagram and have the whole class, including each individual partner, add something to it
- Explain what issues a locally rising sea-level causes and what issues a locally decreasing sea-level causes
- Walk through Global Average Sea-Level, Local Sea-Level, and Regional Sea-level change visualizations with students
- Talk about why these changes might happen

Part 2: Flood Mapping (75 minutes)

Students create a flood map and assess the risk sea-level rise poses to a coastal community.

- Review the Venn diagram that students created in Part 1
- Show the ‘Visualizing problems’ slide
- Follow this with showing the rest of the slides to walk through creating a flood map

Associated resources include:

- [Student Guide](#)
- [Slides](#)



Teaching Notes and Tips

This lesson aligns with these standards:

- [NGSS HS-ESS3-5](#): Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
- [Polar Literacy Principle 5E](#): Effects of climate change at the Poles is directly connected to changes in sea level around the world

Assessment

While no tailored assessments are designed for this lesson, consider using an exit ticket. See below for some resources on exit tickets:

- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. Available at: <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).

References and Resources

- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).
- Next Gen Science Standards (n.d.) *HS-ESS3 Earth and Human Activity*. Available at: <https://www.nextgenscience.org/dci-arrangement/hs-ess3-earth-and-human-activity> (Accessed: 4 September 2026).
- Polar Literacy (n.d.) *Principle #5: The Poles are experiencing the effects of climate change at an accelerating rate*. Available at: <https://polar-ice.org/polar-literacy-initiative/principle-5/> (Accessed: 4 September 2026).
- QGIS (n.d.) *Spatial without Compromise*. Available at: <https://www.qgis.org/> (Accessed: 3 September 2026).
- QGreenland (n.d.) *Sea Level Rise - Case Study Student Guide*. Available at: [Student Guide](#) (Accessed: 4 September 2026).
- QGreenland (n.d.) *Sea Level Rise: Risks and Mitigation*. Available at: [Slides](#) (Accessed: 4 September 2026).