

Sea Level Rise

What is causing sea level to rise?
What is thermal expansion?
How does rising sea level affect me? My community?

Objective

Students will be able to describe how sea level is rising. Students will understand sea level rise's impact on the globe and on their community. Students will be able to actively engage with the ART map to see how sea level affects different areas of the region.

Preparation

Have videos ready to engage students.

For middle to High — [Nasa Sea Level Rise video](#) (2 mins)

For elementary — [melting land ice](#) (2 mins) and thermal expansion: [expansion & contraction](#) 1:15 mins and [expanding water](#) 3 mins

You'll want this link ready as well [ART Map Exploring tool](#). Adapting to Rising Tides is a interdisciplinary project that provides guidance, tools and information to help agencies and organizations understand, communicate and begin to resolve complex climate change issues.

Delivery

Ask: What do you know about climate change and sea level rise? What have you heard? What questions do you have?

Play the video(s) for your respective grade level and have students answer questions to the best of their ability. Have students discuss in small groups or pairs what they learned or what prior knowledge was confirmed.

Tell students that climate change and the resulting effects, like sea level rise, often feel too big for people to understand how it affects them personally. Today, they're going to explore how sea level rise affects them and their community.

MS and HS groups can explore the ART tool solo, if they have internet access, by following the directions and answering questions.

Teachers of elementary grade students can print out the different map scenarios for students to observe, project their screen and have students answer questions, or go through each step with their students if students have devices.

Debrief

What are the two reasons sea level is rising?

How is the projected sea level rise of 12 inches going to affect your home/school/shoreline community?

What are the implications of flooding and damage to infrastructure like waste treatment plants or bridges?



Theme

Human Impact & Climate Change

Age

4th-12th grade

Duration

45-60

Materials

Printed work sheets or access to PDFs, internet access

Standards

NGSS: MS-ESS1-1.;2-4.;3-2.
5-ESS3-1; 2-1
4-ESS2-2; 3-2
EP&C's: P3: A-C; P5: A&B

Vocab

Expansion: spreading out

Contraction: bunching up

Thermal Expansion: spreading out of molecules due to rise in temperature.

King tides: cyclical very high tides that happen 1-2 times a year

Storm surge: rise in sea level that occurs with large weather events

IMPACTS OF RISING SEAS ON SAN FRANCISCO BAY

WHAT'S AT RISK?

In the Bay Area, experts project that climate change will increase tide levels 16 inches by 2050, and 55 inches by the end of the century. These changes will have dramatic impacts across our region.

POTENTIAL BAY AREA IMPACT

-  **SCHOOL AND HEALTHCARE FACILITIES**
89 threatened
-  **ROADS AND HIGHWAYS**
1780 miles under water
-  **HOMES**
270,000 renters and homeowners displaced
-  **WETLAND HABITAT**
3,100 acres lost
-  **TOTAL COST**
\$50 billion

Source: *The Impacts of Sea Level Rise on the San Francisco Bay*, Pacific Institute 2012

KEY

-  Vulnerable to inundation with predicted sea level rise
-  Baylands and wetlands that could provide protection if restored/maintained



Healthy wetlands function as natural sponges that trap and slowly release rain and flood waters.



Wetlands can adapt to sea level rise by accumulating sediment over time.

Levees fronted by wetlands are effective, inexpensive and provide public access, as well as flood protection.

Information from USGS, EPA and Wetlands International

RESTORED WETLANDS PROTECT US

Wetland restoration is a cost-effective solution to rising tides in San Francisco Bay, serving as a buffer against severe storms and flooding. By restoring wetlands in the Bay, we can protect our homes and keep our communities safe.

Take action online at savesfbay.org/at-risk

SAVE THE BAY

Adapting to Rising Tides (ART) Project

****Upon opening the link you will be asked to accept the disclaimer. Make sure you run through the tutorial so you can better use this tool****

Enter in your school or home address in the top right hand corner of the map. Then scroll find the part of the Bay shoreline closest to you.

1. According to globalchange.gov the average sea level rise scenario for 2050 is 1-1.3 feet (12-15 inches). Enter this scenario into the “One Map, Many Futures” window. What is the depth of flooding on the shoreline in this scenario?
2. Now, add the 5-yr storm surge to this scenario. What is the depth of flooding with storm surge added? (this scenario refers to a large storm that we see on average every 5 years)
3. Finally, look at the depth of flooding when 50-yr and 100-yr King Tide events are included in the scenario. (King Tides are exceptionally high tides and happen 1-2 times a year)
4. How does this sea level rise scenario affect your home or your school? What businesses, neighborhoods, and public utilities on the shoreline near your school or home are affected in this scenario?
5. Run this same scenario but use South Bayside System Authority as the address. This is one of the larger waste treatment plants for the Peninsula of the SF Bay. What are the implications of flooding at this treatment plant?

Melting Ice

Answer the questions below:

1. Give one example location of sea ice and one example of land ice:
 - a.
 - b.

2. What can you conclude from the experiment in the video that compares the melting of water ice and land ice?

3. Why do you think the melting of land ice causes sea level rise, but water ice melting does not?

4. Where are the effects of sea level rise going to be seen first? Who is in the most immediate danger from sea level rise?

5. What are two questions about sea level rise that you have?
 - a.
 - b.

