

# STEM ACTIVITY OF THE WEEK



## Climate and Our Coast

**Theme:** Climate Change, Sea Level Rise, Waterfront Community, Carbon Footprint

**Ages:** 6<sup>th</sup> – 12<sup>th</sup> grade

**Prep Time:** 5 minutes

**Activity Time:** 30-45 minutes

### Activity Summary:

One of the unique aspects of Hudson River Park is that it is 400 acres of water – the Hudson River! To protect these waters, HRPK scientists pay close attention to environmental conditions and regularly monitor the River. You can check out real-time updates on Hudson River conditions through the Hudson River Environmental Conditions Observing System (HRECOS) [webpage](#). Due to the impacts of climate change, the Hudson River has seen shifts in the local environment. For example, when extreme weather events like Hurricane Sandy occur, the Park is one of the first areas to flood creating negative effects to the shoreline, habitat and water quality. This week's lesson focuses on building solutions to fight climate change impacts. Explore how adaptation methods are used and try your hand at designing structures that are commonly applied in the real world to protect our shorelines!

### Objectives:

- Students will define the difference between weather and climate
- Students will identify at least one adaptation strategy to sea level rise

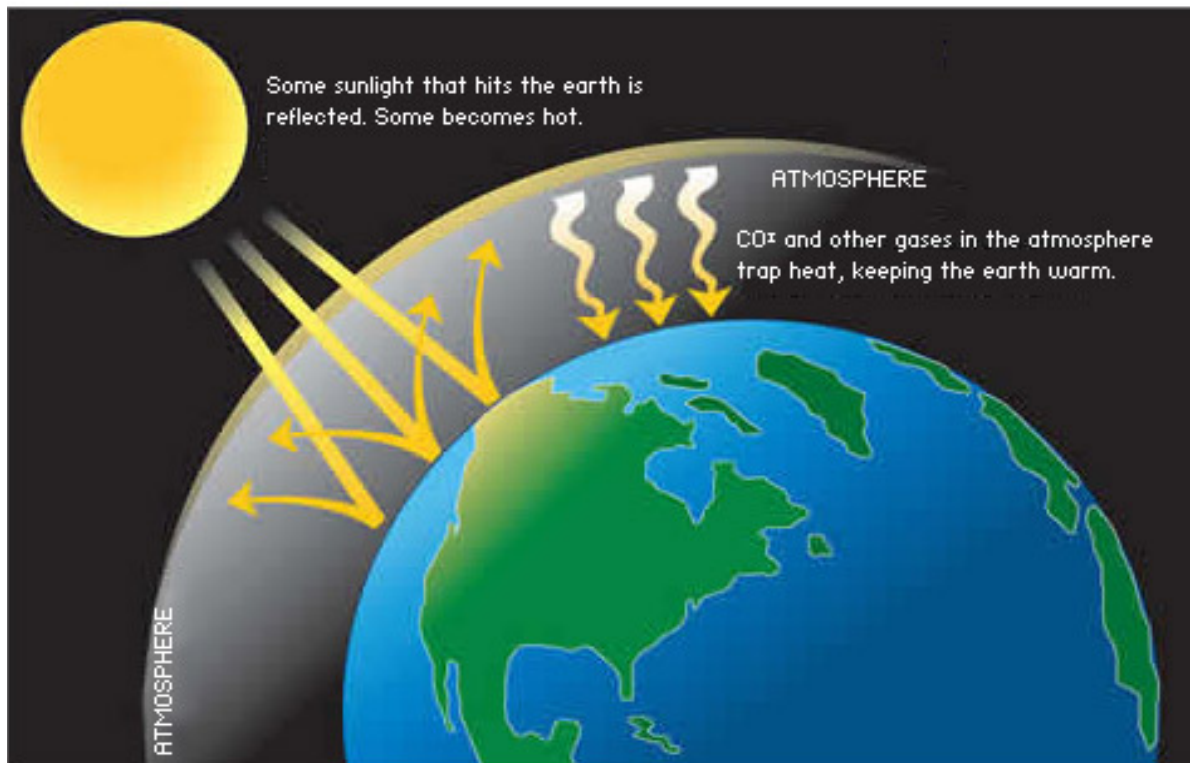
### Materials:

- Climate and Our Coast Worksheet
- Pencil
- Flat bin, tray or other rectangular container
- Pitcher of water
- Cotton pad or ball
- Project materials (suggested)
  - Rubber bands
  - Sponges
  - Dried pasta
  - Cardboard
  - Cotton balls
  - Popsicle sticks
  - Chopsticks
  - Clay
  - Felt
  - Gravel
  - Soil
  - Sand
  - Duct Tape
  - Plumbers Putty

### Lesson Procedure:

1- Background Reading: Climate Change and Our Atmosphere

## The Greenhouse Effect



There are many variables that are involved in climate change and human activity is a major contributor. This lesson takes a look at climate change through the lens of human emissions of carbon dioxide (CO<sub>2</sub>). To understand this, we must first observe the structure of Earth's atmosphere. Greenhouse gases are gaseous compounds that absorb heat from the sun and allowing the heat to stay within our atmosphere, creating the greenhouse effect. This prevents the Earth from freezing. There are several greenhouse gases in the Earth's atmosphere but today, we will focus on one that we as humans emit every day: CO<sub>2</sub>. CO<sub>2</sub> is absorbed by plants in order to photosynthesize and grow, giving us our food and oxygen. All living organisms release CO<sub>2</sub> naturally but we also produce CO<sub>2</sub> in larger quantities when we burn fossil fuels like coal, oil and natural gas. Fossil fuels are burned to power our vehicles, transport goods and waste, to provide electricity, heating, etc. There is 30% more carbon dioxide in the air today than there was about 150 years ago! This excess CO<sub>2</sub> causes the atmosphere to act as a heat trapping blanket that gets thicker and thicker creating changes to the climate and extreme weather events like hurricanes and droughts. These shifts in environment impact all aspects of life on Earth such as migratory and reproductive behaviors in organisms which can influence our economy, food source and more.

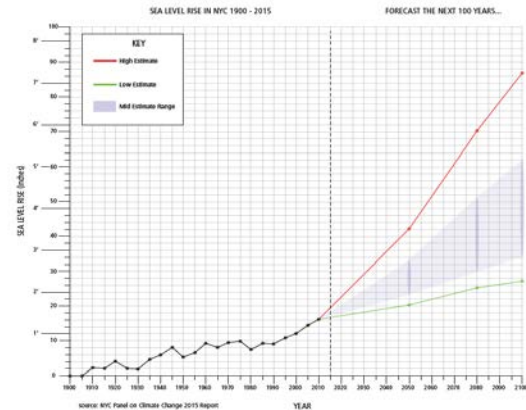
### 2- Weather VS Climate

Let's begin by defining the difference between weather and climate. **Weather** is the day-to-day conditions where we learn the temperature, % chance of rain, humidity, cloudiness etc. for the next few days. Weather changes with location; it can be hot and sunny in one part of the world while it's cold and snowy in another. **Climate** is the average of weather over a course of decades or more. While weather can change in just hours

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and sometimes minutes, it takes hundreds, thousands or millions, of years to see changes in climate. Therefore, an essential difference between climate and weather is the measure of time. When we study climate, we can see how the changes affect people and the environment all around the world allowing us to learn and plan for the future by looking at trends in the past.

Observe the images below and identify whether each is a representation of weather or climate.



### 3- Adapting to Sea level Rise

New York City is made of 520 miles of shoreline established with communities and businesses. Therefore, the threat of flooding is one of the most significant implications of climate change that must be addressed in our city.

Below are examples of solutions that help to manage flooding and sea level rise from harming shorelines. It is key for designers to also consider how these barriers can simultaneously promote and protect wildlife habitat as well as public access for people to reach the waterfront.

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**Floodwalls:** Permanent or deployable walls used at the shoreline or upland to prevent flooding.



**Levees:** Embankments located at the shoreline that provide protection from flooding.



**Elevation of Land and Streets:** Elevation of existing or new development sites and streets above the expected storm level to protect from flooding.



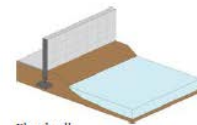
**Living Shorelines:** A bank stabilization technique that uses plants, sand/soil, and limited use of hard structure to provide shoreline protection and maintain valuable habitat.



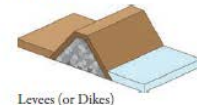
**Revetments:** Shoreline structures typically made of stone rubble or concrete blocks placed on a sloped surface to protect the underlying soil from erosion and reduce the force of wave action.



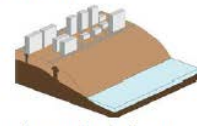
**Floating Islands:** Planted mats or structures that can reduce the impact of waves while providing ecological benefits, such as habitat restoration and improved water quality.



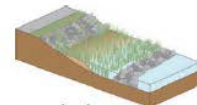
Floodwalls



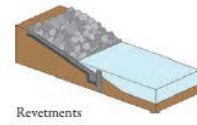
Levees (or Dikes)



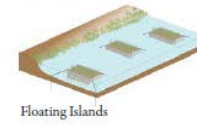
Elevation of Land and Streets



Living Shorelines



Revetments



Floating Islands

Image by Gowanus Canal Conservancy

**Your Challenge:** Design and build a model of an adaptive structure that will protect shorelines from rising sea levels. Use one or more of the examples above as a foundation for your design. Refer to the Climate and Our Coast Worksheet to guide your process.

## Activity Instructions:

1. **Gather** your project materials. You may be as creative as you would like to build your structure, you do not have to use the same materials listed!
2. **Design & Build** your structure through the middle of your tray or container, creating a “shoreline” side and “land” side. When complete, you will slowly pour your pitcher of water into the “shoreline” side to observe whether your design holds up against the flood.
3. **Test** your success by using a cotton pad as your flood gauge. Center the cotton pad on the “land” side. Your structure should be completely seal the water from entering into the “land” side and prevent the cotton pad from getting wet.
4. **Record** and rate your trials in the Climate and Our Coast worksheet.



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Student project examples:

