SEA LEVEL ACTIVITY 3

'TIME MACHINE' FOR TIME TRAVELING: SEA LEVEL THROUGH TIME ACTIVITY WHEEL

Summary: Students have a hard time thinking about time on a geologic timescale and considering how different things were in these different temporal periods. This activity focused on sea level is designed to assist with that. We measure sea level to determine where the ocean meets our shorelines, but this measure has changed a lot throughout geologic time. In the Last Glacial Maximum (~21,000 years ago), sea level was ~394 feet lower than today because as the water froze, it moved from the global oceans into the polar ice sheets. Large parts of our Continental Shelves, areas of the seafloor around our coastlines that today are our relatively shallow beaches, would have been part of the land. A visit to the seashore would have been a much longer trip!
Sea level has also been higher in the past.~125,000 years ago, a time geologists call the Eemian,,the Earth was warmer and water had moved from the ice sheets into the oceans making sea level ~26 feet higher than today. Here we use New York City to look at what life would have been like in different climates and time periods in a shoreline city.

**Note: this activity can be completed and then compared to other locations. Students can research what might have been the effect in their own location, and they can create their own images using the Activity Wheel as a template.*

Goal: Throughout geologic time water has moved between the world's oceans and the ice sheets changing sea level with changing climates. This activity looks at different times in our past when sea level was different than today.

Materials:
At home alternatives noted in italics

- For each activity wheel you need one top and one bottom wheel – print on card stock if you can as it is easier for the students to work with
- Scissors for cutting out the wheels
- Brads to put together the activity wheel
  Alternative to 'brads': a thumbtack capped with a chunk of eraser or a bent paper clip. (INCLUDE PICTURES OF EXAMPLES)
- Pens to label with names

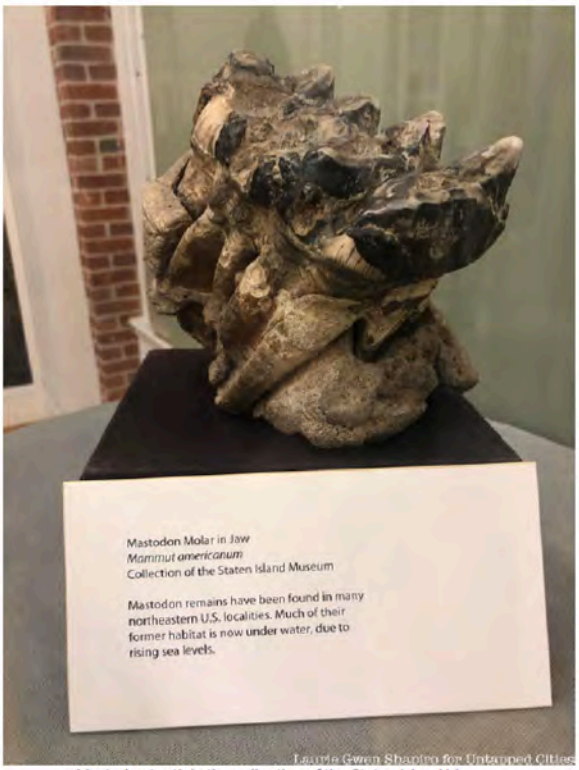
Set Up:
Lay out the materials on a table.

*Note: I set up a block of wood and a hammer and a nail at the table to just tap a hole in the activity wheel center with the nail to help in putting wheels together with the brad. This is a fun additional step that students enjoy, however, it is not necessary.

Activity:
Students can make their own Activity Wheel – cut out, stack the "top circle" onto the "bottom circle", put together with a brad through the central black dot. You can either start with the discussion questions so that students are thinking about change through time or you can wait until they are done and then spin through the wheel with them as you talk about the story.

Suggested Questions For Discussion As they Work:

- **Discussion:** What do you think this area looked like in the past? Your Time Machine (Activity Wheel) will let us look at the past and then think about the future.
    - **Note**: Start your discussion with the 'Last Warm Period' Eemian window and try and find a place to point to show them how high 26 feet is – it is just over 2 stories high on a building.)
    - **Discussion 'Last Warm Period':** Did you know that many thousands of years ago sea level was up to 26 feet higher than today? There would be ocean where we have beach today (~120,000 years ago) and we would have had to move inland to settle on the waterfront.
    - **Discussion 'Last Ice Age':** Even more recently (12,000 years ago), the New York City area was covered by a big ice sheet that stretched all the way down from the Arctic covering Canada and much of the northern United States.. ~1 mile of ice sat on top of where NYC is now!
    - **Discussion 'Last Ice Age':** At the front edge of the ice, there were Mastodons, big woolly elephant-like



Mastadon tooth in the collection of the Staten Island Museum

Mastodon tooth (molar) from the Staten Island Museum. Mastodon remains have been found in many northeastern states, however much of their habitat is now underwater due to rising sea levels (consider the time machine you just made!) Many roamed the New York City area, but their remains were not preserved.

creatures that stood 7-14 ft. tall. Thousands of years ago mastodons roamed all through New York City area in fact one was found in Inwood Park! But much of their habitat is now below sea level. The American Museum of Natural History has reconstructed the remains of a Mastodon that you can visit on the 4th floor.

- **Discussion 'Present Day':** This is the New York City waterfront today. This picture was taken on the very tip of the Battery looking back at New York City. You can see that the water line falls below the seawall that was built to protect the city from flooding.
  Discussion '100 Years From Now': What about 100 years from now? What do you think this area will look like? This picture shows water levels increasing ~5 feet. While we don't know exactly what the amount of sea level change will be in 100 years, we do know it is changing. There are different science teams working on this with different projections for what will happen with future sea level since it depends on us!
  - **Note:** The New York City Panel on Climate Change (NPCC) 2019 Report states that NYC sea level rise projects range from 38.1 cm (1.25 ft) in a low emissions scenario to 190.5 cm (6.25 ft) in a high emissions scenario. https://doi.org/10.1111/nyas.14006
  - **Note:** The Intergovernmental Panel of Climate Change (IPCC) 5th Report issued in 2013 predicts that global sea level rise by 2100 is in a range of 52-98cm (1.7-3.2 feet) under a high greenhouse gas emissions scenario.
- **Discussion 'What Can You Do?':** Each one of us has a critical role in what happens in the future. We must be environmental stewards reducing the amount of greenhouse gas emissions we contribute and we can help others as well. There are a variety of ways that students and their families can decrease their 'carbon footprint'. Discuss potential solutions together.
  Complete Earth Institute's 'What More Can You Do?' poster as a family. Put your initials next to pledges that you are not already doing, but will commit to doing in the future. Add the additional discussed solutions that you came up with to the poster as well! Hang the poster in your home to remind you of the pledges that you have made to the Earth!

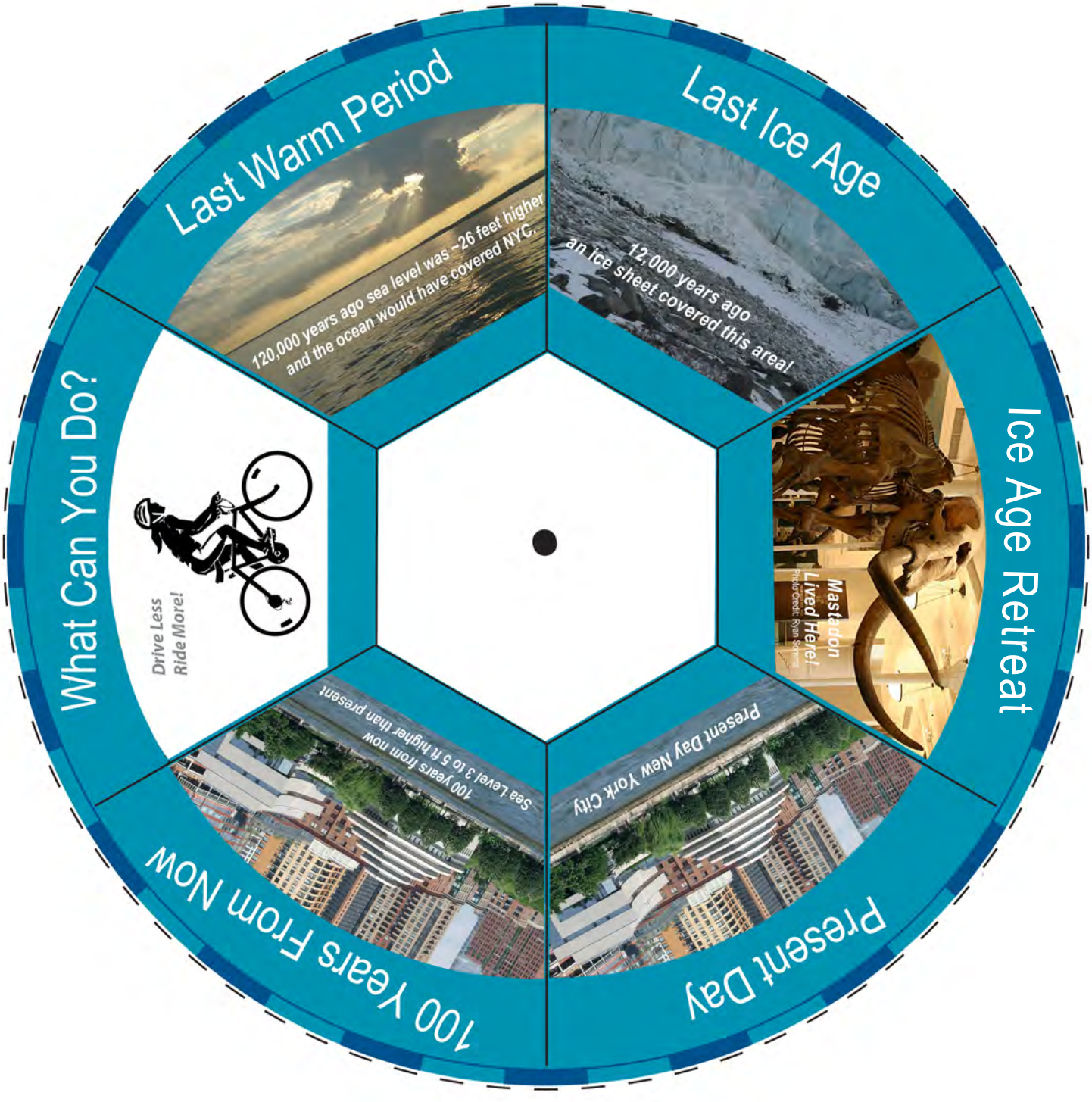
Note: This activity ties well into the next activity "Predicting Future Sea Level Rise" which asks students to consider what has happened with sea level in their region over the past 100 years, and to consider where they think it might go in the next 100 years. The activity also connects back to the "Oceans Connect Us All to the Ice in the Polar Regions" on how water in the hydrosphere moves between a liquid state in the oceans and a frozen state in the ice sheets, and to the "Just How Much Ice is There in the Polar ice Sheets" which looks at where the potential for a rise in sea level is.

Instructions:

1.) Cut out top circle by cutting outside dashed line
2.) Cut out window on top circle by cutting along the three straight dotted lines lines
3.) Cut out bottom circle by cutting outside the dashed line
4.) Punch hole through black dot in center of top circle
5.) Punch hole through black dot in center of bottom circle
6.) Place top circle on bottom circle and attach together using brass clip

Top Circle

Bottom Circle



What YOU Can Do

Some of the things we can each do to help limit climate change are very simple.

What are you already doing?

Use compact fluorescent light bulbs (CFLs).

Turn off the TV and play outside.

Ride your bike or walk instead of driving for short trips.

Take a shower, rather than a bath. Keep it short and warm, not hot, to really make a difference.

Set the thermostat no higher than 68 deg.F when you're heating, and no lower than 78 deg.F when you're cooling.

Pack lunch in a cloth bag using refillable containers, rather than single-serving packages. Don't forget your cloth napkin!

If we each conserve energy and use fewer fossil fuels every day, we can limit changes to our climate. It's time to get in the habit of thinking about the energy we use and using it more wisely.

About Climate Change

A lot of little things add up to big savings for the planet.

Plant a tree. It stores carbon as it grows.

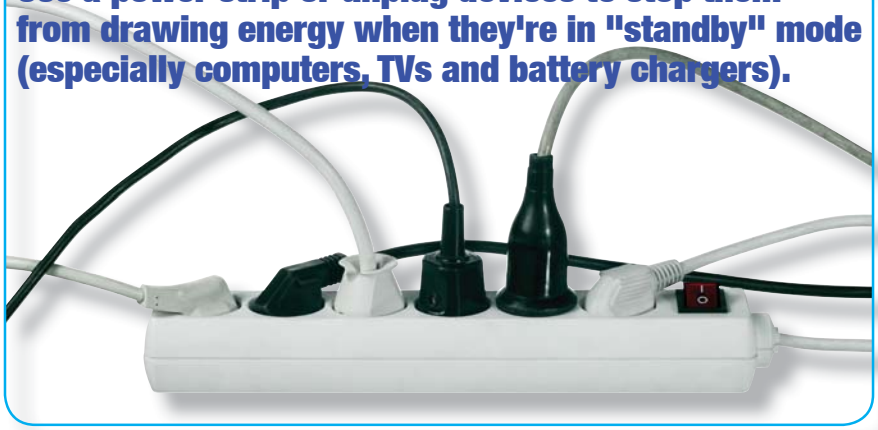
What else could you do?

Play games that don't need batteries or electric power.

Take the bus or subway instead of the car for longer trips.

Skip the clothes dryer and hang your laundry to dry.

Use a power strip or unplug devices to stop them from drawing energy when they're in "standby" mode (especially computers, TVs and battery chargers).



Turn lights off when you leave a room.

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