**Computational Guided Inquiry: Investigating Sea Level Rise Impacts in Tacoma, WA**

**Learning Objectives**

1. Increase climate literacy by connecting sea level rise due to ice melt in the Polar Regions to local impacts in Tacoma, WA.
2. Learn tools to apply to decision-making given uncertainty in sea level rise and flooding.
3. Gain computational skills through calculating and graphing marginal expected damage curves in Excel.

**Pre-class activities**

1. Read the Introduction below, which includes the linked article: [How is World Sea Level Rise Driven by Melting Arctic Ice?](https://www.scientificamerican.com/article/how-is-worldwide-sea-level-rise-driven-by-melting-arctic-ice/) (Sneed, A. 2017) and a short [video](http://video.nationalgeographic.com/video/magazine/170622-ngm-antarctica-melting-sea-levels-climate-change), then answer the Pause for Analysis questions.

2. Explore the Riskfinder.org website for Tacoma, WA and answer the Discussion Questions.

**Introduction**

Polar *Connection*

One of the biggest expected impacts of climate change will be the rise in sea levels around the world as temperature increases and ice in the Polar regions continues to melt at an accelerated pace. Current studies estimate that the total increase in sea level by 2100 will range from 0.2 to 2 meters (NOAA 2016), but there is also the possibility of an increase of 3 meters or more depending on how fast ice in the Arctic and Antarctic regions melts.

Sea level rise (SLR) will have significant consequences for coastal cities around the U.S. where an increase of 0.9 meters would displace 2 million or more Americans (Hauer et al. 2016). Higher seas also result in higher flood levels and storm surges, which along with increased extreme weather events, will potentially cost billions of dollars in damages. Hurricane Sandy, which hit the Eastern Coast of the U.S. in 2012 and flooded New York’s subway system is reported to have cost $50 billion in damages (Murphy 2015).

While changes in sea levels are expected to be relatively gradual, taking place over hundreds of years, there is much uncertainty in the timing and extent of future SLR. Cities need to start preparing for the coming SLR now, however, trying to determine the best course of action from a policy and urban planning perspective is challenging.

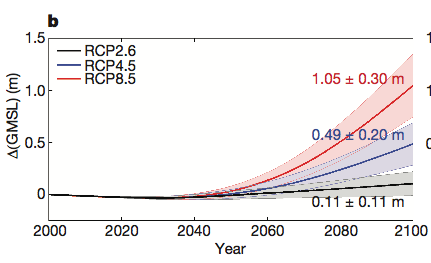
To get a better idea about how Polar regions can affect global sea level rise, start by reading this article from the Scientific American: [How is World Sea Level Rise Driven by Melting Arctic Ice?](https://www.scientificamerican.com/article/how-is-worldwide-sea-level-rise-driven-by-melting-arctic-ice/)[[1]](#footnote-1)

**Pause for Analysis**

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| What is the key difference between land ice and sea ice in terms of how their melting will impact sea level rise? |
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In addition to contributions to sea level rise from the Greenland Ice Sheet in the northern hemisphere, Antarctica in the southern hemisphere is also predicted to contribute to future increases.

**Figure 1. Large Ensemble mod analyses of future Antarctic contributions to GMSL**



A recent paper in *Nature* by DeConto and Pollard (2016) modeled extreme scenarios of ice melt in Antarctica and found that it could contribute as much as an additional meter to SLR by 2100 and more than 15 meters by 2500.

To learn more about the contribution of Antarctic ice melt to sea level rise, watch this short [video](http://video.nationalgeographic.com/video/magazine/170622-ngm-antarctica-melting-sea-levels-climate-change) (3:40) from National Geographic.[[2]](#footnote-2)

The graph above is from the DeConto and Pollard (2016) paper and shows Antarctic’s potential contribution to global mean sea level rise (GMSL) in meters by the year 2100.

**Pause for Analysis**

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| If you had to guess, what do you think is driving the different trajectories of SLR (e.g. RCP2.6, RCP4.5, etc.) over time? |
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*Sea Level Rise Impacts in Tacoma, WA*

Now take a couple minutes to explore the [Risk Finder website](https://riskfinder.climatecentral.org/place/tacoma.wa.us?comparisonType=city-council-district&forecastType=NRC_High&level=4&unit=ft)[[3]](#footnote-3) that looks at the impacts of flooding in Tacoma under different sea level rise scenarios.

Answer the following questions based on information from the website.

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| 1. How many different sea level rise scenarios are there? List them below: |
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| 2. How many people in the Tacoma population are at risk given 6ft of flooding? (Hint: adjust the water level meter on the left.) |
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| 3. How many homes are at risk given 8ft of flooding? (Hint: click on the ‘Buildings’ tab under ‘What Is at Risk?’) |
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**Discussion Questions**

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| 1. What factors do you think need to be taken into consideration when deciding how much money a city should spend on adaptation and protection against sea level rise? |
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| 2. What do you think are some of the biggest challenges regional planners face when making these decisions? |
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**References**

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1. Scientific American article: https://www.scientificamerican.com/article/how-is-worldwide-sea-level-rise-driven-by-melting-arctic-ice/ [↑](#footnote-ref-1)
2. National Geographic video link: https://video.nationalgeographic.com/video/magazine/170622-ngm-antarctica-melting-sea-levels-climate-change [↑](#footnote-ref-2)
3. Riskfinder.org website: https://riskfinder.climatecentral.org/place/tacoma.wa.us?comparisonType=city-council-district&forecastType=NRC\_High&level=4&unit=ft [↑](#footnote-ref-3)