Sea Level Rise and Savannah

Earth Science

Module Description	In this phenomenon-based module students are transported to the Savannah/Tybee Island region to better understand how coastal flooding, tides, sea level rise and climate change are impacting these communities. Through this experience, students will learn the foundational science behind these impacts, create data visualizations, and determine methods that they can engage with to mitigate the effects of climate change. The curriculum is supported by the *Smart Sea Level Sensors* project, a unique partnership between Chatham Emergency Management officials, City of Savannah officials, and Georgia Tech faculty who are working together to install a network of internet-enabled sea level sensors across Chatham County.
Related Georgia Science Standards of Excellence	**S6E2.** Obtain, evaluate, and communicate information about the effects of the relative positions of the sun, Earth, and moon. **S6E3.** Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes. **S6E6.** Obtain, evaluate, and communicate information about the uses and conservation of various natural resources and how they impact the Earth.
Related Georgia Standards of Mathematical Excellence	**Statistics and Probability Domain (6.SP)** Develop understanding of statistical variability **MGSE6.SP.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. Summarize and describe distributions **MGSE6.SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **MGSE6.SP.5** Summarize numerical data sets in relation to their context, such as by: b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range)

5E Stage	Student Activities How will students engage actively in the three dimensions throughout the lesson?	Teacher Activities How will the teacher facilitate and monitor student learning throughout the lesson?
Engage How does the lesson capture student interest, activate prior knowledge, and connect to a complex question, global issue, or real world problem?	• Climate Stories video focusing on Tybee Island • Alternate: students can read news articles/videos on recent hurricanes, King Tides, all this flooding and engage in a class discussion • KWL on climate change/sea level rise	• Allow for students to discuss experiences, & generate questions based on the videos/articles • Have students fill out the "K" and "W" in their KWL charts. Give them time to share their thoughts.
Explore How does the lesson allow students to develop a common base of experiences by actively investigating the phenomenon or problem?	• Students are given sample historical data from Ft. Pulaski & they create histograms for visualizing the frequency of tides and analyze the data looking for trends and what statistical sense can be made of the data • Background information on Sea Level Sensor project including data from sea level sensors. • Students should explore the sea level sensor data site and look for patterns and trends in the data.	• Students should work in pairs (or individually) as they plot the same data they are working with and perform statistical analyses to have a better understanding of high tides at Ft. Pulaski during the month they have data for • Introduce students to the Smart Sea Level Sensors project and the array of data sources (review how the sensors work, allow students to examine the sensor if available). Review data for trends/patterns
Explain How does the lesson allow students to develop, share, critique, and revise their own explanations before connecting those to accepted scientific explanations and terminology?	• Students are given more sample historical data from Ft. Pulaski (high and low tides) for analysis and graphing plus the lunar calendar for their month. • Students should observe there are generally 2 high and 2 low tides for each day, the cyclical pattern of tides and how the highest tides tend to occur around new/full moons • Tides, sea level, climate change (causes of sea level rise) • Students will explore whether melting land or sea ice has a greater effect on sea level in the Land vs. sea ice activity	• Review with students how to graph the tides • Review with students the trends and cyclical patterns that they observe in the data (generally 4 tides, the timing of highest tides with moon phases, the timing of tides occurring ~12 hours & 25 min apart- connect to what students know about the lunar cycle • Discuss use of models in this activity • Connect the phenomenon of increased coastal flooding to sea level rise (what would that mean for high tides in the future?)
Elaborate How does the lesson allow students to extend their conceptual understanding of the three dimensions through opportunities to apply knowledge, skills, and abilities in new experiences?	• Students will reflect on their own ecological footprint, the personal choices they make and where there is room for improvement in their lives • They will analyze global sea-level and temperature data through the Lessons in Sea Level Rise problem set • Students will understand how increased amounts of carbon dioxide affect global temperature (and the role humans play in producing the carbon dioxide)	• Monitor students as they complete the ecological footprint activity and offer explanations for why certain categories are included and why some choices make a negative impact on the environment. • Conduct the Lessons in Sea Level Rise problem set as a class activity. Each student can analyze the graphs on their personal computers, but it will be easier to answer classes as a group. • Remind students of the plan to increase the height of Highway 80. Read the article, why are there concerns this isn't enough? • Play the Bill Nye climate change video
Evaluate How does the lesson—through both formative assessments embedded throughout the lesson and a summative assessment that might coincide with the elaborate phase—make visible students' thinking and their ability to use practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions?	**Formative:** KWL- completed throughout the module Other activities from the module **Summative:** What's my climate story? *(Students work individually or in groups to brainstorm a realistic way to improve the ecological/carbon footprint of their home, their schools or their communities and communicate their plan of action to an audience).*	