

Our Coast, Our Future



Mass Audubon



Massachusetts Office of
Coastal Zone Management

Coastal Climate Resilience in Massachusetts

Description:

This 7-part unit framework for middle school students presents a snapshot of Massachusetts coastal communities in the face of climate change and then uses a scenario-based structure to provide students an opportunity to dig into locally relevant issues. Students practice skills in defining problems and decision making while conducting research and constructing explanations. Using a hypothetical and locally relevant community-level challenge, students work together to weigh the pros and cons of solutions across various social, economic and environmental impacts. The culminating project is a communication piece that is student driven to reach the broader community, such as a blog post, video project, art installation or news story. The product will feature a presentation of their hypothetical scenario and recommendations as a mock-case study, and (for 8th grade students) make a direct connection to a real-world scenario that could be addressed with similar considerations and solutions.

This unit uses some of the structure and tools provided by [Earth Force](#) as these materials are tested, evaluated, and align with the objectives of this project. Earth Force is an enthusiastic partner and willing to share and shape their materials to this project's needs. This provides teachers extensive supplementary information for this unit and may encourage adoption of resources for future projects.

Background: Climate change affects all communities in Massachusetts, but has particular impacts along our coast. As global temperatures increase, a common set of factors drive the effects on all coastal cities and towns. Like all communities, coastal communities have existing structures, policies, and practices which affect residents in ways that are not always equitable. Responses to climate change can make existing inequities worse or better depending on how they are addressed, and whether a full range of community voices is included in the discussion.

We assume students come in with some basic knowledge about climate change -- the greenhouse effect, the warming it causes, human activity as the source of excess GHGs. We will provide external resources for teachers who haven't taught this yet and need materials for it.

Note on grade targets and standard alignment: While the unit is developed for middle grade students, the strongest alignment according to Mass Curriculum Frameworks is with 6th grade and 8th grade. However, individual school districts may adjust their scope of sequence so this is presented as a guideline. Additionally, 8th grade unit will support the Massachusetts Civic Education requirements which will align well with the product in the final lesson.

Unit Overview

The unit is designed to be facilitated over 7 lesson blocks that are broken up into a total of 16 classes.

1. **Presenting the Challenge** -- *Introduction to the unit and the challenges students will address (pg 3)*
2. **Issue Selection** -- *Choosing which of the three challenges the class will focus on (pg 5)*
3. **Research Preparation** -- *Learning how to research problems and solutions effectively (pg 7)*
4. **Research** -- *Investigating the specific scenario and ways to address it, in depth (pg 9)*
5. **Perspectives** -- *Taking roles of community stakeholders to evaluate possible solutions (pg 10)*
6. **Community Presentation** -- *Discussion of stakeholder perspectives and optimal solutions (pg 12)*
7. **Report Out and Civic Engagement** -- *Presentation of results to the wider community (pg 13)*

In addition to the lesson components listed below, each class will incorporate the following:

Differentiation: Examples include text transcripts to videos, graphic organizers for concept mapping, and definitions of key vocabulary (tier one and two) and concepts.

Assessment: The majority of classes contain a student worksheet or writing prompt for formative assessment and checking for understanding.

Pre-unit Background

We have curated a list of external video and web resources in the event the subject of climate change is new for your students or they need a refresher. In this document you will also find a list of resources related to environmental and climate justice. These resources [can be found here](#).

Lesson	1 – Presenting the Challenge
Description	This lesson provides an introduction to the unit, the concept of climate justice, and the three challenges students will choose from for the remainder of their work.
Objective(s)	<ul style="list-style-type: none"> • Define the climate change challenges that face coastal communities. • Define and understand climate justice. • Recognize potential barriers to equitable access to climate solutions. • Create an inventory of community assets and vulnerabilities related to climate change.
Time	Estimated time: 3 classes
Steps / Activities	<p><u>Class 1:</u></p> <ul style="list-style-type: none"> • Essential Question: What challenges might communities face from climate change? • Students watch a welcome video orienting them to challenges and impacts coastal communities face with climate change, including associated social justice issues, and setting the stage for the three scenarios in this unit: <ul style="list-style-type: none"> ○ Protecting property and public safety in the face of extreme storms. ○ Maintaining access to shoreline recreation and natural spaces despite beach erosion and higher tides. ○ Protecting community services and infrastructure in urban areas when flooding disrupts transportation and roads ○ Define “community” for the purpose of the challenge ○ Define mitigation and adaptation strategies ○ Differentiate between individual and community strategies <p><u>Class 2:</u></p> <ul style="list-style-type: none"> • Essential Question: How do we work together to make our climate solutions and conversations rooted in justice? <p>Students will be introduced to climate justice and common barriers to it by:</p> <ul style="list-style-type: none"> • Roleplaying in a language barrier opening scenario. • Watching a video about climate justice issues and solutions in the city of Boston. • Taking a deeper dive into a climate justice barrier and work together as a class to understand how that barrier comes up in different community settings as well as how we may begin to address them. <p><u>Class 3:</u></p>

	<ul style="list-style-type: none"> • Essential Question: How can community members identify areas in which to focus their climate solution efforts? <p>Students conduct a community climate resilience inventory to evaluate the strengths and vulnerabilities of their community in the face of climate impacts using a community resilience checklist.</p> <ul style="list-style-type: none"> • The checklist is broken into three categories: societal, environmental, and infrastructure. • Students will explore curated resources to discover answers that may not be easily observable. • Checklist items will encompass key issues and considerations that are presented in the challenge scenarios.
Supporting Materials and Tools	<p>Facilitator guide</p> <p>Supporting tools and student documents</p>

Lesson	2 – Issue Selection
Description	<p><i>Choosing which of the three challenges the class will focus on.</i></p> <p>In this lesson, students will use their broader understanding of coastal issues and choose a specific, hypothetical scenario that they will address. They will use decision making tools and templates to review the three presented scenarios from lesson one and determine which is most locally relevant to them and what they would like to work on as a class. They will be presented with a broad overview of each issue with initial information on community impacts across social, economic and environmental impacts.</p>
Objective(s)	<ul style="list-style-type: none"> • Identify factors or characteristics critical to understanding climate impacts for a specific community. • Summarize a community’s current and future vulnerability to climate impacts, including ecological, infrastructure, and social and economic impacts. • Identify future research that will be needed to make a climate action plan.
# Classes (estimated)	3 classes
Steps / Activities	<p><u>Class 1:</u></p> <p>Essential Question: How does a community identify what climate change issue to investigate?</p> <ul style="list-style-type: none"> • Students will be presented with a broad overview of each issue introduced in Lesson One with initial information on community impacts across social, economic and environmental impacts. • Teachers will lead students through decision making activities that involve an issue selection grid to evaluate against criteria that includes local relevance and student interest. • Students will choose the issue to focus on at the end of class 1 or beginning of class 2. Teachers should influence decision making method for final decision based on class needs and practice. <p><u>Class 2:</u></p> <p>Essential Question: What specific climate challenges are being faced by the community?</p> <ul style="list-style-type: none"> • Students will explore the chosen scenario using StoryMaps that will include new content from videographer, links to news articles and segments, resources from trusted sources like

	<p>CZM and NOAA, and images from databases like mycoast.org. Climate justice issues will be central to the presentation of the issues and focus.</p> <p><u>Class 3:</u></p> <p>Essential Question: What additional information and research will community members need to gather to make a climate action plan?</p> <ul style="list-style-type: none"> Students will use this information to complete Digging Deeper activity to identify the questions they'd like to address, where they need to get more information and assign these remaining questions and research to small groups of students for Lessons 3 and 4.
Supporting Materials and Tools	<p>Facilitator Guide</p> <p>Supporting tools and student documents</p>

Lesson	3 – Research Preparation
Description	<p><i>Identifying questions for research on problems and solutions</i></p> <p>This lesson will help students narrow their focus for researching specific problems that occur in their chosen scenario, and the solutions to them, as well as techniques and expectations for the research that will follow in Lessons 4 and 5.</p>
Objective(s)	<ul style="list-style-type: none"> • Select appropriate research tools and sources for researching climate change impacts at the local level. • Differentiate between policy and practice when describing climate change impacts and solutions.
# Classes (estimated)	2 classes
Steps / Activities	<p><u>Class 1:</u></p> <p>Essential Question: How do you identify important community voices and perspectives when addressing climate issues?</p> <ul style="list-style-type: none"> • Students will watch a video from the introductory scientist/narrator to check in on the progress and give advice on how to think through problem solving (community perspectives, credible sources and weeding through complicated and intertwining info). • Students will brainstorm perspectives that are important in the target community. Activity will be guided to encourage identifying a broad range of perspectives. • Students will complete a What's What: Policy and Practice activity that will provide students an opportunity to look at their chosen issue and identify if the behaviors and solutions associated with the climate issue are related to either a community policy or a practice as the communities' approach to changing a policy is different from changing a practice. <p><u>Class 2:</u></p> <ul style="list-style-type: none"> • Essential Question: What questions are important to describe problems and find potential solutions in this scenario? • Students will identify key questions to research problems and potential solutions for their chosen scenario. <ul style="list-style-type: none"> o Burning Question activity • Teacher / class will categorize questions and divide out to student groups -- one or two questions per group. <ul style="list-style-type: none"> o May require prioritizing which questions to research, depending on number generated.

	<ul style="list-style-type: none"> o Questions modified as needed, with teacher guidance, so that each group investigates a problem (just one) and possible solutions (several). • Teacher will provide tips on research / credible sources, including: <ul style="list-style-type: none"> o How to identify credible sources of information and where (and where not) to find credible information o How to process information that is presented in snippets (like "nut graphs" and tweets) and recognize bias and clickbait. o How to navigate complicated and interconnected information. o May be expanded into a separate class if students are not already familiar with basic principles. • Students will be given several resource options to use online platforms to create a graphic organizer to form understanding of their climate problem and focus their areas of research.
Supporting Materials and Tools	<p><u>Facilitator Guide</u></p> <p><u>Supporting tools and student documents</u></p>

Lesson	4 – Research
Description	<p><i>Researching problems and solutions in the specific scenario, in depth</i></p> <p>In this lesson students will work primarily in small groups to research the questions and areas identified in Lesson 3.</p>
Objective(s)	<ul style="list-style-type: none"> • Select detailed strategies to address one aspect of a local climate change problem. • Summarize these strategies for other students.
# Classes (estimated)	2 classes, plus homework
Steps / Activities	<p><u>Class 1:</u></p> <p>Essential Questions: What are the key problems in our chosen scenario? How might those problems be solved?</p> <ul style="list-style-type: none"> • Teacher will provide reminders about research approach from Lesson 3 – listening to a wide range of voices from the community, and choosing credible sources. • Student groups will use the StoryMap curated source list to investigate the problem they are working on, and potential solutions to it. <ul style="list-style-type: none"> o Students will describe how both problem and solutions as related to policy, practice, or both. <p><u>Class 2:</u></p> <p>Essential Questions: What are the key problems in our chosen scenario? How might those problems be solved?</p> <ul style="list-style-type: none"> • Student subgroups will each share out the result of their research and record the findings of each group on a provided worksheet.
Supporting Materials and Tools	<p>Facilitator guide</p> <p>Supporting tools and student documents</p>

Lesson	5- Perspectives
Description	<p><i>Taking roles of community stakeholders to evaluate possible solutions</i></p> <p>In this lesson, students will explore the issue from the perspectives of key stakeholders. They will be put into small groups to step into the role of a stakeholder group and prepare for a class discussion, framed like a town meeting or presentation which will happen in Lesson 6.</p>
Objective(s)	<ul style="list-style-type: none"> Analyze the pros and cons of solutions to a local climate change problem from the perspectives of different community stakeholders. Develop arguments to support the solutions that work best for specific stakeholders.
# Classes (estimated)	2 classes plus homework
Steps / Activities	<p><u>Class 1:</u></p> <p>Essential Question: How do we evaluate what individual stakeholders or groups value?</p> <ul style="list-style-type: none"> Teacher will review <u>Stakeholder Perspectives Slide Show</u> as a classroom and discuss the values of the different stakeholders. Students will use a graphic organizer to think about how different stakeholders think about the hypothetical scenario and relates back to the issues in selection matrix from Lesson 2. Conduct an activity on different ways to communicate about climate change. Student groups will each be assigned a stakeholder identity. <p><u>Class 2:</u></p> <p>Essential Questions: How do we develop convincing arguments to support climate change solutions?</p> <ul style="list-style-type: none"> Students will work in small groups to make a case for the strategies that make the most sense given their stakeholder interests. Students will also identify areas where they can compromise; what's okay and what is not okay from a values perspective, and think about cost and timeline of strategies. Students will practice and refine their arguments within their small groups and create support materials for presentation in Lesson 6. Students will be provided with a rubric that can be used to assist analysis and preparation of their presentation.

Supporting Materials and Tools	Facilitator guide Supporting tools and student documents
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Lesson	6 – Community Presentation
Description	<p><i>Discussion of stakeholder perspectives and optimal solutions</i></p> <p>In this lesson, students will conduct a discussion similar to a town meeting format. They will present their proposed solution from their perspective and make a case for alternatives or compromise.</p>
Objective(s)	<ul style="list-style-type: none"> • Present arguments for the solutions that work best for specific stakeholders. • Discuss options and select preferred solutions for the community.
# Classes (estimated)	1 class (prep happens in the previous lesson)
Steps / Activities	<p><u>Class 1:</u></p> <p>Essential Question: What does effective and collaborative decision-making look like?</p> <ul style="list-style-type: none"> • Student groups will each present their perspective, priorities, and what options they advocate for and why. • After all groups present there will be a brief discussion that addresses any final thoughts or questions facilitated by the teacher. • Students will vote (e.g., “dot voting”) to decide their top 4 solutions to put forward to address the issue. • Once a decision is reached which involves final, complimentary solutions students complete the last stages of the Case Study Template. • <i>Civics option for grade 8 classrooms:</i> Students discuss how this issue is relevant to their own community: <ul style="list-style-type: none"> ○ What similar issue are they aware of where the town could use the same tools or processes? ○ Bring discussion back to Phase 1 inventories: Is there a climate related hazard or issue that affects all or most of the community and would be good for people to learn more about?
Supporting Materials and Tools	<p><u>Facilitator guide</u></p> <p><u>Supporting tools and student documents</u></p>

Lesson	7 – Report Out and Civic Engagement
Description	<p><i>Presentation of results to the wider community</i></p> <p>Overarching Essential Question: How do we effectively and equitably communicate climate change challenge solutions to our communities?</p> <p>In this final lesson, students will flex their civic engagement muscles. Their final project will be to create a product that engages others with their project outside of their classroom, and ideally their school. Goal is to use the <i>hypothetical scenario</i> investigated in Lessons 2-6 to share their learning and process but also make comparisons to a local issue if appropriate. Students will have a rubric to guide this process.</p>
Objective(s)	<ul style="list-style-type: none"> • Create products that explain and support selected solutions to local climate change impacts to the wider community.
# Classes (estimated)	3 classes plus homework, more depending on type of presentation
Steps / Activities	<p><u>Class 1:</u></p> <ul style="list-style-type: none"> • Students will brainstorm ideas and develop a plan to present their knowledge and solutions to locally relevant climate change issues directly based on work done in lessons 1-6. <ul style="list-style-type: none"> ○ Students will consider what content and format is appropriate for the specific target audiences within the community. Students will consider primary audience and secondary audience and designs presentation project to match. Types of projects could include: <ul style="list-style-type: none"> ▪ Social media engagement ▪ Video, Podcast ▪ Paper slides video ▪ Local news article or op-ed style blog ▪ Art installation ▪ Presentation to school peers/parents/community members ▪ Civics related action (e.g., meeting with town or city officials to present findings) ▪ Other ○ Student presentation projects should make the connection between the solution and the challenge clear, considers the roles and perspectives of community members and increases overall understanding of climate resilience.

	<ul style="list-style-type: none"> ○ Student solutions should relate directly to adapting the community's systems or infrastructure to prevent and/or recover from coastal flooding, stormwater inundation, or heat AND have other positive impacts on the community. • Students can begin work on projects as homework. • Students can work on the project together as a whole class or through complimentary small group projects. <p><u>Class 2:</u></p> <ul style="list-style-type: none"> • Students will use class time to work complete first drafts of presentations and materials. • Teachers should facilitate an active working space and make sure students are on task, have an organized plan, and be available to answer questions and direct students to reference materials from earlier lessons. • Students can complete final draft as homework. <p><u>Class 3:</u></p> <ul style="list-style-type: none"> • Students present “final drafts” within the class and offer any constructive critique, identify any errors, and evaluate any areas of the project that may need additional work. • Students make final updates and plans to for final community presentation based on format. • Teacher facilitates final discussion to wrap up project.
Supporting Materials and Tools	<p>Facilitator guide</p> <p>Supporting tools and student documents</p>