

Honors Seminar Course Proposal

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What Makes an Island?

Vulnerability and Resilience in Coastal Communities along the Rural to Urban Continuum

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Maine Maritime Academy is beginning a research program in collaboration with the University of Bergen (Norway) to explore the common vulnerabilities of coastal communities along the Atlantic coasts of North American and Europe. This program is envisioned to include community leaders and researchers in both Maine and Norway to explore overlaps in challenges as well as possibilities for resilient solutions in the face of rising sea levels and global climate change.

We propose to teach an elective Honors Seminar that introduces students to the breadth and depth of these common vulnerabilities while also introducing students to some of the tools used to develop understanding of problems that can lead to policy solutions. Challenges that we may explore that could be familiar to some of our students include:

1. The impact of increasing storm surge and amplification of storm intensity on coastal infrastructure
On March 10, 2024, Upper Machias Bay in Washington County, Maine experienced the ninth “100-year flood” or higher in 6.5 years, with the storm event on January 10, 2024 topping the FEMA base flood elevation by more than 1 ft. Storm event flooding at this level resulted in significant damage to infrastructure designed for lower storm surge maxima and resulted in damage to the dike that now requires replacement. The question of how to replace the dike is complex, however, because of the diverse needs any structural replacement must serve. A sustainable solution will require input and buy-in from the people who depend on the dike, including clambers, businesses that rely on the associated roadway and local residents concerned about impacts to drinking water quality.
2. Requirements for infrastructure sustainability to support port city economies
Because they are the bridge between land and sea, the economies of coastal communities often rely on the transit of goods and services to and from commercial ports and the maintenance and growth of port infrastructure. These activities require sustainable working waterfronts. Here in Maine, a broad coalition of stakeholders has successfully engaged to coordinate and finance harbor dredging in Portland, the state’s largest commercial port city, portions of which have not been dredged in 70+ years. Funding for this project is including an innovative (first in the U.S.) application of Federal Brownfields Redevelopment funds to deepen the port and address significant historical contamination in the harbor.
3. The impact of warming coastal waters on sustainable fisheries
The future of the lobster fishery here in Maine is bringing together scientists, policymakers, community leaders and industry experts to address the challenge of the warming Gulf of Maine and

the resulting migration of the commercial lobster fishery out of U.S. coastal waters. As with the problem of the dike in Upper Machias Bay, the problem of addressing the instability of an economically important fishery involves a range of participants with different, not always realistic and sometimes mutually exclusive definitions of a successful solution.

In this Honors Seminar, students will engage with three main themes and a set of social science tools applied in the exploration of these themes. The three themes are: understanding social and environmental vulnerability in coastal communities; the nature of sustainability in coastal communities; and the role of infrastructure durability (including water, sanitation, energy and transportation) in supporting and developing community resilience. To explore these themes, students will be introduced to system dynamics models and Geographic Information Science (GIS) as tools to apply across a range of possible case studies.

Some of the case studies we will explore will emerge from our new research partnership with the University of Bergen (Norway). In the Spring of 2025, Master's students in Bergen, Norway will work with the Sunrise County Economic Council in Machias, Maine to develop a set of research problems and systems models. In Fall 2025, students in our Honors Seminar will then have the opportunity to discuss these system models with the Norwegian students. Through these discussions, we hope to encourage cross-cultural conversation about the complexities of social and environmental challenges as well as how we develop workable policy outcomes.

Students will also examine the energy, transportation, water and sanitation infrastructure that serves coastal communities. With a focus on the challenges that communities are experiencing from increasing storm frequency and intensity, as well as sea-level rise, we will examine case studies that explore the use of micro-grids and renewable energy to increase rural resilience; the redesign of coastal roadways to improve tidal exchange and reduce flood risk; and new visions for coastal water and sanitation infrastructure to maintain necessary services under threats of increased salinization and impacts to waste handling.

Finally, students in this Honors Seminar will learn to work with social science tools, including system dynamics models and GIS, to examine community vulnerabilities and to assess the possible outcomes of proposed policy solutions. A background in system dynamics modeling and/or GIS is not required.