

The Economics of Climate Change in **Maine**



From extreme weather to rising sea levels—experts agree that climate change is not a future problem, it's affecting Maine today. Most conversations about climate change center on the environmental impact, not the economic reality. When talking about climate many focus on the future while ignoring the reality of the present. As businesses in Maine suffer hits to their current bottom lines, real-time action is needed to address economic costs.

To explore the economic impacts created by climate today, and discuss future opportunities for innovation and growth, [Science is US](#) and the [Maine State Chamber of Commerce](#) convened panels of thought leaders to examine how climate change is affecting key economic sectors in the state, strategies to build economic resilience through a science, technology, engineering and mathematics (STEM) ready workforce and ways to innovate for Maine's climate future.

Introduction and background

The portion of Maine's economy driven by STEM grew between 2017 and 2021 with STEM directly contributing \$6 billion more to the state's GDP¹. STEM professionals account for more than one-third of the state's workforce, but this number will have to grow even more to keep pace with the economic impacts of climate change. The state needs a two-pronged approach, one that emphasizes training and recruiting workers to meet the needs of today while simultaneously focused on the

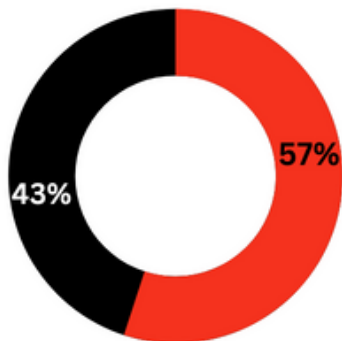
education necessary to build the workforce for the green economy of tomorrow. STEM professionals will be central to the solution. As President and CEO of the Maine State Chamber of Commerce Patrick Woodcock remarked, "the clean energy transition goes well beyond simply thinking about solar panels and wind turbines. It goes into the fundamentals of supply chains across the globe, consumer products and research and development that will position our state in a leadership role."

STEM and Maine's Economy

Science, technology, engineering, math and medicine directly account for

34% of Maine's Jobs

37% of Maine's GDP



STEM Jobs in Maine are widely available at every level of educational attainment

- STEM professionals with less than a bachelor's degree
- STEM professionals with a bachelor's degree or higher

¹ Science is US. "People of Science: An inclusive analysis of the U.S. STEM workforce and its economic impact." March 2023. <https://scienceisus.org/people-of-science>

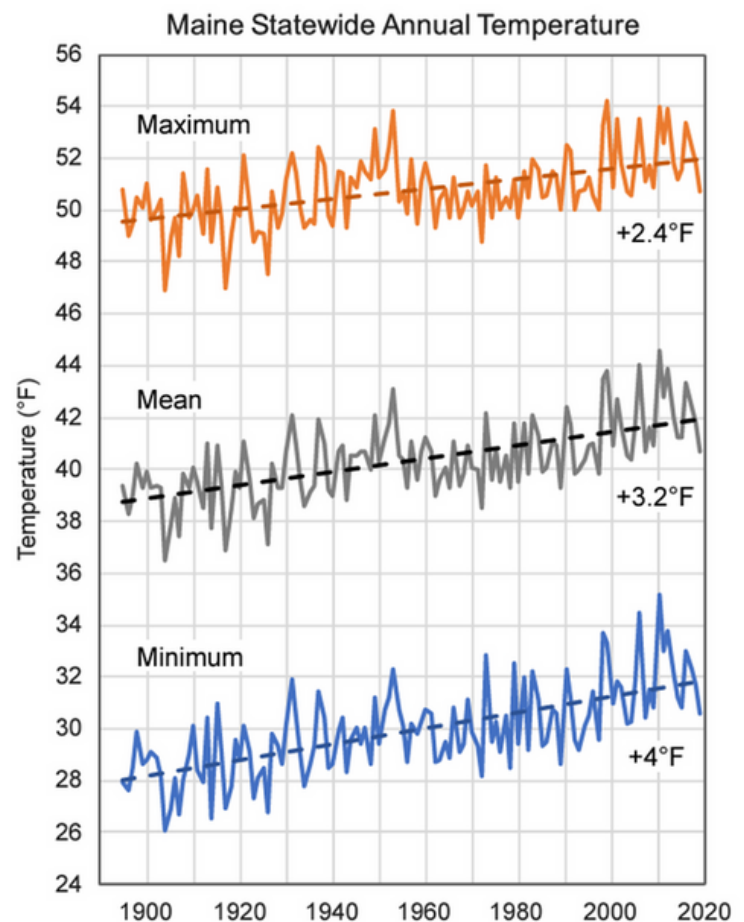
Insights from academic experts and industry leaders

There has been a 3.2°F temperature increase in Maine over the last 100 years. The state has also experienced more intense precipitation and storm damages². Putting this climate data into perspective, Jonathan Rubin, Director of the [Margaret Chase Smith Policy Center at the University of Maine](#), noted “there are three types of costs that need to be considered with climate change—direct, adaptation and mitigation.” Direct costs can include property damages, adaptation

costs encompass expenditures to make existing infrastructure more weather-resilient and mitigation costs refer to measures aimed at preventing further negative impact.

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Patrick Woodcock, President and CEO of Maine State Chamber of Commerce



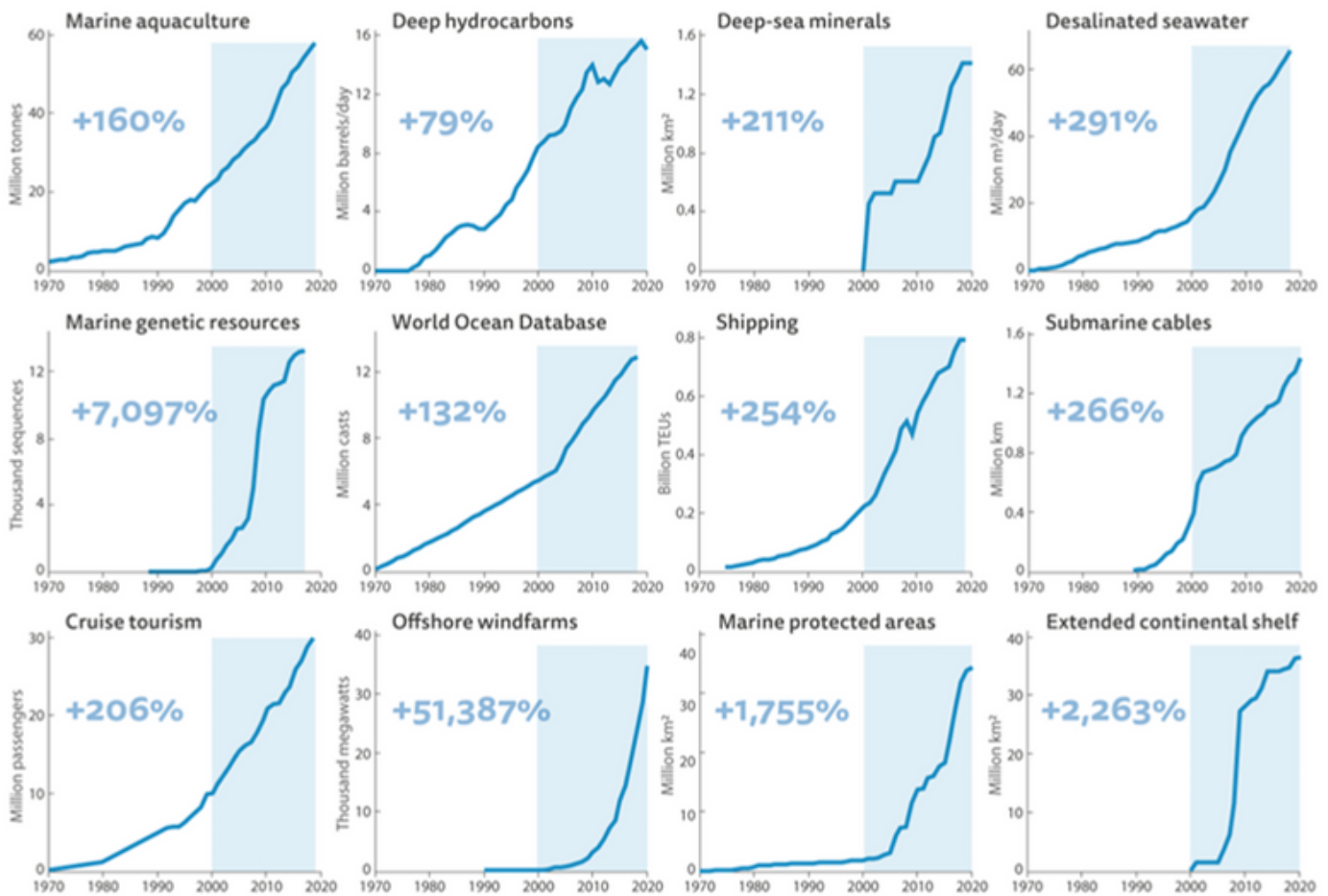
Data from the [NOAA U.S. Climate Divisional Database](#), chart from “Scientific Assessment of Climate Change and Its Effects in Maine.”

² Scientific and Technical Subcommittee of the Maine Climate Council. “Scientific Assessment of Climate Change and Its Effects in Maine.” August 2020. https://www.maine.gov/future/sites/maine.gov/future/files/inline-files/GOPIF_STS_ClimateImpactsMaineReport_Final.pdf

At the same time, “Blue Acceleration”, as Kanae Tokunaga, Senior Research Scientist in Coastal and Marine Economics at the [Gulf of Maine Research Institute](#), explained, is happening against the backdrop of current climate change effects. “We are experiencing a phenomenal rate of change over the last 30 years, with a sharp acceleration in ocean uses³.”

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Jonathan Rubin, Director of the Margaret Chase Smith Policy Center, University of Maine



Data from “[The Blue Acceleration: The Trajectory of Human Expansion into the Ocean](#)”, graphs from “[Blue Acceleration: An ocean of risks and opportunities](#).”

³ Ocean Risk and Resilience Action Alliance. “Blue Acceleration: An ocean of risks and opportunities.” October 2021. <https://www.globalresiliencepartnership.org/wp-content/uploads/2022/01/orraa-blue-acceleration.pdf>

This new phase in humanity's relationship with the ocean includes promoting equitable access to marine resources, with an emphasis on sharing the benefits that populations reap from the ocean.

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Kanae Tokunaga, Senior Research Scientist in Coastal and Marine Economics, Gulf of Maine Research Institute

How are these costs, impacts and opportunities manifesting themselves differently in Maine's key economic sectors? Patrick Strauch, Executive Director of [Maine Forest Products Council](#), for example, pointed out a shorter harvesting season as a direct cost the forestry sector contends with due to a warming climate. "The northward migration of insects and diseases is perhaps our greatest threat," he added. Hospitality, another key driver of Maine's economy, has faced adaptation costs related to rising temperatures. "One major change for

us," said Rauni Kew, Green Program Manager of Maine's [Inn by the Sea](#), "is that when the Inn first opened, it didn't have air conditioning—it wasn't needed. Now we need it and that isn't only a cost to install and maintain."

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Not all costs are strictly negative, however. The last category, mitigation, offers economic opportunities as well. The switch to bulk amenities and the sheet and towel program (where linens are laundered and replaced on request) at different hotel chains, for instance, has significantly reduced single use plastic and energy costs. Maine's lobster industry is also looking into how to use lobster shells as a biopesticide and biofertilizer to protect against disease. "It is good business to be a good steward of the environment," commented Curt Brown, a marine biologist for [Ready Seafood](#). Pulling all these observations together, Rachel

Kerestes, Executive Director of Science is US, offered a helpful analogy. “If we consider climate change impacts from the notion of an ecosystem, in the biological sense everything from the plants, to the animals, to the people and the natural environment are connected. Similarly, there is an economic ecosystem. All the different industries interact with each other and can provide potential solutions.”

“When the Inn first opened, it didn’t have air conditioning...now we need it.”

Rauni Kew, Green Program Manager, Inn by the Sea

So, what are the gaps that a resilient, future-focused Maine needs to fill right now? Workforce is top of mind, as challenges posed by climate change will only exacerbate an existing skilled labor shortage. “Employers are reporting increasing difficulty finding the workers that they need. This is true across all types of sectors,” according to Philip Jordan, Vice-President of [BW Research Partnership](#). To transition to a decarbonized economy, he underscored the importance of basic STEM education and transferable skills.

Based on surveys conducted as part of his work, there is no doubt people are interested in working in climate-related jobs, yet there are still prevailing feelings of “STEM is not for me” or that “STEM is too hard.”

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Curt Brown, Marine Biologist, Ready Seafood

Speaking further about perceptions that can hold people back and prevent them from pursuing new STEM skills, Rachel Schattman, Assistant Professor of Sustainable Agriculture at the [University of Maine School of Food and Agriculture](#), found that “one of the big inhibitors for farmers, foresters and range land managers when it comes to adapting to climate change is people’s confidence in their ability to try something new.” The cultural and social changes needed to counter this includes eliminating the stigma that individuals need advanced degrees to be STEM professionals, supporting industries with up-to-date science information that would in turn empower them to adapt and

celebrating career choices that don't require bachelor's degrees.

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Vaughan Woodruff, Vice President of Workforce at [ReVision Energy](#), agreed with Schattman's assessment: "We are largely going to depend on folks who we have not been holding in esteem

for our economy—trades workers. If we're not investing in workforce, then we're going to get left behind." This includes expanding apprenticeship programs and increasing the visibility of different trade career pathways.

"Employers are reporting increasing difficulty finding the workers that they need."

Philip Jordan, Vice-President, BW Research Partnership

Maine's climate future hinges upon the green economy jobs of tomorrow, many of which don't currently exist. While the transition is well underway according to Meena Naik, Director of Lifelong Learning at [JFFLabs](#), she stressed that "green jobs need to be

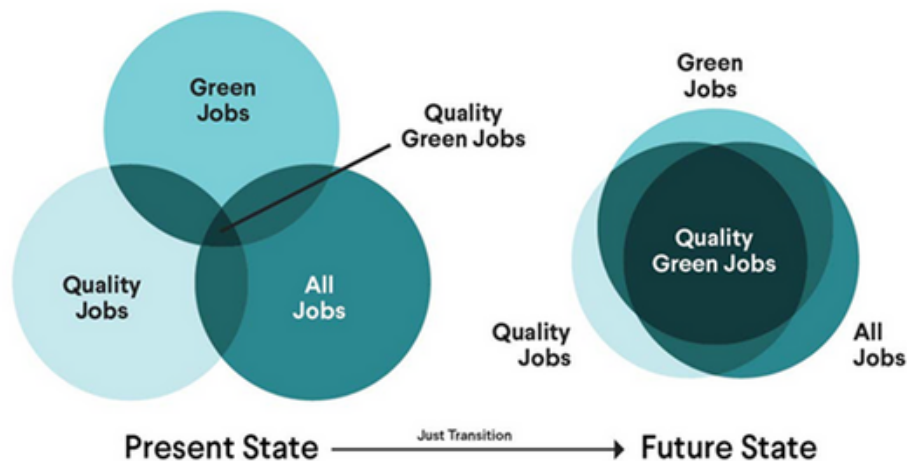


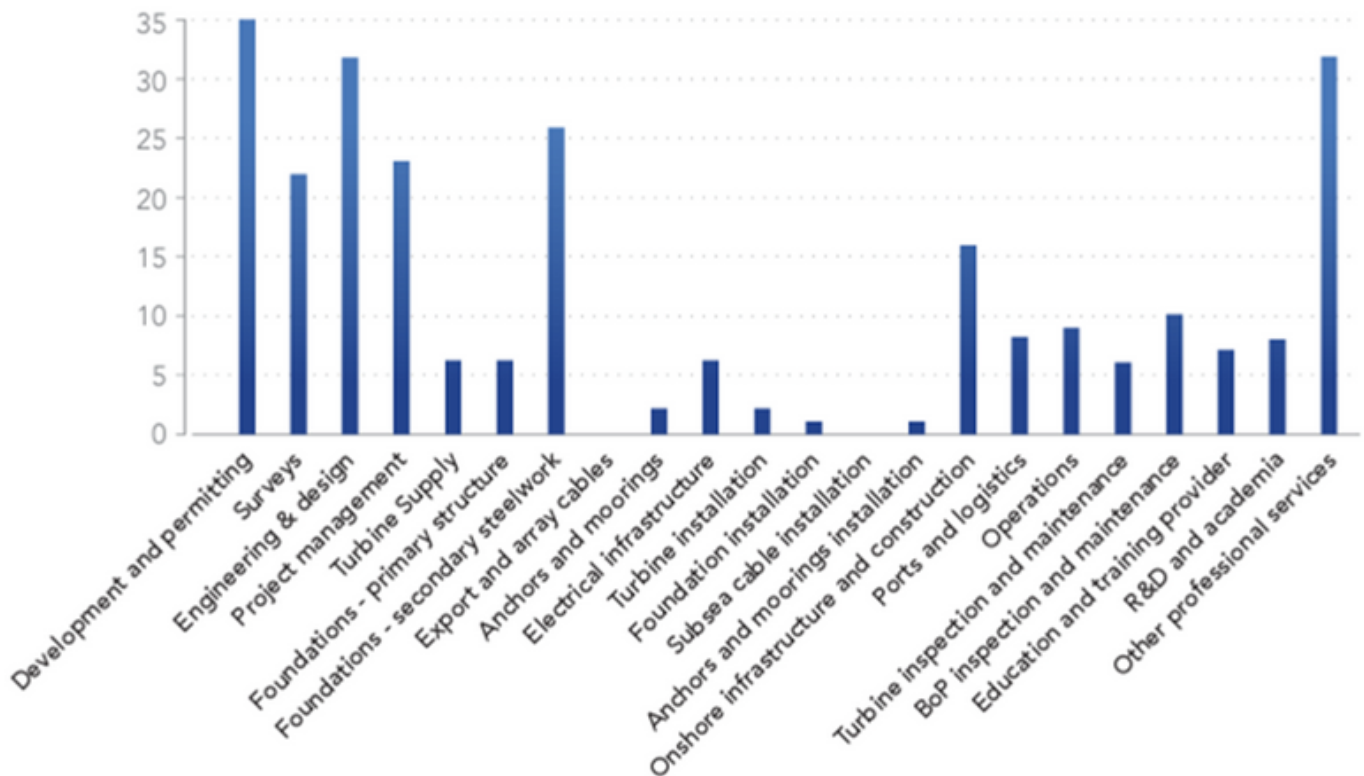
Image from "[Growing Quality Green Jobs: Driving Economic Advancement in the Green Economy.](#)"

defined by the skills rather than the industry. If there is a skill that is contributing to a more sustainable tomorrow, we should be tagging that as a green job⁴.” Naik’s colleague, Sara Vander Zanden, Senior Manager at JFFLabs, further added that regions having the most success in preparing their STEM jobs for the future are doing three core activities—looking in places that folks don’t normally consider for potential workers, using language that matters to respective

communities and embracing technology as a way to reach more workers while keeping costs low.

“One of the biggest inhibitors... when it comes to adapting to climate change is people’s confidence in their ability to try something new.”

Rachel Schattman, Assistant Professor of Sustainable Agriculture, University of Maine School of Food and Agriculture



Maine offshore wind supply chain companies categorized by contracting area. Graph from [“Offshore Wind Supply Chain & Workforce Opportunity Assessment.”](#)

⁴ Jobs for the Future. “Growing Quality Green Jobs: Driving Economic Advancement in the Green Economy.” June 28, 2023. <https://info.jff.org/growing-quality-green-jobs>

“When recruiting new workers, terms like ‘economic opportunity,’ ‘wealth building,’ and ‘family-sustaining wages’ resonate across the board,” Vander Zanden explained.

“If we’re not investing in workforce, then we’re going to get left behind.”

Vaughan Woodruff, Vice President of Workforce, ReVision Energy

These insights come at a critical time as the state makes significant headway in aligning its resources, infrastructure and investments to capitalize on new economic opportunities. The state’s [offshore wind roadmap](#), for example, allows Maine to generate its own energy and be less dependent on importing energy sources. “There are so many economic opportunities, whether you’re the largest company or the smallest company,” Jake Ward, Vice President for [Innovation and Economic Development at the University of Maine](#), commented. While large scale renewable energy development remains a challenge, burgeoning partnerships between academic institutions in Maine are leveraging STEM skills for potential solutions.

On the supply side of the clean energy equation in Maine, Michael Stoddard, Executive Director of [Efficiency Maine Trust](#), highlighted the state’s well-established use of heat pumps. “There will be exponential growth in this sector as people look to switch to lower cost ways to heat their businesses and homes or to operate their vehicles.” In fact, Stoddard already sees many high school graduates taking on well-paying jobs in this field, keeping pace with the increase in related installation and maintenance services.

“Green jobs need to be defined by the skills rather than the industry.”

Meena Naik, Director of Lifelong Learning, JFFLabs

These innovations are just the start of a larger sea change. Based on Tokunaga and her colleagues’ research, Maine’s aquaculture market is projected to exceed \$30 million by 2030 and shipping cargo capacity has grown five times over since 2000. Commercial fisheries are also interacting with new tools and technologies, incorporating things like electronic monitoring for product tracing and quality control.

To ensure that all these new advances restore equity to previously marginalized and underrepresented communities, Tokunaga especially called out the importance of STEM education in formal, as well as informal, settings moving forward.

Conclusion

Maine's natural resources and stature as a leader in alternative energy research makes it well-positioned to achieve a shift in its economy without leaving legacy industries and workers behind. While some traditional sectors, like forestry, hospitality and lobstering, have been confronted with direct, adaptation and mitigation costs as a result of climate change, the new era of "Blue Acceleration" with a particular focus on equity is also presenting Maine with opportunities to

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incorporate new green jobs into its future. Growing sectors like aquaculture and offshore wind are building upon Maine's existing STEM prowess. To support these developments, workforce investments in recruitment, apprenticeship programs and STEM training must be prioritized.

"There will be exponential growth in [the use of heat pumps]."

Michael Stoddard, Executive Director, Efficiency Maine Trust

The reality of climate change's impacts on Maine today is significant, but manageable. With smart public policy, strategic investments and a commitment to tackle climate head-on Maine is poised to lead the nation.