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HEARING ON
TURNING THE TIDE FOR OCEAN CLIMATE ACTION: UNLEASHING THE CLIMATE BENEFITS OF OUR BLUE PLANET

BEFORE THE
HOUSE SELECT COMMITTEE ON THE CLIMATE CRISIS

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INTRODUCTION

Chairwoman Castor, Ranking Member Graves, and Members of the Select Committee, thank you for the opportunity to testify today regarding the National Oceanic and Atmospheric Administration's (NOAA) work on our ocean and climate. I am pleased to join you during National Ocean Month and Capitol Hill Ocean Week; a time when Congress focuses on the importance of our ocean and Great Lakes and discusses how we can protect them and the communities that rely on them - something we at NOAA do every day.

The Department of Commerce's Climate Action Plan[1] and Department Administrative Order 216-22[2] aim to incorporate climate considerations into Department policies and planning and to foster and enhance the resilience of vulnerable communities against the key climate risks of extreme heat, drought, wildfires, flooding, coastal inundation and impacts to fisheries. At NOAA, we seek to build a climate ready nation, with the goal of a thriving nation whose prosperity, health, safety, and continued growth benefit from and depend upon a shared understanding of, and collective action to reduce, the impacts of climate change. NOAA received almost $3 billion in Infrastructure Investment and Jobs Act funding that will support the ocean, climate, and communities. This funding will restore coastal habitats and ecological features that protect coastal communities from flooding and coastal storms and work towards infrastructure that is climate smart, climate ready, and climate resilient.

[1] https://www.sustainability.gov/pdfs/doc-2021-cap.pdf
[2] https://www.commerce.gov/news/press-releases/2022/04/secretary-raimondo-establishes-commerce-climate-council-directs

OCEAN AND CLIMATE

The ocean plays a critical role in supporting life on our planet, affecting everything from the air we breathe and the food we eat, to weather and climate patterns. Our well-being is tied to the health of the ocean, and supporting a healthy ocean is a key part of NOAA's mission that requires observations, data processing, research, advanced modeling, analysis, prediction, assessments, and science-based stewardship of ocean resources. Ocean health is essential for the safety and economic well-being of our Nation. NOAA works closely with other federal agencies in exploring, mapping, and understanding our ocean and its relationship to the atmosphere and climate as well as managing its living marine resources that help sustain the many people, businesses, and communities that depend on them.

The Earth is an ocean planet, and every sector of society is affected by the ocean, either directly or indirectly. Coastal and global ocean observations and associated research are foundational to characterizing ocean and environmental changes over time. These efforts are key to improvements in weather, climate, marine, and ocean forecasts, especially for high impact events such as hurricanes, floods, terrestrial and marine heat waves, drought, and El Niño, as well as sea level rise, ocean acidification, and ocean oxygen loss.

Climate change is impacting our ocean in myriad ways. The complex interactions between greenhouse gas emissions and changes in ocean storage of heat and carbon dictate climate impacts, such as melting of sea ice, ocean deoxygenation, ocean acidification, sea level rise, coastal flooding, and changes in the distribution and abundance of marine organisms. We are already seeing these impacts: fifteen of the lowest minimum extents of sea ice in the Arctic have occurred in the last 15 years[3] and we are losing approximately 350,000 km^2 of sea ice per decade.[4]

These climate impacts threaten the numerous valuable ecosystem services provided by the ocean, such as absorbing carbon and heat from the atmosphere and mitigating some of the damaging effects of climate change. In total, more than 90%[5] of the excess heat in the Earth's system caused by human-induced accumulation of greenhouse gasses in our atmosphere is stored in the ocean. If that heat was converted into energy, it would be equivalent to a Category 5 hurricane occurring every second for 30 years. Even one of the least understood environments on the planet, the layer of cold ocean water where sunlight doesn't reach, known as the twilight zone, provides critical ecosystem services, by supporting ocean food webs and commercial fisheries. The deep ocean zone also plays an important role in storing carbon in its sediments.

[3] Executive Order on Tackling the Climate Crisis at Home and Abroad https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/

[4] https://www.ncdc.noaa.gov/snow-and-ice/extent/

[5] https://www.climate.gov/news-features/understanding-climate/climate-change-ocean-heat-content

Ocean Observations Inform Decision Making

The ocean and coasts compose 80 percent of the Earth's surface, and NOAA's geostationary and polar-orbiting satellites are constantly observing and taking measurements in this vast area, providing daily global measurements of ocean color and sea surface temperature. In addition, NOAA uses data from NASA, USGS, and international partners to support many of our ocean and coastal applications. These data are available in near real-time to users through the National Centers on Environmental Information (NCEI), NOAA CoastWatch, and the US Integrated Ocean Observing System (IOOS).

NOAA's ocean observation enterprise collects data on past and present conditions of ocean ecosystems, from ocean temperature and other physical parameters to biological conditions like the distribution and abundance of living marine resources. This information provides the foundation for understanding and predicting future changes. The United States, guided by NOAA, leads the world in observing our ocean, accounting for over half of the observations of the global ocean that exists today.

These ocean observations contribute to a number of the goals laid out in the Executive Order on Tackling the Climate Crisis at Home and Abroad.[6] Our global and coastal weather and climate prediction, combined with measurements of the marine environment from NOAA's fleet of ships and aircraft, ground observations, and satellites, enables informed decision making across a wide range of stakeholders, including resource managers and policy makers. As our ocean observations improve and expand, so do the opportunities to ensure safety, enhance commerce, sustain fisheries, generate renewable energy such as efficiently harnessing offshore wind, wave and tide and current energy, and understand our changing climate.

NOAA is working to collect and provide partners with finer-scale data on ocean and coastal regions that is critical to predicting the frequency, severity, and location of environmental changes, such as marine heat waves and sea level rise. We are also improving simulations of ocean interactions with the atmosphere, land, and ice to advance short term forecasts and subseasonal, seasonal, and decadal predictions and assessments. By advancing both short and longer term projections of ocean conditions, we will be able to provide living marine resource managers and stakeholders with early warnings and the best management strategies for resilience and adaptation to changing ocean conditions. Additionally, as we obtain improved representation of ocean topography and the ocean's interactions with the earth system, we can improve simulation of ocean circulation and thus anticipate future rates of heat and carbon uptake. Finally, we are advancing our ecological forecasts in order to provide earlier warnings of events such as coral bleaching and harmful algal blooms, which can wreak havoc on coastal systems, human health, and regional economies.

[6] https://repository.library.noaa.gov/view/noaa/34474

Changing Ocean

Ocean warming is causing ocean deoxygenation and leading to changes in the distributions of marine organisms. In addition to altering organisms' distribution, low oxygen events can disrupt habitat support functions, impair living shoreline protections such as oyster reefs, and undermine nutrient cycling, carbon sequestration, recreational fishing activities and more.[7] NOAA's National Centers for Coastal Ocean Science (NCCOS) has funded the research and development of hypoxia (low oxygen area) forecasts in the Gulf of Mexico since 1990 and in the Chesapeake Bay since 2005. This information provides important information to interagency management bodies like the Chesapeake Bay Program and the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force.

As carbon dioxide levels in the atmosphere increase, so too does the amount of carbon dioxide absorbed by the ocean. The ocean absorbs about 25% of global carbon dioxide emissions. This absorption leads to significant changes in seawater chemistry, leading to ocean acidification. This is a threat to food security, economies, and culture because of its effects on a broad range of marine life including protected species of corals, harvestable species like crabs and sea scallop, and mussels, and oysters that are cultivated in aquaculture systems. The NOAA-supported Regional Coastal Acidification Networks provide an open forum for the review of the latest science on ocean acidification and its biological, economic, and cultural effects with a focus on identifying knowledge gaps. These networks are building stronger connections between scientists, decision makers, fishermen, Tribes, and other stakeholders to identify regional priorities and information needs for ocean acidification.

Ocean acidification may also promote growth of toxic phytoplankton species that form harmful algal blooms (HABs) and increase the amount of toxins in surface waters. HABs can produce toxins or cause other harmful effects that damage ecosystems, disrupt our seafood supply, impact economies, and threaten human health. Marine and fresh waters of the United States are increasingly impacted by HABs with blooms reported in every state, leading to annual economic losses of millions of dollars.[8] NOAA is researching HABs and the impact of ocean acidification along our coasts, including in the Great Lakes and Alaska, and is now providing short (once or twice weekly) and longer-term, seasonal forecasts for these events so health officials, environmental managers, water treatment facility operators, and seafood and tourism industries can proactively prepare.

Three of NOAA's programs–Sea Grant, NCCOS, and the National Environmental Satellite, Data, and Information Service (NESDIS) through the NOAA Coast Watch Program–have partnered to create a HAB Liaison position to work with federal partners and communities to

[7] https://doi.org/10.1038/nclimate2595

[8] Sanseverino, Isabella, et al. "Algal bloom and its economic impact." *European Commission, Joint Research Centre Institute for Environment and Sustainability* (2016).

better serve decision-makers through the development of new data-driven communication tools. The NCCOS and IOOS also support the HAB Observing Network. Finally, we are one of three co-chairs of the Interagency Working Group on Harmful Algal Bloom and Hypoxia Research Control Act, in which we work across 17 Federal agencies and with stakeholders to develop action plans and assess HAB events. Investments in HABs research represents a coordinated effort across NOAA and the federal government to advance our nation's ability to observe, monitor, forecast, and manage blooms that are being exacerbated by climate change.

Ocean and the Economy

Changing ocean conditions are affecting Americans whose livelihoods depend on the sea, such as fishermen. Marine fisheries and seafood industries supported more than $255 billion in economic activity and 1.8 million jobs in 2019.[9] Environmental changes are creating significant challenges for fishing industries and coastal businesses by influencing the location of fish stocks, the productivity of fish stocks, and the fishing industry's interactions with bycatch, protected species, and other ocean users. To reduce impacts, increase resilience, and take advantage of new opportunities, NOAA Fisheries is improving science, and implementing adaptable management approaches. For example, scientists from across NOAA are working together to improve ocean forecasts and projections relevant to marine fisheries management. NOAA's Climate Ecosystems and Fisheries Initiative (CEFI) is a cross-NOAA effort to build the end-to-end operational modeling and decision support system needed to help living marine resource managers, stakeholders, and resource-dependent communities identify best strategies for resilience and adaptation to changing marine ecosystems. NOAA's FY 23 budget request includes $20 million to begin building the CEFI system. In partnership with the Regional Fishery Management Councils, Fishery Commissions, states, Tribes, academia and others, we are taking steps to help fisheries prepare for and respond to changing climate and ocean conditions.

Ocean-related segments of the U.S. economy – the blue economy – were worth nearly $373 billion GDP in 2018.[10] Our ocean is now experiencing a rise in economic importance, which has strategic implications. A strong blue economy depends on healthy ocean, coastal, and Great Lakes resources. The science and management to conserve and sustainably use these resources is at the heart of NOAA's mission.

As Administrator, supporting sustainable economic development by advancing the New Blue Economy is one of my main priorities. The New Blue Economy leverages data, information, and knowledge about our ocean to address societal needs and create economic innovation and

[9] National Marine Fisheries Service. 2022. Fisheries Economics of the United States, 2019. U.S. Dept. of Commerce,
NOAA Tech. Memo. NMFS-F/SPO-229, 236 p. https://www.fisheries.noaa.gov/resource/document/fisheries-economics-united-states-report-2019

[10] https://oceanservice.noaa.gov/annualreport/2020/ocm.html#gdp, https://coast.noaa.gov/data/digitalcoast/pdf/econ-report.pdf

opportunities. The New Blue Economy is an economy founded on emerging capabilities for acquiring data and developing information and knowledge that supports economic growth. NOAA is helping our Nation respond to changing conditions with a New Blue Economy fueled by ocean information and American ingenuity, while protecting ocean and human health and ensuring social equity. This economy has the potential to create new jobs, foster innovation, and help to fight the climate crisis by spurring sustainable economic growth that is informed by the best-available climate and ocean data.

To help build out the New Blue Economy, we aim to increase funding for coastal mapping and improve our understanding of the impacts a changing climate has on our ocean, coastal, and Great Lakes resources. Today, there is a need and desire to observe and understand our ocean for near-term benefit, but we must also take actions that will preserve this resource for future generations.

OCEAN AND CLIMATE SOLUTIONS

Though we have been researching the ocean for hundreds of years, we have only recently come to understand its role in maintaining planetary stability. As the climate changes, the ocean is also changing and warming. According to a recent study by NOAA researchers, the likelihood of a hurricane developing into a Category 3 hurricane or stronger, with sustained winds greater than 110 miles an hour, is increasing by about 8 percent per decade.[11] At NOAA, we are working to provide the information needed to prepare for, respond to, and recover from extreme events and generate lasting solutions to society's needs, while sustaining and promoting the services the ocean provides.

The ocean connects us, feeds us, sustains us, and offers solutions to climate change. These solutions include renewable ocean energy, carbon-neutral shipping, and blue carbon ecosystems like mangroves, salt marshes, and seagrass beds. There is a growing interest in understanding how ocean solutions can help facilitate the removal and sequestration of carbon dioxide from the atmosphere, and there's increasing demand for NOAA and its federal partners to verify the approaches being proposed by private industry.[12] Tackling the climate crisis is one of my three main priorities as Administrator, and we must take action now to accomplish it. NOAA, with its observations, products, services, Tribal consultation, stakeholder engagement, and stewardship responsibilities, is working to help decision makers at every level build resilience to climate change.

Offshore Wind

NOAA is working closely with other Federal agencies including the Department of Energy to mitigate climate change and achieve the Administration's goal to deploy 30 gigawatts of

[11] https://www.pnas.org/doi/full/10.1073/pnas.1920849117

[12] https://nap.nationalacademies.org/read/26278/chapter/1

offshore wind energy by 2030, while protecting biodiversity and promoting co-ocean use. NOAA advances the Administration's wind energy priorities through science, modeling, and products that inform decisions for offshore wind energy planning and development. NOAA Fisheries also works with the Bureau of Ocean Energy Management (BOEM) and offshore wind developers to minimize the negative impacts of offshore wind projects on endangered or threatened species, marine mammals, fisheries, marine habitats, fishing communities, and NOAA's scientific enterprise.

As the demand for offshore wind grows, so does NOAA Fisheries' associated regulatory workload, demand for data and marine planning, and the need for scientific surveys and monitoring to understand impacts to trust resources and U.S. fisheries. We are looking to increase capacity and continue to build expertise to keep pace with the growth of offshore wind development off our coasts. The NOAA 2023 Budget includes an increase of $45 million to support our increasing work in this area.

Enhancing Ocean Science for Solutions

At NOAA, we are collecting data 24/7 from a robust network of weather radars, satellites, fixed and drifting buoys, aircraft, ships, and uncrewed systems. Our National Centers for Environmental Information hosts the authoritative archives of climate and historical weather data and information. NOAA also makes ocean and coastal specific space-based data available through the NOAA CoastWatch and the nation-wide IOOS system. We conduct research, create products, tools, and educational resources, and we disseminate forecasts, warnings, climate predictions and projections, and maps. We know that all of this must be continuously informed, updated, and improved upon to understand and predict our ocean and climate, forecast the weather, and inform the public.

We are investing in our observations and modeling capabilities, in the translation of data and knowledge into actionable information for decision-makers, and in the New Blue Economy. Our FY 2023 budget request includes investments to improve climate-related ocean and coastal observations and to deliver user-informed data, tools, and services to local communities – including Tribes and underserved communities in line with the Administration's Justice 40 initiative – to help them better prepare for and respond to the impacts of climate change. Additionally, the Infrastructure Investment and Jobs Act (IIJA), signed by President Biden on November 15, 2021, provides a $2.96 billion dollar investment for NOAA over the next 5 years. NOAA will use these new resources to work towards infrastructure that is climate smart, climate ready, and climate resilient to prepare communities for the on the ground impacts of increasingly intense precipitation, hurricanes, flooding, drought, extreme heat, and fire weather events. IIJA funds will be used to recapitalize and modernize the global ocean and Great Lakes observing system assets and improve quality products, services, and capabilities at NOAA, Department of Defense, and forecast centers around the world.

We are advancing our regional ocean and Earth System models to deliver robust forecasts and projections of acute and chronic ocean conditions over varied spatial and temporal scales to ensure climate-ready management of living resources, and enhance both climate and weather predictions. NOAA's FY 2023 budget request includes $20 million for the CEFI program, which will build the end-to-end operational modeling and decision support system needed to help decision-makers identify best strategies for resilience and adaptation to changing marine ecosystems. A great example of our work in this sphere can be seen in the NOAA co-led production of an interagency Sea Level Rise Technical Report with projections through 2150 for all U.S. coastal waters. The findings were unequivocal: sea level along the U.S. coastline is projected to rise, on average, 10-12 inches in the next 30 years (2020-2050). Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. There will be more damaging coastal flooding that will reach further inland. Whether or not we curb emissions now and into the future will have a major impact on the rate of sea level rise that occurs.

Over 127 million people in the United States live in coastal counties[13], which face a number of threats spanning from increasing storm intensity to coastal inundation and sea level rise. These growing coastal risks threaten aging infrastructure, disrupt food and water supplies, and make it difficult to plan for natural disaster response and recovery. There is an increasing need for accessible and geographically comprehensive ocean data and information for decision-making in these rapidly changing communities. We are investing in environmental literacy programs and working with communities on resilience. We have supported the creation of tools such as the Office of Coastal Management's Sea Level Rise Viewer, the Homeowner's Handbooks and the Resilience Indices promulgated by several Sea Grant programs, and the National Integrated Drought Information System's Drought Early Warning System products.

Not all communities are experiencing these hazards in the same way. Communities of color, already under strain due to legacy and current environmental injustices as well as impacts of the COVID-19 pandemic, are disproportionately impacted by climate change.[14] As Administrator, one of my main priorities is improving equity and environmental justice in our service delivery, and to that end, we are improving and creating new tools that address the need to mitigate the compounded threats presented by climate change and injustice. During the first year of this Administration, we held a series of Climate and Equity Roundtables across the country with the goal of understanding what communities need from NOAA to build resilience to climate hazards they face. For example, NOAA's Climate Program Office and the National Integrated Heat

[13] Economics and Demographics https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html#:~:text=Coastal%20counties%20of%20the%20U.S.,land%20mass%20(excluding%20Alaska).
[14] United Nations COVID-19 Response https://www.un.org/en/un-coronavirus-communications-team/un-working-ensure -vulnerable-groups-not-left-behind-covid-19

Health Information System (NIHHIS) are working together with CAPA Strategies LLC to provide science support for citizen science, community based campaigns to map the hottest parts of communities through the NIHHIS-CAPA Urban Heat Island Mapping Campaign program. The 2022 campaign will map heat inequities of 14 communities across the country this summer, and two international cities. We are now funding Climate and Equity pilot projects, co-developed with these communities, in response to the feedback received during the Roundtables. This is one example of NOAA's work on the Justice 40 initiative, increasing equity in our services and working directly with the most underserved communities to understand and co-create responses to needs that they identify.

In January 2022, NOAA also participated in interagency Tribal consultations on subsistence fishing in Alaska. Subsistence fishing is an important way of life in Alaska and we look forward to continuing our conversation with Alaska Native leaders and finding new ways to partner with and address climate change impacts on the Alaska Yukon-Kuskokwim region.

Blue Carbon and Nature-Based Solutions

To counter the threat of climate change, we are also investing in understanding, protecting, and restoring coastal blue carbon ecosystems such as seagrasses, mangroves, and salt marshes. These ecosystems offer multiple co-benefits for adaptation, mitigation, and ecosystem services such as providing fish habitat and supporting recreational and commercial fisheries. Coastal blue carbon habitats have been shown to sequester up to ten times as much carbon per equivalent area as tropical forests[15], making them some of the most efficient natural carbon sinks in the world. However, they cover a relatively small portion (<1%) of the Earth's surface. In the United States, it is estimated that coastal blue carbon habitats sequester a net quantity of 4.8 million metric tons (MMT) of carbon dioxide annually, which represents less than 0.1% of the total annual U.S. carbon dioxide emissions of 5,000 MMT/year.[16] Some countries already include blue carbon ecosystems in their Nationally Determined Contributions as mitigation and/or adaptation measures, offering the potential for a common language and a suite of approaches to international monitoring and evaluation of methods. For countries with large areas of blue carbon habitat, such as the U.S., conservation and restoration can offer an efficient means to offset greenhouse gas (GHG) emissions, and provide a pathway for climate finance.

The Biden-Harris Administration's *Conserving and Restoring America the Beautiful* report outlines specific goals and principles to address climate change, the disappearance of nature (both natural areas and biodiversity), and inequitable access to the outdoors. One specific recommendation in the report is to expand the National Marine Sanctuary System and the

[15] Mcleod, Elizabeth, et al. "A Blueprint for Blue Carbon: Toward an Improved Understanding of the Role of Vegetated Coastal Habitats in Sequestering Co 2." *Frontiers in Ecology and the Environment*, vol. 9, no. 10, 2011, pp. 552–560., https://doi.org/10.1890/110004.

[16] U.S. EPA's Inventory of Greenhouse Gas Emissions and Sinks: 1990-2019 (Chapter 6 Land Use, Land-Use Change, and Forestry)

National Estuarine Research Reserve System as a valuable existing tool to meet those goals. These protected areas provide a long-term legal and management framework for conservation and restoration of blue carbon habitats, as well as serve as focal points for research, education, and community engagement. In addition to expanding the systems and their funding, we are working with our partners to pioneer methods for quantifying coastal blue carbon within the network of coastal sites. Our actions aim to ensure that carbon will continue to be sequestered and stored carbon will not be released by trawling, mining, or oil and gas extraction.

We also support the integration of coastal wetlands data in our national Inventory of U.S. Greenhouse Gas Emissions and Sinks, produced by the Environmental Protection Agency (EPA), and provide technical support for individual states that are actively working to include blue carbon ecosystems within their own greenhouse gas inventories. This experience has positioned NOAA to share this foundational information nationally and internationally through capacity building activities, including a recently established partnership between NOAA and the U.S. Department of State. Through this new Blue Carbon Inventory (BCI) Project, NOAA is working with partners to provide technical guidance to countries as they strive to include coastal wetlands in their own greenhouse gas inventories and reflect the value of these ecosystems in their coastal planning and management. Through these partnerships, NOAA is helping to enhance the sustainable management of coastal habits, and the realization of their multiple benefits for adaptation, mitigation, and ecosystem services. We are also investigating the efficacy and tradeoffs of carbon dioxide removal technologies and how NOAA's mission, products, and services can help catalyze the work of our federal, nonprofit, and private partners already underway.

We are funding nature-based and climate adaptive infrastructure projects, such as our floating pier in Alaska, that provide resilience for communities, as well as numerous ancillary co-benefits. In 2022, IIJA provides $200 million for NOAA coastal grant programs, including to restore coastal habitats and ecological features that protect coastal communities from flooding and coastal storms as well as assess and remove marine debris.

NOAA is playing a critical role in the development of a report to the National Climate Task Force identifying key opportunities for greater deployment of nature-based solutions across the federal government, including through potential policy, guidance, and program changes as outlined in President Biden's Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies. We know that there are proven ways that nature can help. Protecting coastal communities from storms, waves, flooding, and erosion can also protect biodiversity and provide ecosystem services that support livelihoods, culture, food security, water quality, recreation, and tourism. Through this report, NOAA will identify ways that more support can be given to these effective solutions.

The many observations, products, and services that NOAA continues to expand and improve upon are complemented by our invaluable work on place-based engagement, service delivery, and the co-creation of knowledge. Not only does NOAA continue to expand its ocean and climate information, we also strive to empower communities to make informed decisions using the best available science, including Traditional Ecological Knowledge and Indigenous Knowledge (TEK/IK), and support tools. Ensuring that NOAA's products and services continue to address the needs of our nation, and are iteratively refined in collaboration with our diverse stakeholders and our government-to-government relationship with Tribes, is key to sustaining our mission and building our New Blue Economy from the ground up.

International Engagement

In addition to NOAA's domestic climate science, service and stewardship mandate, our mission and climate engagement extends beyond the political boundaries of the United States to many of the countries and communities that depend on the ocean. For decades, NOAA has provided a broad range of tools and information to our international partners to reduce disaster risk; build resilience to/in a changing climate; support decision-making to better prepare for and adapt to weather, water and climate extreme events; and understand the ecosystem impacts of climate change such as coral bleaching, ocean acidification, and shifting resource populations such as fish stocks.

NOAA's interest in international climate information systems extends from providing accessible and timely climate data to its application for management, decision-making and adaptation purposes. NOAA collects and makes available an extensive array of space-based and in situ Earth observation data and information that are essential for climate scientists and decision makers around the world. Additionally, NOAA participates in, and often leads, international data sharing arrangements that ensure these streams of information are global in scope and availability. NOAA provides expertise and leadership to climate assessments such as the annual State of the Climate report and Intergovernmental Panel on Climate Change as well leadership at multilateral organizations related to weather, water and climate, such as the World Meteorological Organization.

NOAA's applied climate information systems efforts includes work with the Local2030 Islands Network, a global network of islands focused on climate resilience and sustainability. NOAA provides climate data and additional support to islands for building Communities of Practice and Data Dashboards related to resilience. NOAA also supports the Weather Ready Nations Program, which enhances the linkages between the National Meteorological and Hydrological Services (NMHS) and disaster managers and planners. This work highlights NOAA's vested interest in providing accurate and useful climate data and products while also supporting the development of in-country climate information systems capabilities. These and other efforts underpin NOAA's engagement as one of the five core implementing agencies for the President's Emergency Plan for Adaptation and Resilience, or PREPARE. Through this plan, NOAA will

enhance its support for developing countries and communities in vulnerable situations around the world as they adapt to and manage the impacts of climate change.

CONCLUSION

NOAA's work to assess, understand, and predict the ocean and its role in climate and share this knowledge, as well as its efforts to build resilience and mitigate climate change, is critical to the people in the United States and around the world. NOAA, as an authoritative source of climate information, is working with other federal agencies, state and local government leaders, Indigenous communities, private businesses, international partners, and the public, so that together we can bolster adaptation and boost resilience to the impacts of climate change and build a climate ready nation.