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**ON THE
ADVANCING EARTH SYSTEM SCIENCE AND STEWARDSHIP AT NOAA**

**BEFORE THE
HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENVIRONMENT**

September 23, 2021

Chairwoman Sherrill, Ranking Member Bice, and Members of the Subcommittee, thank you for the opportunity to testify today regarding my priorities for the National Oceanic and Atmospheric Administration (NOAA).

One week from today marks my 100th day as Administrator of NOAA. This happens to be my third tour of duty at NOAA - previously, I served as Chief Scientist during the Obama Administration, and a few years before that, I led our Office of Oceanic and Atmospheric Research and the National Ocean Service. In my first 100 days as Administrator, I can tell you that the urgency with which NOAA is working to address our Nation's most pressing challenges is like never before. From combatting the climate crisis and bolstering the equitable development and delivery of climate science and services; reinforcing scientific integrity and rebuilding our scientific workforce; ensuring our agency is diverse, equitable, inclusive, and accessible; to promoting economic development while maintaining environmental stewardship - the NOAA workforce has been firing on all cylinders to meet the increasing demands of our mission.

That mission is science, service, and stewardship -- to understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources. As NOAA Administrator, I would like to share with you my main priorities in pursuit of this mission, and in alignment with the goals of the Biden-Harris Administration.

The first pillar of that mission - our science - is at the core of our agency and serves as the foundation for smart policy and decision-making. From the depths of the ocean to the surface of the sun, we are observing, measuring, monitoring, and collecting data, and turning those publicly-available data into earth system models, information, tools, and forecasts for public use. NOAA's trusted data are the basis for your weekend weather forecast that you can access on your phone with a press of a button; they provide your constituents with forecasts and warnings for harmful algal blooms; feed into our models that predict the movement of wildfire smoke in real-time; and identify impacts of climate change on fisheries and living marine resources to improve management. It is essential that NOAA's data and information adhere to

the principles of scientific integrity in order to maintain our trusted status and issue our life-saving weather forecasts and warnings as well as our climate predictions and projections. The Biden-Harris Administration has made upholding scientific integrity as a main priority, and I have already taken steps to ensure NOAA not only meets, but exceeds, those expectations, including by requiring all NOAA political appointees to complete scientific integrity training.

The second pillar of our mission is service, and as Administrator, I have made it one of my top priorities to expand upon NOAA's authoritative climate products and services that can be applied to a diverse range of missions. We play a unique role in that not only do we collect data and conduct research, but we are mandated to make it operational - research to operations, applications, and commercialization, or R2X as it is known in the scientific community. The operations part means that we must provide the public and our Federal, state, tribal, and private sector partners with actionable environmental information in order to make decisions in the face of climate change. These decisions can range from businesses planning where to locate their next offices; municipalities looking to ensure their plans for construction of new housing developments will be resilient to increasing sea level rise, flooding, and heavy precipitation; large insurance companies seeking to incorporate climate risk into their insurance policies; or a resident of New Orleans wondering if they should rebuild or relocate after the latest hurricane. My vision is that people will know they can turn to NOAA for reliable, accurate, accessible, relevant, easy-to-use climate information for planning, adaptation, and resilience decisions and actions. And we are seeing increasing demands for this kind of information. As demonstrated by the record-setting summer of extreme heat, exceptional drought, raging wildfires, unprecedented floods, disastrous hurricanes, and other extreme weather events, the climate crisis is upon us and requires a whole-of-government response. At NOAA, we are responding to the Administration's call to action to work across the Federal government to prepare for, adapt to, and build resilience against this crisis in myriad ways, working collaboratively with our sister agencies.

The third pillar of our mission is stewardship. Stewardship means that we conserve our lands, waters, and natural resources, protecting people and the environment now and for generations to come. NOAA sits within the Department of Commerce, and therefore, it is our responsibility to promote economic development without sacrificing environmental stewardship. The two are not mutually exclusive; in fact, they can go hand in hand. Through our stewardship, we create jobs and opportunities for sustainable economic growth and innovation. For example, each national marine sanctuary is a significant driver of eco-tourism and local recreation; the new Civilian Climate Corps will provide training and well-paying, quality jobs for the next generation of climate-ready workers; the National Coastal Resilience Fund provides funding for projects that enhance fish and wildlife habitats and increase protection for coastal communities, which leads to job creation in communities across the country and protection of critical infrastructure. This aligns well with another of my top priorities to advance what is now called the new blue economy, which I define as the knowledge-based ocean economy - looking to the ocean for data, information, and knowledge that can be applied to new, sustainable business development, products, and services that support offshore wind, transportation, shipping, exploration, recreation, fisheries, aquaculture, tourism, and other new and traditional ocean-based sectors. The new blue economy offers opportunities for sustainable, climate-smart innovation and economic growth based on sound science.

Essential to fully realizing NOAA's mission, is integrating equity into everything we do at NOAA, from development of new products to delivery to all - including the most vulnerable - communities. I have made equity a central focus to ensure that equity is not *something* we do, but rather embedded in *everything* we do. Doing so will better position NOAA to help tackle the climate crisis, produce better science, deliver better services, be better stewards of the environment and the economy, and build a more inclusive workforce.

Making my vision for NOAA a reality requires significant investment in our critical infrastructure. To conduct more cutting edge research and transition into operations, expand our delivery of authoritative climate information and services, mitigate and adapt to the climate crisis, strengthen ecosystem and community resilience, meet the Administration's offshore wind goals, improve upon our world-class weather and climate models - we must scale up our core systems that are the backbone of this crucial work. Investments in research and R2X, observational infrastructure such as the NOAA fleet and satellites, high performance computing, ocean observations, laboratories, aircraft, and uncrewed systems, are essential to meeting our mission and this moment. NOAA's FY2022 budget request includes these important investments that will enable us to better serve *all* Americans through our science, service, and stewardship.

Scientific integrity

As mentioned, a major priority of the Biden-Harris Administration as well as NOAA is Scientific Integrity. When I served as NOAA's Chief Scientist, I co-authored the agency's first Scientific Integrity policy. At the time and to this day, our policy is viewed as a model for the Federal Government. But as we've learned, even with a model policy in place, scientific integrity can still be threatened. We must stay vigilant to ensure its principles - to promote a continuing culture of scientific excellence and integrity, and ensure that management and policy decisions are based on sound, transparent, and reliable scientific activities - are upheld. And there must be consequences if policies are violated. This Administration has made it clear that we must affirm and reinforce the value of science and scientific integrity, and to that end, I directed my political staff to undertake the Department of Commerce's Scientific Integrity training, to which they complied in August 2021.

Scientific workforce

Integral to maintaining a high standard for our science is our scientific workforce. As this Committee found in the March 2021 staff report titled, "Brain Drain: Quantifying the Decline of the Federal Scientific Workforce," over the past decade, while some Federal science agencies have greatly increased staffing, there has been an alarming decline in employment at others.¹ At NOAA, our workforce declined by 8.6% from FY 2009-2020, and our STEM workforce in particular was 1.6 % smaller in 2020 than it was at the end of the previous decade.² The report also found that racial, ethnic, and gender gaps in our STEM workforce are pervasive and pernicious. This is unacceptable to me and I am committed to reversing these alarming trends. I know that in order to maintain, and grow, our status as a preeminent science agency and global leader in climate science and services, the agency must attract and retain a

¹ House Committee on Science, Space, and Technology, Majority Staff. [Scientific Brain Drain: Quantifying the Decline of the Federal Science Workforce](#). Mar. 2021.

² Ibid.

diverse STEM and overall workforce. To be the leader in providing mission-agnostic climate products and services, NOAA must look like the communities we seek to serve and reflect the great diversity of the American public.

To recruit and retain the workforce necessary to achieving our mission and fulfilling this Administration's priorities, we must ensure that NOAA's culture is inclusive. Employees must feel a sense of belonging or we risk further "brain drain." To that end, we are working hard to create a culture of diversity, equity, inclusion, and accessibility (DEIA). In July, we held the inaugural We Are NOAA Week, a week that examined the challenges, progress, and opportunities for advancing DEIA at NOAA. During this week, I participated in a conversation with our twelve Employee Resource Groups and NOAA leadership, where I heard feedback and ideas from employees on how to advance DEIA at NOAA and made a commitment to incorporate their recommendations and engage more regularly with the workforce.

In accordance with EO 13985 on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, earlier this summer we completed Service Equity Assessments to better understand barriers to access for underserved communities to some of our programs, and are working to incorporate the findings made in those reports.³ We are currently undertaking a self-assessment on the status of DEIA within the agency's workforce as directed by EO 14035 on Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce.⁴ In addition, we have been holding a series of Climate and Equity Roundtables in various regions across the country, where we hear from local stakeholders in underserved communities that are vulnerable to climate change about how NOAA can better serve their needs. These are just a few examples of the ongoing efforts to better integrate equity at NOAA, both internally within our workforce, and externally in the work we do to serve communities. My goal is that these efforts will improve NOAA's culture and enable us to foster a more diverse and inclusive STEM and overall workforce that will continue to grow into the next decade.

Climate science and services

One of my top priorities is to expand upon NOAA's authoritative climate products and services that can be applied to a diverse range of missions. For this reason, I announced on July 21 the creation of a new NOAA Climate Council (NCC), which will leverage and coordinate our resources and expertise to strengthen the delivery of NOAA's climate products and services. The NCC is already working to ensure that our critical climate information and services are delivered effectively and equitably. These information and services are needed more than ever before, as communities across the country are increasingly grappling with the impacts of climate change as evidenced by a summer of record extremes. July 2021 was the world's hottest month ever recorded, and 2021 is likely to be among the world's 10 warmest years on record, according to NOAA's National Centers for Environmental Information (NCEI).⁵ The 2020 State of the Climate report, led by NCEI and published by the American Meteorological Society in August 2021, found that greenhouse gas levels and global

³ [E.O. 13985](#), Jan 20, 2021.

⁴ [E.O. 14035](#), Jun 25, 2021.

⁵ <https://www.ncei.noaa.gov/news/global-climate-202107>

temperatures reached record highs in 2020; the number of tropical cyclones was well above average; ocean heat content was record-setting; and other alarming indicators of climate change are already underway, consistent with an increasingly warmer earth.⁶ NOAA reported that in 2020, the U.S. experienced an unprecedented 22 separate billion-dollar disasters that killed at least 262 people - wildfires, drought and heatwave events, tornado outbreaks, hurricanes, hail storms, and more.⁷ And so far, we are on track for another record-setting year of costly disasters.

Every Federal agency looking to understand the impacts of climate change on their mission, starts first with NOAA's authoritative data. Beyond just providing data, NOAA convenes and works directly with other Federal science agencies to produce climate science and to support the agencies who need to use our science within their missions. Under the Congressionally-mandated U.S. Global Change Research Program (USGCRP), NOAA works with the other twelve USGCRP member agencies and co-leads multiple interagency working groups focused on global climate change and climate science, adaptation and resilience, international collaboration, climate and human health, sustained assessments, and the social sciences of climate and global change.

NOAA's science has made it clear: climate change is already devastating our communities, and we must prepare ourselves for the unavoidable impacts to come. To enable communities to better prepare for, respond to, and recover from increasing extreme weather and climate events, NOAA has requested an additional \$855.1 million over enacted levels which will bolster climate research, expand our local and regional decision-support services, products, and tools, and help our most vulnerable communities build resilience. With more resources, we will be able to improve upon and increase the critical delivery of our trusted global-scale climate information to communities that need it to plan for the future. For example, NOAA's Regional Integrated Sciences and Assessments (RISA) program will expand to reach more communities across the country, especially the vulnerable, and work with them to create and implement climate resilience plans. We will engage with tribes and local indigenous groups to co-develop knowledge and co-manage resources. The National Sea Grant College Program will work with more coastal communities to help them better understand their climate risks and develop decision-support tools. These are just a few examples of my plans to expand the reach of our climate products and services and get them to the communities that need them the most. NOAA has the authoritative data, knowledge, expertise, and tools needed to adapt to, mitigate, and build resilience against climate change, and with additional resources, we can make them more accessible, more usable, and more widely available to help meet decision-making needs in communities.

Research, observations, and forecasting

Fundamental to my vision of expanding NOAA's authoritative climate products and services is our research, observations, and forecasting. Our research enables us to understand current and projected changes in our climate and is the foundation of our products and tools. In our budget request, we are asking for an increase of \$149.3 million to improve our understanding of climate change across timescales - weeks, years, decades, centuries - and use this information

⁶ [State of the Climate in 2020](#). Aug, 2021.

⁷ <https://www.noaa.gov/stories/record-number-of-billion-dollar-disasters-struck-us-in-2020>

to improve climate predictions and projections as well as our understanding of the impacts of climate change. We will research the interactions between ocean and climate in order to better understand and project sea level rise, coastal inundation, precipitation, sea ice, and other indicators. We will work across NOAA and with our academic partners to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts using our Unified Forecast System (UFS). We will work with our agency partners, such as NASA and the National Science Foundation, to enhance our understanding of the coupled earth system which will in turn inform adaptation and management decisions. Our research also serves to inform other Federal agencies about their own climate risks.

Observations and forecasting are essential to measuring and predicting climate change, and there is an increasing demand for NOAA's actionable environmental data. A network of satellites, aircraft, radar, buoys, surface systems, atmospheric sampling stations, uncrewed systems, ships and more are continuously collecting data that we archive, integrate into models and tools, and provide to the public, other Federal agencies, and academic and private sector partners. To meet the growing need for our data, NOAA has proposed a \$368.2 million increase which will enable us to continue to invest in our observational network. We will continue to track weather, climate, and other environmental conditions and store this information in our publicly-available records. Our records serve as the baseline against which we measure climate and environmental changes. We will also continue to support and maintain our ocean and atmospheric observation systems, which feed into our essential operational weather, climate, and marine forecasts and services.

To improve our climate and weather forecasting and facilitate collaboration between NOAA and the academic and private sector weather forecasting community, we awarded a contract in April to design and build the Earth Prediction Innovation Center (EPIC). EPIC will help us accelerate improvements to our operational weather and climate forecasting, which will in turn strengthen our unified, Earth system models, weather and climate services, and improve our decision-support tools. The transition of our research, observations, and forecasts into operations continues to be a priority. For example, we recently transitioned two Harmful Algal Bloom (HAB) forecasts into operations, which will inform Florida and Texas coastal residents about where and when red tide might impact their beaches, and give Lake Erie residents an early outlook of a bloom's likely severity. The delivery of our HAB forecasts is an example of a key service we provide that enables local planners, the public, and other stakeholders to make informed decisions about, in this case, when to plan beach outings and other outdoor activities. We will continue to work to ensure that our weather and climate research, observations, and forecasts are transitioned into tools, products, and services that are disseminated to all communities, working with local partners to ensure information is equitably distributed and helps people make informed decisions.

Climate adaptation and resilience

As the ocean and climate experience unprecedented warming, the Nation continues to deal with increasingly frequent and severe extreme weather events. Coastal and inland communities alike need more tailored forecasts and products to make decisions, which rely on improving our understanding of the ocean-climate nexus. This improved understanding will lead to more opportunities for NOAA, our Federal partners, and the private sector to create new products that will enable communities and businesses to adapt to climate change.

Sea level rise, hurricanes, HABs, flooding, and other ocean-related climate risks threaten people and infrastructure. Many of the impacts of these threats can vary significantly depending on the geography and environmental conditions in a place, and therefore local planners need hyper-localized climate information specific to their community. The demand for this information is already creating new opportunities for innovation, both within NOAA, between NOAA and other Federal agencies, and in the private sector. For example, NOAA’s Sea Level Rise Viewer is a web mapping tool that visualizes community impacts from sea level rise and coastal flooding, informing local planning decisions. The joint NOAA and BOEM OceanReports is a new web-based marine spatial planning tool that can analyze any U.S. ocean “neighborhood” and inform decision-making and planning for offshore energy, climate resilience, and conservation efforts. NOAA supports and coordinates with FEMA and other federal agencies, who use and provide flood data information products and services to support local decision-making; for example, FEMA’s National Flood Hazard Layer enables communities to better understand their level of flood risk and type of flooding. First Street Foundation leverages NOAA’s data to create property-level flood risk mapping tools to inform individuals and communities about the risks to their properties and livelihoods from rain, riverine, tidal events, and storm surge.⁸ Tailored climate information products, based on ocean and climate data, are emerging as a major market within the new blue economy.

I recognize that communities that are most vulnerable to climate change and least well-resourced need additional support to prepare for and respond to sea level rise, hurricanes, flooding, and other extreme events. To ensure communities can access and utilize our climate risk tools and adequately prepare for increasing extreme weather events, NOAA has requested \$57.9 million in FY 2022 to better integrate equity and environmental justice into our activities and service delivery. These resources will enable us to better respond to the needs of vulnerable and historically underserved communities, including implementing recommendations from our Service Equity Assessments to remove barriers to access to our services, providing Spanish language translations of our Sea Level Rise Viewer and other decision-support tools, and increasing recruitment and hiring of a diverse workforce so we can reflect the communities we seek to serve. We will expand our work to ensure that the most vulnerable communities are included in our resilience efforts and can reap the benefits of the new blue economy.

New blue economy

Advancing the new blue economy is another main priority of mine. This means leveraging the data, information, and knowledge that we derive from the ocean, and applying it to sustainable economic development. The new blue economy is being centrally driven by data about the status and trends of the ocean environment, and NOAA is, and will continue, to play a leading role in the collection and provision of this data.

The new blue economy presents us with opportunities to create innovative new climate-smart

⁸ <https://www.floodfactor.com/about>

products, services, and businesses in traditional and novel blue economy sectors. To meet the moment and our mission, NOAA must continue to collect diverse sets of data, provide quality assurance and control, and ensure the data is accessible. The commercial sector will continue to utilize our open data, and make innovations that will lead to new products and services. As the climate and ocean continue to change, the demand for products and services that are adaptable to changing conditions will continue to grow. This demand underscores the need for improvements in technology for measuring, modeling, and predicting the ocean - our FY 2022 budget request will enable NOAA to address these challenges and make necessary improvements.

Ocean exploration

Understanding our ocean, its relationship to climate, and improving our dissemination of ocean data and information requires observations, measurements, and modeling. Underpinning our models, products, and services that predict changes in our whole Earth system is quality, reliable data on past and present ocean conditions. Our ocean is changing at an unprecedented rate and much of the ocean remains largely unexplored and not well-understood. To improve our weather and climate predictions, we must improve our understanding and knowledge of the ocean, which requires us to collect more data and information through ocean exploration, observation, and mapping. In fact, NOAA's participation in the UN Decade of Ocean Science for Sustainable Development (2021-2030) promotes cooperative research and data sharing to improve the global understanding of the ocean and its effects on our climate and on the global community. Ocean exploration, observation, and mapping data will enable us to provide better products and services, and to advance the new blue economy by providing needed information to industries such as transportation, aquaculture, tourism, energy, and others. Ocean science is a prerequisite for sustainable blue economy development, and improving our knowledge of the ocean by doing more exploration, data collection, and mapping will improve our climate products and services and create more opportunities for economic development and innovation.

Offshore wind

The Biden-Harris Administration has set the goal of deploying 30 gigawatts (GW) of offshore wind energy by 2030, and we are working to advance that goal. The proliferation of the offshore wind sector is a prime example of how the new blue economy offers opportunities for sustainable business development, and a place where NOAA can promote economic development while maintaining environmental stewardship. The installation and deployment of offshore wind requires data and information about the conditions of the ocean and how they will change over time. It also requires a scientific understanding of protected resources, fisheries, and habitats to minimize impacts from wind siting to our trust resources and the communities that rely upon them. NOAA's knowledge of the ocean and marine resources, our observations, and forecasts play an important role in achieving the Administration's offshore wind goal. In FY 2022, NOAA has requested \$20.4 million which will support interagency coordination, scientific assessments and guidance, environmental and marine resource assessments, and development of new fisheries survey methods, to achieve the goal of 30 GW by 2030. As the offshore wind energy industry continues to grow, and as the renewable energy market expands, NOAA will continue to leverage our scientific information while ensuring we continue to protect marine resources and fisheries. These activities are essential to facilitating offshore wind energy development as a climate change mitigation strategy while protecting communities, setting quotas for commercial and recreational fishermen, and monitoring and

assessing the recovery and conservation programs for protected species and essential fish habitat.

Space weather

Space weather events pose a major risk to the economy, communications, and national security, and therefore must be observed and forecasted. The Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act (PROSWIFT) authorizes agencies to develop formal structures to transition space weather research to NOAA. The Space Weather Operations, Research, and Mitigation (SWORM) Interagency Working Group identified the need for space weather R2O2R (research-to-operations-to-research), and we are working to close the gap in our ability to improve space weather forecasting and warning services. NOAA has requested \$5 million in FY 2022 to accelerate our space weather predictions and ensure we are prepared for a future space weather event. Space weather is a critical component of our research, observations, and forecasting that enables us to meet our mission and provide critical information and services to the public.

Federal collaboration

Interagency Working Groups

Through EO 14008 on Tackling the Climate Crisis at Home and Abroad, the President created the National Climate Task Force to coordinate the whole-of-government response to the climate crisis.⁹ The Task Force recently announced the creation of five interagency working groups (IWG) to support communities in developing resilience strategies to address the risks of drought, wildfires, extreme heat, coastal hazards, and floods. NOAA is involved in each of these efforts and has a leadership role in two of them. CEQ Chair Mallory and I are co-chairs of the Coastal Resilience IWG, and EPA Administrator Regan and Health and Human Services Secretary Becerra and I are co-chairs of the Extreme Heat IWG. Through these IWGs, we are focusing on coordinating across the government and developing strategies to reduce the devastating impacts of these climate-related hazards on communities, particularly those most vulnerable and least well-resourced.

Other Federal collaboration mechanisms

EO 14008 also directed us to work with FEMA and the Office of Science and Technology (OSTP) policy to produce a report on “ways to expand and improve climate forecast capabilities and information products for the public.”¹⁰ We are also involved in the development of a report on “the potential development of a consolidated Federal geographic mapping service that can facilitate public access to climate-related information that will assist Federal, State, local, and Tribal governments in climate planning and resilience activities.”¹¹ Both of these reports are underway and expected to be delivered to the Climate Task Force in short order. These efforts won’t end with the delivery of the reports; once complete, I have directed my staff to move towards implementing the findings and recommendations. I view this effort as one of many key steps in achieving my vision to expand NOAA’s authoritative, equitably-delivered climate products and services.

⁹ [E.O. 14008](#). Jan 27, 2021.

¹⁰ [E.O. 14008](#). Jan 27, 2021.

¹¹ *Ibid.*

NOAA collaborates with other Federal agencies on climate through mechanisms such as the USGCRP, where we co-lead the development of the National Climate Assessment. We also co-chair with OSTP the Interagency Council for Advancing Meteorological Services (ICAMS), which convenes Federal science and stakeholder agencies and departments - NASA, NSF, FEMA, others - to coordinate and advance Federal meteorological activities. ICAMS is a historic modernization of Federal coordination on meteorological activities to advance our services and ensure U.S. global leadership. Together with USGCRP - it presents a systemic, whole-of-government opportunity for strategic collaboration to ensure that all Americans have access to the information and services they need to prepare for, respond to, and adapt to climate change and increasing extreme weather events.

Conclusion

In my first 100 days as NOAA Administrator, we have made great strides in implementing Administration priorities, including: working to expand NOAA's authoritative climate products and services, reinforcing scientific integrity and building a diverse and inclusive workforce, advancing the new blue economy, and ensuring equity is central to everything we do. We still have much work to do, and I am hopeful that through our FY 2022 budget request, we will be able to make substantial investments in NOAA's science, service, and stewardship and bolster our development and delivery of climate information and services. We are at a critical juncture in our fight against the climate crisis, and the need for actionable, authoritative weather and climate information, tools, and services is greater than ever before. NOAA is well-poised to help meet these needs, and support our communities as they prepare for, respond to, mitigate, and adapt to climate change.