United States Senate
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
WASHINGTON, DC 20510–6125
WEBSITE: https://commerce.senate.gov

July 21, 2025

The Honorable Donald J. Trump
The White House
1600 Pennsylvania Avenue, N.W.
Washington, DC 20500

Dear Mr. President,

Communities across the United States are experiencing more frequent, intense, and costly flash floods, hurricanes, tornadoes, atmospheric rivers, landslides, heatwaves, and wildfires. The lessons from Kerrville, Palisades, Asheville, Lahaina, and too many other natural disasters are that providing Americans with more timely and accurate weather information can avoid billions in property losses and save lives. We have a once-in-a-lifetime opportunity to create the world's best weather forecasting system that would provide Americans with much more detailed and customized alerts days instead of minutes ahead of a looming extreme weather event.

There is strong support for making the generational investments necessary to become a weather ready nation that will empower Americans to get out of harm's way. It will take better weather data collection, world leading analytics, cutting edge research, modernizing alert systems, and a partnership between your Administration and Congress to pass enabling legislation. To that end, I offer the following five recommendations that if pursued on a bipartisan basis would make America the world leader in weather forecasting:

1) Modernizing Weather Data Collection

We need to compile more data by land, air, space, and sea by modernizing our weather data collection tools, including better radar, hurricane hunters, weather satellites, and ocean buoys

Radar: Upgrading the nation's aging Doppler radar network will enable meteorologists to deliver more accurate forecasts and provide longer warning lead times. It does this with higher resolution data from phased array radar (PAR) to "see" into the storm in ways not visible on current radar. PAR can detect rapid changes in storms like tornado formation or microbursts, improve tracking of hazards like hail, and zoom in on the most dangerous features of extreme weather. These systems can also scan the atmosphere in under a minute, six times faster than current radar, detecting rapid changes in the storm for increased warning lead times and fewer false alarms.

This new technology should replace the current analog Doppler radar systems from the 1980s, which are increasingly costly to maintain and risks failure every day. NOAA is planning to replace the current outdated Doppler network but lacks the resources necessary to develop the best radar technology and infrastructure at the pace we need them to.

Hurricane Hunter Aircraft: NOAA studies have found that including data collected by the Hurricane Hunters improved forecast accuracy by at least 10 to 15 percent. However, NOAA needs to rebuild its Hurricane Hunter aircraft fleet by replacing the current WP-3D Hurricane Hunter aircraft that have been in service since the 1970s and will be decommissioned by 2030. New C-130 Hurricane Hunter aircraft are more capable than the half-century old WP-3D aircraft, with the ability to deploy more drones and uncrewed systems, conduct higher resolution scans from more advanced radar, and provide highly accurate wind, temperature, pressure, and humidity measurements from additional sensors.

NOAA's 2022 Aircraft Plan calls for four new C-130 aircraft to meet this mission, and the bipartisan National Defense Authorization Act for Fiscal Year 2023 (P.L. 117-263, § 11708(b)) included authorization for up to six new aircraft. While two C-130 aircraft are funded, completing the fleet modernization in fiscal year 2026 will ensure forecasters can utilize this irreplaceable data source to better predict the path and intensity of hurricanes headed toward the United States, which is crucial for first responders to inform evacuations and pre-position emergency resources.

Weather Satellites: NOAA's satellites are its "eyes in the sky" that stay locked in place above the United States and give scientists continuous data on storms as they develop. NOAA needs to expand these capabilities with the next generation of weather satellites, the Geostationary Extended Observations (GeoXO) satellite system. Once launched, GeoXO can track lightning strikes that start wildfires, wildfire smoke, red tides that poison fisheries, and generally provide better extreme weather early warning capabilities. For example, if GeoXO had been deployed during the 2023 Canadian wildfire smoke event that blanketed much of the eastern United States, its instruments could have provided hourly, high-resolution maps of smoke pollution, enabling more accurate health advisories and allowing schools, airlines, and outdoor workers to make safer decisions. This year, smoke from massive Canadian wildfires is again posing health risks to Americans across the country. This is new technology that does not exist in today's satellite system.

To get these next generation satellites built, NOAA must proceed with the recommendations laid out under your first Administration and build the planned network of six satellites, five instruments, and supporting ground systems. The data from the Lightning Mapper (LMX), Sounder (GXS), Atmospheric Composition (ACX), Imager (GXI), and Ocean Color (OCX) instruments are key and necessary inputs for any world leading forecasting model.

Buoys and Ocean Data: NOAA's Integrated Ocean Observing System (IOOS) is a network of buoys, gliders, high frequency radar arrays, and other instruments that gather ocean data critical for weather forecasting, search and rescue, and navigation. The IOOS network provides real-time surface and subsurface ocean temperature measurements that feed into NOAA's hurricane forecast model to detect rapid intensification of hurricanes and other extreme storms.

For example, the above average warm water in the Gulf contributed to the recent flash flooding in Central Texas, while changes to tropical weather patterns and ocean temperatures have contributed to flooding across the country, from the Southwest through the Mid-Atlantic and into the Northeast. Just halfway through the summer, according to the National Weather Service, the country has already experienced twice as many floods in July as usual.

To preserve and expand the critical real-time data these buoys provide, we need to modernize and recapitalize aging infrastructure and better integrate ocean data into our weather forecasting models. Enacting the Integrated Ocean Observation System Reauthorization Act of 2025 (S.2126), bipartisan legislation Senator Roger Wicker and I introduced, will help maintain and resource IOOS infrastructure and networks.

2) World Leading Analytics

Catching up with and surpassing European weather forecasting capabilities will require more supercomputing and improvements in data analytics

NOAA has long aimed to close the performance gap between its Global Forecast System (GFS) and the European Centre for Medium-Range Weather Forecasts, which often outperforms U.S. forecasts. For example, in October 2012, the European model correctly predicted Hurricane Sandy would turn toward the U.S. East Coast seven to eight days in advance, while the U.S. model initially forecast it would head out to sea, missing the U.S. entirely. Of course, Sandy did hit the U.S., with devastating effects for the entire Mid-Atlantic region, killing 254 people and causing nearly $70 billion in damages. Conversely, in 2015, the European model predicted Hurricane Joaquin would stay offshore, which it did, while the U.S. model forecast a direct hit on the East Coast, prompting costly emergency preparations that were ultimately unnecessary. And in February 2021, when a historic Arctic outbreak plunged Texas and much of the South into record cold with heavy snow and ice, and the European model provided more accurate early guidance on the extent and longevity of the cold air mass. According to NOAA and the Texas Department of State Health Services, at its peak, the power outages that resulted left nearly 10 million people in the cold and dark, unable to cook food, and resulted in more than 200 deaths.

In order to catch up to Europe's highly advanced weather modeling, NOAA needs to increase its focus and investment in supercomputing, data analytics, and data assimilation, a key technique in weather forecasting that combines real-world observations with a numerical weather model. We need to take steps to expand the GFS ensemble system with higher resolution and better physics, refine the Unified Forecast System, and streamline the path from research to operations with projects like the Earth Prediction Innovation Center (EPIC) to improve collaboration with external scientists and the private sector. All of this will require Congress to provide NOAA with more supercomputing resources if we are to lead the world in weather forecasting.

3) Cutting Edge Research

As our communities experience more frequent and extreme weather, now is the time to invest in additional cutting-edge basic and applied research

For decades, NOAA's Office of Oceanic and Atmospheric Research has supported next-generation science and technology that enables increasingly adept forecasting products and services that save lives from extreme weather events. While NOAA research only accounts for about 10 percent of the agency's funding, its work has far-reaching impacts including better flash flood and precipitation prediction, developing next generation hurricane models, and improving extreme heat planning scenarios. The research arm also operates testbeds where new technologies and models are rigorously evaluated before they are transitioned to NOAA operations or private sector applications.

The office also focuses on ways to better communicate extreme weather threats to the public. For example, NOAA's National Severe Storm Laboratory in Oklahoma is testing a new tornado and extreme weather early warning system. Even though it's still in the testing phase, in March the system provided Missouri communities two hours of lead time, allowing 120 people to seek shelter before a dangerous EF-3 tornado touched down. Current tornado warnings only give communities 13 minutes of warning on average.

4) Modernizing Alert Systems

We must strengthen and expand weather emergency communication channels to keep the public informed and help first responders prepare and react to natural disasters

Americans need more timely, relevant, and actionable information so they know when to get out of harm's way. Investments like upgrading NOAA's weather radio technology from obsolete copper technologies to Internet or satellite-based systems are vital to providing reliable and continuous weather and emergency alerts. Expanding NOAA's VHF broadcasts to reach rural areas that other systems do not reliably cover will provide irreplaceable hazard alerts for campers, tourists, hunters, and tribal members, as well as mining, forestry, and agriculture workers living in remote areas. Expanding current FEMA programs to build out local sirens and provide first responders with crucial flood maps and satellite images will also significantly enhance local disaster response capabilities.

However, no single alert technology should be considered sufficient in an emergency. We should augment both public and private alert communications and embrace multi-channel delivery systems to ensure messages reach users via their preferred platforms, whether that is through FM and AM radio, apps, websites, SMS, push notifications, television, or social media. The private sector can provide value-added information including more customized alerts and warnings, giving people additional ways to access critical and timely information.

5) Advancing Bipartisan Legislation

The bipartisan Weather Act Reauthorization Act of 2024 would strengthen weather research and forecasting and expand commercial data partnerships

A bipartisan bill Chairman Ted Cruz and I introduced last year, the Weather Act Reauthorization Act of 2024 (S. 5601) would modernize the essential research programs you signed into law in the 2017 Weather Act and establish new programs to advance forecasting, strengthen emergency preparedness, and support farmers and resource managers with better tools for agriculture and water management. The legislation also expands and codifies public-private partnerships to acquire and utilize innovative data sources, supporting efforts like the Commercial Data Program. Former House Science Chairman Frank Lucas and Ranking Member Zoe Lofgren introduced a bipartisan companion bill in the House (H.R. 3816) last month.

Now is the time to take the tough lessons learned in the wake of the recent natural disasters and human tragedies in places like Texas, North Carolina, and New Mexico and create the world's best weather prediction system. We must meet the moment or the situation is only going to get worse. The United States used to experience an average of nine extreme weather events every year that cost over $1 billion each, but in the last five years the number of disasters has spiked to an average of 23 per year, and last year it was 27 events. A recent comprehensive government study predicted that extreme weather will cost Americans $1.5 trillion over the next decade, not including loss of life or health-related costs. That's why the costs of making the once-in-a-lifetime smart investments described above are minuscule compared to savings that better weather forecasting will provide every American.

Sincerely,

Maria Cantwell
United State Senator