



Data for Climate Risk Assessment in Vulnerable Communities June 23, 2021: Webinar Transcript

On June 23, 2021, the nonprofit [Center for Open Data Enterprise](#) (CODE) co-hosted a public webinar on *Data for Climate Risk Assessment in Vulnerable Communities*. CODE co-hosted the Roundtable with the [National Oceanic and Atmospheric Administration](#) (NOAA), with support from the [Amazon Sustainability Data Initiative](#) and [Amazon Web Services](#). A full recording of the webinar is available [here](#), and CODE's Briefing Paper with background on this topic can be downloaded [here](#). The following transcript has been edited slightly for clarity and continuity.

CODE welcomes inquiries and opportunities for collaboration at contact@odenterprise.org. For more information about CODE, please visit www.OpenDataEnterprise.org.

INTRODUCTION

Joel Gurin: Greetings everyone! And welcome to the webinar on *Data for Climate Risk Assessment in Vulnerable Communities*. This webinar is being co-hosted by the [National Oceanic and Atmospheric Administration](#), or NOAA, and the nonprofit [Center for Open Data Enterprise](#) known as CODE.

I'm Joel Gurin and I'm the President of CODE. We are an independent nonprofit organization here in Washington whose mission is to maximize the value of open and shared data for the public good. We are excited to be collaborating with NOAA to bring you this webinar today and very pleased to see such great turnout.

Today's webinar will be followed by a roundtable tomorrow on data for climate risk assessment, also co-hosted by NOAA. Our work with NOAA is the latest of many projects that CODE has conducted with the White House and a wide range of Federal agencies since we were founded in 2015. Webinars and roundtables like these help address critical gaps between data users and data providers and help everyone collaborate to use data to solve public problems.

In addition to our webinars and roundtables, CODE publishes research reports with insights, best practices, and recommendations on utilizing data for public good. We also develop resources for the U.S. and international data community including several websites and online tools. You can visit our website at OpenDataEnterprise.org to find more information and read our latest reports.

CODE would also like to thank our partners at Amazon for their support of our work on this webinar, tomorrow's roundtable, and our related reports on this project. The [Amazon Sustainability Data Initiative](#) (ASDI) seeks to accelerate sustainability research and innovation by minimizing the cost and time required to acquire and analyze large sustainability datasets. They support innovators and researchers with the data, tools, and technical expertise they need to move sustainability to the next level.

Our other Amazon partner, [Amazon Web Services](#), provides a reliable, scalable, low-cost infrastructure platform in the cloud that powers hundreds of thousands of businesses in 190 countries around the world and that is helping to make climate-related data available worldwide. You will hear from our Amazon partners later in this program.

Today's webinar is part of a project to help governments and local communities use data from a wide range of sources to assess their risks from climate change. Understanding those risks is the first step to becoming more climate-resilient, and data is the key to that understanding.

We are going to hear today about using data to gauge the risks of climate hazards like hurricanes and wildfires and to look at social and other factors that may make communities especially vulnerable to those risks. And we will look at these issues from the perspective of the Federal government, local leaders, and the private sector.

We have an outstanding lineup of speakers today. We will have a brief session at the end of the webinar where our speakers will expand on their talks and answer some questions from the audience. Please feel free to tweet about this webinar using the handle [@odenterprise](#) and use the hashtag [#ClimateRiskData](#).

Now I'm going to introduce our opening speaker. We are very honored to have with us Don Graves, the Deputy Secretary of the U.S. Department of Commerce. Mr. Graves has decades of experience in the private sector, government, and nonprofit leadership. Most recently, he served as Counselor to President Joe Biden during the 2020 Presidential Campaign. Prior to that, he served as Executive Vice President and Head of Corporate Responsibility and Community Relations at Key Bank. Mr. Deputy Secretary, over to you.

KEYNOTES

Don Graves: Hello, everyone. It's great to be here with you today. Throughout my career, I witnessed the impact that extreme weather can have on our communities and our economy. For example, after Hurricane Katrina, I traveled to Louisiana to support economic development and small businesses that were devastated by the storm. Hurricane Floyd hit the East Coast just days ahead of my wedding in 1999.

People associate 2020 with the year we experienced the worst global pandemic in over a century. But last year also set a record on the climate change front: a total of 22 weather and climate events cost the U.S. over \$96 billion.

Tragically, climate change, extreme heat, and water scarcity disproportionately affect low-income households and communities of color. That's why you're all here today, because communities need localized data to make decisions about their own climate risk. Integrating data from across the government and private sectors, acting on that data, and then sharing best practices is inherently challenging. But this type of information will help build stronger and more resilient communities, particularly those that are most at risk from climate threats.

Fortunately, we are seeing data sharing across the country. For example, this summer, NOAA and partner scientists, seasoned volunteers, and community coordinators embarked on an urban heat mapping campaign in 11 states. Together they produced detailed local maps that give city officials and community groups life-saving information they need to protect people from extremely high temperatures. That's just one example of incredible partnership that not only makes data more accessible to local decision makers but also helps build productive public-private partnerships around climate risk data more broadly.

I'm excited that the Department of Commerce and NOAA are well-represented today. Our scientists are at the forefront providing world-class data and innovative solutions to address the climate crisis.

Thank you to our co-host and partners for joining the discussion today and for working with us to drive data towards meaningful climate action. We look forward to strengthening our partnership on this important issue moving forward.

With that, I'll turn it over to Ben Friedman to kick off our roundtable discussion.

Benjamin Friedman: Hi, I'm Ben Friedman, the Deputy Undersecretary for Operations for NOAA. I'm excited to welcome you all to this webinar today.

For over 50 years, NOAA has been the world leader in climate science and services. And our climate science is the foundation for smart policy and decision-making in a changing world. We deliver client services to Federal agencies, states, tribes, communities, and businesses across America. And our climate stewardship protects our lands, waters, resources, and people.

From the sea to the sun and coast to coast, NOAA is observing, measuring, monitoring, and collecting data using satellites, ships, planes, drones, and more. Our publicly accessible data feeds into NOAA's world-class climate and weather models which provide Americans with daily, weekly, and monthly weather forecasts and longer term climate projections.

This information is especially critical for communities most vulnerable to climate change and its impacts. And NOAA is well-positioned to support the Biden-Harris administration's whole-government effort to tackle the climate crisis while ensuring we do so in just and equitable ways.

NOAA is constantly looking for opportunities to improve our tools and enhance our services to the public. That's why I'm thrilled that NOAA has partnered with the Center for Open Data Enterprise or CODE to co-host this roundtable. NOAA cannot do this alone. The roundtable provides a forum for us to convene diverse stakeholders to develop action-oriented, data-driven solutions to reduce, prepare for, and adapt to climate-related risks.

As you listen to the speakers today, I hope that we can all come together to identify new areas of collaboration with stakeholders across the public, private, academic, state, and local levels. We'll explore strategies to increase access to and the use of climate data and share best practices for incorporating data into climate solutions.

Finally, I want to thank CODE for co-hosting today's event and to Amazon Web Services and the Amazon Sustainability Data Initiative for their support. And thank you for coming together to engage on this important topic.

Now I'd like to introduce my colleague, Ko Barrett, to provide keynote remarks on the importance of climate data for developing climate risk policy. Ms. Barrett is widely recognized globally as an expert on climate policy, particularly on issues related to climate impacts and strategies to help society adapt to a changing world. She currently serves as a Senior Advisor for Climate for NOAA's Office of Oceanic and Atmospheric Research. She provides strategic advice and scientific leadership for climate research, application, and services across NOAA research, working to coordinate and integrate activities across NOAA's portfolio and climate-related programs to enhance the effectiveness of NOAA in meeting climate mission goals.

Ms. Barrett is also currently serving as a Vice Chair for the Intergovernmental Panel on Climate Change or IPCC, a role she has held since 2017.

Thank you again. And Ko, I now turn the floor over to you.

Ko Barrett: Let me begin by congratulating all who conceived of and organized this roundtable on how to evolve our climate data services to help guide and inform climate risk policy. This is such an important topic and it's such a critical time in our nation's history.

It feels like all the planets have aligned. We have a President who has made it a priority from day one to confront the climate crisis at home and abroad, we have a groundswell of concern and support for action from large segments of society, and we have a wide recognition that we can take strong action on climate change and seize the opportunity to rethink our infrastructure and jobs. These new realities have me feeling hopeful about the future. So I'm eager to share this moment with all of you and figure out how we can best make rapid progress together.

Planning and problem-solving begin with understanding. For more than 50 years, NOAA has invested steadily in observing, modeling, predicting, and understanding earth's climate system. And we have increasingly incorporated social science into our public engagements to better understand the needs of Americans. We know that human-caused global warming and natural climate variability combine to produce extreme weather and climate events that impact human and natural systems.

Over the last four decades, the annual average of [billion-dollar natural disasters](#) in the United States has quadrupled. The drivers of these disasters and their cause are not solely due to climate change. We know, for example, that more people are building, living, and working in harm's way. But climate change is driving a troubling trend.

Our climate models project that climate-driven extreme events including more heavy rain events, more extreme heat even in the ocean, more drought, more wildfires, and stronger Atlantic hurricanes will increase this century. Unless substantial large-scale action is taken to address these and other climate risks, the impacts on human and natural systems are likely to worsen.

A key question for us is: How can we provide decision-makers with the data and information they need to take meaningful action on climate?

Climate affects large areas over long periods of time. But communities and businesses take action on shorter time scales, often in finite geographies. Importantly, their actions are based on their priorities, their experiences, and their values.

Our challenge in the context of this meeting is to strengthen the link between climate data and those local decisions. As people better understand the link between climate change and the things they care most about, the better able they will be to address climate-related risks.

Let's take for example the City of Charleston, South Carolina. City officials there knew they had a growing problem with flooding but they weren't sure how to prioritize given limited funding to improve resilience. Should they focus on tidal flooding driven by sea level rise and storm surge? Or perhaps on riverine flooding, given Charleston sits where four major rivers meet the Atlantic? Or perhaps on flash flooding driven by heavy rainfall, given that they've built large impervious surfaces on flat coastal lands with poor drainage?

The officials worked with a variety of NOAA entities and partners to help them decide. The [Carolinas Integrated Sciences and Assessments](#) program helps provide local data. The South Carolina Sea Grant program hosted community workshops. The local NOAA weather forecast office helped emergency service providers provide the information needed about flood warnings.

NOAA's [Office for Coastal Management](#) helped the city identify relevant tidal flooding, storm surge, and sea level rise data. NOAA's [National Centers for Environmental Information](#) interpreted relevant sections of the [National Climate Assessment](#) and utilized their [Climate at a Glance](#) tool. NOAA's [Climate Program Office](#) provided the climate resilience toolkits, steps to resilience, risk assessment, and decision support framework, and downscaled the climate projections from the [Climate Explorer](#), a web-based resource that offers graphs and maps of a range of climate variables for every county in the United States.

The city worked with the [UNC Asheville National Environmental Modeling and Analysis Center](#), and [FernLeaf Interactive](#), a private sector firm, to produce a vulnerability and risk assessment using the steps to resilience. They learned that heavy rainfall events and not storm surge present the greatest set of challenges. Today, Charleston is taking action to adjust its flood risks associated with very heavy rainfall events and they're working with the U.S. Army Corps of Engineers to plan for large engineering projects to mitigate their flood risks.

This is important work. Did you catch that? Two Federal agencies, nine entities from four NOAA line offices and two actors from academia and the private sector working with the city to address its climate risks. This is no small feat.

We must place a high value on listening to people working in other domains of expertise. Every community is unique and faces its own challenges. There aren't necessarily right answers but ranges of options with different tradeoffs in costs and benefits.

At NOAA, we will continue to focus on relevant science at the right scales of time and space to help people make no-regret choices for how to move forward sustainably and equitably even in the face of uncertainties.

Let's dwell for a moment on equity. Climate risks are often greatest among our nation's poor, elderly, and minority populations. This fact was poignantly illustrated in a recent NOAA-funded citizen science campaign to [map the hottest places in Richmond, Virginia](#). On one of the hottest days of summer, some Richmond neighborhoods were up to 16 degrees Fahrenheit hotter than other neighborhoods. The hottest places were predominantly covered with asphalt and concrete but little or no tree shade. They were also in historically redlined communities where the city's poorest populations and people of color live. Not surprisingly, those are the same places where most of the 911 calls for help were placed due to people experiencing heat stress and heat strokes.

This is the kind of actionable intelligence local decision-makers need to help them decide what to do and where to protect the most vulnerable and historically underserved communities. We need much, much more of this.

The good news is that though each location is unique and may be grappling with its own distinct set of climate-related hazards, the resilience process unfolds in much the same way in every location and is therefore highly replicable. The [U.S. Climate Resilience Toolkit Steps to Resilience](#) is a time-tested framework that helps communities document their climate hazards, decide which situations they most want to avoid and come up with workable solutions to reduce those risks.

To scale this kind of real and lasting resilience across the more than 30,000 communities in the United States, we need a climate services workforce that's able to meet demand nationwide. We need to train and prepare an interdisciplinary workforce in both the public and private sectors. Now is the time. Though we are already developing an all-of-government approach to confronting the climate crisis, it would not be enough. I think we need an all-of-society approach. We need to establish public-private partnerships that allow government scientists and service providers to work with professionals in commercial sectors, nonprofit organizations, and academia harnessing the strengths of each.

Together, let's promote greater awareness and use of the data and tools that are already available. Let's leverage and build on those data and tools that have proven successful at helping people. Let's grow the community of resilience professionals that support local resilience planning. Let's provide expert guidance and train professionals so that we can scale up and accelerate the pace of local risk assessment and resilience-building all across this nation.

Doing these things together I predict will result in more peer learning across disciplines which will in turn help drive our nation's nascent climate services enterprise to maturity.

LIGHTNING TALKS

Joel Gurin: Thank you, Ms. Barrett, and thanks to all our opening speakers for your very insightful remarks. Now, I'm going to introduce our next three speakers who will give brief lightning talks about examples of using data to understand and address climate risks.

Krystal Laymon is the Deputy Director for Climate Resilience at the [White House Council on Environmental Quality](#). Previously, she was a policy advisor in the U.S. Department of Energy's [Office of Energy Efficiency and Renewable Energy](#) focused on clean energy strategies for vulnerable populations. She is a specialist in climate resiliency and energy policy. Today, she will be speaking about the approach the White House is taking to climate risks and resilience and the vision laid out by President Biden.

Next, Dr. Jennifer Jurado is responsible for [climate resilience and environmental planning initiatives for Broward County, Florida](#). Her work focuses on urban adaptation, sustainable resource management, and clean energy strategies. For nearly two decades, she has guided the integration of science to inform resilient design standards and has led large scale and multijurisdictional initiatives involving public-private partnerships. Dr. Jurado will discuss some of the strategies and steps that Broward County has taken to address its climate risks.

Finally, Dr. Ed Kearns is the Chief Data Officer for the [First Street Foundation](#) and leads the First Street science and data activities related to quantifying and communicating risks. He previously served as Interim Chief Data Officer for the U.S. Department of Commerce and was appointed as NOAA's first Chief Data Officer in 2017 where he led the development of strategies for managing NOAA's data as a national asset. He promotes new uses and wider understanding of data through partnerships and technologies such as First Street's [FloodFactor.com](#). He will talk about his work at NOAA and his work at First Street Foundation to make its flood data more accessible and applicable.

Now, we will hear first from Krystal Laymon.

Krystal Laymon: I'm Krystal Laymon, Deputy Director for Climate Resilience at the White House Council on Environmental Quality. Thank you for inviting me to join you today. Today is an important conversation about the types of data needed to address climate risks in disadvantaged communities and supporting communities to make data-driven decisions. This topic is important to me and the Biden Administration because coupling data and science with planning and decision-making can improve a community's resilience against climate change and natural disasters. And it is no secret that it's usually the most

historically underserved and overburdened communities that have the toughest time recovering and rebuilding from a natural disaster.

I am proud to say that on day one, we hit the ground running at the White House to support disadvantaged communities and build resilience strategies. President Biden is taking a whole-of-government approach to tackle the climate crisis and environmental justice.

As part of these efforts, the President issued [Executive Order 14008](#). This Executive Order asks appropriate agencies to identify ways to expand and improve climate forecasting capabilities and information products for the public. And it consulted Federal geographic mapping service that can facilitate public access to climate-related information that will help state local and tribal governments in climate planning and resilience activities.

This Executive Order also created the first ever [White House Environmental Justice Advisory Council](#), made up of 26 long-time environmental justice advocates and experts from all around the country who have already been on the ground working on these issues.

This White House Council brings greater feasibility to increase the Federal government's efforts to address environmental injustice. We ensure that climate resilience is part of this conversation and ask advisory council members to provide advice and recommendations and a whole of government approach to environmental justice including and of course not limited to climate change mitigation, resilience, and disaster management.

At the White House, we are committed to pursuing environmental justice for communities of color, low-income communities, tribal or indigenous communities, and frontline and fenceline communities with new policies like Justice40 and our climate and economic screening tool.

The [Justice40 Initiative](#) is an exciting opportunity that aims to deliver 40 percent of the overall benefits of Federal investments in clean energy and infrastructure to historically disadvantaged communities. The climate environmental justice screening tool which we are developing will help us identify and target the communities most in need and will inform equitable decision-making across the Federal government.

I am pleased to say that agencies are already hard at work on these initiatives and so is the White House Advisory Council. Last month, the White House Environmental Justice Advisory Council hosted its third public meeting to finalize their recommendation on Justice40, the screening tool, and updates to [Executive Order 12898](#). And now CEQ is actively reviewing these recommendations.

This Administration also understands the need for a whole-government approach to tackle large climate issues that affect disadvantaged communities, which is why many environmental justice workstreams are coordinated at the agency level through the [White House Environmental Justice Interagency Council](#). They considered the advisory council's recommendations on how to adjust current and historical environmental injustices.

In addition, the White House Office of Domestic Climate Policy recently launched a new coastal resilience interagency working group. It will report to [National Climate Task Force](#). This working group is co-led by CEQ and NOAA.

This interagency body will coordinate major Federal efforts to go coastal resilience and support data-driven strategies. It will also collaborate with U.S. state, local, tribal, and territorial governments to make effective and equitable investments.

We also recognize that Federal agencies have showcased various data and mapping strengths to support disadvantaged communities such as CDC's [Social Vulnerability Index](#), DOE's [Low-income Energy Affordability Data Tool](#) and FEMA's [National Risk Index](#). It is crucial to identify ways for communities and decision-makers to best utilize these tools and many others because, like reports that can sit on a shelf, the same can occur with data tools and maps.

Solutions are attainable but it takes strategic planning by and in communities to build their resilience to the impacts of climate change. We need to work together to ensure that disadvantaged communities have an opportunity to fully participate in planning for these risks and understanding the challenges many communities face with capacity, priorities, and technical expertise. It is especially important that we address the problem proactively to mitigate negative impacts and adapt to our already changing world.

[Slides for the following presentations by Jennifer Jurado, Ed Kearns, and Ana Pinheiro Privette can be [viewed on the recorded webinar](#) starting just after 28:00.]

Jennifer Jurado: I'm Jennifer Jurado. I'm the Chief Resilience Officer for Broward County and it's my pleasure to share today our efforts as a county in supporting community resilience and addressing climate risks. Much of what I'll be discussing today has been substantially aided by our work as a regional collaborative so I just want to share that we are a partner in the [Southeast Florida Regional Climate Change Compact](#) now going on about 11 years.

As a four-county effort, we have worked to develop planning tools and guidance that support shared climate mitigation and adaptation strategies. Some of these key work products have included a regional vulnerability assessment, development of a regional sea

level rise projection, and regional action plan. That process has made for a robustness in deliverables that has aided its implementation at the local level.

Shown here is one of our key deliverables, the Southeast Florida regional sea level rise projection. It is really based upon a 50-year planning horizon: We benchmarked most of our planning efforts to 2070. We are looking today at a sea level rise projection of about 40 inches relative to 2010. And collectively, we do apply this projection in our modeling activities. However, it was recently updated and so some of our planning efforts are actually just a little bit behind this projection.

We also partnered with NOAA to see the installation of a NOAA ports monitoring station at Port Everglades that has now provided us with local sea surface elevation. This has been really important in helping to improve model calibration as well as look at the specifics of surge impacts at a localized scale. So we have relied upon longer term datasets for the projection itself. But the local data ends up being really important when we are looking at our own models and trying to explore the exposures of our local infrastructure.

With this joint adoption of the sea level rise projection, we then begin to work at a local level to translate that guidance to some of our planning and regulatory tools. This is included in our development of a priority planning area map that we used to delineate areas at risk and help inform land use planning decisions and capital projects. And then at our county, we also adopted a future conditions map series in 2017 and have adopted several additional maps and ordinances relating to this map series since that time, including a groundwater table map that informs our drainage infrastructure. We've just now adopted a future conditions, 100-year flood elevation map that accounts for an intensification in 100-year storms as well.

This next set of images shows the most recent exercise in our development of the future conditions flood map. We accounted for two feet of sea level rise in our drainage and discharge of our storm water system. We accounted for the effects of extreme tides which later on is about another foot of water level. We modeled, through downscaling processes, a change factor of 13 percent for our rainfall events. And then we also assumed super saturation of the ground soil and loss of storage as part of this rain scenario.

We then translated those water levels to various zones. And this map that now has been adopted as one of the tools that we used in setting finished floor elevations and which will help inform infrastructure siting moving forward.

Here are a few examples of how this work translates to infrastructure interest including the evolution of flood levels in a residential setting and what this will mean to redevelopment. In this case, we would be building to this blue line if this home were reconstructed today. You can see the change in infrastructure requirements for a marina here in Hollywood and then the change in the groundwater table is shown in this upper

graphic where you can see that shift relative to land surface and what it means for expansion of drainage infrastructure.

So in closing, I would just note that regional models and local data are both important in vulnerability assessments. We had used scenarios to evaluate conditions and translate to recent events to help further explore the reality of these changes. We have worked with a stakeholder community in that engagement process including the technical and private sector. We have worked to translate the results of these analyses to economic terms that move beyond the exposure to really look at the savings and additional benefits that come through deriving and making these investments in resilience.

And finally, we've worked to translate those benefits to the immediate population and immediate economic considerations not just those of a future community. And through that approach, we've been able to gain a lot of support for the efforts that I shared here today. Thank you.

Ed Kearns: Hi, I'm Dr. Ed Kearns from First Street Foundation. I'll be talking about assessing climate hazards data. I did serve as NOAA's first Chief Data Officer over the last few years before joining First Street Foundation and helped reestablish the Commerce Chief Data Officer position as well. I led the NOAA Big Data Project (now called the [Big Data Program](#)), oversaw NOAA's data archive at National Climate Data Center which is now known as the [National Centers for Environmental Information](#), and also led the NOAA [Climate Data Record Program](#). So I'm very familiar with climate data and how hard it is to use and how hard it is to make accessible. I worked a lot on that when I was at NOAA.

Now at First Street, I'm doing a different way of applying these data for climate assessments, so that's what I will talk about today.

From my experience, I would say that data access is a necessary but insufficient condition for data use. You really need the expertise to understand how to interpret the data for their climate application.

At First Street, we are a nonprofit foundation that is dedicated to the quantification and communication of flood risk to Americans. We have begun to use data from the Federal government in order to create a flood assessment at the very personal level, at a property level across the United States and including projections of climate change. These are things right now that are not available to folks very easily. FEMA is sort of the state-of-the-art right now as a gold standard, but FEMA flood maps are out of date. A lot of them are done inconsistently across United States and they don't include projections of climate change.

First Street took on this challenge. We've assembled all sorts of different kinds of data from the Federal government, most of them open Federal government sources, to bring to bear on this problem including precipitation frequency, data from NOAA, river flows from USGS, tide gauges from NOAA, [CMIP5](#) climate simulations that were downscaled by [NASA NEX](#) and bringing all these together. It is a challenge to handle this much data of this kind of complexity with the climate assessments, but that's what First Street has done. We've used a flood model to integrate this information and make it very personal by combining with real estate information from the private sector, combining the flood model outputs with the real estate information to generate a maximum flood depth at the building footprint for every property in America. And we are doing this for 2020 and going out to 2050. We are building climate projections into that risk so we can let every American know how the risk is going to affect them.

We communicate this through a website called [FloodFactor.com](#). We give this data away for free. Our idea is to democratize this data to kind of correct the data asymmetry that's in the marketplace right now where some insurance companies and some investment groups have this information but the average everyday person on the street does not. We are putting this information out there for everybody to use for free, publicly available.

We have downscaled to three-meter resolution so we can get very meaningful insights at that property level. And we've done integrations with [Realtor.com](#), [Redfin.com](#), and others so we are providing our information not just at the website but along with other ways that people are viewing real estate information so they can become aware of the climate risk.

If I'm going to sum up what the experience has been over the last few years including my last year or so at First Street, it's that access is important but you really need to have expertise too to maximize the value. Modern ways of accessing data through the cloud are fantastic, how the data are being served up. The format does matter and the wider the community format, the wider the community of users is going to be. So for example, [GRIB](#) format is great for weather forecasters but not so great for generic data scientists, where [Cloud Optimized GeoTIFF](#) is better.

You definitely need that expertise to interpret the data, not just have access to it. Finding ways of aggregating other kind of specific property-level data sharing, data for research that is sensitive, is very important too. Maximizing the scale of the application by leveraging partnerships particularly in the private sector is a great tool. Some expertise can be introduced by transforming the data by introducing the tools that people are already using. This is also a great way to accelerate the use of data.

Thank you very much.

SPECIAL PRESENTATIONS

Joel Gurin: Thanks to our lightning talk speakers for a great set of talks and some very useful examples of using data to address climate risk. I'd like to now introduce two speakers from Amazon who have supported CODE's work on this project.

Dave Levy is the Vice President for U.S. Government, Nonprofit, and Healthcare Businesses for Amazon Web Services. He helps government, enterprise, and nonprofit customers realize the potential of technology to transform their organization and fulfill their missions. Prior to joining AWS, he worked for Apple Inc. for 12 years and led the team that helped government usher in the age of mobile technology. His remarks today will touch on AWS's approach to climate risk and how their services are helping local communities address major climate hazards.

Then we are going to hear from Dr. Ana Pinheiro Privette who is the lead on the Amazon Sustainability Data Initiative or ASDI. ASDI is a program that seeks to leverage Amazon's scale, technology, and infrastructure to help create global innovation for sustainability. She was trained as an environmental engineer and as an earth sciences researcher at the New University of Lisbon and at MIT. After spending most of her career at NASA and NOAA as a scientist, she led projects for the White House Climate Portfolio including the [Obama Climate Data Initiative](#) and the [Partnership for Resilience and Preparedness](#) or PREP. She will discuss how ASDI is supporting work like the NOAA Big Data Program and advancing efforts to address climate risk.

And now, we will hear from Mr. Levy.

Dave Levy: Hi, I'm Dave Levy, Vice President for U.S. Government, Nonprofit, and Healthcare for AWS, Amazon Web Services. Thank you for the opportunity to speak with you today.

AWS and Amazon are committed to building a sustainable business for our customers and the planet. In 2019, Amazon co-founded the [Climate Pledge](#), a commitment to be net zero carbon across our business by 2040, ten years ahead of the Paris Agreement. Companies that have signed the Climate Pledge now number over 100 and have agreed to report carbon emissions annually, implement decarbonization strategies, and neutralize remaining emissions with credible offsets.

As part of this pledge, Amazon has made ambitious commitments towards reaching this goal and is on a path to achieving 100 percent renewable energy usage for our global infrastructure by 2025. Amazon's commitment to increase the deployment of renewable energy resources is valuable for the planet, good for business, and important for our

customers. As part of our sustainability efforts, Amazon advocates and supports a public policy that advances access to the expansion of clean energy.

AWS is focused on energy efficiency and continuous innovation in our data centers in order to reduce energy usage and increase operational excellence. Our scale allows us to achieve higher resource utilization in energy efficiency than the typical on-premises data center. In fact, the international analyst firm 451 Research found that [AWS's infrastructure is 3.6 times more energy-efficient](#) than the median of surveyed enterprise data centers with more than two-thirds of this advantage due to a more energy-efficient server population and a higher server utilization. We have the report on our website if you'd like to read it.

AWS customers use our services to make faster progress on their own sustainability goals. In addition to our analytics, Internet-of-things and machine-learning services, AWS hosts geospatial and environmental datasets like [Earth on AWS](#). And [AWS Cloud Credits for Research](#) are available to support research using this earth observation data on AWS.

Big problems require we all bring our best to the table. AWS enables faster, cheaper, and better experimentation which supports innovation. We are helping our customers develop and expand workloads that support the needs of a carbon neutral and resilient society. We're enabling organizations to build new scientific knowledge and translate it into actionable insights that actually help make better decisions.

Data is at the core of this process. Data is required to measure, monitor, and manage climate processes. The cloud-scalable infrastructure can help us make sure that data and knowledge are more easily accessible by anyone.

At AWS, we are committed to help Federal agencies make their foundational and authoritative data more accessible and more usable. And we partnered with NOAA and NASA to move petabytes of data to the cloud. This includes weather and climate data hosted on AWS allowing for easier, faster, and cheaper data analysis.

By hosting foundational data on the AWS cloud, the NOAA Big Data Program or BDP in collaboration with Amazon Sustainability Data Initiative, ASDI, seeks to remove some of the redundant efforts that customers have to endure when discovering, accessing, and using NOAA data to support its workloads.

Most of the data scientists' effort is often associated with time-consuming dataset acquisition and wrangling tasks rather than model development and knowledge creation. NOAA data staged on AWS addresses this issue by enabling both more efficient data access and analysis. Customers no longer need to acquire and maintain the data, and in addition, they can leverage AWS scalable computing and scalable services right next to the data.

As this data is staged in the cloud, it is then enabling government agencies to better perform against their mission. Businesses are able to build on top of the data and bring new solutions to the market to help address pressing issues like climate change and support economic development.

Let's look at a practical example. After severe, extreme weather events like hurricanes and flooding, some of the largest challenges include identifying the level of destruction and assessing how much infrastructure has been destroyed or relocated. Timely access to baseline prior to event and post event remote-sensing imagery over affected areas is often critical to enable disaster response teams to take action and ensure that lives are properly protected.

To minimize latency in accessing the data, the [NOAA Emergency Response Imagery](#) or ERI is now available on AWS. This work is possible due to the collaboration between the NOAA Big Data Program, ASDI, and the [AWS Open Data Program](#). By providing NOAA's ERI data to the public via an Amazon Simple Storage Service or [Amazon S3](#) bucket, users can access and analyze data in the cloud with low latency and use other AWS services as well as other datasets available in the ASDI catalog. This simplified access to cloud services is particularly helpful for users performing artificial intelligence and those extracting knowledge and insights that support effective disaster response.

We are committed to playing an enablement role in the space and are eager to understand how AWS and Amazon in general can support building more sustainable and resilient communities. We believe that AWS can play a key role in building this space by including collaboration, facilitating access to data and tools, and bringing our scale and expertise to the table.

We look forward to working closely with the climate risk communities to better understand and serve your needs. Thank you.

Ana Pinheiro Privette: Hello. Thank you for the opportunity to participate in this webinar. My name is Ana Pinheiro Privette. I'm the lead of the Amazon Sustainability Data Initiative and I sit on the Sustainability Team at Amazon.

Following Dave Levy's remarks, I would like to take a few minutes to introduce you to the Amazon Sustainability Data Initiative, which is a tech for good program that Amazon has been running for several years now. It seeks to leverage Amazon's scale, our technology, and our infrastructure to promote more innovation and problem-solving in the space of sustainability where climate resilience falls.

What we are trying to do is to leverage this technology to reduce the cost, the time, and the technical barriers that are required in using large datasets and extracting knowledge

and insights to make more effective decisions. I'd like to give you a quick background on the program and also make you aware of the resources that we are bringing to the community that might be of value to the conversation we are having today and to the climate resilience space in general.

We have built a program around several areas. The first one is focused on the democratization of data. And here, what we're trying to do is recognize that there are datasets out there that are critical for this conversation that traditionally are difficult to access and that there's a lot of repetitive effort that the community has been doing to use them. Once we identify those datasets, we work to the extent possible with the data providers and subsidize bringing the data to the cloud, hosting it, and making it openly and freely available for anybody. You don't even need to have an AWS account if you want to access the data.

We have created an extensive catalog so far. It has historical records of weather forecast. We have been working with the [Earth System Grid Federation](#) to bring this data to the cloud as well and a lot of satellite imagery. So just feel free to explore.

The second component of the program is focused on bringing the compute and analytical capabilities next to the data. So now we have all these data in the cloud and more easily accessible and findable and usable, but how do we encourage experimentation on top of it? How do we offset the cost of that experimentation?

One of the mechanisms we have created is through [cloud grants](#). We have an open call for proposals to our website. We generally subsidize one year of free computing for solutions related to sustainability. And so, that's something that is available out there for those that would like to experiment. In particular, those that are focused on the data that we are making available are more compelling grants for us to provide.

The third component is focused on promoting knowledge exchange. And what we mean there is that there's a recognition that the space needs to move as fast as we can and we can all move this faster if we work together and share our knowledge. We are very eager to play an enablement role where we encourage customers in the community to tell their stories, their best practices, lessons learned, share that knowledge to the extent possible, hold tutorials or seminars. There's the myriad of things that we've been trying to do in that space.

I'll stop here and just reiterate our commitment to the space, to the open data, and hopefully to building a value chain that can support climate resilience, in particular, in vulnerable communities, which we are very committed to. Thank you.

Q&A SESSION

Joel Gurin: Great. Thank you, Dave and Ana, and thanks to all our speakers for those terrific presentations. Now for this Q&A session, let's go around the virtual room in the order in which people presented.

Don Graves, I'd like to start with you. People generally think of the department as kind of an economic department, and yet it includes NOAA and other science-driven and data-driven bureaus. How do you see all of the work we've heard about today from NOAA and others serving the overall mission of the Department of Commerce as they work to reduce climate risk for communities around the country? How does it fit it and how does the Department of Commerce overall support that work?

Don Graves: I have two points to make about that. First, our economy as we all know and as we've been talking about is really driven by data and science. You can't separate our economic growth, our economic opportunities from data and science. The Department is often known as the department of business but it's actually a department of science, data, and innovation. It's important to remember that.

The second point is that it's pretty clear that our nation's economic well-being is inextricably tied to climate change. As I noted in my opening remarks, last year alone, we saw a record-setting 22 weather and climate events that cost the U.S. over \$96 billion. So the Department has to prioritize climate research and integrate climate data and information in every aspect of the Department's activities. The integration has to also account for equitable climate considerations. As we know, climate change disproportionately affects low-income, vulnerable households, low-income communities, underserved communities, and communities of color.

In addition, the Department can prioritize blue-green economic initiatives that will help our economy build back better and will lead eventually to good-paying jobs. NOAA and Commerce's other bureaus including NIST, the Patent and Trademark Office, and the Economic Development Administration can all contribute to the Department's efforts and those of the Federal government in that regard by marrying the data and the science with decisions around our economy.

As we've heard today, climate change is a multifaceted issue that has to be dealt with and addressed in a multidisciplinary and all-hands-on-deck approach. It's not just an individual bureau like NOAA. It's not just the Department of Commerce. It's all of the Federal government working in concert with our partners in the private sector, in our research institutions and in the nonprofit sector.

The Department of Commerce is well-poised to bring all of these different disciplines, the diverse perspectives, the diverse sets of partners together to address the climate crisis and do so in a way that is economically viable and also equitable.

Joel Gurin: Thank you for that broad perspective. Ben Friedman, I'm going to turn to you now for the NOAA perspective. And again, thank you so much to NOAA for working with us to co-host this webinar. What are some of the other strategies and tools that NOAA is using to increase this kind of stakeholder engagement with the public?

Benjamin Friedman: NOAA is a great science agency but we mark our success not just based on our science but on delivering great products and services to the American public. We are ultimately really a service agency. And public interaction and engagement with the public is at the core of everything we do.

I don't have an opportunity to talk about everything we do engaging with the public but I can give you a handful of examples. We have a regional coordination network where we place employees throughout the country to work with decision-makers at the local, state, and Federal levels and through that, we've had some great success.

In the Great Lakes, for example, we've worked with state officials and local officials to work with farmers to make sure that they have the best weather data to know when to use fertilizer in their crops so there isn't runoff into the Great Lakes. Just by providing that data, we've significantly reduced the runoff to the Great Lakes and the farmers love it because they have the best data to make sure that their fertilizer is actually working and not ending up in the Great Lakes. Something as simple as that has been very effective.

We have the [Regional Integrated Science and Assessment](#) program or what we call RISA. This is 11 different programs across the country that work again with local, state, and Federal officials and the private sector to kind of be the in-between between research and operations. So they provide the great information and they look for tools that can be used at the local levels to really address climate issues whether it's climate training, whether it's providing climate data, whatever it is, they are kind of the go-between between the researchers and the decision-makers at the local level.

We have the [Sea Grant](#) program, which is a program that has existed for over 50 years. There are 34 individual programs that are university-based across the country and coastal areas in the Great Lakes and we work closely with local officials to deal with local climate issues through the Sea Grant program.

And then our [Office for Coastal Management](#) has a whole series of programs to work with decision-makers on climate issues including our newest program, the SRA program, working with coastal zone issues and coral reef issues. So that's an office that provides a lot of the services as well.

I'll just finish by saying, our [Climate.gov](https://climate.gov) is a NOAA-run, award-winning website that provides great information and services to communities around the country. And we are currently going around doing regional climate listening sessions with communities to see what their needs are and how we can provide better services. Again, I don't have time to talk about everything, but we have a whole range of products and programs designed to interact with communities and make sure that our data and our information is actually being used by communities around the country.

Joel Gurin: Thank you. That's a great synthesis of the ways that NOAA interacts with communities.

Ko Barrett, what we just heard from Ben is a great segue to the question I was going to ask you. You gave a wonderful example of how NOAA has different bureaus and offices supporting the City of Charleston and addressing its flood risk. Could you tell us how you think this kind of collaboration might be scaled to support other kinds of other vulnerable communities as well?

Ko Barrett: I mean that's precisely what we aim to do at NOAA and with our partners, scale up and accelerate this kind of collaboration to support other vulnerable communities. Over the past 5 years or so, same kind of collaborative approach to resilience planning using the climate resilience toolkits. Steps to Resilience has occurred in over 30 municipalities in the Southeast. In fact, it was so interesting to listen to Jennifer's presentation because the Steps to Resilience were employed in her example from Broward County.

Building on the same proven tools and techniques, NOAA plans to launch a new Climate Smart Communities initiative next year designed to scale up and accelerate the pace of resilience planning, equity and inclusion, and resilience planning in many, many more U.S. communities. So it's a central focus of our work moving forward.

We see a particular need to center equity and inclusion in our resilience planning because there have been historically some service equity gaps for these low-income and minority communities. Our boots on the ground activities have been working on this gap and Ben just mentioned some of them in his response. Because of that, NOAA is positioned to scale up these services so that all communities, businesses, tribes, states, and Federal agencies in the U.S. have access to our world-class climate information tools and services so they can make informed decisions about the future.

But honestly, the need is so great. We really need an army of trained climate adaptation experts working with trusted local leaders to employ the solutions that are needed all across the board.

Joel Gurin: Thank you. And now, Jennifer Jurado, building on that question - and this is a question from someone in the audience - how can vulnerable local residents and vulnerable communities access the kind of planning tools that are being developed in Broward County and others in the Southeast? How do you make that connection?

Jennifer Jurado: I'm really pleased to answer that because we've struggled a great deal with regards to communications and how do you get that information out there and in a digestible form. And interestingly, a lot of that work has also been informed by our business community which has been interested in helping with the communication. Just a couple of months ago, we launched a resilience dashboard that can be viewed at Broward.org/resilience. I think it's very powerful in that it paints a picture with regards to the exposures. It's now largely flood-based but we will be adding the heat map work as we move in that direction.

But it really explores the challenges for our community. It provides both inland and coastal examples of exposures. It presents all of the action plans that we have at the Broward County level, at the four-county level. It includes a whole dashboard, we call it a dashboard within the dashboard, of all the planning tools, all the future conditions maps we linked to flood risk. I'm thrilled that Ed has been really gracious in sharing his work so community members can get in there.

But in addition to that, we also have a resilience project showcase, clean energy showcase. And so once you've explored all that information then you can begin to look at your local municipality and municipalities all have tabs in there as well, and you can see where are the resilient investments being made, are they happening in my community, if they are not happening in my community, why not? And you can also see physical examples of what those resilient investments deliver and how they are beneficial. So we are in the process of working on a county-wide plan that brings all that type of infrastructure planning together for multidecade.

And in terms of building support for a plan, I think it's really important to start to give community members examples of what they can stand to gain and how those investments can support conditions that are being realized in their community. And there's a lot more to the dashboard than I've just shared but it's very engaging and it's not just passive one-way receive of information. And we are working with the school districts and making this available - well, the Broward School District is another learning tool. So again, very excited about having brought that to our community.

Joel Gurin: Thank you. Ed, let me follow up with a question to you. You talked about how FloodFactor tries to put flood risk data into the hands of users outside of the private sector. Can you tell us how you think the data can be used to support civil society groups and vulnerable communities?

Dr. Ed Kearns: Thanks, Joel. The first reason behind FloodFactor is making this data available under a noncommercial data license to any government agency, from the Federal government all the way down to local municipalities, so those data can be used in bulk for the kind of work that Jennifer was just describing. We are actively seeking those kind of relationships.

The other thing is that we are really trying to accelerate the use of this data, since time is of the essence. There are a lot of resources that need to be brought to bear - as Jennifer's group has been successful in bringing about, as we heard NOAA is helping Charleston do. This is really difficult to do and trying to understand this data is tough. So we've been trying to boil all these complicated data down into some very usable risk indexes and economic impact estimates that can be readily picked up and used.

But we understand even those data can be hard for some municipalities to use. So we are also seeking partners, whether it's engineering firms or mapping partners, other folks that can convey that information to those local agencies in a very easy to use way so they can accelerate their planning activities.

Joel Gurin: Ed, thank you. So let's wrap up. Ana, first, I want to thank you again - both the Amazon Sustainability Development Data Initiative and Amazon Web Services for supporting our work on this webinar and tomorrow's roundtable. Given everything that we've heard, I'm going to ask you first, and then I'm going to go through every speaker. In one or two sentences, what do you most hope that people will take away from the webinar today?

Ana Pinheiro Privette: Thank you, Joel, and thank you again for the opportunity to be a part of this process and support it. I would say that it has been very evident by everything that everyone said today that we need to move fast and the best way to move forward is to bring the best of everybody to the table. It needs to be quite an agile process. All that experiment, bring to the surface what's working and the best practices that are emerging. So I think it's the need for the private sector and everybody to be at the table playing their role.

Ed Kearns: Anything we can do to accelerate the data use. I guess I'm repeating myself a little bit here but it is so important to not just get the data into everybody's hands but to bring the experts that can interpret it along the way.

Jennifer Jurado: I would acknowledge the power of partnerships not to be intimidated by the data that we may not understand. You can see that there's a number of individuals, resources, entities who are out there to help translate and utilizing science can be effectively and is successful in helping to support the decision-making that a leadership is prepared to undertake when it's demonstrated to be robust and defensible.

Ko Barrett: I would say the need is great but the resources are also great. And together, we can solve this problem.

Joel Gurin: Perfect. And Ben Friedman, thanks again to you and to NOAA for making this all possible. How would you sum up what you hope people will take away from today?

Benjamin Friedman: I would just say that yes, as Ko said, the need is great. The climate crisis is the biggest one facing humanity, maybe ever, but we are up to the task. NOAA is up to the task. The Federal government is up to the task. We have a lot of resources going into this. So use our resources and our services. We are here. That's why we are here and we want to help and support.

Joel Gurin: Fantastic. Thank you so much. And I think that's a perfect note to end this webinar. We want to thank both the speakers and everybody who has joined us today for this terrific discussion.