

NYSERDA Environmental Research Program Plan Update

Research Area: Climate Change Impacts & Adaptation

Final Report | May 2026

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2 Introduction

2.1 Program Overview

Climate change is driving more frequent and severe weather events in New York State, impacting infrastructure, ecosystems, and communities. NYSERDA’s Environmental Research Program (ERP) supports policy-relevant research to increase understanding of the environmental and health impacts of energy choices and emerging energy options. The ERP seeks to provide a scientific foundation for developing effective and equitable energy-related environmental policies and resource management practices that prepare the state for a changing climate. One of ERP’s primary areas of research is Climate Impacts and Adaptation (see box 1 for a full list of research areas).

The Climate Impacts and Adaptation area has historically focused on forward-looking climate information, impact assessments, and research on climate adaptation¹ in New

¹ Adaptation is generally defined as the process by which human and natural systems adjust to climate and its effects to moderate harm or exploit beneficial opportunities, thereby moving toward resilience.

York. ERP led and published the [*New York State Climate Impacts Assessment \(NYSCIA\): Understanding and Preparing for Our Changing Climate*](#) in December 2024. NYSCIA informs climate resilience planning and disaster preparedness, and provides New Yorkers public access to climate information. Climate projections from the NYSCIA—and, previously, projections from the 2011 *Responding to Climate Change in New York State (ClimAID)* report and 2014 update—have been widely integrated into State policy and planning efforts. Notably, the New York State Department of Environmental Conservation (DEC) adopted the NYSCIA sea level rise projections as the official state benchmarks that were required by the Community Risk and Resiliency Act. NYSCIA projections have also informed multiple electric utility vulnerability assessments and supported evaluations of climate change risks to the State's building sector through research led by the University at Buffalo School of Architecture and Planning's Resilient Buildings Laboratory. Other previous work has covered a wide range of topics and sectors, from agriculture adaptations to mapping future sea level rise.

ERP develops comprehensive research plans for each component of the program. As illustrated above, proactive research planning on climate impacts and adaptation ensures that adaptation strategies are informed, coordinated, and effective, while aligning with state policy objectives and stakeholder priorities. This document focuses on the Climate Impacts and Adaptation area as part of NYSERDA's comprehensive research plan.

2.2 Research Planning

The research planning process identifies critical gaps and research needs in New York State, with a particular focus on the areas representing the major issues related to energy-related environmental and health impacts. The plans are updated approximately on the same timeline as funding cycles to incorporate new research findings, policy developments, and stakeholder input. Each update provides an opportunity to revisit and refine priorities to address pressing climate-related challenges, incorporate the needs of environmental and climate justice communities, and foster opportunities for innovation. ERP published the most recent plan for the Climate Impacts and Adaptation focus area (then the Climate Change Adaptation focus area) in January 2019.

Since the last research plan was published, the State took several significant steps to respond to climate change. In July 2019, the State passed the [Climate Leadership and Community Protection Act](#) (the Climate Act), committing to reduce economy-wide greenhouse gas (GHG) emissions. In 2023, NYSERDA established the Energy Equity Collaborative to provide a coordinated forum for community-based organizations and stakeholders to work together with the state to address energy equity and climate justice issues and develop equitable programs. In 2024, the Governor announced an initiative to develop a [statewide climate adaptation and resilience plan](#), and the State published the [Extreme Heat Action Plan: Adaptation Agenda for 2024–2030](#). In December 2024, NYSERDA published the [NYSCIA](#), a comprehensive scientific investigation into how climate change is affecting the communities, ecosystems, infrastructure, and industries of the Empire State. Most recently, in December 2025, the state published the [New York State Energy Plan](#) (SEP), as a long-term plan to guide how the state can deliver affordable and reliable energy while aligning with the CLCPA targets. ERP developed this Climate Impacts and Adaptation research plan to build on these significant scientific and policy advancements.

This research plan is not intended to lay out specific projects for the program to fund. Rather, ERP will use this plan to guide research funding decisions, coordinate research efforts, and track progress toward resilience goals while remaining flexible to needs that arise in the state over the next several years. ERP will also use this plan to foster research partnerships with other programs at NYSERDA; partner agencies in New York State; other research funding organizations; the scientific community; local governments and municipal stakeholders; and community-based organizations and non-profits (see Box 2 – Potential Partner Uses). Working with partners, ERP aims to close critical knowledge gaps, support evidence-based decision-making, and help New York State adapt effectively to a changing climate while promoting environmental justice and economic resilience.

Box 2 – Potential Partner Uses

To complement ERP’s efforts, this plan can be used by partners to:

- Inform other research funding opportunities;
- Increase relevance of grant applications;
- Design research and innovation efforts;
- Cite pervasive knowledge and capacity gaps; and
- Successively track adaptation needs.

3 Priority Research Themes

3.1 Process Overview

Climate impacts and adaptation research is most equitable and impactful when aligned with the specific needs of decision-makers and communities. Those needs can be highly dynamic. Policy and planning efforts emerge in response to social drivers and economic change, as well as extreme weather and climate. Additionally, grassroots efforts in communities shed light on previously undiscovered climate impacts. Scientific evidence is also dynamic but develops over longer periods of time as theory, data, models, and/or expert opinion converge.

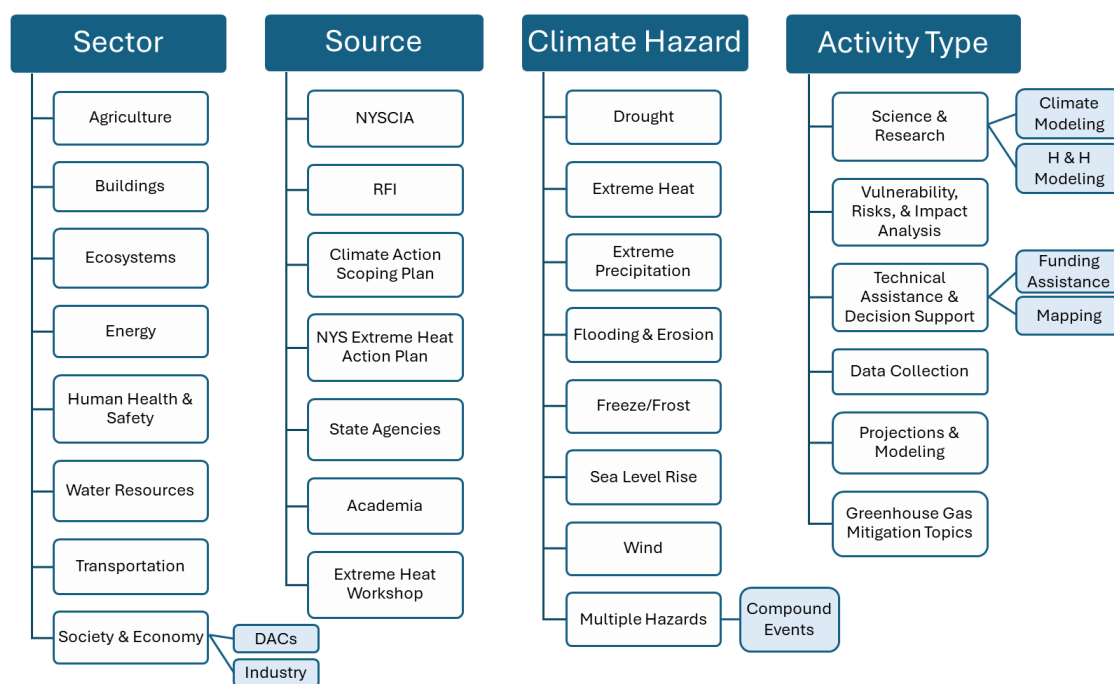
The input for this research plan reflects the needs of decision-makers and communities, as well as the strength of scientific evidence. This plan synthesizes extensive input previously gathered through iterative engagement central to the development of large, statewide efforts like the Climate Act Scoping Plan, the Extreme Heat Action Plan, and the NYSCIA, as well as targeted conversations with the Energy Equity Collaborative, State agency staff, and electric utilities, key stakeholders for the program. Additionally, in June 2025, ERP issued a Request for Information (RFI) to gather broad stakeholder input on needs for data, information, and research to advance climate adaptation in local, county, and state planning and response. Research needs were also identified by the author teams from the NYSCIA.

A database of research needs was compiled from these diverse sources. All responses were organized into discrete research needs. Next, each discrete need was classified by categories (see Figure 1): source, sector, hazard, and activity type. The sub-category for source is simplified in this figure. The sub-categories for sector and climate hazard are taken from the NYSCIA. The sub-category for activity type is based on generalized capabilities and steps in climate planning processes synthesized from the National Oceanic and Atmospheric Administration's (NOAA) Steps to Resilience (StR) and the Federal Emergency Management Administration's Mitigation Framework for Leadership Group (MitFLG) ². The activity type sub-category includes values for policy prescriptive ideas (not relevant to research planning) and GHG mitigation (less relevant to Climate Impacts and Adaptation), which were received from stakeholders but not relevant to this research plan. The database also includes tags for the priority themes identified below. This structured approach created a unified framework that allowed for meaningful

² [Parris et al 2025](#) and [MitFLG 2024](#) illustrate that researchers and practitioners in the field of climate adaptation use a wide variety of terms to describe their work. For the sub-category on Activity Type, definitions for each classification were established using both sources to allow for consistent classification.

comparison and helped identify recurring themes across diverse inputs. The interactive capabilities of the database will allow ERP staff to filter, sort, and search to assist with research prioritization.

Figure 1. Columns that categorize each need into distinct groups to enable easier sorting and analysis



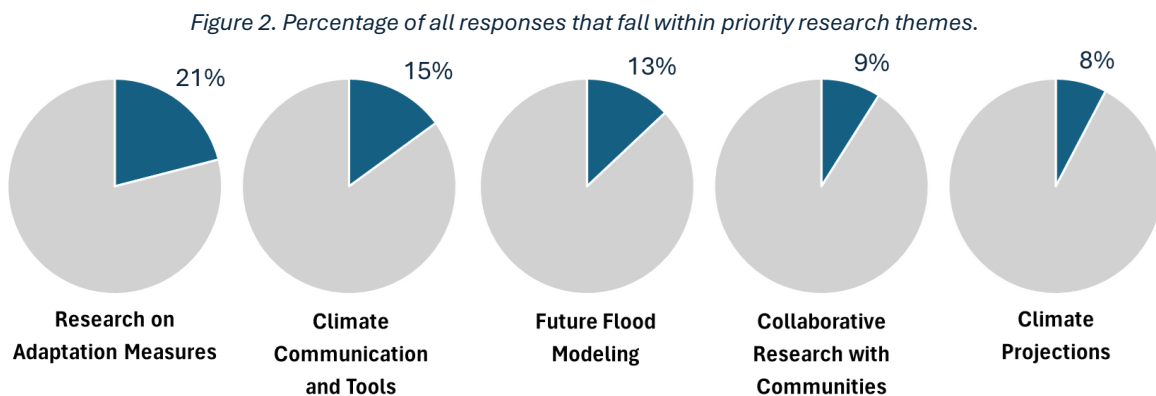
In total, 515 individual needs are included in the database. Various needs overlap but have subtle distinctions. For example, some infrastructure-related needs emphasize improved data on asset conditions across all forms of infrastructure, while others specifically focus on building data. Similarly, many needs relate to more than one climate hazard (e.g., precipitation change and sea level rise) or more than one sector (e.g., human health and ecosystems). Nevertheless, some prevalent themes emerged.

Within the sector category, “Society & Economy” was the most prevalent after “General,” totaling 82 needs. Within the hazard category, flooding and erosion were identified frequently (45 responses), as were responses that reference multiple climate hazards (i.e. the “multiple hazards” classification). For the final category, Activity Type, the three most common response types were Technical Assistance and Decision Support (119 responses), General Science & Research (97 responses), and Vulnerability, Risk, and Impacts Analysis (90 responses). Across all responses, the need for projections, impact assessments, or related research was particularly strong – more than half of the responses (319) referenced one or more of these areas.

Based on frequently expressed needs, we identified the following priority research themes:

- **Research on Adaptation Measures** that reduce the vulnerability of critical infrastructure and energy systems.
- **Climate Communication and Tools** to ensure decision support systems effectively integrate climate projections into planning processes and are accessible to a wide range of users.
- **Future Flood Modeling** to better characterize both inland and coastal future flood risk for planning and emergency preparedness.
- **Collaborative Research with Communities** to ensure equitable, locally informed, and actionable adaptation strategies.
- **Climate Projections** to provide consistent, high-resolution, and decision-relevant information on future climate conditions, extremes, and uncertainties to support regional and sector-specific planning.

Each need was then categorized under one or more of these priority research themes. The distribution of needs related to each theme is illustrated in Figure 2. Research on Adaptation Measures was the most prevalent theme, followed by Climate Communication and Tools, Future Flood Modeling, and Collaborative Research with Communities. Each of the themes are described in more detail below.



3.2 Research on Adaptation Measures

Research on Adaptation Measures emerges as a priority theme, with respondents emphasizing the need to evaluate the effectiveness of adaptation and resilience strategies to support decision-making. Many needs call for cost-benefit analyses of climate hazards and adaptation measures to justify resilience investments, incorporating metrics such as avoided damages and public health savings to better capture community-wide benefits, costs to strengthen infrastructure resilience, and the costs of inaction. Respondents also stress the need for standardized resilience metrics and scoring frameworks to assess the performance of adaptation actions over time. More research and larger investment in

nature-based solutions (NbS) are identified as a critical need, particularly to understand their effectiveness under future climate scenarios. Additional priorities include research focused on strengthening resilience across infrastructure systems, energy networks, and power grids to better understand impacts and improve long-term climate resilience.

3.3 Climate Communication and Tools

Many needs focus on tools that translate complex climate data into accessible, web-facing platforms for non-technical audiences, including the general public and decision-makers such as municipal planners. These tools should simplify climate information, clearly highlight regions and populations facing elevated risks, and support intuitive interpretation and discourse among non-technical users, including language translation when feasible. Integrating climate projections with sociodemographic and infrastructure data was identified as particularly valuable for supporting adaptation, helping decision-makers and the public understand which areas and communities face the greatest risks. Increased access to user-friendly climate projections would support more informed adaptation and resilience planning.

3.4 Future Flood Modeling

While many New York State agencies are currently investing in flood and erosion data, including updated mapping, respondents consistently highlighted the need for better projections of future flooding and erosion. Specifically, they emphasized projections that incorporate future precipitation patterns, compound flooding, and sea-level rise. To develop better future flood data in urban areas, more detailed surface inundation modeling needs to account for stormwater capacity, land cover, topography, and sub-daily rainfall to capture short-duration extreme events. To improve inland flood projections across NYS, respondents expressed a need to modernize and integrate local hydraulic and watershed models. Mapping aging infrastructure, such as sewer and stormwater systems, and linking this current infrastructure with hydrology models can better identify vulnerable flooding areas.

Respondents also emphasize the need for expanded monitoring, validation, and real-time forecasting of the extent, depth, and overall duration of floodwaters. Overall, NYSERDA prioritizes updating and improving future flooding projections, as more integrated, high-resolution model data is needed for effective adaptation planning. Partnerships with other organizations to support flood modeling were also suggested as a key strategy.

3.5 Collaborative Research with Communities

Collaborative research with communities is critical to ensuring adaptation strategies are equitable and grounded in local input. Many responses emphasize the need for community-informed approaches that integrate local knowledge and lived experience into adaptation planning. Respondents also stress the value of coproducing more granular data on climate vulnerabilities within underserved communities, perhaps partnering on research projects with community organizations, recognizing that this data is essential for identifying inequities and informing targeted, effective adaptation efforts. Data collection, aggregation, analysis, interpretation, dissemination, and access are all important components of a climate data justice framework to advance equitable community climate adaptation. Many respondents emphasize the importance of community engagement to understand how communities perceive climate risks and adaptation options, including the inherent trade-offs that come with climate action or inaction. Gaps in technical expertise and capacity were noted, particularly in rural and underserved areas that often lack funding, staff capacity, and technical support. Finally, assessing health impacts and vulnerabilities, especially in underserved populations, was identified as a major priority for ensuring effective and equitable adaptation. It will be helpful for the program to engage with other programs at NYSERDA (e.g., ECE team, social science research) and other agencies (e.g., DOS, DEC) who work closely with communities.

3.6 Climate Projections

Decision-relevant climate projections are a foundational need for effective adaptation and resilience planning. Respondents emphasized developing more localized, higher-resolution projections of hazards (e.g., temperature, precipitation, wind, and extreme events) to better capture extreme events that occur within a 24-hour period. Particular emphasis is placed on topics related to urban heat island effects and atmospheric processes near the Earth's surface. Expanded modeling of extreme events, including flooding, heat waves, wind, drought, and winter storms, is also identified as a need.

It is also important for initiatives like the NYSCIA to keep abreast of evolving national and international climate projection products, such as the models included in the Coupled Model Intercomparison Project (CMIP), and to interpret and tailor their use for New York.

Effective climate modeling should emphasize impacts, compounding hazards, and decision-relevant uncertainty, rather than focusing solely on individual climate variables. Priority needs include generating finer-scale projections of extreme precipitation, such as changes in rainfall intensity, duration, and frequency, to better assess flash flooding risk, as well as developing datasets that represent compound and cascading events, such as

extreme wind occurring simultaneously with icing. Clear articulation of uncertainty across emissions scenarios, time horizons, and modeling approaches is critical to support robust, risk-informed planning under future climate scenarios.

3.7 Impact Assessment and Other Themes

As noted above, respondents identified many research needs related to the impacts of climate change on various sectors. These needs include better information on the disproportionate impacts of climate change on low-income and rural communities, as well as impacts on agriculture, health, infrastructure, and ecosystems. Although responses were perhaps too broad and varied to constitute a focused research theme like the five outlined above, it is worth noting that climate impact assessment and analysis as a general topic was prevalent in the responses.

State agencies have identified the NYSCIA as an important resource that can be continually updated as the science evolves to provide a robust source of climate impact information for the state.

Several other themes appear frequently but were less focused on research than the themes outlined above. Examples include the need for more climate education, distinguished from climate communication as formal pedagogy, and efforts to increase the number of students studying climate resilience. Stakeholders also note the need for assistance in locating and applying for grant funding, particularly in rural communities, and identifying other potential funding sources.

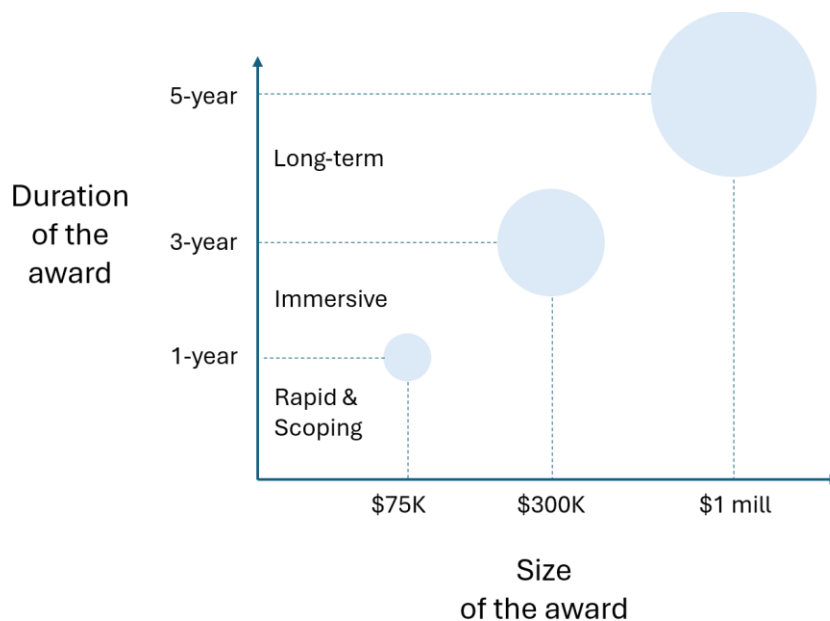
4 Structures for Funding Research

In addition to alignment with research needs, the structure of research funding is also important. For example, Collaborative Research with Communities is better supported by providing long-term funding, where relationships can be built on trust and tangible outcomes (e.g., risk reduction, community resilience) can be accrued. This section describes strategies for structuring climate impacts and adaptation studies to positively impact society.

4.1 Award Typology

Research funding at NYSERDA is awarded via contracts that take a variety of forms. Across the range of needs identified in the database, ERP can use four different award types that suit different climate adaptation contexts: long-term, immersive, rapid, and scoping (see Figure 3). The section below describes these award types in greater detail.

Figure 3. Varying approximate funding by award types



4.1.1 Long-term

Awards spanning five years or more are generally considered long-term in the research community. Long-term awards are useful in climate adaptation for numerous reasons including, among others, measuring outcomes and collaborating with communities. For example, it may be helpful to track the growth and survival of tree plantings used to shade residential buildings and lower air conditioning and energy usage during heat waves. In this case, multiple years' worth of data over successive heat seasons may be required to determine the survival and growth rate of trees or energy usage and costs to ensure the adaptation measure is reliably performing. Similarly, a wealth of social science demonstrates that building relationships over time creates trust between scientists and community members, including those in underserved communities. Those relationships are critical to reconcile scientific knowledge with lived experience (i.e., knowledge of place, people, and cultural history, especially including any legacy injustices). Because long-term research projects require larger investments of time and funding, they may be fewer in number.

4.1.2 Immersive

Research awards commonly span one to three years. Shorter-duration awards require less funding but consequently limit what can be accomplished, especially in newer areas of science such as climate adaptation. As outlined in the NYSCIA methods, scientific evidence is generally considered stronger when multiple lines of evidence (data, models, expert opinion, etc.) align toward similar trends or concepts. Multiple studies conducted by

different researchers and/or with different methods help to bolster confidence in findings. Consequently, shorter-duration awards are best suited to tackle very focused or immersive questions, problems, or elements of solutions.

Immersive projects may be well suited to investigate specific needs or pilot small-scale solutions. For example, local flood patterns can often be difficult to ascertain from data over large spatial and temporal scales. Heavy rainfall can be unpredictable both in terms of its timing, duration, and frequency from one location to the next. Immersive research can help use local flood data, community observations, and flood models to understand where flood adaptation might make the biggest difference in terms of reducing flooding in a specific location. Immersive projects can be coupled with long-term projects, where collaborative relationships lead to in-depth investigations of problems or solutions. For example, it may be necessary to monitor the efficacy of adaptation measures over multiple locations or over a longer period than allotted in an immersive award, in part because storms vary from one year to the next.

4.1.3 Rapid

Climate extremes cause significant impacts in New York State, especially when combined with underlying injustice and aging infrastructure. Additionally, regulatory, policy, and funding changes can significantly change drivers and opportunities for adaptation. Rapid research and assessment are often needed to, among other things, document impacts (e.g., the extent and magnitude of flood damages), shed light on rapidly unfolding needs for adaptation (e.g., offsetting abrupt increases in flood insurance in low-income communities), and/or gather expert opinion on stop-gap solutions as recovery and resilience efforts take hold³. Rapid awards, especially those connected with specific events, are time-sensitive and, given the experimental nature of the research, may be limited to one year and smaller amounts of funding. Consequently, a key feature of rapid awards is streamlined proposal requirements to minimize the administrative burden for both NYSERDA and the awardees. Because it can be difficult to anticipate when climate extremes occur or when the combined effects of climate hazards and other drivers result in measurable impacts, rapid awards may be solicited year-round.

4.1.4 Scoping

Scoping awards are small awards that help catalyze immersive and long-term projects. In the case of catalyzing long-term research, scoping awards provide resources for convenings (e.g., workshops) and/or discussions. Long-term partners often need to, among

³ Kyrkjebo, N.I., et al. (2021). Rapid Research and Assessment on COVID-19 and Climate in New York City. *Journal of Extreme Events*.

other things: a) identify research contexts jointly (e.g., framing issues together, forming shared vocabulary, appreciating respective disciplines and/or lived experiences), b) form shared principles for collaboration (e.g., procedural guidelines for engagement and issues around data governance), and/or c) ensure organizations can work together (e.g., contracting issues). In the case of immersive projects, scoping awards can help take stock of available data relative to the research questions posed and/or formulate refined research questions. In both cases, the scoping awards make for thoughtful, feasible proposals with a greater chance of achieving societal impacts.

4.2 Evaluation and Prioritization Criteria

Beyond the award type, proposal evaluation criteria are critical to encourage impactful research. ERP already uses explicit proposal criteria related to both contractual requirements for publicly funded research, sound project management, and societal relevance, such as cost criteria, project design, and impact of previous work, respectively. ERP engaged the Advisory Body to help evaluate potential factors or indicators of impactful and actionable research. This section describes criteria that offer new and/or refined ways to evaluate and/or prioritize research in future funding opportunities.

4.2.1 Alignment with Research Gaps in the NYSCIA

For the NYSCIA, NYSERDA assembled more than 250 New York–based, national, and Indigenous climate science experts and representatives from diverse communities and industries to provide a credible, science-based analysis of what to expect from climate change in New York State. Each chapter not only provides traceable accounts that evaluate the evidence base for major findings, but it also provides a summary of research gaps. In many cases, the research needs collected through processes like the RFI and various other planning efforts are related to research gaps developed by NYSCIA author teams and can add nuance to the gaps stated in the chapters. To build on the work in NYSCIA, future research could focus on the gaps identified in the chapters, and proposals can be encouraged to provide brief descriptions of how the work relates to those gaps, particularly addressing areas where the evidence base is weak or limited. There was strong agreement among the Advisory Body that describing fit with the work in the NYSCIA would increase the credibility of the proposed research.

4.2.2 Alignment with the State Energy Plan, NYS Adaptation and Resiliency Plan, and Other State Plans and Initiatives

The Advisory Body emphasized the importance of strong alignment with New York State planning and policy efforts (e.g., State Energy Plan, Extreme Heat Action Plan, NYS Adaptation and Resiliency Plan). Large, statewide plans and initiatives like these generally

undergo broad engagement and review, meaning that any research needs identified through these planning processes will have strong support.

The State Energy Plan, for example, recommends that NYSERDA undertake research for climate hazards that currently have low certainty (e.g., winter weather) and on emerging resilience and adaptation technologies for the energy system. While the NYSARP is currently under development, ERP should coordinate closely with that planning effort and align research as needs are identified through the NYSARP process.

ERP will also continue to align priorities with those of the program's funding sources.

4.2.3 Alignment with Research Themes

Research proposals that align with the research themes in this plan can help to demonstrate their importance to decision makers and communities. The database developed for this plan can also be used by the research community to evaluate how a research proposal might address needs across multiple contexts (sectors, regions, communities, systems, etc.).

4.2.4 Utility of Research Products

Research proposals often make a case that it would be useful to generate knowledge, data, or information on a given issue without specifying how the outputs of the research will be used. Actionable, usable, and *used* climate research requires careful design that accounts for key factors such as a clearly defined context for who will use the research, how various actors will be involved in the research and/or use of the research, how the research results align with specific decisions (e.g., are data at sufficient temporal or spatial scale to take action?), and how the data and information will be made accessible in a usable format over the long-term. The Advisory Body emphasized the importance of addressing these factors, noting that the result does not always have to be a website or an information tool.

Conducting collaborative research with communities, scientists, and policy-makers can help build a shared awareness of an emerging issue.

The utility of a project also lies in understanding whether it is truly new and innovative research. It will be important for ERP staff and researchers to identify whether research on a particular topic is already being conducted by other entities before proceeding down that path, in order to reduce duplication of effort and enhance coordination and collaboration.

4.2.5 Consequence

Risk and vulnerability assessment is a fundamental part of adaptation planning. Directing research to high-vulnerability and/or high-risk areas is critical to minimize impacts. For example, extreme heat in cities varies from one neighborhood and building to the next. Yet,

while one neighborhood may be hotter than another, the buildings in that neighborhood may be newer and thus have better insulation and/or air conditioning, lowering the consequences for residents. One prioritization factor might be a focus on addressing high-vulnerability and/or high-risk situations where high consequences are at stake for many people and ecosystems or critical infrastructure that provides a public good⁴. The Advisory Body expressed agreement that research should address the biggest pain points of New Yorkers and sustainability goals, including economic benefits. Making a risk-based case for where research could help address significant consequences of climate change could help ERP prioritize funding.

4.2.6 Feasibility

Adaptation planning relies on research that can inform climate-related decisions within real-world planning timelines, policy contexts, and resource constraints. Explicit attention to feasibility is needed to assess whether proposed research can be meaningfully advanced using existing data, models, and analytical approaches, or whether substantial foundational research would be required before results could inform adaptation planning and policy. Consideration of feasibility also includes whether proposed research is appropriately scoped to leverage available funding to move research forward efficiently and generate more immediate impact. Feasible research proposals clearly describe assumptions, data readiness, methodological limitations, and any prerequisites for successful implementation, helping ensure that awarded research balances ambition with practicality and maximizes the impact of research funding.

5 Conclusion

This research plan demonstrates NYSERDA's commitment to responsive, relevant, and equitable research on climate adaptation and impacts. Over the past decade, the Climate Impacts and Adaptation program area within ERP has demonstrated a key underlying principle of adaptation: adjusting to what scientists, decision-makers, and communities learn about climate and its impacts. From early investments in climate projections to comprehensive and rigorous investigations like NYSCIA, ERP evolved through research planning to support both state policy- and decision-making to community-based adaptation efforts.

⁴ For the sake of simplicity, public goods are broadly defined as those that are non-excludable, non-rival, evidence-based, rooted in collective action, and intended to serve public interest. For more information on public and private adaptation, see: Tompkins, E.L., Eakin, H. 2012. Managing private and public adaptation to climate change, *Global Environmental Change*, Volume 22, Issue 1, Pages 3-11, ISSN 0959-3780, <https://doi.org/10.1016/j.gloenvcha.2011.09.010>.

The message from a wide array of diverse stakeholders is clear: NYS needs research on the efficacy of adaptation solutions, developed with and for disproportionately impacted communities and in formats that can be used to build capacity over time. In this plan, ERP outlines a strategy to support research issues that matter to New Yorkers through structured investment that meets near- and long-term needs. ERP continues to call upon the research community to align with state efforts and with communities in increasingly intentional ways, including making a strong case for research to address disproportionate vulnerabilities and impacts. In so doing, ERP fulfills its mission to provide a scientific foundation for developing effective and equitable energy-related environmental policies and resource management practices that prepare the state for a changing climate.