CLIMATE ACTION PLAN

RUTGERS
Office of the President
TASK FORCE ON CARBON NEUTRALITY
AND CLIMATE RESILIENCE

June 2021

Land Acknowledgment

We acknowledge and honor that Rutgers, the State University of New Jersey, is located on Lenapehoking, the ancestral homelands of the Lenape people. We recognize the continued significance of these lands for the Lenape peoples, communities, and nation.

We also acknowledge that Rutgers, through the Morrill Act of 1862, benefited from the violent dispossession of 208,000 acres of land belonging to western tribal nations.

We recognize the many and diverse Indigenous peoples—past, present, and future–who call New Jersey home.

As the Intergovernmental Panel on Climate Change concluded, "Indigenous and local knowledge (ILK) can play a key role in understanding climate processes and impacts, adaptation to climate change, sustainable land management (SLM) across different ecosystems, and enhancement of food security." As the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services concluded, "Recognizing the knowledge, innovations and practices, institutions and values of indigenous peoples and local communities and their inclusion and participation in environmental governance often enhances their quality of life, as well as nature conservation, restoration and sustainable use."

Thus, we believe that awareness of Indigenous exclusion and erasure, and our continuing responsibility to the Lenape and the other Indigenous peoples of the United States, is particularly important as we seek to build a more sustainable and resilient future for Rutgers, New Jersey, and the world.

Acknowledgements

This Climate Action Plan is the product of hundreds of members of the Rutgers community, contributing their time and thoughts despite the challenges of the COVID-19 pandemic. The Task Force expresses its appreciation to the many students, staff, and faculty who participated in the climate action planning Town Halls held in person in February 2020 and online in November 2020 and April 2021, as well as to those who submitted comments on our prior reports; and especially to the 18 students and 112 staff and faculty who participated in the Task Force's Working Groups.

We thank Executive Vice President Tony Calcado, Executive Vice President Prabhas Moghe, and Senior Vice President Barbara Lee for their support in our work, and President Robert Barchi and President Jonathan Holloway for their leadership in establishing and supporting the Climate Action Planning process. We thank Senior Director of Institutional Equity & Strategic Initiatives Joan Collier, Scarlet and Black Postdoctoral Fellow Alexandria Russell, Professor Jack Tchen of the Clement Price Institute on Ethnicity, Culture & the Modern Experience, Chief Mann of the Turtle Clan, Ramapough Lunaape Nation, and Ana Oian Ametsa of Four Directions Mutual-Aid for their assistance in the development of the Indigenous land acknowledgement.

The members of the Task Force would also like to thank the thirteen students who served as the Task Force's Student Advisory Panel, and express their deep gratitude to Professor Angie Oberg, the Task Force's Administrative Director, without whose knowledge, diligence, and organization this work would not have been possible.

June 23, 2021

Dear President Holloway, members of the Boards of Governors and Trustees, members of the Rutgers community, and members of the New Jersey community:

The last year and a half have been challenging for Rutgers, the nation, and the world. We are living in an age of crises: an age, in the original definition of the word crisis, of critical turning points, which may yet resolve for better or for ill.

Thanks to remarkable feats of biomedical science, including advances made here at Rutgers, the COVID-19 pandemic has passed its turning point in the United States. We all look forward to returning to campus in the fall. But the nation continues to face other domestic and global crises: of racial injustice, of economic inequality, of democracy, and of climate and biodiversity.

These crises are intertwined. The impacts of the climate crisis are falling most heavily on many of the same racially and economically marginalized people who are being most strongly affected by the pandemic. Efforts to tackle the climate crisis in the United States have been long delayed by the same minoritarian political institutions and epistemological polarization that challenge public health measures and now threaten American democracy itself. We cannot successfully move forward on the climate crisis without addressing these other crises at the same time.

Nonetheless, there are good reasons to be hopeful. The development of multiple COVID-19 vaccines at unprecedented speed shows how quickly we can make change when we work together toward a common goal. Earlier this year, President Holloway joined with the leaders of 125 other colleges and universities in calling upon the United States to create a 100% clean energy power sector as soon as feasible, commit to national net-zero emissions no later than 2050, and work across sectors to drive greater national ambition on climate and prepare the country for the effects of climate change – and the US Presidential administration is following through.

Universities, particularly large, public and land-grant universities like Rutgers, have key roles to play in tackling the climate crisis. The climate crisis demands the involvement of all three pillars of a university's mission: instruction, research, and engagement. Large universities are also economic and political forces, and their economic and political capabilities can be brought to bear to advance climate action.

The climate crisis is also a scale-spanning crisis, which universities are particularly well structured to address. In the climate crisis, local actions are tied to global causes and consequences, and actions today create legacies for many generations to come – and universities are scale-spanning institutions. As locally-rooted parts of the globally-networked academic sector, universities like Rutgers are bridges between local and global communities; as multigenerational institutions, universities like Rutgers can foster the long-term perspective needed to manage the climate crisis.

Now, it's time for Rutgers to step up.

Rutgers already has a record of substantial climate action: we are a national leader in linking climate research to community needs, and an early pioneer of on-campus renewable energy. But we have lacked a coordinated, University-wide, strategic approach that makes climate action a whole-of-University priority. This Plan proposes an approach to mobilizing the entire University to act on climate. It lays out an ambitious, yet achievable and feasible, pathway for creating a carbon-neutral, more resilient Rutgers while advancing climate action across the state of New Jersey and across the world.

Let's get to work.

President's Task Force on Carbon Neutrality and Climate Resilience

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Angela Oberg, Administrative Director

June 23, 2021

Dear President Holloway, members of the Boards of Governors and Trustees, members of the Rutgers community, and members of the New Jersey community:

Students across the world stand at the forefront of activism in response to the climate crisis. This pattern holds at Rutgers, home to a vibrant community of student leaders who witness the persistent, devastating climate impacts to our coastal home state. Over the past year and a half, so many of us have struggled in response to overlapping crises. Yet, in response, we have demonstrated remarkable strength, perseverance, and capacity for community care. In this context, the Student Advisory Panel to the Task Force is proud to share the Climate Action Plan, a comprehensive roadmap for our next steps toward carbon neutrality and climate resilience.

Contributions to this ambitious and essential step were not isolated to the great deal of research and analysis performed by the Task Force. The development of the Climate Action Plan started long ago in the minds of students, faculty, and staff who came together to recognize the gaps in Rutgers' university-wide sustainability portfolio, draw inspiration from the work of other universities and organizations, and who made their informed voices heard. Demands for robust climate action began several years ago. With that momentum building to a climate march in the fall of 2019, students, faculty, staff, and community members coalesced to flood through College Avenue to collectively show their support for climate action. With these voices in the background, unceasingly demanding change, President Robert Barchi commissioned the President's Task Force on Carbon Neutrality and Climate Resilience. The Task Force called on the Student Advisory Panel to liaison between the Task Force and the Rutgers student community with three primary functions: organizing student engagement, creating an ongoing dialogue between the Task Force and student community and advising the Task Force and Working Groups. We represent students from all four chancellor divisions of the University: Rutgers–Newark, Rutgers–Camden, Rutgers–New Brunswick, and Rutgers Biomedical and Health Sciences. We are students with diverse interests, engaged in undergraduate and graduate studies in biology, English, public policy, medicine, engineering, business, political science, and law. It has been our great pleasure to fulfill these responsibilities to the Rutgers community.

The Climate Action Plan reflects calls from students throughout the Rutgers community, particularly those for 100% renewable energy, on a timeline that reflects the urgency of the climate crisis. In addition, the Plan shows that these solutions are not just a necessary step for climate action but that they are both financially achievable and technologically feasible for Rutgers to implement.

We urge this plan to be used as a template and a living document to be further matured with input from all Rutgers community members instead of a finished product that achieves

sustainability. For this reason, the Climate Mobilization Office recommended in the following pages is of critical importance. A consistent request from student sustainability advocates, this office should amplify student voices in partnership with the University. For this vision to come to fruition, we still need robust and sustained student involvement. We hope that the Student Advisory Panel will persist after the Task Force's conclusion as a body that can grow and maintain relationships between student groups across Chancellor units, facilitating student activism as the Climate Action Plan comes to life across our campuses.

We call on current and future students to persist in the fight for climate action and climate justice. But, to realize these extraordinary changes, we must cultivate a culture of sustainability that holds our Administration and institutions accountable.

We are all in this together.

Student Advisory Panel

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THE PROBLEM

The science is clear: climate change is real, humans are responsible for it, and it is having increasingly severe impacts throughout the world, including here in New Jersey. Since the late nineteenth century, global average surface temperature has risen by about 1.1°C (2.0°F) as a result of human activities, predominantly emissions of carbon dioxide and other greenhouse gases.[1] In New Jersey, the rise in average temperature has been about twice as fast: average statewide temperature is now about 2°C (3.6°F) warmer than in the late nineteenth century.[2]

The climate change experienced to date is already causing substantial impacts in Rutgers' home state. Sea-level rise associated with global warming is responsible for about 70% of tidal flooding along the Jersey Shore,[3] and in the absence of human-caused global sea-level rise, Hurricane Sandy would have flooded about 25,000 fewer New Jerseyans.[4] A warmer atmosphere is also increasing the frequency of intense rainfall events, such as those New Jersey experienced during Hurricanes Floyd and Irene.[5] Heat waves are also becoming more intense and frequent, with associated deleterious impacts on human health.[6]

These impacts will keep getting more severe with every bit of greenhouse gas emitted into the atmosphere. The only way to stabilize the global climate is to bring net human-caused carbon dioxide emissions to zero – meaning every tonne of carbon dioxide emitted into the atmosphere must be balanced by the deliberate removal of an equal mass – and to sharply reduce emissions of other greenhouse gases. The faster net carbon dioxide emissions are reduced, the better the odds of achieving the ambitious target laid out in the Paris Climate Agreement of limiting global warming to well below 2°C (3.6°F) above pre-industrial levels. According to the Intergovernmental Panel on Climate Change, achieving the Paris Agreement's most ambitious goal, that of limiting warming to 1.5°C (2.7°F), requires global net-zero carbon dioxide emissions by about 2050; achieving the less ambitious 2.0°C (3.6°F) target requires this by the 2070s.[7] Yet even 1.5°C (2.7°F) of warming leaves significant residual risk to which individuals, businesses, universities, governments – and, indeed, all of society – must adapt.

Rutgers is contributing to both the problem and the solution. Annually, we emit about 470,000 tonnes of carbon dioxide – enough to cause, based on current US government estimates of the social cost of carbon, about $24 million of damage to global society each year. At the same time, we are playing key roles in developing technologies to avoid emissions and helping communities in New Jersey respond to climate change. By making climate action – both within the University and more broadly – a key strategic priority, Rutgers has the opportunity to scale up these efforts and become a national leader in joining research and teaching to community climate action.

MOBILIZING THE UNIVERSITY

In recognition of the necessity of climate action, University leadership established the President's Task Force on Carbon Neutrality and Climate Resilience in September 2019. We were charged to develop the University's strategic plan for contributing to achieving global net-zero carbon dioxide emissions ('carbon neutrality') and for enhancing the capacity of the University and the State of New Jersey to manage the risks of a changing climate ('climate resilience'). A key element of the task force's charge is that these strategies do not stop at Rutgers' borders. As the state university of New Jersey, Rutgers has an opportunity and an obligation to help lead the State to a more just, sustainable, and resilient future; in so doing, we can build a model for community-engaged climate leadership in higher education that can serve as a guide for other public universities around the country and the world. Thus the theme of linking activities on campus to the broader goal of climate-positive, equitable economic development – the socially equitable transformation of New Jersey's economy to one that is powered by clean, renewable energy, produces net-negative carbon emissions, and is resilient to climate and related impacts and shocks – should be fully integrated into Rutgers' climate strategies.

The overarching goal of this Climate Action Plan is to: Mobilize Rutgers' academic, operational, and economic capacities to advance just, equitable climate solutions and help achieve national net-zero greenhouse gas emissions no later than 2050.

Mobilizing Rutgers' full capacities requires making the climate crisis a central, organizing principle for the University – an integral element of University strategy, not simply of University climate strategy. As we work to achieve institutional carbon neutrality and enhance institutional resilience, we must do so in a way that is highly visible to the University community, creating opportunities for teaching and research — even in those situations when it might be modestly more efficient from an operational perspective for planning and implementation to be undertaken, less visibly, purely by operational staff. We must seek to eliminate barriers – whether created by internal institutional borders, budget policies, the absence of adequate funding, or promotion criteria – to the engagement of faculty and staff from across the University's many disciplines in this effort. And we must support curricular, co-curricular, and extra-curricular student involvement in the transformation of our campuses.

At the same time, we must recognize that on-campus activities are, on their own, just a small contribution to national climate action. To make a more substantial benefit, we must keep the larger goals of justice, equity, and global net-zero emissions as lodestars. Within our campus, host communities and state, we must be attentive to both distributive justice – who feels the burdens of the costs of climate change and of climate action, and how these burdens relate to pre-existing inequities – and procedural justice – ensuring that all of those affected have a say in critical decisions. This includes justice toward historically marginalized groups, including low-income and minoritized residents of New Jersey, as well as New Jersey's indigenous Lenape people. As a trusted convener, Rutgers can play a critical role in bringing diverse stakeholders together to foster research-informed, participatory dialogues that move climate action forward. In so doing, we can create opportunities for our students and faculty to gain valuable experience building real-world solutions.

Rutgers can have its biggest impact on the climate crisis by becoming a model for how a large, public university in an urban megaregion can work across disciplines and sectors to accelerate transformative, science-based regional climate action. As a land-grant university, Rutgers has a long history of bringing together community-based extension, use-inspired research, and instruction to advance agricultural and community development. The Climate Grant University concept[8] broadens this model to ensure that – regardless of their resources – communities have access to the information they need to engage in effective climate action. With strong leadership, building upon strengths we already have, Rutgers has the opportunity to become the archetype of the Climate Grant University.

In so doing, Rutgers can accelerate the socially equitable and inclusive transformation of New Jersey's economy to one that is powered by clean energy, produces net-negative carbon emissions, and is resilient to climate and related impacts and shocks. We can help create a future that is:

- **Climate-positive**, because it absorbs more carbon than it emits;
- **Just** and **equitable**, because everyone gets a fair share of benefits, costs, risks and the opportunity to have a say in making decisions; and,
- **Sustainable**, because it promotes economic development while sustaining natural resources and the environment for future generations.

Box 1.1 Developing the Climate Action Plan

Throughout the development of this Climate Action Plan, the Task Force sought to leverage the expertise, vision, and commitment of the Rutgers community through broad stakeholder engagement. Early in the process, the Task Force assembled a Student Advisory Panel comprised of students from all four Chancellor units and co-chaired by the five student Task Force members. This body was integral in keeping the lines of communication open between the Task Force and the many deeply-engaged student groups across the University.

To support the technical work of the Plan, the Task Force established eight sectoral working groups examining (1) energy and buildings, (2) transportation, (3) food and water, (4) supply chain, (5) land use and offsets, (6) climate preparedness, (7) climate-positive, equitable economic development, and (8) governance and financing. Each of these working groups, like the Task Force itself, was comprised of staff, faculty, and students representing all four Chancellor units. In total, over 120 people contributed to the research and analysis conducted by the working groups. At two key stages, the working groups developed reports for public comment – the Interim Report released in July 2020 and the Phase 2 Report released in February 2021. These public comment periods provided important feedback from the Rutgers community, however the most substantial input came from the three sets of town hall meetings held February 2020, November 2020, and April 2021. All three town halls were well-attended, drawing hundreds of participants, including the November 2020 and April 2021 meetings which were held virtually due to COVID-19. The town hall meetings served as a venue for the Task Force to provide status updates, but more importantly, they created an opportunity for the Rutgers community to come together and discuss their visions for climate action through participation in breakout sessions. Many of the ideas generated in those sessions directly shaped the goals and recommendations in this plan.

The Task Force recognizes the importance of engaging external stakeholders including public-, private-,and NGO-sector state leaders and the communities in which Rutgers' campuses are based. However, the emergency created by the COVID-19 pandemic hindered such engagement during the development of this plan. This engagement remains critically important and should be prioritized as restrictions are lifted.

POLICY CONTEXT FOR CLIMATE ACTION

The University must advance climate action cognizant of the evolving global, national, and State policy environments. Globally, the Paris Climate Agreement calls for limiting global warming to well below 2°C (3.6°F) above pre-Industrial levels. As of May 2021, enacted national policies around the world set the planet on a course for about 3°C (5.4°F) of warming by 2100, while policy pledges would lower that trajectory to about 2.4°C (4.3°F), and national net-zero targets (not yet matched with policy) would lead to about even odds of keeping warming below to 2.0°C (3.6°F). More stringent policy is thus needed to meet net-zero targets, and even stronger policy is needed to increase the odds of keeping warming well below 2°C (3.6°F).[9]

The economic environment for climate action looks far more favorable than it did a decade ago. Dramatic declines in the cost of solar and wind technology have led to reductions in global power sector emissions from their peak in 2018. Globally, half a trillion dollars were invested in renewable energy and electrification of transportation and heat in 2020. In countries home to two-thirds of the world's population, it is cheaper to build a new solar or wind facility than a new fossil-fueled power plant.[10] Some of the most capital-intensive measures to reduce emissions (such as building efficiency improvements and expanded renewable electricity generation) can be justified on financial grounds alone.

Nationally, the Biden-Harris administration has committed to lowering US emissions by 50-52% below 2005 levels by 2030, and called for decarbonizing the US electric sector by 2035 and achieving national net-zero emissions by 2050. Legislation needed to achieve these goals is still pending, but proposed federal infrastructure spending would represent a major investment in climate-related research, development, and deployment. Presidential Executive Orders have established a whole-of-government, interagency approach that centers on climate change in both foreign and domestic policy. They have called for more thorough analysis and disclosure of climate-related financial risk by both the public and private sector, and the integration of climate objectives into federal procurement; for incorporating the best-available climate science into benefit-cost analysis; and for centering issues of equity and environmental justice.

At a State level, New Jersey has a long, bipartisan history of climate action. The State's Renewable Energy Portfolio Standard, introduced in 1999, mandates that a growing percentage of the State's electricity – 22.5% in 2021 – come from renewable sources. The New Jersey Clean Energy Program of the Board of Public Utilities, established in 2003, provides residents and enterprises with a range of incentives to undertake renewable energy and energy efficiency projects. The Global Warming Response Act of 2007 set a statewide goal of reducing greenhouse gas emissions by 80% below 2006 levels by 2050. In 2018, New Jersey rejoined the Regional Greenhouse Gas Initiative (RGGI), a multi-state compact to support trading of greenhouse gas emissions permits among regulated entities in the Northeastern US, of which it was a founding member in 2007.

The current State administration has established a community solar energy pilot program, directed energy utilities to improve energy efficiency on customer premises, and promoted offshore wind energy and energy storage. The 2020 State Energy Master Plan established a statewide goal of 100% clean energy by 2050. Of relevance to Rutgers' activities as a research and educational institution, the Plan includes a call for "expand[ing] the Clean Energy Economy with a focus

on supporting the growth of in-state clean energy industries through workforce training, clean energy financing solutions, and investing in innovative research and development programs."[11] While New Jersey has yet to adopt a statewide carbon neutrality target, it seems likely that New Jersey will ultimately follow New York state and the Biden administration in setting a statewide target of carbon neutrality by 2050. A key question for this Task Force has thus been the extent to which Rutgers can outpace the state and the nation as a whole, and help the state more broadly achieve this goal.

In parallel with its efforts to reduce greenhouse gas emissions, New Jersey has a long history of policies to improve the state's ability to adapt to a changing climate. Much of the focus is on vulnerable coastal areas, dating back to the 1914 Waterfront Development Act. Superstorm Sandy in 2012 and the state's slow recovery heightened the salience of climate change adaptation issues and associated policies. In 2019, the New Jersey Department of Environmental Protection appointed a Chief Resilience Officer, who under Executive Order 89 is mandated to actively engage with the state's higher education institutions in developing and implementing a statewide climate change resiliency strategy. In 2020, the State established the New Jersey Climate Change Resource Center at Rutgers, with the mission of "creat[ing] and support[ing] the use of impartial and actionable science to advance government, public, private, and nongovernmental sector efforts to adapt to, and mitigate, a changing climate."

A number of New Jersey policy initiatives have focused on or relate to environmental justice and equity. Executive Order 23 highlighted that "New Jersey's low-income communities and communities of color have been exposed to disproportionately high and unacceptably dangerous levels of air, water, and soil pollution, with the accompanying potential for increased public health impacts." In 2020, New Jersey enacted a groundbreaking Environmental Justice Law that requires the development of Environmental Justice Impact Statements for major facilities seeking permits in overburdened communities. The state Energy Master Plan highlights the importance of increasing clean transportation options for low- and moderate-income and environmental justice communities, supporting the development of Community Energy Plans with local community groups, and enhancing deployment of rooftop solar, community solar, and energy efficiency in identified communities. The state's Health in All Policies goal seeks to integrate health and health equity considerations into policymaking across sectors.

In addition to the statewide policy context, climate mitigation and adaptation planning is also happening in some of the communities in which Rutgers' campuses sit. In 2020, the City of Newark updated its Sustainability Action Plan. Working with Jacques Cousteau National Estuarine Research Reserve, the City of New Brunswick in 2015 completed a Getting To Resilience assessment, focused on the city's vulnerability to flooding. The City of New Brunswick obtained their Sustainable Jersey Bronze certification in 2017,[12] and two Rutgers faculty and staff are part of the New Brunswick's 'Green Team' commissioned by the Mayor to assist the City in their current recertification.

WHAT MAKES RUTGERS UNIQUE

The University must also advance climate action cognizant of the distinctive strengths, challenges, and opportunities posed by our own institution's history and structure. As Rutgers' official history declares, *Rutgers, The State University of New Jersey, is the nation's eighth oldest institution of higher learning—one of only nine colonial colleges established before the American Revolution—and has a centuries-old tradition of rising to the challenges of each new generation.*[13] One of the most critical challenges facing current and future generations is the climate crisis. Moving towards carbon neutrality and climate resilience is a complex and daunting task, but also an exciting and critical opportunity in the history of the University.

ACCOMPLISHMENTS

Rutgers is already a leader in climate change research and engagement. The Rutgers Institute of Earth, Ocean, and Atmospheric Sciences, the Rutgers Climate Institute, and the Rutgers Energy Institute bring together over 200 faculty who are working to understand our planet, how humans interact with it, and how we can do so in a manner more sustainable and resilient. National Science Foundation statistics show that we are among the top four Big 10 schools in research activity in the Earth, ocean, and atmospheric sciences. Our pioneering efforts over the last decade to engage broad stakeholder networks in New Jersey in climate action – through networks like the New Jersey Climate Change Alliance, which is coordinated out of the Rutgers Climate Institute and the Bloustein School of Planning & Public Policy; through initiatives like the Getting To Resilience program, operated out of the Jacques Cousteau National Estuarine Research Reserve, and the New Jersey Climate Change Resource Center (NJ CCRC); through pioneering educational efforts like the Coastal Climate Risk & Resilience graduate traineeship and the associated Climate Resilience Corps organized by NJ CCRC – are at the cutting-edge of community-engaged climate research and engagement.[14,15] In announcing his executive order on climate resilience, Governor Murphy specifically recognized Rutgers' efforts in this regard. Rutgers scientists are also key players in the science and engineering of offshore wind energy. Our faculty are active in efforts like the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, and the National Climate Assessment. (Indeed, the current chair of the IPCC is a Rutgers alumnus.) President Holloway has made the Earth 2100 initiative – focused on mobilizing all aspects of the university's research and teaching missions to help create an ecologically resilient and climatically stable future – one of the twelve Big Ideas underpinning the University's current endowment campaign.

Rutgers has already taken substantial steps to reduce its carbon emissions. A highly efficient cogeneration plant was installed in 1997 on Busch Campus to provide both electricity and heat, and a wide variety of energy efficiency investments have been ongoing to the present day. In 1999, President Fran Lawrence helped create the New Jersey Higher Education Partnership for Sustainability. In 2005, President Richard McCormick established the University Committee for Sustainability, which delivered the university's first sustainability plan and an updated greenhouse gas emissions inventory in 2007. In 2009, the first large-scale solar array was

built on the Livingston Campus, and it was significantly expanded with the addition of solar canopies in 2013, becoming for a time the largest campus solar facility in the nation. In 2014, President Robert Barchi re-vitalized the University Committee for Sustainability, encouraging coordination of many campus activities and convening annual forums. A very active building program has been underway for several years now, and new facilities are built to the equivalent of a LEED Silver performance standard. The Rutgers Master Plan, released in 2015, highlights environmental sustainability as a key objective. Earlier this year, responding to a request from a student-led coalition, the University's Boards of Governors and Trustees committed to divesting the endowment from fossil fuels by 2031.

OPPORTUNITIES AND CHALLENGES

These many accomplishments have bloomed throughout the University. They have grown in the absence of a strategic Climate Action Plan and of science-informed metrics and milestones that could guide such a plan. To grow further, though, we must bring our academic and operational excellence together in a visible, coordinated, strategic manner. Rutgers' massive size and broad, statewide community connections gives our University the opportunity to redefine the state-of-the-art of climate action in higher education. Our broad reach – including a network of more than 500,000 alumni and a presence in every county in the state – is a critical resource in this regard. As Rutgers turns to bring most of its population back to campus in the fall after more than a year dispersed, we have the opportunity to rethink how the campus is structured and how it operates in order to better address the climate crisis and other key challenges of the 21st century.

Our Complexity

- A complex governance structure
  - 3 main campuses: Camden, New Brunswick, and Newark
  - 4 Chancellor units: Rutgers–Camden, Rutgers–New Brunswick, Rutgers–Newark, and Rutgers Biomedical and Health Sciences (RBHS)
  - 29 schools and colleges
  - 12 central administration units
- Our campuses – Camden, New Brunswick, and Newark – are all in urban areas; we also have a physical presence in all 21 New Jersey counties, including our expansive New Jersey Agricultural Experiment Station (NJAES) off-campus facilities
- Rutgers operates one of the largest campus bus systems in the US and the second largest transit system in the state, behind New Jersey Transit.
- Rutgers–New Brunswick has one of the largest university-operated residence hall systems in the country (nearly 16,000 beds).
- Rutgers–New Brunswick is geographically distributed across five sub-campuses with land in six municipalities and divided by a river.

Our Sheer Size

- More than 70,000 students and 27,000 faculty and staff
  - Diversity – of culture, economic situations, and experience, among other aspects – is one of our greatest strengths. Climate impacts affect all of us, and climate solutions will come from and be integrated across the diverse populations of the University.
  - Faculty and students are engaged in climate, environmental and social impact research across all campuses; tapping into this vast research will be incredibly valuable to University climate action.
- More than 6,000 acres of land on and off campus
- Over 1200 facilities (owned, leased, and affiliated) across all 21 New Jersey counties
- Nearly 950 buildings owned across New Jersey
- 29 million square feet of all building types – academic, administrative, and housing
- One of the largest dining/food service operations in higher education:
  - 6.3 million meals served yearly by Rutgers Dining at Rutgers–New Brunswick.
  - Gourmet Dining (a New Jersey-based business) provides dining services to Rutgers–Newark, Rutgers–Camden, and Rutgers Athletics

Our Financial Realities

- Annual operational budget of $4.3 billion, including $250 million for supplies, $120 million for plant operations and maintenance, and $180 million for debt service
- A deferred maintenance liability approaching $5 billion. This is both a challenge and an opportunity, if we can identify climate-positive ways to address it.
- Very thin operating margin to keep tuition costs down.
- Substantially less cash reserves than similar schools.
- A high cost-of-living and high prevailing wage.
- A broad union presence that strengthens the ability of faculty, students, and staff to participate in institutional governance and brings commitments to maintaining employee standards of living.

Our Infrastructure

- Seventy percent of the buildings on our flagship campus in New Brunswick were constructed at least 25 years ago; more than forty percent of buildings are over 50 years old.
- Sixty percent of all our buildings are relatively small—under 10,000 square feet—and more difficult to retrofit in a cost-effective way.
- Sixty miles of underground water and sewer lines.

RECOMMENDED CLIMATE GOALS

In addition to the overarching goal of climate mobilization, this plan recommends that Rutgers set specific goals related to climate change mitigation, climate change adaptation, and campus culture:

1. Achieving carbon neutrality by 2040 and becoming carbon-negative – removing more greenhouse gases than we are putting into the atmosphere – no later than our 275th anniversary in 2041, including by:
    a. Reducing direct emissions from fossil fuel consumption 20% by 2030 and 100% by 2040 (relative to the FY 2019 baseline of about 216,000 tonnes CO_2-eq)
    b. Eliminating emissions associated with electricity purchased off the grid by 2030 (compared to a FY 2019 baseline of about 144,000 tonnes CO_2-eq)
    c. Reducing indirect emissions associated with commuting, travel, and the supply chain 30% by 2030 (relative to the FY 2019 baseline of about 108,000 tonnes CO_2-eq for commuting, travel, and the food supply chain)
    d. Expanding carbon sequestration in campus lands, building materials, and peer-verified, Rutgers-managed off-campus projects by at least 2000 tonnes CO_2-eq by 2030 and more thereafter
    e. Employing third-party offsets as a complementary strategy of last resort to address remaining emissions
    f. Using Rutgers' economic and institutional capacities to advocate for addressing the societal choices that underlie indirect emissions
2. Working across campus and engaging with our host communities to establish comprehensive plans for just and equitable climate adaptation
3. Building a culture of sustainability that integrates climate action into academic research, teaching, outreach, engagement, campus life, and university policy across Rutgers' campuses.
    a. Using the campus and the State of New Jersey as living laboratories for climate-positive, equitable, sustainable, and resilient development
4. Fostering the creation of educational opportunities for our students, economic opportunities for our host communities and New Jersey residents, and a global model for cross-sectoral collaboration to advance climate action.

Though goals 1 and 2 are structured around climate mitigation and adaptation separately, it is important to recognize that these two elements of climate action are interlinked. Investments in climate action should look for opportunities to both reduce emissions and enhance adaptation on our campuses and across the State.

This document is organized around the four climate goals above, with the remaining sections dedicated to describing how each goal could be achieved. Realizing goal 1 relies on a collection of mitigation solutions, which are described in Section 2. These solutions are actionable items that, when implemented, will measurably decrease Rutgers' net greenhouse gas emissions. To further support the realization of the climate goals, there are recommended actions marked in boldface type throughout the plan. Enacting these recommendations will be critical for successful implementation. Additional details on implementation are in the supplemental reports.

MOVING FORWARD

2021-2024: LAYING THE GROUNDWORK

Taken together, establishing the goals laid out in this Climate Action Plan as University-wide priorities will be a first step toward establishing Rutgers as a model Climate Grant University. In order to achieve these goals, a major focus over the next three years should be putting in place the processes and policies that will guide campus climate mobilization, most notably by establishing a Climate Mobilization Office and a network of Climate Mobilization Task Forces across operational and academic units. The University should focus on building bridges between operational and academic elements, expanding and seeding initiatives that simultaneously address mitigation and adaptation goals while creating opportunities for education, research, and service. The University should support efforts to increase the number of faculty, students, and staff working on climate solutions from a broad range of interdisciplinary and transdisciplinary perspectives, while also working to engage alumni and donors in climate solutions. Climate goals should be integrated into all manner of university policies and planning, including revisions to the University Physical Master Plan and revisions to the University budgeting system.

At the same time, the University should begin a focused campaign of capital investments designed to lower the University's on-campus and electricity-related emissions, including decommissioning old, inefficient buildings; undertaking energy efficiency retrofits; expanding on-campus solar generation; and investing in off-campus renewable energy.

2025-2030: MOVING FORWARD

The year 2030 is a major marker in our proposed climate goals. By this point, a combination of on-campus and off-campus renewable electricity, supplemented by the University's co-generation facilities, should meet all its electricity demand. Energy conservation measures and energy efficiency measures should reduce overall energy demand by 20%. Land management practices, supplemented by the use of carbon-negative building materials, should sequester a cumulative 2000 additional tonnes of carbon dioxide – a small amount in the overall scale of University emissions, but an amount that will create substantial opportunities for education and research and an important step toward the longer-term goal of net-negative emissions.

2031-2040: GETTING TO NET-ZERO

During the second decade of the Climate Action Plan, the University will need to focus on two major mitigation challenges: eliminating on-campus emissions from fossil fuel combustion, and accelerating the reduction of indirect, off-campus emissions from sources like the supply chain and commuting.

Eliminating on-campus emissions will require the replacement of fossil fuel gas-powered heating and co-generation systems, likely with a combination of geothermal systems and electric heat pumps. This is the one major element of our proposed capital investments for which financial benefits do not currently match or exceed costs, but we expect costs to decline substantially over the current decade, and the goal of carbon neutrality cannot be achieved without it.

Rutgers' ability to reduce its indirect emissions will be somewhat limited by the overall pace of societal emissions reductions: it is impossible to eliminate our commuting emissions, for example, so long as fossil-fueled vehicles remain in use. Rutgers should therefore continue to advocate for measures that speed societal emissions reductions. At the same time, we will likely need to purchase some modest level of third-party carbon offsets in order to achieve carbon neutrality in advance of statewide carbon neutrality; we should therefore put in place processes that ensure that the offsets we employ meet the highest quality standards and maximize their side benefits to residents of New Jersey and our host communities.

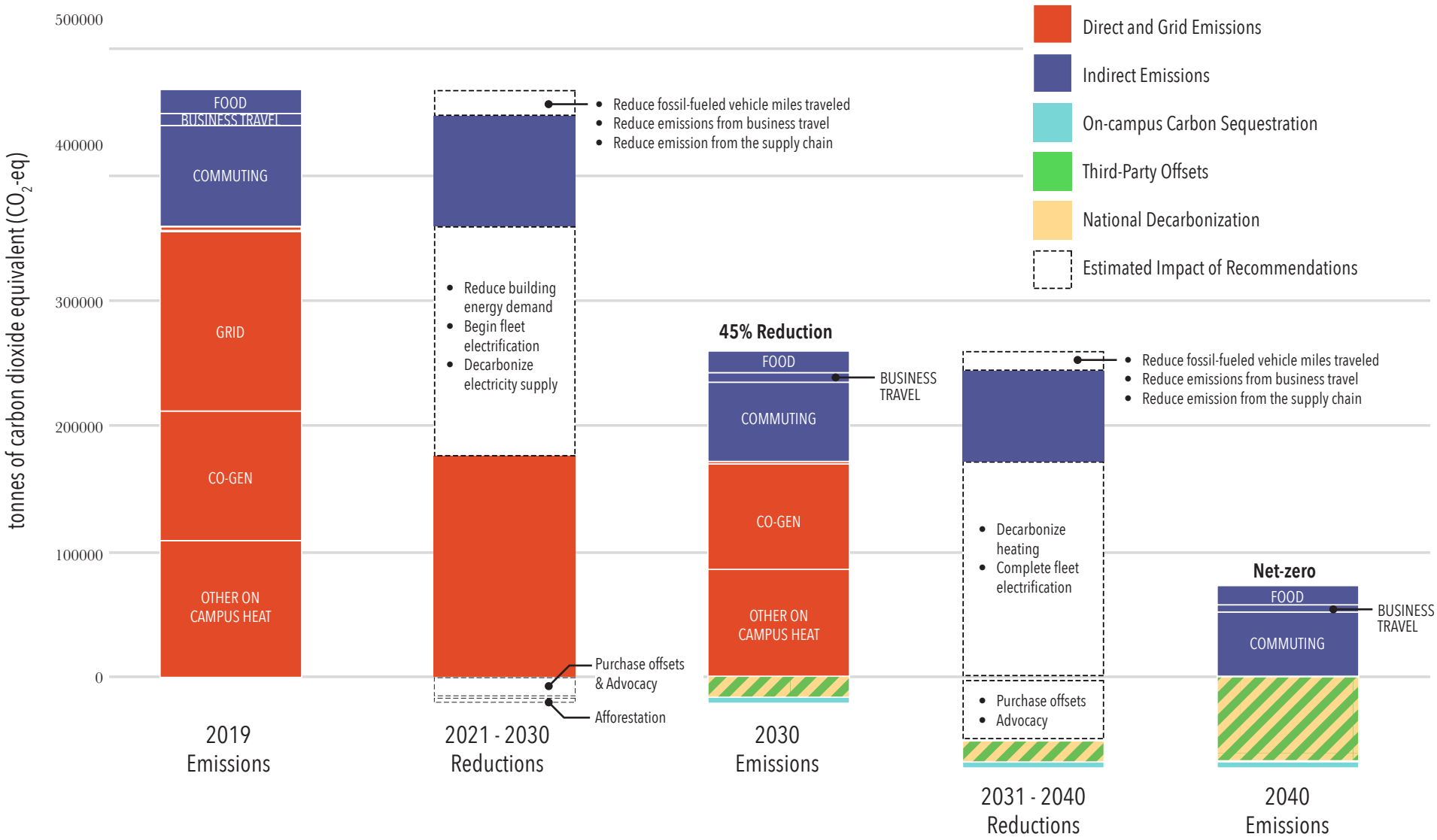
Between now and 2040, when Rutgers will eliminate on-campus carbon dioxide emissions, we project that Rutgers will emit a total of about four million tonnes CO_2-equivalent from on-campus activities and electricity generation. Based on current US government estimates of the social cost of carbon, these four million tonnes will cause a total of about $200 million of damage to global society – a debt that we can repay through educational, research, and service activities that accelerate the global achievement of carbon neutrality and help the people of New Jersey – and of urban megaregions throughout the world – become more resilient to the impacts of climate change.

2041-2050: BECOMING CLIMATE POSITIVE

In the year 2041, Rutgers will celebrate its 275th anniversary. By this point, under the goals laid out in the Climate Action Plan, we will have eliminated on-campus carbon dioxide emissions. Combined with expanded carbon sequestration on Rutgers-owned lands, possibly augmented by third-party offsets to address residual indirect emissions, Rutgers should be responsible for net removal of greenhouse gases from the atmosphere.

It is our vision that, by following the pathway laid out in this Climate Action Plan, Rutgers will become a global leader in University climate action. Over the coming decades, Rutgers will not only make our campuses more sustainable and more resilient, but also measurably accelerate climate action across the State and the northeast urban megaregion. In so doing, we will build a global model for a large, public, land-grant university that puts tackling the global climate crisis at the center of its mission, and links all aspects of our activities in the service of transformative change.

PATHWAY TO CARBON NEUTRALITY



Becoming Carbon-Negative

GOAL 1: Achieving carbon neutrality by 2040 and becoming carbon-negative – removing more greenhouse gases than we are putting into the atmosphere – no later than our 275th anniversary in 2041

2

SUMMARY OF RECOMMENDED MITIGATION SOLUTIONS

DIRECT & GRID EMISSIONS SOLUTIONS

Reduce Building Energy Demand
Retrofit less efficient buildings
Decommission old, inefficient buildings
Adopt new construction and energy standards
Install metering, monitoring and control systems
Decarbonize Vehicles and Equipment
Electrify fleet
Electrify maintenance equipment
Decarbonize Electricity Supply
Expand on-campus solar generation
Purchase off-campus solar or wind electricity
Decarbonize Heating
Phase out fossil natural gas heating and cogeneration

CARBON SEQUESTRATION SOLUTIONS

On-campus and Off-campus Grounds
Expand no-mow/eco-mow zones
Convert lawn to trees
NJAES Farms and Research Stations
Promote sustainable agricultural practices on Rutgers farms
Develop an emissions inventory and reduction plan for Rutgers farms
University Forested Lands
Afforest "vacant" University-owned land
Adopt enhanced management practices
Implement "on-site" carbon offset projects
Campus Master Planning
Follow the planning principles and sustainability framework embodied in the University Physical Master Plan - Rutgers 2030
Develop Low Carbon Construction Materials Policy

INDIRECT EMISSIONS SOLUTIONS

Reduce Fossil-Fueled Vehicle Miles Traveled
Create safe bicycle and pedestrian infrastructure
Expand telecommuting
Expand subsidies for public transit
Provide parking cash-out
Facilitate EV adoption
Reduce Emissions from Business Travel
Provide incentives for reducing emissions from business travel
Reduce Emission from the Food Supply Chain
Menu changes (e.g., more "Plant Forward" diet)
Adopt a climate-friendly food labeling system
Increase use of reusable water bottles and hydration stations
Continue supporting locally sourced fresh products
Explore anaerobic digestion and/or commercial composting with the local communities
Reduce Emissions from the Rest of the Supply Chain
Implement a comprehensive University source reduction & reuse policy and program
Purchase products with reduced toxic or hazardous chemicals

SUMMARY OF RECOMMENDED MITIGATION ACTIONS

DIRECT & GRID EMISSIONS REDUCTION

- Adopt a greenhouse gas emissions budget for direct (Scope 1) and electric grid (Scope 2) emissions.
- Consider consolidating University-owned vehicle fleet management.
- Conduct a detailed analysis of technology options, costs, and timeframes for eliminating fossil natural gas-powered heating.
- Determine how much debt to take on in order to achieve climate objectives.
- Account for the availability of subsidies when prioritizing capital projects, particularly when subsidies are available for projects that would need to begin within constrained time periods.
- Explore a full range of ownership and financing options for capital expenditures.
- Examine misalignments of incentives in Responsibility Centered Management.
- Be attentive to the ability of mitigation investments to support campus and community climate adaptation.
- Explore opportunities to integrate workforce development opportunities into project contracts, including partnerships with labor unions and community colleges.

INDIRECT EMISSIONS REDUCTION

- Expand the categories of Scope 3 emissions tracked, and increase the frequency of tracking.
- Commence regular tracking of commuter emissions.
- Offer carbon reporting guidance to help staff consider how to reduce and offset travel-related emissions.
- Continue and expand programs to support local food and agriculture resiliency efforts.
- Continue and expand partnerships with local farms, indoor cultivation facilities, farm-to-school initiatives, food waste reduction initiatives, food-to-energy initiatives, donations food banks, food service and throughout the food supply chain.

THIRD-PARTY AND OFFSITE OFFSETS

- Establish an advisory board to oversee investments in offsite "offset" approaches.

ADVOCACY

- Continue to engage actively with sectoral advocacy efforts.
- Work to shape and respond to opportunities for government financing of climate infrastructure and research.
- Integrate climate-related criteria into procurement processes.
- Use shareholder power to advocate for more robust climate risk disclosures.

RUTGERS GREENHOUSE GAS EMISSIONS

In developing a baseline greenhouse gas emissions inventory, the Task Force focused on FY 2019, the most recent year unaffected by the COVID-19 pandemic.[16] Based on an analysis of Rutgers' consumption of goods and services in FY 2019, Rutgers' annual greenhouse gas (GHG) emissions are approximately 470,000 tonnes carbon dioxide equivalent (CO_2-eq) (see Figure 2.1). This estimate includes all four Chancellor units (Rutgers–Camden, Rutgers–New Brunswick, Rutgers–Newark, and RBHS).

For comparison, in 2018, New Jersey's net emissions were 97 million tonnes;[17] thus, Rutgers is responsible for about 1 in every 200 tonnes of greenhouse gas emitted in New Jersey. Based on current US government estimates of the social cost of carbon dioxide, Rutgers' emissions cause about $24 million of damage to global society each year.[18]

The largest sector contributing to Rutgers' greenhouse gas emissions is the building sector, with a total of about 360,000 tonnes (76%), coming from on-campus heating and electricity generation – largely powered by fossil natural gas – and electricity purchased from the grid. The transportation sector is the second largest sector, contributing 20% of total emissions, with most of those emissions stemming from commuters' automobiles.

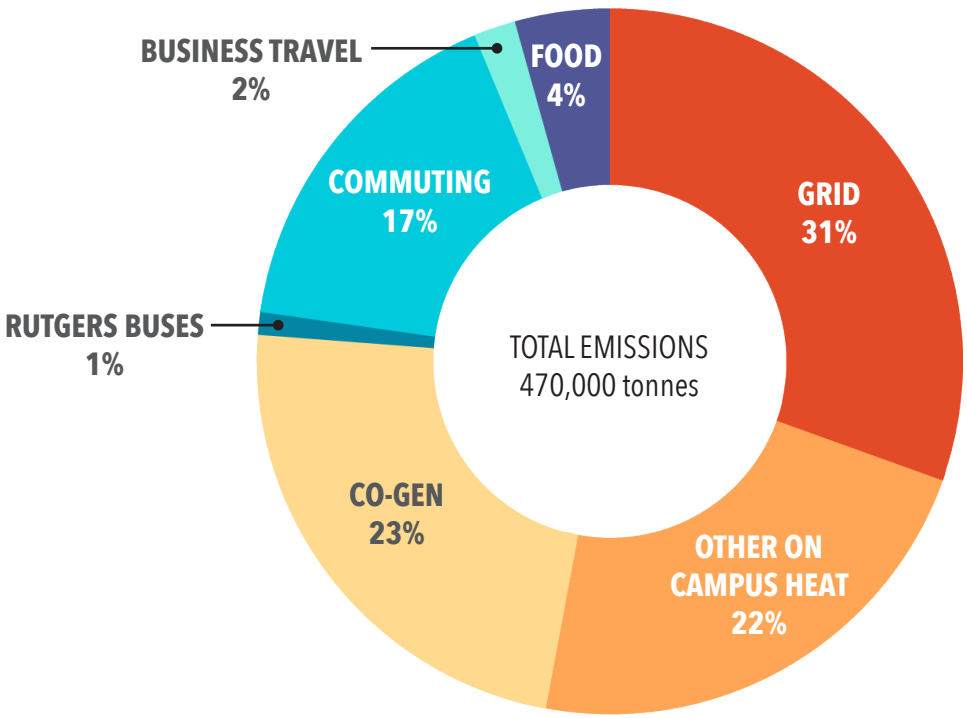


Figure 2.1. Rutgers greenhouse gas emissions for FY 2019

Greenhouse gas accounting uses the concept of 'scopes' to help organizations understand and structure decisions about the boundaries of their emissions. There are three scopes or level of responsibilities for emissions. Scope 1 emissions are direct emissions from sources that are owned and/or controlled by Rutgers, and constitute about 46% of assessed emissions. Scope 1 emissions include combustion of fossil fuels in University-owned facilities (45% of assessed emissions) or vehicles (1%), fugitive emissions from refrigeration (not yet assessed), and emissions from on-campus agriculture or livestock husbandry (minimal). Scope 2 emissions arise from purchased electricity (31% of assessed emissions) (see Figure 2.2). These are emissions from sources that are not owned nor operated by Rutgers, but whose production are directly linked to on-campus electricity consumption.

Finally, Scope 3 emissions come from sources that are not owned, operated, or controlled by Rutgers, but are either directly financed (e.g., food and product supply chain emissions, commercial air travel paid for by the institution) or are otherwise linked to the campus via influence or encouragement (e.g., air travel for study abroad programs, regular faculty, staff, and student commuting). Assessed Scope 3 emissions constitute 23% of the overall inventory. So far, we have only been able to assess emissions associated with commuting (17% of total), business travel (2%) and the food supply chain (4%). Future efforts are needed to assess other Scope 3 categories, such as those associated with purchased goods and services other than food, capital goods, waste, and investments.

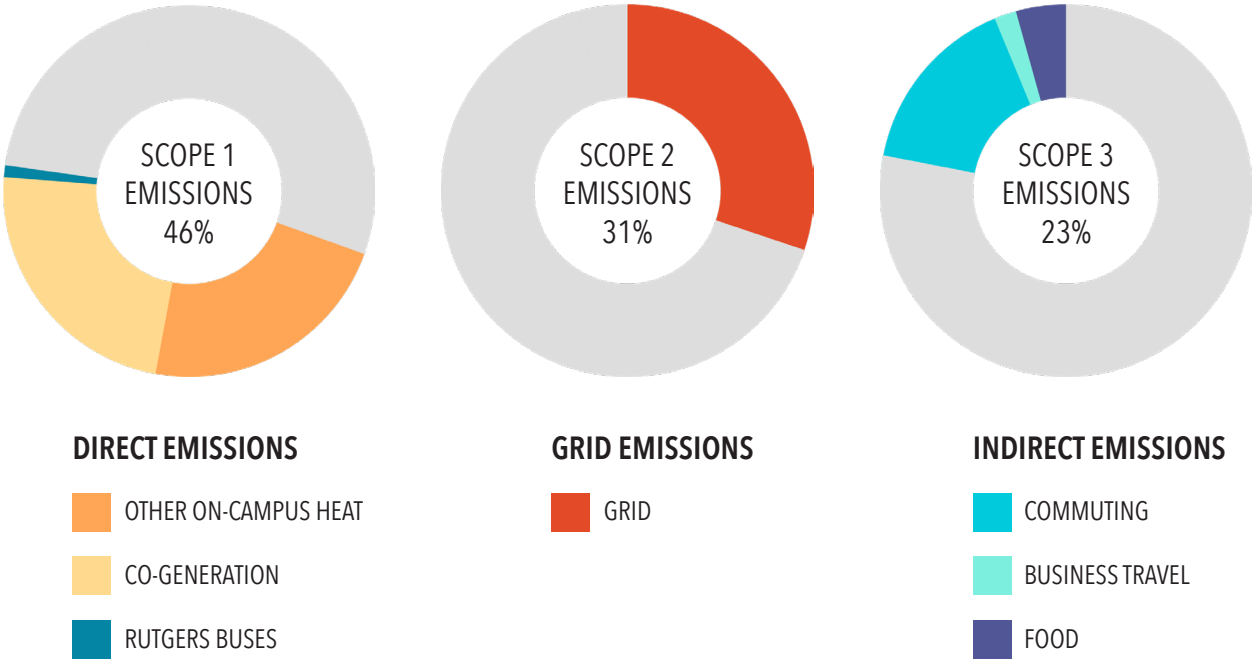


Figure 2.2. Rutgers greenhouse gas emissions by scope for FY 2019

ELIMINATING DIRECT & GRID EMISSIONS

SUPPORTING GOALS

1a. Reduce direct emissions from fossil fuel consumption 20% by 2030 and 100% by 2040

1b. Eliminate emissions associated with electricity purchased off the grid by 2030

Direct, or on-campus, activities (Scope 1) and electric grid (Scope 2) emissions make up 77% of Rutgers' greenhouse gas emissions and are the emissions that Rutgers has the most control over. As a metric to measure its progress toward its goals, **Rutgers should adopt a greenhouse gas emissions budget for direct (Scope 1) and electric grid (Scope 2) emissions, from FY22 to the indefinite future, of 4 million tonnes CO_2-eq (equivalent to 11 years of emissions at FY19 levels).** This budget can be met through a series of cost-effective investments over the current decade in building energy efficiency and in renewable energy generation, a gradual replacement of the campus fleet with electric vehicles as current vehicles are retired, and, in the 2030s, the final, currently costly step of transforming of campus heating infrastructure to one that does not rely upon fossil natural gas (Figure 2.3).

DIRECT & GRID EMISSIONS SOLUTIONS

Table 2.1. Solutions for Direct and Grid Emissions

	Potential Emissions Reductions (t CO_2)	Estimated Total Capital Costs	Estimated Annual Financing Costs*	Estimated Annual Savings	Estimated Additional Staffing Needs (FTEs)	Estimated Net Annual Financial Impact	Net Annual Financial Impact per est. t CO_2
Reduce Building Energy Demand	**72,000**	**($100 M)**	**($6 M)**	**$20 M**	**10**	**$12 M**	**$170**
Retrofit less efficient buildings							
Decommission old, inefficient buildings							
Adopt new construction and energy standards							
Install metering, monitoring and control systems							
Decarbonize Vehicles and Equipment	**5,000**	**($35M)**	**($4 M)**	**$4 M†**	**3**	**$0 M**	**$0**
Electrify fleet							
Electrify maintenance equipment							
Decarbonize Electricity Supply	**116,000**	**($770 M)‡**	**($26 M)**	**$40 M§**	**3**	**$13 M**	**$110**
Expand on-campus solar generation							
Purchase off-campus solar or wind electricity							
Decarbonize Heating	**172,000**	**($1,500 M)**	**($85 M)**	**$23 M**	**5**	**($60 M)**	**($360)**
Phase out fossil natural gas heating and cogeneration							

* All calculations assume an interest rate on loans of 4.75%, consistent with Rutgers' current blended rate. Amortized over 30 years for buildings and 12 years for vehicles.

† Includes avoided cost of new diesel bus purchases

‡ For a third-party Power Purchase Agreement (PPA), capital costs would be borne by the third-party owner, not the University. However, discussions with rating agencies indicate that PPA obligations may effectively constitute debt for rating purposes, so the per-kWh cost of the PPA is shown here as a financing cost.

§ Includes subsidies of $80/MWh based on current New Jersey Transition Renewable Energy Credit prices.

Reduce Building Energy Demand

Reducing on-campus stationary-source fossil fuel consumption requires a focus on building energy conservation and efficiency. Investments in building retrofits to increase the efficiency of systems, particularly heating, ventilation, air-conditioning, and lighting, will be the biggest contribution. Rutgers has ongoing projects to improve building comfort and increase efficiency. The State of New Jersey's Clean Energy Fund has programs, in which Rutgers has historically participated, that can cover up to half of project costs. Rutgers should also systematically prioritize older buildings for decommissioning based on energy performance.

For new construction, Rutgers already requires new buildings to meet the LEED Silver standard; this target should be raised and should incorporate quantitative energy-intensity maxima for buildings by type and usage. The design and powering of new buildings should be evaluated within the context of plans to gradually transition the campus away from fossil natural gas.

Another action to meet the 2030 goal of reducing on-campus stationary-source fossil fuel consumption is to install metering, monitoring, and control systems in Rutgers buildings. Building-level metering will help identify inefficient buildings and help target capital investments in efficiency. Monitoring and controls can be used to manage energy better by allowing remote changes in temperature and lighting settings for times when buildings are not in use. Metering and monitoring also provide the information needed to inform and encourage behavioral conservation initiatives that focus on providing occupants with feedback on their energy use and encouraging energy conservation measures like turning off computers and lab equipment when not in use. The Task Force estimates that cost-effective retrofits, control, and conservation measures can reduce overall building-related energy use by about 20% by 2030.

Decarbonize Vehicles and Equipment

In addition to buildings, Rutgers-owned or Rutgers-controlled vehicles and equipment contribute to the University's direct fossil fuel emissions. Electric vehicles powered by New Jersey's electric grid are substantially lower emitting than internal-combustion engine vehicles; this will become even more true as the State and University electric grids decarbonize. For many smaller service vehicles, the technology is already available, but additional charging points will be needed.

For diesel buses (subcontracted to First Transit), there are more difficult implementation issues, not least that battery technology performs poorly under cold weather conditions. New Jersey Transit is running pilot electric bus programs in Camden and Newark, which will provide useful information about readiness of the technology. However, the load that the current Rutgers buses carry and the time in service may make this infeasible for some time. If the technology is feasible, current cost estimates are close to break-even,[19,20] and available federal grant programs could allow the current fleet to be transitioned to electric at minimal cost as vehicles age out of operation. Rapid cost reductions expected over the course of this decade will shrink the size of required grants. In addition to the climate benefits, such a transition would also produce substantial air quality and health benefits.

Prioritizing vehicles for electrification entails categorizing vehicles by application, comparing how the vehicle is used in real campus applications, and identifying which vehicles would optimally go electric first in light of actual use patterns. This will be a process with the decision to prioritize electric vehicles (EVs) within specific campus fleets depends in large part on their driving range and functions.

Currently, there is no financial incentive at the department level to switch to a fully electrified fleet. Multiple departments and divisions control their own fleets, creating duplication of resources, and these areas might not want to share their existing resources. The siloing of fleets is a large impediment. While switching to EVs could save money in the overall maintenance of vehicles, centralizing fleet management would realize even greater savings. Therefore, **Rutgers should consider consolidating fleet management of all University-owned vehicles into one central department.**

Decarbonize Electricity Supply

Reaching the 2030 goal of eliminating emissions from electric grid purchases requires a combination of expanding solar generation on campus and purchasing renewable electricity generated off campus.

Rutgers has nearly a decade of experience in operating solar generation facilities on campus, including what was at the time of its construction in 2013 the largest campus solar facility in the nation. Rutgers' solar facilities are on the Rutgers–New Brunswick Livingston campus and include a 1.4 MW solar array with 7,993 solar panels and 8 MW of solar parking lot canopies, composed of about 33,000 solar panels. Based on this experience, a natural opportunity for decarbonizing the campus electricity supply is to displace grid electricity (about 0.3 t CO_2/kWh) with more on-campus solar production. Over the last decade, solar prices have dropped considerably; according to the National Renewable Energy Lab, for a 200 kW commercial system, installed system costs dropped from $5.43/W in 2010 to $1.83/W in 2018.[21] Thanks to rapidly declining costs, augmented by substantial subsidies, on-campus solar offers net financial savings to the University. A new assessment of campus potential suggests that 26 MW of solar could be built on campus parking lots and 16 MW on campus rooftops.

On-campus solar can be debt financed by Rutgers itself, or Rutgers may enter a power purchase agreement (PPA). PPAs are financial agreements between developers of renewable energy supply and customers. Through a PPA, Rutgers would enter into a legal contract with a generator of renewable electricity for the power output or a portion of power output, for a dedicated period of time (typically 5-25 years). PPAs allow Rutgers to avoid up-front capital costs, but a significant share of the net financial savings associated with the renewable system is shared with the third-party generator. Alternative ownership models, such as cooperative, community solar – in which Rutgers might be a partial owner of the system alongside community members – might allow Rutgers to retain a larger share of savings and should also be explored.

Campus solar is promising but is limited by campus space. To meet Rutgers electricity needs

while eliminating fossil fuel use, Rutgers will have to utilize off-campus renewable energy sources, potentially including both off-campus solar and off-campus off-shore wind energy. As with on-campus solar, these could be directly financed by the University, but PPA financing will, in general, be the most viable option for off-campus projects.

Decarbonize Heating

To reach the 2040 goal of eliminating all emissions from on-campus fossil fuel combustion, Rutgers will need to eliminate its fossil-natural-gas-fueled heating and co-generation plants. Fossil natural gas is a key part of the current campus energy system, powering the co-generation facilities in New Brunswick and Newark and central heat plants on most campuses (see Appendix A). Combustion of fossil natural gas is responsible for about 215,000 tonnes of annual CO_2 emissions, nearly half of the total Rutgers emissions inventory.

As the ongoing co-generation plant upgrades have a planned lifetime of 35 years, achieving any carbon neutrality target before 2055 without offsets will require either early retirement of these facilities or substitution of renewable alternatives to fossil natural gas. This challenge is common to large universities, and a recent University of California study[22] assessed alternative solutions. This study identified three core solutions: (1) reducing energy demand through investments in deep energy efficiency, (2) replacing fossil natural gas with renewable biogas or hydrogen, and (3) electrifying end uses and employing carbon-free electricity sources. It also noted that small-scale carbon capture and storage might be a potential future solution, but does not currently exist in deployable form.

In contrast to building energy efficiency, renewable energy, and fleet electrification, transitioning the campus heating off of fossil natural gas currently has a substantial net financial cost. The Task Force was not able to conduct a detailed analysis of technology solutions and costs. However, we expect technology costs to decline and policy support to increase over the coming years, placing the goal of fully transitioning away from fossil natural gas by 2040 well within the realm of financial possibility. Moving forward, **the University should conduct a detailed analysis of technology options and costs for eliminating fossil natural gas-powered heating, including an analysis of the feasibility of eliminating fossil natural gas earlier than 2040.**

Financing Capital Expenditures for Decarbonization

Achieving the goals laid out in this Climate Action Plan requires a substantial investment by the University. The largest budgetary items are capital expenditures – investments in the physical infrastructure of energy transformation. Much of this investment will yield net savings, but mobilizing the necessary capital is nonetheless a complex task.

Although reducing building energy demand, decarbonizing vehicles, and decarbonizing electricity all create net savings, the University is constrained in its total debt capacity if it wishes to maintain its current credit ratings. The estimated financial benefits of these solutions are substantial, even at higher financing costs; however, a credit downgrade would likewise increase

borrowing costs for other University investments and could have a negative impact on qualitative factors such as the University's reputation. Therefore**, determining how much debt to take on in order to achieve climate objectives is a decision that should be made in a broader discussion of borrowing priorities.**

For some solutions, subsidies make the decision to invest even more advantageous. For some energy efficiency investments, for example, a majority of the costs can be covered through partnerships with utility companies such as PSE&G. Likewise, estimates of the costs associated with renewable energy and fleet electrification projects depend upon available grants and subsidies. This highlights the importance of close cooperation in climate action implementation between University Treasury and experts in Facilities and in the proposed Climate Mobilization Office with expertise in the energy sector. **Discussions of priorities for capital projects should take the availability of such subsidies into account, particularly when subsidies are available for projects that would need to begin within constrained time periods.**

The University should also think creatively about ownership structures for some solutions, particularly renewable energy. For example, direct ownership of solar facilities maximizes the net savings to the University, but also incurs the greatest debt burden and greatest risk. Third-party ownership, through a power purchase agreement, may avoid the debt burden and does avoid the risk, but shares net savings with a third party. Intermediate solutions – for instance, the University serving as a part-owner of a facility cooperatively owned with organizations in neighboring communities – could yield intermediate costs and savings. Similarly, while we calculate fleet electrification costs as though the fleet were primarily University owned, in practice, the majority of Rutgers' fleet is owned by third-party operators like First Transit; under that ownership arrangement, financing costs would be eliminated, and savings reduced. **University Treasury and experts in Facilities and the Climate Mobilization Office should therefore work together to explore a full range of ownership and financing options.**

A final consideration relates to the University budgeting system under Responsibility Centered Management. While investments in energy efficiency and renewable energy have positive returns of investment, the incentives for making these investments may not align with the decisions to make the investment. If debt service costs and savings are allocated to different entities within the University – for example, if a responsibility center bears the debt service cost for a retrofit, but the savings are spread across the University based on floor space – the best financial decisions for the University as a whole will not result. **The ongoing re-examination of the University's Responsibility Centered Management system should examine such misalignments of incentives.**

Linking Mitigation to Adaptation, Equity, and Justice

In making capital investments to eliminate direct emissions from fossil fuel consumption, Rutgers should also be attentive to the ability of these investments to support campus and community climate adaptation. Examples include expanding microgrids and adding electric storage, so that the campus can be decoupled from the electric

grid in an emergency, as well as integrating Resilience Hubs that would allow community members access to heating, cooling, and device charging during an emergency. Electric buses have substantial battery capacity (comparable to several days of electricity use in a typical household) and could serve as a key emergency storage resource for supporting Resilience Hubs.

In alignment with this plan's focus on justice and equity, renewable energy and energy efficiency investments should be conducted in a manner that creates good-paying jobs and career-development opportunities for New Jersey residents. **The University should explore opportunities to integrate workforce development opportunities into project contracts, including partnerships with labor unions and community colleges.**

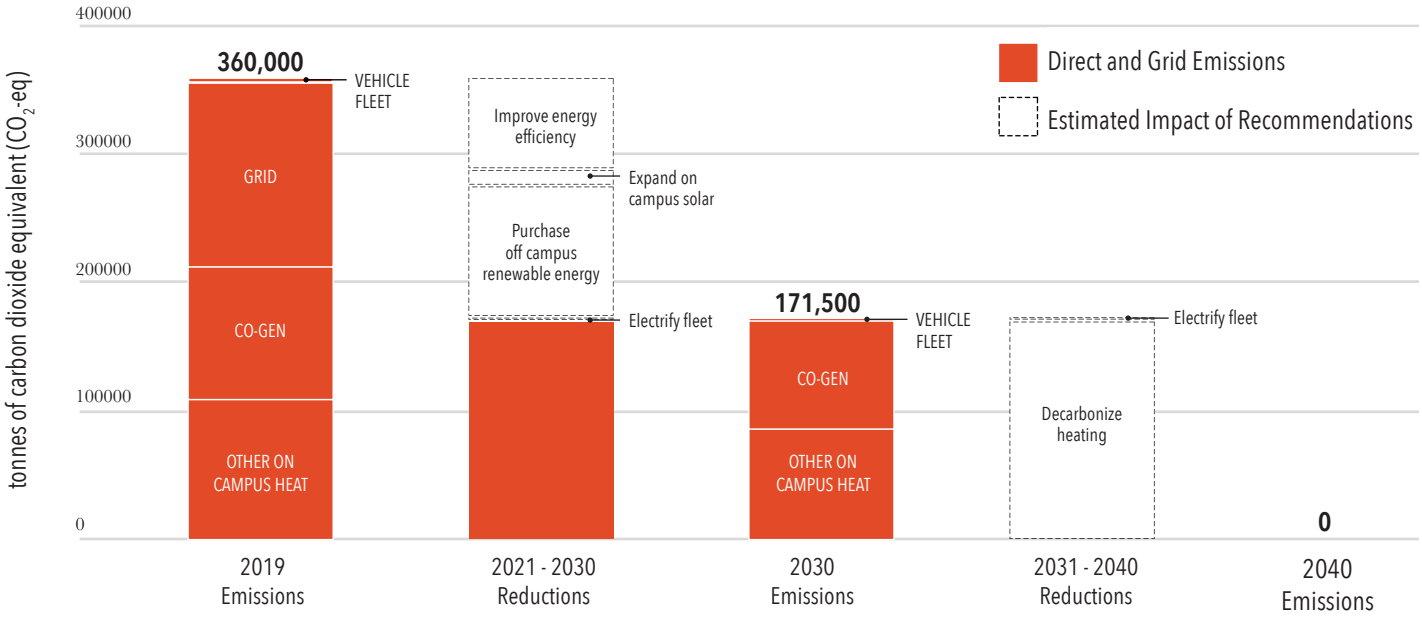


Figure 2.3. Recommended timeline for eliminating scope 1 and 2 emissions

ELIMINATING INDIRECT EMISSIONS

SUPPORTING GOAL

1c. Reduce indirect emissions associated with commuting, travel, and the supply chain 30% by 2030

The GHG Protocol[23] identifies 15 categories of indirect 'Scope 3' emissions. Of particular relevance to Rutgers are emissions associated with business travel; staff, faculty, and student commuting; purchased goods and services; waste generated in operations; and investments. The Task Force was able to estimate emissions associated with business travel, commuting, and purchased food. Together, these categories are responsible for 23% of assessed emissions. Scope 3 emissions fluctuate year to year based on both employee behavior and slight changes in data collection methods to improve accuracy. Moving forward, **Rutgers should expand the categories of Scope 3 emissions it tracks, as well as increase the frequency with which it is able to do so.**

INDIRECT EMISSIONS SOLUTIONS

Table 2.2. Solutions for Indirect Emissions

	People Needed to Implement Solution			
	External	Students	Faculty	Staff/Dept
Reduce Fossil-Fueled Vehicle Miles Traveled				
Create safe bicycle and pedestrian infrastructure	X	X	X	Planning, Dev & Design
Expand telecommuting			X	Human Resources, All
Expand subsidies for public transit	X	X	X	Human Resources
Provide parking cash-out		X	X	Human Resources
Facilitating EV adoption		X	X	Human Resources; Facilities
Reduce Emissions from Business Travel				
Provide incentives for reducing business travel emissions		X	X	Transportation; Research & Sponsored Programs
Reduce Emission from the Food Supply Chain				
Menu changes (e.g. more "Plant Forward" diet)	X	X	X	Dining Services
Adopt a climate-friendly food labeling system	X	X	X	Dining Services
Increase use of reusable water bottles and hydration stations		X	X	Dining Services
Continue supporting locally sourced fresh products	X			Dining Services, Procurement
Explore anaerobic digestion and/or commercial composting with the local communities	X			Dining Services, Procurement
Reduce Emissions from the Rest of the Supply Chain				
Implement a comprehensive University source reduction & reuse policy and program		X	X	Procurement
Purchase products with reduced toxic or hazardous chemicals	X			Procurement
Contract with suppliers that offer end-of-life reuse, recycling, and/or takeback agreement programs	X			Procurement

Whereas the operational changes required to address Scope 1 and 2 emissions are largely managed by University Facilities, the indirect nature of Scope 3 emissions means that addressing them requires engaging a broad range of staff, students, and faculty across the University , as well as external vendors and partners. On the operational side, different units are in the lead in implementing different solutions.

Reduce Fossil-Fueled Vehicle Miles Traveled

An important step in reducing emissions associated with vehicle miles is improving commuter emissions tracking. **The Department of Transportation Services should commence the process of tracking driving commuter emissions based on data it could collect from executing an annual Rutgers Commute Survey.** This data could be parsed in many ways to help guide future emission reduction programs. Accurate and regular surveying would allow the University to determine the percentage of employees who use alternative transportation options to get to work. For any mode of travel that involves vehicle emissions, Rutgers will be able to capture the mode of travel (drive alone, carpool and vanpool) in order to apply accurate emissions calculations to the type of commute utilized. The fraction of electric vehicles owned by faculty, staff, and students and used for commuting could also be tracked. A variety of transportation demand management solutions can incentivize commuters to avoid driving alone to campus.

Create safe bicycle and pedestrian infrastructure

All campuses should increase the ability of students, staff, and faculty to walk, bicycle, or use e-scooters (now available in New Brunswick) to travel safely on campus and between campuses and residential areas. The needs vary between campuses, and this requires planning of new protected bicycle lanes, sidewalks (where not available) and safer pedestrian crossings to access campuses. These changes can reduce the need to provide bus transportation and may make locations near campus more attractive for many employees who wish to walk or bicycle to their jobs. These changes should be part of any master planning process initiated for the various campuses.

Expand telecommuting

Rutgers has successfully operated largely remotely during the COVID-19 pandemic, demonstrating the feasibility of increasing options for working at home for many faculty and staff. While many faculty currently work at home on some days, there are impediments for many staff to do so. The main impediment to allowing more staff to work at home is current contract rules. Every Rutgers unit should devise a plan to consider how to allow staff who desire to work at home on some days to do so. Rutgers Human Resources and the staff unions should work together to make this part of any new contract.

Expand subsidies for public transit

Public transit in New Jersey is not set up for an easy transit commute to the New Brunswick campus. The Newark campus has the most potential to shift persons to transit, with Camden

next. A typical person who already owns a vehicle is highly unlikely to switch to transit, especially if it greatly increases the time spent commuting to and from campus. While New Jersey Transit is not financially capable of providing more free or discounted transit at this time, Rutgers should explore options with New Jersey Transit to make transit trips to campus more affordable and more feasible. New Jersey Transit's new monthly FLEXPASS reduces monthly costs for those who work at home and commute less frequently; this offers an opportunity for many Rutgers staff and faculty.

Provide parking cash-out

A parking cash-out policy is aimed to create an opportunity cost associated with parking. As such it provides a free cash benefit to all employees (and possibly students) which can be used to pay for their parking (or part of it), or they can take the cash in lieu of the parking benefit. Long term benefits can include a reduced demand for on-campus parking, but implementation will require contractual changes negotiated with the unions. As an initial step, Rutgers should evaluate the feasibility of implementing a cash-out policy and determine the details of how this can work on each campus.

Provide incentives for EVs

While federal and state policy will lead to increased EV usage over the next decade, Rutgers may be able to provide additional incentives for employees and students to convert more rapidly. This can include providing more on-site EV charging stations and possibly discounted parking costs for those who commute with an EV. EV charging stations should be placed in visible locations and made available to those who use EVs for their commute.

Reduce Emissions from Business Travel

Business travel emissions tracking

Data on business travel for the entire university are captured through procurement data, which provide a means to estimate emissions. Most emissions are associated with air travel, but ground travel by car and train are also commonly used. Emissions included in this category cover all employee travel funded by Rutgers and are based on the departure and arrival cities for each trip. Additional travel, especially faculty travel not funded by the university, are also a source of emissions. Systems should be put in place to measure total emissions from business travel on an annual basis.

Incentives for reducing business travel emissions

For business travel (especially air travel), Rutgers should put measures in place to reduce potential emissions. For example, **the Department of Transportation Services should offer carbon reporting guidance to staff to help them consider how to reduce flight emissions and offset them. Faculty, staff, and students should also be encouraged to consider virtual options and or greener travel options when possible.** For example, Rutgers sits on the Northeast corridor, and train travel is both easily accessible for trips to major destinations and should generally be selected over using a car.

Reduce Emissions from the Food Supply Chain

Emissions from the Rutgers food supply chain system constitute 20,500 tonnes of CO_2-eq or 4% of assessed University emissions. These emissions are dominated by emissions associated with beef and chicken menu items. The Climate Task Force estimates that a 25-30% reduction in food supply chain emissions can be achieved from menu changes, including up to a 20% reduction in the amount of meat in recipes, and including more plant-based foods on the menu with taste being the primary driver. Local food suppliers continue to be a priority for food procurement, especially seafood, chicken, fruits, and vegetables, when in season. In collaboration with the Menus of Change University Research Collaborative (https://www.moccollaborative.org), several initiatives have been launched to redesign menus and introduce climate-friendly food labels to reduce food-related emissions. Food waste reduction remains a priority.

The following represent several immediate recommendations that the University Dining Services could implement.

- Targeting a 25% reduction in emissions from menu changes, including a shift to more "Plant Forward" meals
- Adopting a climate-friendly food labelling system to educate eaters of lower carbon food options
- Increasing use of reusable water bottles and hydration stations
- Continuing to support locally sourced fresh products when in season
- Exploring anaerobic digestion and/or commercial composting with the local communities

Sustainability is also a focus of Gourmet Dining, the vendor providing food service to Rutgers-Camden, Rutgers-Newark, and Rutgers Athletics, and they invite partnership on emissions reductions at the facilities they serve. Additional work should be done by the university to work with other food vendors to increase climate-friendly menus and catering events.

In its efforts to reduce food-related emissions, **the University should also seek opportunities to enhance the resilience of the food supply for the Rutgers campuses, the University community, and neighboring communities.** This includes supporting local food producers and securing back-up power for dining facilities so they can continue to serve the community during times of emergency.

The New Jersey Agricultural Experiment Station already invests substantially in programs focused on making agriculture, food supply chains, food-processing, food distribution and food waste reduction more resilient to climate change. As part of the effort to link mitigation and adaptation efforts with respect to the food supply chain, **Rutgers should continue to offer training, and develop new programs to support local food and agriculture resiliency efforts. Rutgers should continue to build its partnerships with local farms, indoor cultivation facilities, farm-to-school initiatives, food waste reduction initiatives, food-to-energy initiatives, donations food banks, food service and throughout the food supply chain.**

Reduce Emissions from the Rest of the Supply Chain, Procurement, and Waste

Scope 3 emissions from the University's supply chain-to-procurement-to-waste management process are currently not tracked. The procurement-to-waste value chain could be a significant emissions tracking opportunity, and Rutgers may also be able to influence its suppliers or choose which vendors to contract with based on their practices. Therefore, the university should develop a data collection system/methodology that will allow for comprehensive and consistent Scope 3 emissions reporting under the guidance of the Climate Mobilization Office.

The GHG Protocol standards[23] provide a methodology that can be used to account for and report emissions from Rutgers. The GHG Protocol provides user-friendly guidance and tools and recommends the following value chain accounting and reporting steps:

1. Define Business Goals
2. Review Accounting & Reporting Principles
3. Identify Scope 3 Activities
4. Set the Scope 3 Boundary
5. Collect Data
6. Allocate Emissions
7. Set a Target (optional) & Track Emissions Over Time
8. Assure Emissions (optional)
9. Report Emissions

Supply chain/procurement Scope 3 emissions arise from the procurement of other products and services which result in indirect CO_2 emissions. The nature of Scope 3 emissions means that there is potential for double counting (they may be allocated to entities other than the University (e.g., suppliers conducting business with Rutgers). Therefore, a clear delineation is applied to ensure the Scope 3 emissions are only attributed to activities which directly result from or are paid for by the University.

The GHG Protocol Product Life Cycle Accounting and Reporting Standard[24] helps understand the emissions associated with a product and identify greenhouse gas reduction opportunities through its life cycle (Figure 2.4). Using this standard, Rutgers can measure the greenhouse gases associated with the full life cycle of the products we procure, including raw materials, manufacturing, transportation, storage, use and disposal.

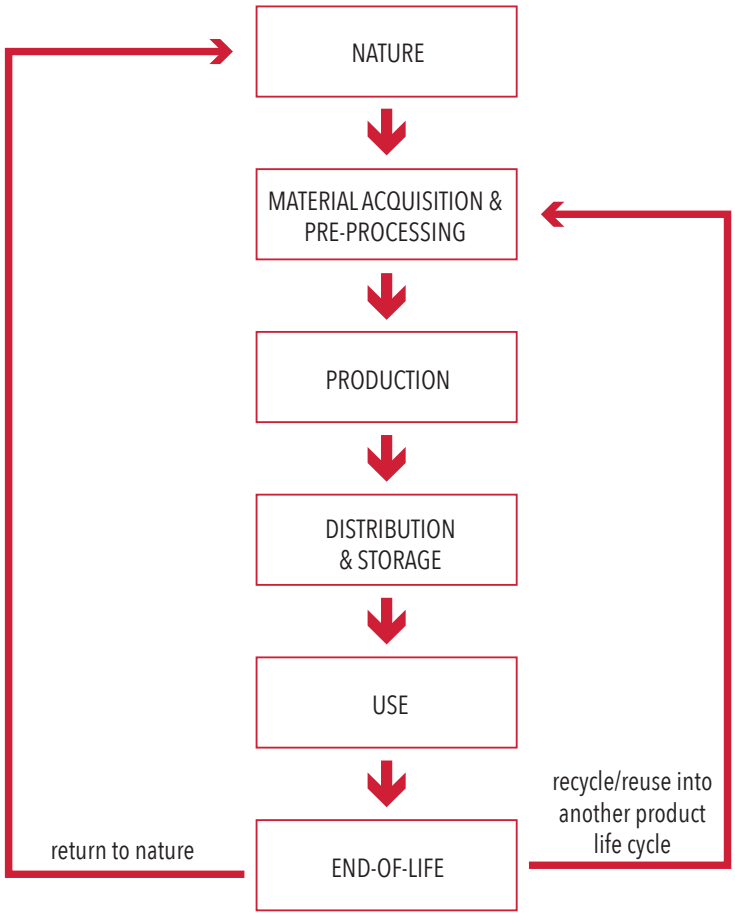


Figure 2.4. Product life cycle (based on GHG Protocol Product Standard[24])

Short-Term Supply Chain and Waste Management Solutions

- Implement a comprehensive University source reduction & reuse policy and program
- Purchase products with reduced toxic or hazardous chemicals
- Contract with suppliers that offer end-of-life reuse, recycling, and/or takeback agreement programs. (e.g. pipettes and vials in lab)

CARBON SEQUESTRATION

SUPPORTING GOAL

1d. Expand carbon sequestration in campus lands, building materials, and peer-verified, Rutgers-managed off-campus projects by at least 2000 tonnes CO_2-eq by 2030 and more thereafter

As the State University of New Jersey and as a land -grant institution, Rutgers University has facilities spanning the state that include 91 discrete locations over 6,600 acres. While many of these locations are quite urban in character, Rutgers manages over 5,000 acres of green space. We recommend that the University reduce greenhouse gas emissions associated with land use and maintenance, increase carbon storage on University land, reduce the energy demand through enhanced design of future land use development, and develop mechanisms to offset emissions.

CARBON SEQUESTRATION SOLUTIONS

Table 2.3. Solutions for Carbon Sequestration

	People Needed to Implement Solution			
	External	Students	Faculty	Staff/Dept
On-campus and Off-campus Grounds				
Expand no-mow/eco-mow zones				Grounds Operations
Convert lawn to trees				Grounds Operations
NJAES Farms and Research Stations				
Promote sustainable agricultural practices on Rutgers farms		AO	AO	NJAES
Develop an emissions inventory and reduction plan for Rutgers farms		AO	AO	NJAES
University Forested Lands				
Afforest "vacant" University-owned land	X	AO	AO	SEBS/NJAES
Adopt enhanced management practices				SEBS/NJAES
Implement "on-site" carbon offset projects	X	AO	AO	SEBS/NJAES
Campus Master Planning				
Follow the planning principles and sustainability framework embodied in the University Physical Master Plan - Rutgers 2030		AO	AO	Planning, Dev. & Design
Develop Low Carbon Construction Materials Policy		AO	AO	Planning, Dev. & Design

AO = Academic Opportunity for research and/or teaching

On-campus and Off-campus Facilities' Grounds

Within Rutgers' main campuses are lawns, treed areas and landscaped spaces covering over 500 acres.

Objective: Reduce greenhouse gas emissions of grounds maintenance and increase CO_2 storage by increasing carbon sequestration in soils and woody vegetation of campus greenspace.

Proposed Actions: Approximately 25 acres of the New Brunswick-Piscataway campus lawns are being converted to no/eco-mow zones. An additional 14+ acres of lawn or disturbed areas have been identified to replant with trees.

NJ Agricultural Experiment Station (NJAES) Farms and Research Stations

Rutgers University owns and operates ten facilities statewide that together contain approximately 1,460 acres of land used for agricultural research, extension, and education.

Objective: Reduce greenhouse gas emissions of ongoing farming and livestock raising activities and increase carbon dioxide storage by increasing carbon sequestration in soils and vegetation through the adoption of enhanced management practices.

Proposed Actions: A planning effort for NJAES facilities is underway that emphasizes the overriding importance of GHG reduction both on Rutgers property and on the land cultivated by our farmer and gardener stakeholders. More concretely, when infrastructure upgrades are required, these investments should be made with climate change mitigation goals in mind.

Rutgers University Forested Lands

In addition to its green space on campus, Rutgers University owns nearly 3,100 acres of upland and wetland forest scattered across eighteen different properties.

Objective: Maintain the existing stores of carbon in the soils and in above- and below-ground plant biomass, and promote enhanced carbon storage (i.e., additional amounts above and beyond baseline conditions).

Proposed Actions: Afforest "vacant" University-owned land and increase carbon dioxide storage on existing forest lands by increasing carbon sequestration in soils and woody vegetation through the adoption of enhanced management practices. Over 800 acres of Rutgers University owned land have been identified for tree planting and management with the goal of sequestering 2000 additional tonnes of CO2 over the next ten years. We recommend that these University initiated "onsite" carbon offset projects follow the same guiding principles as for third party or other offsite offset projects and incorporate peer verification (see Box 2.1, Principles Guiding Carbon Sequestration and Offsets). Development of University-initiated onsite or offsite offset projects provides an educational and research opportunity for both students and faculty.

Campus Master Planning

Objective: Minimize energy demands and maximize carbon capture potential on campus.

Proposed Actions: The University follows the planning principles and sustainability framework embodied in the University Physical Master Plan - Rutgers 2030 (i.e., build up, not out, and return unused space to green space). Adoption of low carbon cement and concrete products in new campus construction projects would help to reduce their carbon footprint.

THIRD-PARTY AND OFFSITE OFFSETS

SUPPORTING GOAL

1e. Employ third-party offsets as a complementary strategy of last resort to address remaining emissions

Carbon offsets serve to reduce or remove greenhouse gas emissions made in a secondary location to compensate or "offset" emissions from other activities. Offsets are used widely in the United States by individuals, businesses, governments, non-governmental organizations, and academic institutions to voluntarily meet their own goals for emissions reduction, as well as by regulated entities to comply with greenhouse gas emission reduction requirements as mandated by laws in several states in the country. Carbon offsets, however, are not a replacement for emissions reductions, and third-party offsets should therefore be a complementary strategy of last resort.

An offset credit yields the ownership of one metric ton of CO_2-eq, which is prevented from entering the atmosphere via an emissions-reduction project. **Investments in offsite "offset" approaches such as carbon credits, emissions permits, or removal/sequestration projects should be overseen under the guidance of an advisory body, consisting of faculty, staff, and students from across Rutgers, the purpose of which is to adjudicate the legitimacy of all planned purchases and projects to ensure integrity of any program** (See Box 2.1, Principles Guiding Carbon Sequestration and Offsets).

Any carbon offset program should contribute to climate-positive, sustainable, economic development at Rutgers University and in its host communities. For example, potential University-initiated projects developed in New Jersey could provide climate-positive economic development benefits including jobs, emissions reductions, air quality benefits, or resiliency benefits, depending upon the project type and location. Peer-verified offset projects have additional co-benefits in providing an educational benefit for students, who will become skilled in technical and accounting principles associated with peer verification. Urban/community tree planting projects in communities where Rutgers and its various facilities are located enhance local land valuation while providing job training to community participants in urban forestry techniques, in addition to providing other non-economic health and environmental wellness co-benefits. Further, Rutgers could support implementation of carbon sequestration healthy soil practices on university-owned farms or farms within its supply chain to offset emissions from our own dining supply chain, as another example.

Any costs to implement an offset program should be distributed equitably across the university community.

Box 2.1 Principles Guiding Carbon Sequestration and Offsets

To ensure that carbon sequestered in University lands and building materials, as well as carbon represented in third-party offsets or projects that the University may develop offsite, effectively balances residual carbon dioxide emissions, it is essential that the University function under a set of guiding principles. At a minimum, these should include: a hierarchy of priorities for the applicability, location, and type of offsets; high-quality due-diligence evaluation guidelines; alignment with Rutgers' educational, research, and public service missions; and ensuring equitable co-benefits.

1. Prioritize reducing Rutgers own emissions
2. Maintain transparency
3. Institutionalize periodic revisiting of offset strategies and criteria
4. Establish a geographic hierarchy of projects (e.g., on-site, Rutgers nexus, New Jersey, region)
5. Evaluate projects using high-quality due-diligence principles
    a. PAVER requirements
        i. Permanent (lasts at least 40 years)
        ii. Additional (beyond Business-as-Usual)
        iii. Verifiable (confirmed by a third party)
        iv. Enforceable (counted only once)
        v. Real (measured by robust accounting)
    b. Project Assessment
        i. Review project protocol, monitoring or verification reports
        ii. Conduct direct outreach to project developers, stakeholders, project funders, brokers, or relevant regulatory entities to vet project
        iii. Site visit (in person or remote tour)
    c. Maximize co-benefits and minimize co-harms to human and ecological health
6. Increase chances of acquiring high-quality offsets by choosing projects that are:
    a. Reasonably priced
    b. Recent vintage
    c. Least environmental risk
    d. Least financial risk
7. Align with Rutgers University mission
    a. Research
    b. Education
    c. Public service
        i. Social justice and equity
        ii. Health benefits
        iii. Advance scalable climate solutions
        iv. Align with university community and host community priorities
        v. Low risk of harm
8. Prefer Rutgers-initiated local projects over over third-party, market-purchased voluntary offsets
9. Align with partners who will invest in research to address Rutgers' and/or their emissions while concurrently purchasing offsets to address these emissions
10. Prioritize projects with equitably distributed co-benefits (improved health, improved environmental quality, biodiversity, employment, job training, etc.).
11. Distribute costs equitably across the University community.

ADVOCACY

SUPPORTING GOAL

1f. Use Rutgers' economic and institutional capacities to advocate for addressing the societal choices that underlie indirect emissions

Scope 3 emissions are indirect consequences of the University's decisions, and their reduction requires influence beyond the boundaries of the University. Although the University can reduce and offset its Scope 3 emissions, it cannot fully eliminate them until the country as a whole achieves carbon neutrality. However, Rutgers can use its economic and institutional capacities to advocate for both public and private actions that reduce Scope 3 emissions.

First, Rutgers can use its organizational voice to add to the national momentum for the adoption of just, equitable climate solutions and the achievement of national carbon neutrality no later than 2050. For example, Rutgers is already participating in sectoral advocacy efforts, like the University Climate Change Coalition, and cross-sectoral efforts, like America Is All In, that seek to advance US climate action. **Rutgers should continue to engage actively with sectoral advocacy efforts.**

Further, in light of expected major expansions of federal investments in climate research and climate action, **Rutgers should work with External Affairs, faculty, and staff to shape and respond to opportunities for government financing of climate infrastructure and research.** The Biden Administration's proposed American Jobs Act includes $35 billion in climate research, development and demonstration, as well as substantial funds for energy efficiency and renewable energy deployment. Active involvement through External Affairs in shaping these opportunities, combined with support for applying for these opportunities once available, can help fund the Climate Action Plan and support academic efforts on climate action across the University.

Second, Rutgers can advocate for change through intentional economic choices, serving as an exemplar as both a customer and an investor. As discussed previously, as a customer, **Rutgers should integrate climate-related criteria into its procurement processes.** Just as the federal government is in the process of doing under the recent Executive Order on Climate-Related Financial Risk, Rutgers should insist that major suppliers to publicly disclose greenhouse gas emissions and climate-related financial risk, while also ensuring that procurement decisions incorporate the social cost of greenhouse gas emissions.

As an investor, Rutgers has already begun to act on climate. As of early 2021, fossil fuel assets currently constitute about $75 million of the University's endowment.[25] Based on the ratio of ExxonMobil's total shareholder equity to the greenhouse gas emissions associated with its activities,[26] we estimate the associated emissions to be about 225,000 tonnes – a substantial share of the University's Scope 3 emissions, were they to be included. Responding to a formal divestment request received from student organizations in spring 2020, in March 2021 the Rutgers Board of Governors and Board of Trustees voted to cease all new investments in fossil fuels, divest from passive index funds with fossil fuel investments by 2022, seek new investment

opportunities in renewable energy and energy efficiency categories that deliver competitive rates of return, and exit all currently held private fossil fuel investments within 10 years. Moving forward, **Rutgers should also use its power as a shareholder to advocate for more robust climate risk disclosures.**

Working Toward Just and Equitable Climate Adaptation

GOAL 2: Work across campus and engage with our host communities to establish comprehensive plans for just and equitable climate adaptation

3

SUMMARY OF RECOMMENDED NEXT STEPS FOR ADAPTATION

- Work with each Chancellor unit to develop a comprehensive resiliency, recovery, and adaptation plan compatible with carbon neutrality and prioritizing those areas with highest exposure and vulnerability and greatest adaptation potential.
- Engage in a broader, stakeholder-based examination of climate vulnerabilities and steps for adaptation among all affected Rutgers groups, including faculty, staff, and students, as well as local campus communities.
- Incorporate projected climate risks and adaptation planning into climate mitigation planning.

- Monitor changing climate in New Jersey and for each campus, making data available for related planning and response efforts with coordinating stakeholders.
- Assess climate vulnerability of critical on-campus infrastructure and develop climate-resilience design standards and guidelines for new and existing buildings and critical infrastructure.
- Coordinate with local, state and federal partners to assess climate vulnerability of critical off-campus infrastructure and provide expertise and financial resources to partner in communities' climate resilience investments adjacent to Rutgers facilities.
- Identify stable funding mechanisms to implement climate-resilient building, infrastructure, and operations on and adjacent to Rutgers facilities.
- Enhance climate/weather risk communication, especially for vulnerable student populations.
- Participate in state and county all-hazard mitigation planning activities through panel participation, technical assistance, and implementation partnerships.
- Develop all-climate hazards mitigation plans for each Chancellor unit in conjunction with neighboring municipalities, counties and state agencies to ensure continuity of teaching, research and service during extreme events.
- Develop plans to address student, staff, and faculty vulnerabilities, by:
    - Evaluating communication protocols among coordinating emergency response entities, especially students
    - Reviewing emergency operations plans to assess current plans for the social, physical, and financial limitations of vulnerable groups
- Participate in adaptation planning efforts in campus-community regions.
- Develop adaptation plans at off-campus research sites.
- Develop adaptation plans by sector and function.
- Seek opportunities to link adaptation, mitigation, and equity.

RISK ASSESSMENT

Climate resilience means that Rutgers can recover relatively quickly from disruptions in our operations due to climate events. It also means that Rutgers can work with our local communities, counties, and the State of New Jersey to provide shelter and support during times of crisis, as Rutgers has during past weather-related emergencies, such as Super Storm Sandy. We still need more assessment to fine tune a climate resiliency plan. **The future Climate Mobilization Office (see Section 4) should work with each Chancellor unit to develop a comprehensive resiliency, recovery, and adaptation plan compatible with carbon neutrality and prioritizing those areas with highest exposure and vulnerability and greatest adaptation potential.**

Our analysis includes an initial scoping of climate resiliency at Rutgers through an examination of climate-related risks affecting Rutgers campuses, identification of sectoral impacts and group vulnerabilities, and examination of current preparedness planning. We also explored climate preparedness planning at other universities and considered preparedness lessons from Rutgers' response to COVID-19 in 2020 and Super Storm Sandy in 2012. Beyond Rutgers' campuses, we also considered the University's field stations and research sites, clinical facilities, and the surrounding communities and commuter-shed regions.

Over the past several decades, Rutgers' campuses have experienced numerous extreme climate events. The diversity of Rutgers' properties, from large campuses to coastal field facilities to experimental farms and forests throughout the state, exposes the University and its people to multiple climate hazards, including extreme heat events, coastal and inland flooding, damaging winds, snowstorms, floods, and tropical and extratropical storms.

Table 3.1. Climate Risks by Hazard and Sector

	SECTOR							
Hazard	Energy and Buildings	Transportation	Food Supply	Supply Chain and Waste Mgmt	Land Use and Offsets	Health	Water Supply	Communication/IT
Precipitation	X	X	X		X	X	X	
Mean Temperature			X		X	X		
Storm Surge		X	X			X		X
Sea Level Rise		X	X			X		
Drought			X		X	X	X	
Extreme Winds	X		X					X
Ice Storms		X	X			X		X
Flooding	X	X	X	X		X		
Heat Waves	X		X		X	X	X	X

Table 3.1 identifies the exposure and vulnerability of different sectors to a range of climate hazards. The sectoral climate risks identified in this table suggest climate change poses significant risks for Rutgers operations. The University's energy and infrastructure systems, buildings, facilities, and land resources face significant and growing potential impacts from the changing climate.

The examination of group vulnerabilities indicates that climate hazards have uneven effects among students, staff, and faculty, and members of surrounding communities. Individuals who are already experiencing housing, food, and income insecurities, as well those with mental and physical health challenges, are often more at risk and may be less resilient when handling climate impacts. As a result of the COVID-19 pandemic and campus shutdown, our analysis of group vulnerabilities was narrowed to a focus on vulnerable student populations, with more limited attention to faculty, staff, and other communities. **A critical next step is a broader, stakeholder-based examination of climate vulnerabilities and steps for adaptation among all affected Rutgers groups, including faculty, staff, and students as well as local campus communities.**

In the event of a weather emergency, students across Rutgers' campuses are not all impacted equally. While a certain level of trauma following a disaster can be expected across the board, students without access to adequate healthcare, a comfortable and safe living environment, necessary food and technology, and social and emotional support are likely to be most affected. Most student populations are vulnerable to the various impacts of climate change, but a student's resilience may vary significantly due to experience, financial resources, training, and stress. Some of these student populations, as well as how they may be adversely affected, are described in Table 3.2.

Faculty and staff at Rutgers can share many of the same challenges and vulnerabilities. There is a widespread assumption that faculty are all financially stable, but many adjunct and part- time lecturers may not have adequate financial resources. This may also be true for some staff, who may rely on additional outside employment. Financial instability could reduce food or housing security, impacting their ability to work. Many faculty and staff members also have children or other family members at home for whom they care. Working from home provides additional challenges to those juggling multiple roles at home, potentially without ample space to create a private work area. Moreover, in the case of COVID-19 shift to remote work, the rapid shift to online learning and work presented a challenge to those without access to high-speed internet, computers, or to those who are not comfortable with online tools.

In addition, staff who work on the food supply chain, maintenance staff, and janitorial staff may have specific roles to fill following an emergency event that require them to get to campus despite commuting challenges like disruption of public transit service or blocked roadways. Research staff and faculty who require access to labs have unique challenges if they are not able to get to campus due to campus closures or commuting difficulties following an emergency event. The larger community surrounding each of the University's campuses may face additional

climate related risks. Climate change impacts may adversely affect residents of New Brunswick, Newark, Camden, and surrounding communities who are of low socioeconomic status and who already face added barriers at the individual and the policy level. Low-income, basic needs insecurity, immigration status, older age, homelessness, substance abuse, and health status are examples of factors that may contribute to negative outcomes due to climate change and related emergencies. Additional research on the greater communities and related climate change variables may benefit understanding and preparedness.

Table 3.2. Student Populations and Potential Impacts due to Climate Change and Extreme Weather

STUDENT POPULATION	POTENTIAL IMPACTS DUE TO CLIMATE CHANGE AND EXTREME WEATHER
Students living on or off-campus in buildings without air conditioning	• Increased risk of dehydration and heat stroke during heat waves • Possible need to relocate • Food insecurity or food safety concerns if food spoils
Commuting students	• Challenges getting safely to campus in severe weather conditions • Public transit delays or schedule changes during an emergency • Blocked access to campus due to road flooding and downed trees • Decreased access to affordable gasoline
International students	• Inability to go home in the event of campus closures or emergencies • Visa challenges and disruptions • Potential loss of funding if out of the country, because of US tax laws
Students with physical and mental health concerns	• Increased likelihood of trauma following an emergency event • Challenges accessing necessary health care due to blocks to physical access to health centers or inundation after an emergency
Medical students and other students working in the field	• Challenges fulfilling required hours if unable to get to work during an emergency • Potential trauma after disaster if working with highly impacted groups
Students experiencing food insecurity	• Inability to access food on campus in the event of campus dining closures or changes to the Rutgers Dining Services food supply • Increased health risks, exhaustion, and other adverse impacts that come from not having access to a healthy balanced diet
Students experiencing housing insecurity	• Lack of safe and stable setting in which to shelter in place, work from home, etc. • Increased stress associated with frequent moving • Fewer options when University housing is closed
Graduate students	• Delays to completing fieldwork due to travel cancellations or restrictions • Possible changes to funding plan • Interruptions to research due to damage to, or loss of, research materials or organisms, caused by power outages
Students supporting children or other family members	• Shift to work from home leading to challenges finding quiet and private spaces to work in the event of University allowing remote work • Lack of adequate and affordable childcare or home health support • Closing childcare impacting student's ability to work
Black, Indigenous, and people of color (BIPOC) students	• Systemic and institutional racism and environmental injustice may amplify many of the above challenges • Reduced likelihood of accessing support

RESILIENCE PLANNING

There is a critical need for more resilience planning at Rutgers and this can be accomplished starting immediately with a comprehensive climate impact and vulnerability assessment for all four Rutgers Chancellor units (Rutgers–New Brunswick, Rutgers–Newark, Rutgers–Camden and RBHS), outlying facilities and surrounding communities.

Climate mitigation planning across all sectors – from energy and water supply to housing and dining – should incorporate projected climate risks and to plan for climate change adaptation in order to build resiliency. There are also many areas where adaptation planning and action at Rutgers, such as tree planting to reduce localized heat island effects, can also contribute to carbon neutrality goals. Identifying opportunities to combine adaptation and mitigation is a critical next step toward achieving both climate resilience and carbon neutrality at Rutgers University. Some examples are highlighted earlier in the report, in the discussion of energy and food system solutions.

For Rutgers, a broad suite of stakeholders is involved in climate preparedness planning. These include representatives from emergency management and risk planning, and other individuals with direct responsibility for university operations including energy systems, communication, transportation, water supply and waste-water systems, dining, housing, athletics, facilities, police, labor relations, and information services, among others. Stakeholders also include representatives of key constituency groups such as students, faculty, staff, and administrators, and members of local communities in each campus region.

Climate change will affect the teaching, research, and service missions of Rutgers University. In terms of next steps, a number of recommendations emerged from this assessment:

- Monitor changing climate risks (e.g., flooding, sea level rise, heat) in New Jersey and for each campus, making data available for related planning and response efforts with coordinating stakeholders.
- Assess climate vulnerability of critical on-campus infrastructure (roads, transit, buildings, utilities) and develop climate-resilience design standards and guidelines for new and existing buildings and critical infrastructure.
- Coordinate with local, state and federal partners to assess climate vulnerability of critical off-campus infrastructure and provide expertise and financial resources to partner in communities' climate resilience investments adjacent to Rutgers facilities (e.g., land restoration, green infrastructure, stormwater management).
- Identify stable funding mechanisms to implement climate-resilient building, infrastructure, and operations on and adjacent to Rutgers facilities
- Enhance climate/weather risk communication, especially for vulnerable student populations identified in this report.
- Participate in state and county all hazard mitigation planning activities by participating on steering committees and stakeholder panels, providing data and technical assistance to New Jersey Office of Emergency Management and each county, and evaluating university/municipal partnerships for implementing mitigation actions.
- Develop all climate hazards mitigation plans for each Chancellor unit in conjunction with neighboring municipalities, counties and state agencies to ensure continuity of teaching, research and service during extreme events

- Develop plans to address student, staff, and faculty vulnerabilities, by:
    - Evaluating communication protocols among coordinating emergency response entities, especially for communication with students
    - Reviewing emergency operations plans to assess current plans for the social, physical, and financial limitations of vulnerable groups
- Participate in adaptation planning efforts in campus-community regions
- Develop adaptation plans at off-campus research sites
- Develop adaptation plans by sector and function

As Rutgers engages in resiliency planning efforts, it should also seek opportunities to link adaptation, mitigation, and equity. For example, in partnering with the communities that host our campuses, Rutgers should seek opportunities that (a) advance the University Climate Action Plan; (b) advance Strategy 6 of the state Energy Master Plan to support Community Energy Planning and Action in Underserved Communities; and (c) result in improved health equity outcomes, particularly for goals associated with outcomes identified in Healthy New Jersey 2030. Rutgers should also leverage existing partnerships with host municipalities, the Rutgers Raritan River Consortium, the Lower Raritan Watershed Partnership, the New Jersey Department of Environmental Protection, Sustainable Jersey and others on watershed restoration, green infrastructure installation and maintenance, stormwater infrastructure improvements, and managed retreat from flood zones, including urban salvage and re-purposing.

Building a Culture of Sustainability

GOAL 3: Build a culture of sustainability that integrates climate action into academic research, teaching, outreach, engagement, campus life, and university policy across Rutgers' campuses

GOAL 4: Foster the creation of educational opportunities for our students, economic opportunities for our host communities and New Jersey residents, and a global model for cross-sectoral collaboration to advance climate action

4

SUMMARY OF RECOMMENDED ACTIONS FOR BUILDING A CULTURE OF SUSTAINABILITY

- Promptly establish the Climate Mobilization Office, which will
  1. advocate for climate mobilization and sustainability at the highest levels of University leadership,
  2. monitor Climate Action Plan implementation and oversee regular updating of the Climate Action Plan,
  3. convene and facilitate engagement of University, community, state, and industry stakeholders in University climate action, and
  4. coordinate, seed, and facilitate research, teaching, and engagement that advances climate action and leverages University investments in climate action.

CLIMATE MOBILIZATION OFFICE

- Stand up the University Leadership Climate Mobilization Council.
- Stand up Climate Mobilization Task Forces within operational and academic units.
- Establish a Climate Mobilization and Sustainability Dashboard to monitor and report on Climate Action Plan progress and other sustainability metrics.

- Amplify, connect, and expand existing interdisciplinary research, teaching and engagement efforts related to climate change, particularly with social equity and economic development lenses.

- Develop a detailed financial model for the Climate Action Plan and identify opportunities to integrate climate considerations into the University budget model.
- Develop a comprehensive strategy for communicating about University climate action to internal and external stakeholders.
- Launch comprehensive climate adaptation planning processes that integrate with (existing or new) planning processes in our host communities.
- Work to shape and respond to emerging opportunities for government financing of climate infrastructure and research.

LIVING LABS FOR CLIMATE ACTION

- Facilitate integration of existing Rutgers programs
- Through knowledge sharing and seed grants, facilitate activities that engage students in University and State climate action.
- Through knowledge sharing and seed grants, facilitate the development and implementation of courses or course modules that use the University or the State as living labs for climate actions.
- Through knowledge sharing, seed grants, and encouraging the adoption of suitable promotion and tenure criteria, facilitate use-inspired, publicly engaged interdisciplinary climate scholarship that addresses the climate-related needs of the University and the State.
- Working with the Rutgers Foundation and the Earth 2100 initiative, fundraise for cross-university cluster hires of (1) teaching faculty focused on linking teaching and University/State climate action and (2) tenure-track faculty focused on publicly engaged climate scholarship that integrates with University/State climate action.

CLIMATE MOBILIZATION OFFICE

Ensuring that this Climate Action Plan is more than just words requires the creation of a new institution – the Climate Mobilization Office (CMO) – to act as the voice of the plan. In order to achieve the ambitious timeframe recommended in this report, **the CMO should be established promptly and should (1) advocate for climate mobilization and sustainability at the highest levels of University leadership, (2) monitor Climate Action Plan implementation and oversee regular updating of the Climate Action Plan, (3) convene and facilitate engagement of University, community, state, and industry stakeholders in University climate action, and (4) coordinate, seed, and facilitate research, teaching, and engagement that advances climate action and leverages University investments in climate action.** In doing so, it will aim to amplify and connect efforts that are already taking place at multiple levels across the University.

CMO STRUCTURE

The CMO will need to be structured in a manner that allows it to have both an operational and an academic role. Thus, it should be headed by a Chief Climate Officer, working closely with the Executive Vice President of Academic Affairs, the Chief Operating Officer, and the Chief Financial Officer, as well as the Senior Vice President for Strategy.

The Task Force identified the following considerations related to the CMO's reporting relationships:

1. The Chief Climate Officer must be able to advocate for climate mobilization and sustainability at the highest levels of University leadership. The CMO must be able to effectively coordinate the University Leadership Climate Mobilization Council (Task I) in a manner that involves regular attention from top University leadership.

2. The CMO's primary role should involves policy-setting and coordination across the entire University, not operational implementation. The CMO should not be responsible for building solar facilities, retrofitting buildings, or public safety during extreme weather events – it should be responsible for overseeing and monitoring actions undertaken by many operational units, some but not all of which report to the Chief Operating Officer. Likewise, it should not be a research institute or center – it should be responsible for amplifying and helping link the work conducted by many existing centers and institutes regarding climate change and its linkages with equity and economic development.

3. Stakeholder engagement should be a central function of the CMO, and the University's greatest capacities with respect to engagement with public, community, and industry stakeholders around climate change rest on the academic side of the University and are a central part of the University's academic mission. The CMO should leverage these capacities in undertaking its mission.

4. Achieving carbon neutrality will require large-scale capital investments, on the order of hundreds of millions of dollars over the next decade (much of it with highly positive net present values and payback periods of less than a decade). The University will get greatest value out of these investments if they are made in a manner that creates teaching and research opportunities, rather than if they are made in a manner that is minimally visible to the academic side of the University. Achieving this integration of the academic and operational missions will require substantial coordination by the CMO.

While driven by measurable targets related to climate action, the CMO should have responsibilities that subsume those of the Sustainability Office envisioned by student advocates. This relationship should be acknowledged by having a member of the senior leadership team whose title explicitly includes sustainability. Data tracked by the CMO will include metrics relevant to sustainability goals and required by sustainability-related university rankings.

Given the need to mobilize a whole-of-University effort, the CMO will need to work closely with a variety of academic and operational units. To facilitate this, the CMO should initially be staffed primarily by personnel detailed from other units.

INITIAL PRIORITIES

I. Stand up the University Leadership Climate Mobilization Council. Drawing upon federal analogies (e.g., the White House National Climate Task Force), the head of the CMO should chair a University Leadership Climate Mobilization Council, composed of the President, the Executive Vice Presidents, Senior Vice Presidents, and Chancellors. Regular meetings of the Council would ensure senior leadership remains appraised of progress on the Climate Action Plan and provide a primary channel of accountability for the implementation of specific climate solutions by operational and academic units. This Council would also equip University leaders to serve as internal and external advocates for the Climate Action Plan.

II. Stand up Climate Mobilization Task Forces within operational and academic (Chancellor/decanal) units. Effective implementation of the Climate Action Plan will require the engagement of staff, faculty and students across the University. Modeled in part on Penn State's Sustainability Council system, the Climate Mobilization Task Force (CMTF) system aims to create a system of distributed leadership for the implementation of the solutions identified in the Climate Action Plan, while engaging the maximum number of members of the Rutgers community in University climate action and helping ensure local practices are shared broadly. The Task Forces are called Task Forces, rather than Councils, to reflect the fact that they are aiming to achieve specific objectives regarding climate action within a defined, 1-3 decade time scale.

The priority operational CMTFs to stand up would approximately correspond to the working groups used to write the Climate Action Plan: (1) Utilities, Maintenance, and Operations, (2) Transportation, (3) Dining Services and Food Service Vendors, (4) Procurement, (5) Planning,

Development and Design, and (6) Public Safety. The initial charges to operational CMTFs focus on: (1) engaging staff in implementing the operational solutions prioritized by the Climate Action Plan, (2) monitoring implementation of the Climate Action Plan solutions, (3) reviewing policies and procedures to identify opportunities to incorporate climate considerations, (4) reporting to the relevant unit heads on these activities, and (5) coordinating with other Climate Mobilization Task Forces via the CMO.

On the academic side, the Task Force systems aims to facilitate the integration of climate action into campus-level/school-level priorities in a manner that reflects the distinctive strengths and goals of each unit. The initial charges to academic CMTFs (Chancellor-level and, at the discretion of the Chancellors and Deans, school-level) focus on: (1) engaging students, faculty, and staff in the implementation of University climate action solutions, (2) identifying ways, within the context of each unit, to expand instructional use of the University and the State as living labs for climate action, (3) identifying ways, within the context of each unit, to enhance structural incentives for use-inspired, publicly engaged, interdisciplinary climate scholarship that addresses the climate-related needs of the University and the State, (4) reporting to the relevant Chancellor/Dean on these activities, and (5) coordinating with other Climate Mobilization Task Forces via the CMO.

III. Amplify, connect, and expand existing interdisciplinary research, teaching and engagement efforts related to climate change, particularly with social equity and economic development lenses. While the academic CMTFs will work through the Chancellor-unit and decanal hierarchy, and therefore focus on instruction, policies and incentives relevant to these units, this task recognizes that there is already substantial interdisciplinary work at Rutgers that could be amplified and better integrated. More specifics are discussed in section 4.2.

IV. Establish a Climate Mobilization and Sustainability Dashboard to monitor and report on Climate Action Plan progress and other sustainability metrics. This dashboard, the data for which will be largely collected through the Climate Mobilization Task Forces, will serve as a primary resource for the University in evaluating whether it is living up to Climate Action Plan goals and allow the University to report on its successes in evaluations, to peer institutions, and to the general public. The data collected for the dashboard will also serve as a resource for teaching and research initiatives.

V. Working with Finance, develop a detailed financial model for the Climate Action Plan and identify opportunities to integrate climate considerations into the University budget model. Tapping into these financial resources in a manner that maximizes the financial and academic return to the University requires integrating expertise that crosses the boundaries of Finance, Institutional Planning Operations (IPO), the Office of the General Counsel, and academic policy expertise to develop a financial model for the Climate Action Plan. At the same time, this cross-cutting expertise is also needed to help identify ways in which budget procedures and costing rules may prioritize or deprioritize purchasing options with higher upfront costs but lower lifecycle and social costs. The same expertise, together with internal stakeholder engagement through the Climate Mobilization Task Forces, can help

identify university policy opportunities to encourage investments in more climate-positive options. Potential options include the establishment of a Green Revolving Fund that would enable the savings from energy efficiency and renewable energy investments to be recycled into further investments and the introduction of an internal carbon pricing system.

VI. Working with University Communications and Marketing, develop a comprehensive strategy for communicating about University climate action to internal and external stakeholders. Developing University-wide branding around the Climate Action Plan, analogous to that employed by the Federal Works Progress Administration during the New Deal, will help set the tone for University-wide climate mobilization.

VII. Working with IPO and academic centers focused on climate-related stakeholder engagement, launch comprehensive climate adaptation planning processes that integrate with (existing or new) planning processes in our host communities.

VIII. In light of the expected major expansion of federal investments in climate research and climate action, work with External Affairs, faculty, and staff to shape and respond to opportunities for government financing of climate infrastructure and research. The proposed American Jobs Act includes $35 billion in climate research, development and demonstration, as well as substantial funds for energy efficiency and renewable energy deployment. Active involvement through External Affairs in shaping these opportunities through the legislative and executive branches, combined with support for applying for these opportunities once available, can help fund the Climate Action Plan and support academic efforts on climate action across the University.

LIVING LABS FOR CLIMATE ACTION

SUPPORTING GOAL

3a. Use the campus and the State of New Jersey as living laboratories for climate-positive, equitable, sustainable, and resilient development

Much like the development of the Climate Action Plan, effective climate action requires a whole-of-University effort, bringing together academics, University operations, and both University and external policy. It is not just about facilities upgrades, nor is it just about academic research, education, extension and engagement. The Climate Action Plan will seek to leverage operational and policy changes to advance academic efforts, and academic efforts to advance operational and policy changes. It is critical to engage students, faculty and staff broadly across the University in achieving the Climate Action Plan's goals.

Specific efforts the Climate Mobilization Office could coordinate in order to achieve the goal of linking the University's academic activities to climate action include:

Facilitate integration of existing Rutgers programs. The CMO could start by organizing a forum that brings together existing Rutgers programs that are focused on climate change, social equity, and economic development. These programs should develop a strategy for coordination and collaboration that foster greater disciplinary cross-over, broaden programs' scope to include considerations related to climate-positive, equitable economic development, and bring the benefits of these programs to a broader range of the University community. Working with the New Jersey Climate Change Resource Center (NJ CCRC) and other entities, the CMO could foster the development of a common portal to help communities access the broad range of Rutgers expertise to help local communities in planning and taking climate action.

Through knowledge sharing and seed grants, facilitate activities that engage students in University and State climate action. Working with the Aresty Research Center, RISE, and related programs, the CMO should develop an easy entry point for students seeking to participate in research and engagement opportunities related to the goals of the Climate Action Plan. The CMO should explore the establishment of a Rutgers Climate Corps, potentially linked to current efforts such as the NJ CCRC's graduate Climate Resilience Corps and New Jersey Agricultural Experiment Station's Environmental Stewards programs, as well as to the proposed federal Civilian Climate Corps. A Rutgers Climate Corps could provide students at all levels opportunities to work as teams with community groups across the state in long-term efforts to advance climate goals.

Through knowledge sharing and seed grants, facilitate the development and implementation of courses or course modules that use the University or the State as living labs for climate actions. These may range from modules familiarizing students with the University's climate footprint to studio courses that substantively advance operational or policy changes. Rutgers experts and students could collaborate with communities to advance climate action planning, conduct Health Impact Assessments, and address environmental justice challenges.

Through knowledge sharing, seed grants, and encouraging the adoption of suitable promotion and tenure criteria, facilitate use-inspired, publicly engaged interdisciplinary climate scholarship that addresses the climate-related needs of the University and the State. As New Jersey's land-grant university, Rutgers has a leg-up on many academic institutions in that it has long had models of faculty, such as tenure-track Extension faculty, who both have long-term, tenured lines and work with stakeholders on the boundary between scientific understand and public need. It also has small but well-developed efforts in this area focused specifically on use-inspired, publicly engaged climate scholarship, as represented (for example) by the NJ CCRC. However, stakeholder engagement in the climate area has not benefited from the long-term, institutional relationship that the commitment of a cohort of dedicated, tenured faculty (like Extension faculty) brings. Instead, much of Rutgers' national leadership in publicly engaged climate scholarship depends upon grant-funded staff without long-term job stability. In addition to facilitating knowledge sharing and providing seed grants, the CMO could encourage use-inspired, publicly engaged, interdisciplinary climate scholarship across schools by working to ensure the conditions exist in all schools for tenure-track scholars who focus on publicly engaged climate scholarship to meet promotion and tenure criteria.

Working with the Rutgers Foundation and the Earth 2100 initiative, fundraise for cross-university cluster hires of (1) teaching faculty focused on linking teaching and University/State climate action and (2) tenure-track faculty focused on publicly engaged climate scholarship that integrates with University/State climate action. Among other benefits, a cohort of teaching faculty specifically focused on bringing University and/or community climate action into the classroom would allow the knowledge of University operational staff to be brought into the classroom without placing excessive, unfunded demands on their time. A cluster hire of tenure-track faculty would strengthen Rutgers' role as a leader in publicly engaged climate scholarship.

5

Glossary

climate impacts The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather and climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes, and can be adverse or beneficial. (From IPCC glossary[27])

climate positive Having a beneficial effect on the climate, for example by removing greenhouse gases from the atmosphere. See also *net-negative emissions*.

climate risk disclosure A climate risk disclosure, or climate-related financial risk disclosure, is a financial disclosure by an organization regarding physical risks caused by climate change and transition risks caused by climate-related policy and economic shifts. The Financial Stability Board's Task Force on Climate-Related Financial Disclosures has developed recommendations regarding climate risk disclosures intended to improve investors' ability to assess and price climate risk.[28]

CO_2-eq Carbon dioxide equivalent emission: The amount of carbon dioxide (CO_2) emission that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs. There are a number of ways to compute such equivalent emissions and choose appropriate time horizons. Most typically, the CO_2-equivalent emission is obtained by multiplying the emission of a GHG by its global warming potential (GWP) for a 100-year time horizon. For a mix of GHGs it is obtained by summing the CO_2-equivalent emissions of each gas. CO_2-equivalent emission is a common scale for comparing emissions of different GHGs but does not imply equivalence of the corresponding climate change responses. (From IPCC glossary[27])

co-generation The simultaneous generation of electricity and useful heat

exposure The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected. (From IPCC glossary[27])

hazard The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. (From IPCC glossary[27])

life-cycle emissions	Greenhouse gas emissions of a product or service throughout its life cycle.
net-negative emissions	A situation of net-negative emissions is achieved when, as result of human activities, more greenhouse gases are removed from the atmosphere than are emitted into it. (From IPCC glossary[27])
net-zero emissions	Net-zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period. (From IPCC glossary[27])
risk	The potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Risk results from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence. (From IPCC glossary[27])
Scope 1 emissions	Direct GHG emissions from sources that are owned or controlled by an entity: for example, emissions from fossil fuel combustion in boilers or vehicles.
Scope 2 emissions	Emissions associated with the generation of purchased electricity.
Scope 3 emissions	Indirect emissions associated with activities other than the generation of purchased electricity.
tonne	Metric ton. Equal to 1000 kg or about 2200 pounds.
vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. (From IPCC glossary[27])

Acronyms

CMO	Climate Mobilization Office
CMTF	Climate Mobilization Task Force
CO_2-eq	carbon dioxide-equivalent emission (see glossary for definition)
EV	electric vehicle
FY	fiscal year
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
IPO	Institutional Planning and Operations
LEED	Leadership in Energy & Environmental Design
NJ CCRC	New Jersey Climate Change Resource Center
NJAES	New Jersey Agricultural Experiment Station
PAVER	Permanent, Additional, Verifiable, Enforceable and Real
PPA	Power Purchase Agreement

Endnotes

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