Developing Pathways toward a Carbon Neutral, Climate Resilient Rutgers

Interim Report of the President's Task Force on Carbon Neutrality and Climate Resilience

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EXECUTIVE SUMMARY

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. Sea-level rise associated with global warming is responsible for about 70% of tidal flooding along the Jersey Shore, and in the absence of global sea-level rise, Hurricane Sandy would have flooded about 38,000 fewer New Jerseyans. A warmer atmosphere is increasing the frequency of intense rainfall events, such as those New Jersey experienced during Hurricanes Floyd and Irene. Heat waves are becoming more intense and frequent, causing deleterious impacts on human health.

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 reduce sharply emissions of other greenhouse gases. According to the Intergovernmental Panel on Climate Change, achieving the Paris Climate Agreement's most ambitious goal, that of limiting warming to 1.5°C, requires global net-zero carbon dioxide emissions by about 2050. And yet even 1.5°C of warming leaves significant residual risk to which individuals, businesses, universities, governments – and, indeed, all of society – must adapt.

It is in the context of these challenges that President Barchi established Rutgers' President's Task Force on Carbon Neutrality and Climate Resilience. The purpose of this Task Force is to develop Rutgers' strategies 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'). This includes not just strategies for Rutgers' own operations, but also ways in which the University's actions can advance the goal of climate-positive, equitable economic development in New Jersey and more broadly.

Rutgers is already a leader in climate change research and engagement. 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 are at the cutting-edge of community-engaged climate research and engagement. In announcing his recent 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, another key state priority.

Rutgers has also already taken substantial steps to reduce its carbon emissions intensity, including building what was at the time of its construction in 2013 the largest campus solar facility in the nation. A very active building program has been underway for several years now, and new facilities are built to the equivalent of at least the LEED Silver performance standard. The Rutgers Physical Master Plan, released in 2015, highlights environmental sustainability as a key objective.

With its extensive history of academic excellence and return on investment to the New Jersey economy comes our next major challenge: designing and implementing our climate neutrality and resilience climate action plan across all schools and operations of this great institution of higher learning, and leveraging climate action at Rutgers to support climate-positive economic development across New Jersey. While some other universities have had inward-looking Climate Action Plans for more than a decade, 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.

Rutgers' climate action planning process is taking place in an active policy environment that includes a statewide commitment to achieve 100% carbon-free energy by 2050 and an active statewide planning process on climate resilience. In addition, New York State has committed to achieving carbon neutrality by 2050, and it seems plausible that New Jersey will follow suit.

Based upon an initial survey of current conditions at Rutgers and an examination of best practices at peer universities, as well as in other private and public sector institution, the Task Force in January 2020 issued a pre-planning report. That report laid out an eighteen-month process leading to the publication of a Climate Action Plan for Rutgers University in mid-2021. The objective of the current interim report is to provide an update on the work of the Task Force, including more detailed scoping of the activities necessary to develop that Climate Action Plan.

Current Task Force Status

Since our January report, following the guidelines laid out therein, the Task Force has:

- Expanded its membership to include student representatives from the New Brunswick, Newark, Camden and RBHS units.
- Expanded its membership to include staff representing the Office of the President; Institutional Planning and Operations; Finance; Facilities, Sustainability and Energy; Transportation; Procurement; Real Estate and Capital Planning; Emergency Management; and Extension.
- Hired an Administrative Director to ensure robust project management and stakeholder engagement for the Task Force.

The Task Force has established a set of seven topical working groups:

1. Energy and Buildings – covering electricity and heat generation; energy and water consumption by University owned and leased building; and energy and water consumption by off-campus housing and other buildings used by the University community;
2. Transportation – covering on-campus transportation, commuting, and University travel;
3. Food Systems – covering food consumed on campus and in the broader community;
4. Supply Chain and Waste Management – covering procurement and waste management;
5. Land Use and Offsets – covering emissions associated with University land use and maintenance, the effects of land use on energy demand, carbon dioxide storage in soils and vegetation on University lands, and offsets of University emissions;
6. Climate Preparedness – covering the resilience of the University, its outlying facilities, and surrounding communities to higher temperatures, more intense precipitation, and higher sea levels;
7. Climate-Positive, Equitable Economic Development – covering the definition of climate-positive, equitable economic development, how Rutgers can contribute to such

development through University functions, and how Rutgers efforts align with state policies for the broader economy.

In addition to greenhouse gas emission reductions and resilience improvements related to University operations, the Working Groups are charged to consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity. Following the work plan laid out in the pre-planning report, these Working Groups have developed preliminary working group reports that compile current knowledge related to each of the seven working group topical areas and identify research needs for the development of the Climate Action Plan. These seven Working Group reports constitute Part 2 of this report.

In February, the Task Force held a set of four town hall meetings across Rutgers campuses – in New Brunswick, Piscataway, Camden, and Newark – with the purpose of soliciting feedback from the Rutgers community on the pre-planning report approach and to help guide next steps of the process. Participation and enthusiasm were high, with approximately 325 attendees engaging in spirited discussions throughout all four town hall meetings. Seven themes emerged from across the town halls, as well as in comments received the Task Force website: 1) broad community engagement; 2) divestment from fossil fuels; 3) building key partnerships; 4) increased transparency in university operations; 5) increased student involvement in university operations; 6) the existence of a "visibility gap" between preferred solutions and carbon emission reductions; and 7) recognition of the unique situations of each campus. These themes will be incorporated into the task force's work moving forward.

In March, Rutgers joined the University Climate Change Coalition (UC3), an alliance of 22 leading North American research universities that is creating a collaborative model designed to help local communities achieve climate goals, accelerate the reduction in greenhouse gas emissions and nurture community climate resilience.

Effects of COVID-19

Over the course of the spring semester, the global, national, and local situation have changed dramatically as a result of the COVID-19 pandemic. This immediate emergency has turned the nation, the region, and the University upside down. As we write this, we are under stay-at-home orders. University courses have moved online. Personal protective equipment from laboratories around the University has been collected and donated to frontline personnel. We are in the midst of a massive recession, deliberately induced by policy in order to save millions of lives, and the University is, at least in the near term, facing significant budgetary constraints.

This immediate emergency does not reduce the importance of developing a robust, cutting-edge Climate Action Plan for the University. Unlike the economy, the climate crisis is not on pause; the planet's geophysical constraints do not stop for pandemics. Indeed, in some ways the present emergency has made the work of this Task Force more urgent.

In developing the University's Climate Action Plan, we are looking at every aspect of the University's operations and activities, with a critical eye as to what changes are necessitated by a shift to a carbon-neutral world with a changed climate. All those systems are currently receiving one of the greatest stress tests in their history. Like the national economy, some of them may

need to be rebuilt or restored when the current emergency ends. As we make decisions, nationally and locally, to rebuild, it is critical that we build back in a manner that is stronger, smarter, and more appropriate for a carbon-constrained world.

The current crisis is an opportunity for learning. Perhaps we can make certain changes that also reduce greenhouse gas emissions stick beyond the duration of the emergency. For instance, perhaps from the present crisis we will collectively learn about opportunities to reduce physical business travel and increase telecommuting without lowering productivity. Similarly, as University buildings are gradually returned to normal operations, we should be giving careful attention to issues like their energy efficiency and their efficient use and occupancy.

Many of the opportunities over the next few years will depend upon national policy. If there are tight budgets and fiscal austerity, the Climate Action Plan should help us identify opportunities to shed old, costly, carbon-inefficient facilities and activities and improve the efficiency of others. If there is a Green Stimulus to advance national economy recovery while moving the country toward carbon neutrality and climate resilience, the University's Climate Action Plan should put it in a position to lead: both leveraging opportunities to improve the climate performance of our on-campus activities, and stepping into a leadership role as the state's public, land-grant institution to advance climate-positive, equitable economic development statewide.

The current emergency also has implications for the process of developing the Climate Action Plan. The pre-planning report highlighted the importance of engaging (1) the student community, (2) the University's governing boards, (3) chancellors and deans, (4) the Rutgers University Senate, (5) alumni, (6) public-, private-, and NGO-sector state leaders, and (7) the communities in which Rutgers' campuses are based, and associated municipal and county leadership. This engagement remains critically important – but at the moment, the main channel for such engagement is through virtual meetings and social media. Thus, the social media operations of the Task Force are taking on an elevated importance.

The pre-planning report also identified a few near-term activities that have been delayed. In particular, it called for contracting an external firm with appropriate expertise to undertake an energy and greenhouse gas audit of the university early in the climate action planning process, and for working with this firm to establish clear policies, procedures, and lines of responsibility for the regular, periodic reporting of emissions inventories. This remains critically important, but given the fiscal uncertainty, we are aiming to push the limits of internal capabilities before turning to an external firm, which we expect to do in September.

The pre-planning report also called for the establishment of a working group involving the Task Force, Institutional Planning and Operations, and University Finance to develop a plan for facilitating high-return-on-investment energy-saving and emissions-reducing investments. This working group has met and has identified the establishment of a Green Revolving Fund as a key instrument, but the details of this plan have been delayed because key operational personnel have been focused on short-term emergency management. Nevertheless, given that the University may be operating under fiscal constraint for some time, establishing an instrument to facilitate high-return, climate-positive investments remains crucial, and we plan to continue to work to this goal over the summer.

Similarly, the pre-planning report called for Rutgers to work toward an in-state renewable energy power purchase agreement and/or a Green-e certified Renewable Energy Credit purchase to provide carbon-free electricity to cover a substantial portion of Rutgers' electricity consumption. Because of the focus of key operational personnel on the COVID-19

emergency, this process has also been delayed, but options here will be evaluated by our Energy and Buildings and working group.

Finally, the pre-planning report called for creating an updated University inventory of climate research and teaching. This remains a valuable activity, but given the high degree of flux in University activities at the moment, makes sense to delay until a more stable time.

Next steps

The Task Force's work over the next 13 months falls into three phases. In Phase 2, which will last through October, the seven Working Groups will be the primary actors. Implementing the work plans they have developed over the last two months, they will be engaging in three categories of activities:

- Establishing a baseline inventory of University greenhouse gas emissions, climate vulnerabilities, and ongoing climate-related activities,
- Identifying potential climate solutions for investigation, and
- Assessing potential climate solutions.

As outlined in the Working Group charges, potential solutions will be assessed along a number of different axes:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

In the course of doing this analysis, the Working Groups will also be flagging potential solutions with low financial costs and institutional barriers, with the intention that implementation of some of these could begin before the completion of the Climate Action Plan.

Throughout Phase 2, the Task Force will meet regularly to monitor Working Group progress. At a virtual workshop to be held in August or September, the Task Force and working group members will provide a more extensive set of progress updates, with an aim of identifying potential solutions that link across Working Groups and so require collaborative assessment.

During Phase 2, different Working Groups will require differing levels of stakeholder and community engagement. Because of the COVID-19 emergency, this engagement will largely take place through direct outreach to community and stakeholder groups. All engagement will be coordinated by the Task Force Administrative Director to eliminate the risk of overtaxing external partners through multiple parallel engagement channels from different working groups. In addition, the Task Force Administrative Director will oversee a unified survey of the University community that integrates data needs of multiple working groups. This survey will address not only activities that contribute to climate change, but also vulnerabilities revealed by the COVID-19 emergency.

The Working Groups will deliver their final reports in September 2020. In October, the Task Force will integrate these reports into a single document and hold a series of Town Halls to receive community feedback on their findings.

In Phase 3, which will last from November 2020 through February 2021, the Task Force will draw upon the Working Groups analyses to develop a set of scenarios for climate action at Rutgers. These scenarios will be defined both by different combinations of underlying approaches and different assumptions about the near-term fiscal situation of the University. In particular, with respect to fiscal impacts, we will consider scenarios of fiscal austerity, scenarios in which substantial stimulus funding is available for shovel-ready projects, and scenarios reflecting Rutgers' pre-COVID fiscal situation. For each scenario, we will assess:

- What is the time frame in which the scenario will achieve carbon neutrality?
- What are the resilience improvements under the scenario?
- What are the financial costs and savings associated with the scenario?
- What are the educational, research, and culture benefits of the scenarios?
- To what extent would the scenario engage Rutgers' external stakeholders and catalyze broader, climate-positive, equitable economic development in New Jersey?
- Under the scenario, how would the Climate Action Plan be managed and progress assessed?

The alternative scenarios will be synthesized in a climate action scenarios report, which will be released for public comment in January 2021. Town halls in February 2021 will provide additional opportunity for community input.

Phase 4 will run from March through June 2021. In this phase, incorporating all the work of the Working Groups and the Task Force to date, as well as the stakeholder and feedback received, the Task Force will develop the Climate Action Plan itself. The Climate Action Plan will present a set of recommended climate action strategies and implementation mechanisms for the University, which will be presented to President Holloway and the Boards of Governors and Trustees in June 2021. It will identify an ambitious, yet achievable and feasible, timeframe and pathway for achieving carbon neutrality, including intermediary targets, and will also identify key metrics for assessing the University's vulnerability to the physical impacts of climate change and a strategic approach for reducing these vulnerabilities. With respect to both carbon neutrality and climate resilience, it will identify supportive educational, research, and engagement efforts, as well as mechanisms for financing and tracking progress.

PART I:

CONTEXT AND DIRECTIONS

I.1. Climate Change is a Key Risk for the 21st Century

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), predominantly as a result of 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 global sea-level rise, Hurricane Sandy would have flooded about 38,000 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]

Climate change is not just an environmental challenge: it's also an economic challenge, an infrastructure challenge, and a public health challenge. And these challenges will keep getting more severe with every tonne 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.[7] For this reason, the Paris Climate Agreement calls for achieving net-zero greenhouse gas emissions in the second half of this century. The faster net carbon dioxide emissions are reduced, the better the odds of achieving the ambitious target laid out in the Paris Agreement of limiting global warming to well below 2°C 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, requires global net-zero carbon dioxide

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[1] K. Hayhoe et al., "Our Changing Climate," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, ed. D. R. Reidmiller et al. (Washington, DC, USA: U.S. Global Change Research Program, 2018), 72–144, doi:10.7930/NCA4.2018.CH2.

[2] NOAA National Centers for Environmental information, Climate at a Glance: Statewide Time Series, published October 2019, retrieved on October 21, 2019 from https://www.ncdc.noaa.gov/cag/

[3] Benjamin H. Strauss et al., "Unnatural Coastal Floods: Sea Level Rise and the Human Fingerprint on U.S. Floods Since 1950," Climate Central Research Report, 2016.

[4] Kenneth G. Miller et al., "A Geological Perspective on Sea-Level Rise and Its Impacts along the U.S. Mid-Atlantic Coast," *Earth's Future* 1 (2013): 3–18, https://doi.org/10.1002/2013EF000135.

[5] Hayhoe et al., "Our Changing Climate."

[6] L. A. Dupigny-Giroux et al., "Northeast," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, ed. D. R. Reidmiller et al. (Washington, DC, USA: U.S. Global Change Research Program, 2018), 669–742, doi: 10.7930/NCA4.2018.CH18.

[7] K. Hayhoe et al., "Climate Models, Scenarios, and Projections," in *Climate Science Special Report: Fourth National Climate Assessment, Volume I*, ed. D. J. Wuebbles et al. (Washington, DC, USA: U.S. Global Change Research Program, 2017), 411–29, https://doi.org/10.7930/J0GB227J.

emissions by about 2050; achieving the less ambitious 2.0°C target requires this by the 2070s.[8] In considering these timeframes, it is important to recognize that these are timeframes for global carbon neutrality – the corresponding timeframes for relatively low carbon-intensity entities, such as universities, particularly in the developed world, are necessarily faster. And yet even 1.5°C of warming leaves significant residual risk to which individuals, businesses, universities, governments – and, indeed, all of society – must adapt.

It is in the context of these challenges that President Barchi established Rutgers' President's Task Force on Carbon Neutrality and Climate Resilience in Setember 2019. The purpose of this Task Force is to develop Rutgers' strategies 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 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.

Based upon an initial survey of current conditions at Rutgers and an examination of best practices at peer universities, as well as in other private and public sector institution, the Task Force in January 2020 issued a pre-planning report. That report laid out an eighteen-month process leading to the publication of a Climate Action Plan for Rutgers University in mid-2021. The objective of the current interim report is to provide an update on the work of the Task Force, including more detailed scoping of the activities necessary to develop that Climate Action Plan.

The COVID-19 Emergency and the Climate Crisis

Over the course of the spring semester, the global, national, and local situation have changed dramatically as a result of the COVID-19 pandemic. This immediate emergency has turned the nation, the region, and the University upside down. As we write this, we are under stay-at-home orders. Many have curtailed their consumption of goods and services, and much consumption that once occurred on campus has been displaced off campus. University courses have moved online. Personal protective equipment from laboratories around the University has been collected and donated to frontline personnel. Some have discussed the possibility of turning dormitories into hospital facilities. We are in the midst of a massive recession, deliberately induced by policy in order to save millions of lives.

[8] Joeri Rogelj et al., "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development," in *Global Warming of 1.5°C*, ed. V. Masson-Delmotte et al. (Intergovernmental Panel on Climate Change, 2018).

This immediate emergency does not reduce the importance of developing a robust, cutting-edge Climate Action Plan for the University. Unlike the economy, the climate crisis is not on pause; the planet's geophysical constraints do not stop for pandemics. Indeed, in some ways the present emergency has made the work of this Task Force more urgent.

In developing the University's Climate Action Plan, we are looking at every aspect of the University's operations and activities, with a critical eye as to what changes are necessitated by a shift to a carbon-neutral world with a changed climate. All of those systems are currently receiving one of the greatest stress tests in their history. Like the national economy, some of them may need to be rebuilt or restored when the current emergency ends. As we make decisions, nationally and locally, as to rebuild, it is critical that we build back in a manner that is stronger, smarter, and more appropriate for a climate-constrained world.

As some of the Working Group reports discuss, the current crisis is an opportunity for learning. Perhaps we can make certain changes that also reduce greenhouse gas emissions stick beyond the duration of the emergency. For instance, perhaps from the present crisis we will collectively learn about opportunities to reduce physical business travel and increase telecommuting without lowering productivity. Similarly, as University buildings are gradually returned to normal operations, we should be giving careful attention to issues like their energy efficiency and their efficient use and occupancy.

Many of the opportunities over the next few years will depend upon national policy, as well as its consequences for state policy. If there are tight budgets and fiscal austerity, the Climate Action Plan should help us identify opportunities to shed old, costly, carbon-inefficient facilities and activities and improve the efficiency of others. If there is a Green Stimulus to advance national economy recovery while moving the country toward carbon neutrality and climate resilience, the University's Climate Action Plan should put it in a position to lead: both leveraging opportunities to improve the climate performance of our on-campus activities, and stepping into a leadership role as the state's public, land-grant institution to advance climate-positive, equitable economic development statewide. Regardless of the fiscal constraints under which we are operating, we believe that Rutgers has both a responsibility and an opportunity to be a national leader in helping solve the climate crisis.

I.2. What Makes Rutgers Unique

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.*[9] One of the most critical challenges facing current and future generations is the climate crisis. Moving towards carbon neutrality and climate resilience at Rutgers is a complex and daunting task, but also an exciting and critical opportunity in the history of the University.

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

[9] https://www.rutgers.edu/about/history

resilient. NSF 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 New Jersey Climate Change Resource Center; through pioneering educational efforts like the Coastal Climate Risk & Resilience graduate traineeship – are at the cutting-edge of community-engaged climate research and engagement.[10] In announcing his recent 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, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, and the National Climate Assessment.

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 (NJHEPS), which helps member institutions develop greenhouse gas emissions inventories for their campuses, and vetted best practices for improving energy efficiency and installing renewables. 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 in 2013, becoming for a time the largest campus solar facility in the nation. In 2014, President Robert Barchi re-vitalized the Rutgers University Sustainability Committee, 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.

With its extensive history of academic excellence and return on investment to the New Jersey economy comes our next major challenge: designing and implementing our climate neutrality and resilience climate action plan across all schools and operations of this great institution of higher learning, and leveraging climate action at Rutgers to support climate-positive economic development across New Jersey. While some other universities have had inward-looking Climate Action Plans for more than a decade, 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.

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[10] Jen Schwartz, "Surrendering to Rising Seas," *Scientific American*, 2018, https://doi.org/10.1038/scientificamerican0818-44; Marjorie Kaplan, Lisa Auermuller, and Jeanne Herb, "Here's How to Save New Jersey from the Rising Tide," *New Jersey Star-Ledger*, June 23, 2019, https://www.nj.com/opinion/2019/06/heres-how-to-save-new-jersey-from-the-rising-tide.html.

The challenges we face are detailed below, and our actions must account for these challenges as we design, develop and execute our Climate Action Plan.

Our sheer size:[11]

- More than 70,000 students and 27,000 faculty and staff
    - Diversity – of culture, economics, and experience, among other aspects – is one of our greatest strengths. Climate impacts affects all of us, and our solutions will come from and will be integrated across all diverse populations of the University
    - Faculty and Students are engaged in climate, environmental and social impact research across all campus; tapping into this vast research will be incredibly valuable to the work of this Task Force.
- More than 6,000 acres of land (including 31 in Camden; 106 in Newark; 137 RBHS; 2,684 NB; and 3,243 across other parts of New Jersey)
- Over 1200 facilities (owned, leased, and affiliated) across all 21 New Jersey counties
- Nearly 950 buildings owned across New Jersey (including 50 buildings in Camden; 654 buildings in New Brunswick; 41 buildings in Newark; 50 buildings at RBHS; and 153 buildings across other parts of New Jersey)
- 29 million square feet of all building types -- academic, administrative, and housing (including 1.6m in Camden; 17.7m NB; 3.3m Newark; 6.3m RBHS; .5m across other parts of New Jersey)
- Rutgers has one of the largest dining/food service operations in higher education:
    - 6.3 million meals served yearly by Rutgers Dining at RU-New Brunswick.
    - Gourmet Dining (a NJ-based business) provides dining services to RU-Newark and RU-Camden

Our complexity:

- Rutgers–New Brunswick has one of the largest university-operated residence hall systems in the country (nearly 16,000 beds).
- Rutgers operates one of the largest campus bus systems in the U.S. and the second largest transit system in the state, behind NJ Transit.
- Our three primary locations are all in urban areas; we also have research and administrative building locations in all 21 New Jersey counties, including our expansive New Jersey Agricultural Experiment Station (NJAES) off-campus facilities
- Rutgers–New Brunswick is geographically distributed across five campuses with land in six cities and municipalities and divided by a river.

Our financial realities:

- Annual operational budget of $4.6 billion, including $239 million spent on supplies and $127 million spent on plant operations and maintenance

[11] Some of the numbers in these bullet points have been updated since the pre-planning report to reflect the statistics used by the Office of Planning, Development, and Design. Budget figures have been updated based on the University's approved FY2020 budget and do not factor into account COVID-related budget cuts.

- A current deferred maintenance liability of $5.1 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.
- New Jersey has a high cost-of-living and high prevailing wage.
- While our broad union presence strengthens the ability of faculty, students, and staff to participate in institutional governance, it also means that we have made commitments to maintaining employee standards of living that ununionized peer institutions have not. Newly signed union agreements obligate the University to 3% annual salary increases.

Our infrastructure:

- 70% of the buildings on our flagship campus were constructed at least 25 years ago; more than four out of ten buildings (42%) are over 50 years old.
- 60% of all our buildings are relatively small—under 10,000 square feet—and more difficult to retrofit in a cost-effective way.
- Rutgers maintains 60 miles of underground water and sewer lines.

Preliminary Inventory of Scope 1 and 2 Greenhouse Gas Emissions

Rutgers has begun an analysis of its baseline emissions and has constructed methods to collect the data needed to track greenhouse gas emissions. In October 2019, Dr. Rachael Shwom (funded by the Rutgers Institute of Earth, Ocean, and Atmospheric Sciences and the Rutgers Energy Institute) hired undergraduates Therese Appuzzo and Richard Jang to assist faculty in gathering data. The goal is to undertake greenhouse gas emission data collection for Rutgers's New Brunswick, Newark, Camden, and RBHS campuses. A preliminary analysis of Rutgers-New Brunswick's emissions was presented in the Task Force's January Pre-Planning Report. Since January, the Task Force has completed the greenhouse gas data for all campuses and utilized Second Nature's Sustainability Indicator Management and Analysis Platform (SIMAP) to analyze the data.

There are three scopes or level of responsibilities for emissions. Scope 1 emissions are most directly within the university's control and decision-making, where scope 3 emissions are indirect consequences of the university's decisions. *Scope 1 emissions* are direct emissions from sources that are owned and/or controlled by Rutgers. This includes combustion of fossil fuels in college-owned facilities or vehicles, fugitive emissions from refrigeration, and emissions from on-campus fertilizer application, agriculture, and livestock husbandry. *Scope 2 emissions* arise from purchased electricity. These are direct emissions from sources that are not owned nor operated by Rutgers, but whose production are directly linked to on-campus energy consumption. Finally, *Scope 3 emissions* come from sources that are not owned nor operated 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). Since Scope 1 and 2 emissions are easy to both measure and reduce, many institutions with carbon neutrality target have chosen to set an earlier target date for Scopes 1 and 2 than for Scope 3.

Scope 1 and 2 carbon dioxide-equivalent emissions from Rutgers total about 365,000 tonnes, roughly 0.4% of all statewide emissions in New Jersey. The New Brunswick campus is responsible for the majority of emissions (57%), followed by RBHS (30%, predominantly in Newark), Newark (9%), and Camden (4%). Scope 1 and 2 emissions are dominated in roughly equal shares by electricity (51%) and heating (47%). Previous rough estimates, including in the pre-planning report, suggest that scope 3 transportation emissions (associated with commuting and air travel) are about 15% of the scale of scope 1 and 2 emissions. Scope 3 supply chain emissions have been calculated for Rutgers Dining data for FY19, but have not yet been quantified, even approximately, for other supply chains.

Table I.2.1. Preliminary FY 2019 Scope 1 and 2 Greenhouse Gas Emissions Inventory
(tonnes carbon dioxide-equivalent emissions)

Scope	Source	Camden	New Brunswick	Newark	RBHS		Total
					Newark	N.B.	
1	Co-Generation Electricity	0	31,061	0	11,994	0	43,055
1	Co-Generation Hot Water	0	40,999	0	26,035	0	67,034
1	Other On-Campus Stationary	5,171	73,637	10,320	10,666	5,732	105,526
2	Purchased Electricity	8,342	53,658	22,094	43,249	9,565	136,908
1/2	Transmission & Distribution Losses	428	2,754	1,134	2,220	491	7,027
1	Campus Buses	n.d.	4,977	n.d.	n.d.	n.d.	4,977
1	Campus Animals	n.d.	6	n.d.	n.d.	n.d.	6
1 and 2	*Total Quantified**	*13,941*	*207,092*	*33,548*	*94,164*	*15,788*	*364,533*

* Not including Rutgers-owned vehicles, fertilizer, refrigerants, or chemicals. Buses and animals have only been estimated for New Brunswick.

I.3. Policy Context for Climate Action in New Jersey

In New Jersey, public policymakers began to develop responses to climate change threats in the late 1990s, during the governorship of Christine Todd Whitman. A key landmark was the establishment of a Renewable Energy Portfolio Standard (RPS) as part of the Electric Discount and Energy Competition Act of 1999. This required energy utilities to begin incorporating renewable energy sources into their supply mix. Governor Jim McGreevey established the New Jersey Clean Energy Program at the Board of Public Utilities (BPU) in 2003, providing residents and enterprises with a range of incentives to undertake renewable energy and energy efficiency projects. The administration of Governor Richard Codey in 2005 brought New Jersey into the Regional Greenhouse Gas Initiative (RGGI), a multi-state compact to support trading of greenhouse gas emissions permits among regulated entities in the Northeastern U.S.

In 2007, under Governor Jon Corzine, New Jersey passed the Global Warming Response Act, which led to the state's first comprehensive greenhouse gas inventory in 2008 and set a statewide goal of reducing greenhouse gas emissions by 80% below 2006 levels by 2050. The 2010 Offshore Wind Economic Development Act, under Governor Chris Christie, continued to accelerate renewable energy development. In 2011, Governor Christie disruptively withdrew

New Jersey from RGGI but then signed the 2012 Solar Act, aggressively increasing the RPS targets.

Like his predecessors in both political parties, the current Governor, Phil Murphy, has made clean energy a policy priority. The year 2018 saw several important actions. Executive Order 7 directed New Jersey to re-join RGGI, a multi-year process that is now underway. Executive Order 8 promoted offshore wind energy and established a process leading to a current agreement with Ocean Wind (a partnership of Ørsted and PSEG) to build the first 1,100 megawatts (MW) of wind turbines in New Jersey waters. New Jersey joined the US Climate Alliance, in solidarity with many other states, upholding the Paris Climate Agreement, from which the Trump administration has announced its intention to withdraw. The Clean Energy Act of 2018 increased the RPS again, established a community solar energy pilot program, set a goal of 3,500 MW of offshore wind by 2030, directed energy utilities to improve energy efficiency on customer premises, and set a goal of 2,000 MW of energy storage by 2030.

Executive Order 28 directed the New Jersey Board of Public Utilities to write an Energy Master Plan, which was released in January 2020. The Energy Master Plan established a statewide goal of 100% clean energy by 2050. Of relevance to Rutgers' activities as a research and educational institution, its seven strategy calls 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."[12]

While New Jersey has yet to adopt a statewide carbon neutrality target, several states – including, in 2019, New York State – have recently adopted statutory targets of achieving net-zero carbon dioxide emissions by 2050. As it seems likely that New Jersey will follow its neighbor in this regard, leading to statewide carbon neutrality by 2050, a key question for this Task Force is the extent to which Rutgers can outpace the state 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 enacted a variety 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, the 1970 NJ Wetlands Act, and the 1973 Coastal Area Facility Review Act and its 1993 update, carried out in coordination with federal legislation establishing the National Flood Insurance Program and Federal Emergency Management Agency in 1968 and subsequent reforms, and the Coastal Zone Management Act in 1972 and its amendments. Superstorm Sandy in 2012 and the state's slow recovery heightened the salience of climate change adaptation issues and associated policies. In 2019, Governor Phil Murphy's Executive Order 89 directed the New Jersey Department of Environmental Protection to appoint a Chief Resilience Officer and an Interagency Council on Climate Resilience, charged with delivering a scientific report on climate change, a statewide climate change resilience strategy, a coastal resilience plan, and an updated state development and redevelopment plan. This Executive Order also called for the Chief Resilience Office to actively engage with the state's higher education institutions in achieving these goals.

In January 2020, Governor Murphy signed Executive Order 100, which directs the state Department of Environmental Protection to enhance its greenhouse gas monitoring and

[12] New Jersey Board of Public Utilities, "New Jersey Energy Master Plan: Pathway to 2050," 2020, https://www.nj.gov/emp/.

reporting program, establish criteria for carbon dioxide emissions and short-lived climate pollutants, reform land use regulations to incorporate climate change considerations, and ensure publicly financed projects integrate climate resilience measures. He also signed S. 4162, which established and provided initial funding for 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." 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 in Community Energy Plans with local community groups, and enhancing deployment of rooftop solar, community solar, and energy efficiency in low- and moderate-income and environmental justice communities. The Administration's Health in All Policies goal seeks to integrated 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 sits. In particular, the City of Newark is in the middle of developing its Sustainability Action Plan 2020, which updates an original 2013 action plan. One of the key action items of the Newark sustainability planning process is to "work with technical advisers and subject matter experts to identify strategies that will allow Newark to meet or exceed climate protection targets in New Jersey's Global Warming Response Act as well as the Paris Climate Accords." 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.[13] Two of our Rutgers Climate Task Force members (K. Lyons and M. Kornitas) are part of the New Brunswick's 'Green Team' commissioned by the Mayor to assist the City in their 2020 recertification.

I.4. Key Recommendations from Pre-Planning Report

The Task Force's pre-planning report, issued in January, recommended the formal launch of a climate action planning process that would lead to this interim report in May 2020 and a final report in June 2021. Key recommendations related to the climate action planning process included:

- Expanding the current task force to include student and staff representatives

[13] Sustainable Jersey is a 501c3 non-profit organization that runs a certification program for municipalities in New Jersey. It helps New Jersey towns build a better world for future generations by supporting community efforts to reduce waste, cut greenhouse gas emissions, and improve environmental equity.

- Establishing a set of working groups, covering: Energy and Buildings; Transportation; Supply Chain and Waste Management; Food Systems; Land Use and Offsets; Climate Preparedness; and Climate-Positive, Equitable Economic Development.
- Providing adequate staffing to support the climate action planning process, including: a high-level administrative director and a program coordinator working directly for the Task Force, and a communications specialist at University Communications and Marketing focused on climate and sustainability.
- Contracting an external firm with appropriate expertise to undertake an energy and greenhouse gas audit of the university early in the climate action planning process.
- Establishing processes for engaging (1) the student community, (2) the University's governing boards, (3) chancellors and deans, (4) the Rutgers University Senate, (5) alumni, (6) public-, private-, and NGO-sector state leaderships, (7) the communities in which Rutgers' campuses are based, and associated municipal and county leadership.
- Advancing the higher-education sector as an agent of climate action, both in New Jersey in coordination with the New Jersey Presidents' Council, the Office of the Secretary of Higher Education, and the New Jersey Higher Education Partnership for Sustainability, and more broadly through the Big Ten Academic Alliance and the Association of American Universities.

In addition, the Task Force identified a few opportunities for action in Spring 2020 that could lead to early successes. The pre-planning report focused primarily on: (1) actions that seemed likely to be necessary for the implementation of any reasonable climate action plan, and (2) actions that are by construction both climate-positive and revenue-positive and need little further analysis to establish their net benefit. These early wins included:

- Establishing clear policies, procedures, and lines of responsibility for the maintenance and reporting of emissions inventories
- Establishing a working group involving the Task Force, IPO, and Finance to green the University financing and budget process to facilitate high-ROI energy-saving and emissions-reducing investments.
- Working toward an in-state renewable energy power purchase agreement and/or a Green-e certified Renewable Energy Credit purchase to provide carbon-free electricity to cover a substantial portion of Rutgers' electricity consumption
- Creating an updated University inventory of climate research and teaching

Since our January report, following these recommendations, the Task Force has:

- Expanded its membership to include student representatives from the New Brunswick, Newark, Camden and RBHS units, as well as staff representing the Office of the President; Institutional Planning and Operations; Finance; Facilities, Sustainability and Energy; Transportation; Procurement; Real Estate and Capital Planning; Emergency Management; and Extension.
- Hired an Administrative Director to ensure robust project management and stakeholder engagement for the Task Force.

The Task Force has established a set of seven topical working groups:

1. Energy and Buildings – covering electricity and heat generation; energy and water consumption by University owned and leased building; and energy and water consumption by off-campus housing and other buildings used by the University community;
2. Transportation – covering on-campus transportation, commuting, and University travel;
3. Food Systems – covering food consumed on campus and in the broader community;
4. Supply Chain and Waste Management – covering procurement and waste management;
5. Land Use and Offsets – covering emissions associated with University land use and maintenance, the effects of land use on energy demand, carbon dioxide storage in soils and vegetation on University lands, and offsets of University emissions;
6. Climate Preparedness – covering the resilience of the University, its outlying facilities, and surrounding communities to higher temperatures, more intense precipitation, and higher sea levels;
7. Climate-Positive, Equitable Economic Development – covering the definition of climate-positive, equitable economic development, how Rutgers can contribute to such development through University functions, and how Rutgers efforts align with state policies for the broader economy.

In addition to greenhouse gas emission reductions and resilience improvements related to University operations, the Working Groups are charged to consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity. Following the work plan laid out in the pre-planning report, these Working Groups have developed preliminary working group reports that compile current knowledge related to each of the seven working group topical areas and identify research needs for the development of the Climate Action Plan. These seven Working Group reports constitute Part 2 of this report.

As detailed in Section I.5, we have also held a series of extremely productive town halls with the University community. Further, in March 2020, Rutgers joined the University Climate Change Coalition (UC3), an alliance of 22 leading North American research universities that is creating a collaborative model designed to help local communities achieve climate goals, accelerate the reduction in greenhouse gas emissions and nurture community climate resilience.

The current emergency has implications for the process of developing the Climate Action Plan. While broad engagement with stakeholder and community groups remains critically important, at the moment, the main channel for such engagement is through virtual meetings and social media. Thus, the social media operations of the Task Force are taking on an elevated importance. Depending on the University's operation status in the fall, it is not out of the question that Town Halls originally planned for then may have to take place entirely electronically. Combined with budgetary constraints, this has also led the Task Force to defer hiring a program coordinator.

The pre-planning report also identified a few near-term activities that have been delayed. In particular, it called for contracting an external firm with appropriate expertise to undertake an energy and greenhouse gas audit of the university early in the climate action planning process, and for working with this firm to establish clear policies, procedures, and lines of responsibility for the regular, periodic reporting of emissions inventories. This remains critically important, but

given the fiscal uncertainty, we are aiming to push the limits of internal capabilities before turning to an external firm, which we expect to do in September.

The pre-planning report also called for the establishment of a working group involving the Task Force, Institutional Planning and Operations, and University Finance to develop a plan for facilitating high-return-on-investment energy-saving and emissions-reducing investments. This working group has met and has confirmed the establishment of a Green Revolving Fund as a key instrument, but the details of this plan have been delayed because key operational personnel have been focused on short-term emergency management. Nevertheless, given that the University may be operating under fiscal constraint for some time, establishing an instrument to facilitate high-return, climate-positive investments remains crucial, and we plan to continue to work to this goal over the summer.

Similarly, the pre-planning report called for Rutgers to work toward an in-state renewable energy power purchase agreement and/or a Green-e certified Renewable Energy Credit purchase to provide carbon-free electricity to cover a substantial portion of Rutgers' electricity consumption. Because of the focus of key operational personnel on the COVID-19 emergency, this process has also been delayed, but options here will be evaluated by our Energy and Buildings and working group.

Finally, the pre-planning report called for creating an updated University inventory of climate research and teaching. This remains a valuable activity, but given the high degree of flux in University activities at the moment, makes sense to delay until a more stable time.

I.5. Feedback on the Pre-Planning Report from Town Halls

In February, the Task Force held a set of four town hall meetings across selected Rutgers campuses – New Brunswick, Piscataway, Camden, and Newark – with the purpose of soliciting feedback from the Rutgers community on the pre-planning report approach and to help guide next steps of the process.[14] Participation and enthusiasm were high, with approximately 325 attendees engaging in spirited discussions throughout all four town hall meetings.

Each meeting began with a brief presentation showing an overview of the Task Force, highlights from the pre-planning report, and next steps, followed by a plenary discussion. The remainder of the meetings were spent in working sessions where participants provided feedback to help guide the development of the interim report. During the working sessions, town hall participants broke out into facilitated discussion groups based on the seven working groups. Depending on the available time, 2-3 rounds of discussions were held at each town hall, giving participants an opportunity to weigh in on multiple topic areas. In addition to the facilitated discussions, town hall attendees were asked to provide input on four supplemental topics via easels placed throughout the room. The four supplemental topics were: Big Ideas; Things To Do in the Next 6 Months; Things I want to Tell the Incoming President; and Things Every Member of the Rutgers Community Should Do.

[14] A video of the introductory remarks at the New Brunswick town hall is available at https://youtu.be/yWhN7QSeP5s. Slides are available at https://go.rutgers.edu/akgo1uf6.

Notes from the discussion groups, easels, and website comments were compiled and analyzed. There were seven themes that emerged from this analysis that cut across multiple topic areas and campuses.

1. **Community Engagement**: The call for broad community engagement emerged as a key issue. It came up on every campus, in several topic area discussions, in the supplemental topics, and through the website. Participants recognized that Rutgers campuses are embedded in local communities and that meaningful engagement with those communities, early and often, will influence project outcomes. There was particular concern regarding vulnerable populations within local communities and how this work might impact them.
2. **Divestment from fossil fuels**: Divestment from fossil fuels was another topic that came through as important to participants and was brought up at every town hall meeting, in discussion groups, on easels, and through website comments. Some also suggested that funds should be reinvested in renewable energy. (See box "Proposals for Fossil Fuel Divestment" for further discussion.)
3. **Building partnerships**: Many participants acknowledge that there are limits to what Rutgers can achieve alone and that building partnerships with local and state governments, businesses, and NGOs will amplify what can be done through a climate action plan. A common example given was partnering with transit authorities to make Rutgers campuses more accessible via public transit. Participants also mentioned the benefits to other topic areas such as food systems, supply chain, and economic development.
4. **Transparency in university operations**: In the discussion groups and website comments, several people requested greater transparency in university operations. For example, there were many questions on each campus about how recycling is handled, with many participants citing conflicting information. There was also confusion about real estate acquisitions and land use decisions on multiple campuses.
5. **Student involvement in university operations**: Closely related to the call for greater transparency in university operations, many students expressed a strong desire to be included in the decision-making processes with regard to university operations across several topic areas.
6. **There is a "visibility gap"**: A significant gap exists between the solutions that participants are most passionate about and what will have the greatest impact on emissions reductions. For example, banning plastics, electrification of buses, and composting were heavily promoted by participants, but would have very little impact on emissions if implemented. The favored solutions are based largely on everyday experiences, and what is seen and unseen. It is a "visibility gap".
7. **Recognition of the unique situations of each campus**: The Camden and Newark campuses each expressed a need to for their particular situations to be taken into consideration through the development of a climate action plan. For example, Camden participants often mentioned their large commuter population and how it influences their carbon emissions. Similarly, Newark participants cited perceptions of lead contamination in the water impacting people's choices.

In addition to these seven broad themes, there were several ideas specific to each topic areas that emerged from the analysis.

Energy and Buildings: All campuses identified poor heating and cooling in buildings, particularly older buildings, as very problematic, as well as a need for building level audits and metering. Several comments, including from the website, suggested that faculty and students be tasked with building level energy audits as part of their research or coursework. There was also concern that there is no incentive for students and other members of the Rutgers community to conserve energy and that many may not be aware of the energy consumption, leading to suggestions that each Rutgers community member calculate their carbon footprint. Other common suggestion include: installing motion sensor lights; planting green roofs; investing in renewable energy; and installing more solar panels.

Transportation: A common theme from all town halls was the need to make public transit a more attractive option for Rutgers community members. Common suggestions included partnering with NJ Transit to make train schedules and connections more practical for commuters as well as offering better financial incentives for taking public transit to campus. Improving walkability and bike share/bike rental options were also popular suggestions across campuses. Citing its large commuter population, Camden participants suggested increasing the amount and affordability of housing to decrease the number of commuters. Rutgers-operated buses and shuttles were brought up at every town hall, but were a particular focus at the New Brunswick and Piscataway meetings. Participants expressed strong dissatisfaction with the buses at these two town halls. Concerns included: a need to electrify the bus fleet; poor maintenance of the buses; incorrect information about bus arrivals; and buses seen idling for long periods of time. Other common suggestions across campuses include: supporting carpooling through matchmaking apps and financial incentives; establishing car-free zones on campus and push parking to the perimeter; more charging stations for electric vehicles on campus; promoting telecommuting; establishing a no-fly perimeter for university travel; and educating people on best walking routes and how to transfer between transit systems.

Food Systems: The suggestions with regard to foods systems were remarkably similar at all four meetings. Concerns about food waste and calls for increased composting were the most common response. Some also suggested partnering with local food banks as a way to reduce waste. Participants were also very concerned about the amount of plastic used in dining halls, including packaging and disposable cutlery. Many people want to see more vegetarian and vegan options as well as increased education about the sustainability of these choices. Participants from Camden are eager to have locally sourced food and people from several campuses want to address food insecurity at Rutgers and in surrounding communities. Newark participants mentioned that Newark is a food desert and the plan should address that. They pointed out that the local businesses provide poor food choices, especially packaged food, and few eco-friendly choices around campus and suggested working with local and state partners to improve options. Additionally, participants in the Newark town hall raised concerns about lead levels in municipal water, prompting requests for more water fountains with filters on campus to discourage purchase of bottled water.

Supply Chain and Waste Management: Far and away the biggest issue for this topic area was recycling. On every campus and from the website, there were questions about how recycling happens at Rutgers. With many people citing rumors and anecdotal information, there was a general call for more transparency with regard to recycling. Some of the comments from the Food Systems discussion also appeared here, including ideas for scaling up composting and banning single use plastics. Another common idea was transparency regarding procurement criteria, suggesting giving preference to vendors and products based on their ecological footprint and ethical considerations.

Land Use and Offsets: There was a wide variety of responses to this topic area with only a couple common suggestions. The first was to consider low maintenance plantings (e.g. native plants) to decrease the need for fertilizers and energy intensive maintenance such as mowing lawns. The second was to use development patterns that encourage walking such as transit-oriented development and increased density. Other suggestions include: consider the carbon capture ability of various surfaces (e.g. wetlands capture more carbon than asphalt); plan land uses to also serve the local community; coordinate with existing county or regional programs; increase use of vertical gardens. With regard to offsets, there was not a consensus about if and how they should be used. There was general agreement that they are controversial and that if they are purchased, the benefit should be a local as possible. Some participants in Newark were confused about land purchases in the areas around campus, erroneously believing that the university was purchasing land.

Climate Preparedness: In this topic area the need to look beyond Rutgers' boundaries and include the surrounding communities and ecosystems was very pronounced. Several participants at multiple campuses see value in identifying vulnerable populations within the Rutgers community and the local communities before potential shocks and prepare to support them when a shock occurs. Many participants also suggest coordinating broadly with state and local governments as well as partnering with other universities to establish best practices. Considerations of the larger watershed were mentioned at all town halls, with Camden participants voicing concern about rising levels of the Delaware River and Newark Participants citing sewage and stormwater issues in the Passaic River. Several other suggestions were made, including: establishing microgrids; training RAs on emergency protocols; using green infrastructure for flood mitigation; building a stockpile of supplies; aiding communities in managed retreat; and communicating effectively.

Climate-Positive, Equitable Economic Development: This is another topic area that was very outward-facing and inclusive of local communities. The most common response was that jobs created by any economic development from the climate action plan should be given to local residents and training should be provided as needed. Divestment from fossil fuels was also frequently suggested. Partnering with local governments and participating in existing development projects was also mentioned several times. Many participants saw this project as an opportunity for Rutgers to take a leadership position within New Jersey and invite other universities, cities, and businesses to join. This could include supporting entrepreneurship programs, creating a green incubator, and building a circular economy. Education also emerged as an important part of this topic with ideas to hold workshops for students and community

members on how to live sustainably and promoting the triple bottom line in the Business School curriculum.

Proposals for Fossil Fuel Divestment

At the February town halls, students and faculty repeatedly raised the question of whether the University endowment should divest from fossil fuels. Management of the endowment is the responsibility of the Joint Committee on Investments of the Board of Governors and Board of Trustees, and evaluation of divestment is not within the main scope of the Task Force's activities.

The University's Investment Policy[15] encourages members of the university community to submit divestment requests to the Joint Committee via the Office of the University Secretary. The committee weighs its fiduciary obligations with the University's core mission, values, and the investment concerns raised in such requests when considering divestment decisions.

The university adopted a formal divestment policy in June 2015. This policy was the result first of input from students, which led to the creation of a committee of faculty, staff, students and board members to advise the university on evaluating questions of divestment. This policy identifies four criteria:

- The divestment is consistent with the fiduciary obligation of The Joint Committee on Investments (JCOI) and the Boards;
- The behavior, action, or product in question is antithetical to the core mission or values of the university;
- The organization, industry or entity to be divested has sole or shared responsibility for the concern(s) identified; and that
- The concern reflects the consensus of the University community.

The Task Force encourages advocates of fossil fuel divestment to submit a divestment request through the process set up by the University's divestment policy.

The Task Force notes that the University has, by establishing the Task Force, recognized the importance of achieving a world with net-zero carbon dioxide emissions. The Task Force also further notes that some analysts have raised concerns that the valuation of companies with a significant fraction of their assets in fossil fuel reserves may be inconsistent with a net-zero future. The potential inconsistency between valuations and climate targets has led to a discourse around 'stranded' fossil-fuel assets and their associated financial risk. Concern about stranded assets has led some investment boards, including that of the University of California Board of Regents, to conclude that investing in fossil fuels is not consistent with their fiduciary responsibilities.

[15] See Appendix B of University Policy 40.2.14, https://policies.rutgers.edu/sites/default/files/40-2-14-current.pdf

I.6. Charge to Working Groups

Part 2 of this report comprises interim reports from each of the seven working groups. The primary purposes of these reports are to specify work the group will complete to fulfill their charge, while additionally:

- increasing awareness of ongoing activities at Rutgers,
- providing a more concrete basis for discussion with stakeholder groups outside Rutgers,
- highlighting 'easy wins' that could be turned into actionable plans either for the interim report or over the summer, and
- identifying areas that need cross-working group discussion.

Questions each working group addresses in the interim report include:

- **Current Status:** What programs and facilities are already in place at Rutgers, and what is their status? (In describing current status, be sure to collect information and describe in a manner useful for more broadly communicating Rutgers' ongoing activities.)
- **Exemplars:** Are there templates and previous examples, either at Rutgers or at other institutions, that are appropriate to use?
- **Working Group Work Plan:** To more fully address the questions laid out in the working group's charge,
    1. What new information is required, and how will it be obtained?
    2. What additional analyses are required?
    3. What resources are required to do these additional analyses?
- **Engagement Plan:** How should the task force engage with Rutgers' external stakeholders such as surrounding communities, state entitles, local organizations, etc. with regard to the topic area?
- **Easy Wins:** Are there any revenue-positive, institutionally compatible 'easy wins' that could be pursued in the next six months?
- **Cross-Working Group Interactions:** What are key areas of overlap with the other six working groups?

More detailed charge questions to each Working Group are provided in the Appendix.

I.7. Next Steps in Climate Action Plan Development

The Task Force's work over the next 13 months falls into three phases. In Phase 2, which will last through October, the seven Working Groups will be the primary actors. Implementing the work plans that they have developed over the last two months, they will be engaging in three categories of activities:

- Establishing a baseline inventory of University greenhouse gas emissions, climate vulnerabilities, and ongoing climate-related activities,
- Identifying potential climate solutions for investigation, and

- Assessing potential climate solutions.

As outlined in the Working Group charges, potential solutions will be assessed along a number of different axes:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

In the course of doing this analysis, the Working Groups will also be flagging potential solutions with low financial costs and institutional barriers, with the intention that implementation of some of these could begin before the completion of the Climate Action Plan.

Throughout Phase 2, the Task Force will meet regularly to monitor Working Group progress. At a virtual workshop to be held in August or September, the Task Force and working group members will provide a more extensive set of progress updates, with an aim of identifying potential solutions that link across Working Groups and so require collaborative assessment.

During Phase 2, different Working Groups will require differing levels of stakeholder and community engagement. Because of the COVID-19 emergency, this engagement will largely take place through direct outreach to community and stakeholder groups. All engagement will be coordinated by the Task Force Administrative Director to eliminate the risk of overtaxing external partners through multiple parallel engagement channels from different working groups. In addition, the Task Force Administrative Director will oversee a unified survey of the University community that integrates data needs of multiple working groups. This survey will address not only activities that contribute to climate change, but also vulnerabilities revealed by the COVID-19 emergency.

The Working Groups will deliver their final reports in September 2020. In October, the Task Force will integrate these reports into a single document and hold a series of Town Halls to receive community feedback on their findings.

In Phase 3, which will last from November through February, the Task Force will draw upon the Working Groups analyses to develop a set of scenarios for climate action at Rutgers. These scenarios will be defined both by different combinations of underlying approaches and different assumptions about the near-term fiscal situation of the University. In particular, with respect to fiscal impacts, we will consider scenarios of fiscal austerity, scenarios in which

substantial stimulus funding is available for shovel-ready projects, and scenarios reflecting Rutgers' pre-COVID fiscal situation. For each scenario, we will assess:

- What is the time frame in which the scenario will achieve carbon neutrality?
- What are the resilience improvements under the scenario?
- What are the financial costs and savings associated with the scenario?
- What are the educational, research, and culture benefits of the scenarios?
- To what extent would the scenario engage Rutgers' external stakeholders and catalyze broader, climate-positive, equitable economic development in New Jersey?
- Under the scenario, how would the Climate Action Plan be managed and progress assessed?

The alternative scenarios will be synthesized in a climate action scenarios report, which will be released for public comment in January 2021. Town halls in February 2021 will provide additional opportunity for community input.

Phase 4 will run from March through June 2021. In this phase, incorporating all the work of the Working Groups and the Task Force to date, as well as the stakeholder and feedback received, the Task Force will develop the Climate Action Plan itself. This plan will present a set of recommended climate action strategies for the University.

Despite the challenges posed by the COVID-19 emergency, the Task Force remains committed to its original goal of delivering the Climate Action Plan to President Holloway and the Boards of Governors and Trustees in June 2021. This plan will identify an ambitious, yet achievable and feasible, timeframe and pathway for achieving carbon neutrality, and will also identify key metrics for assessing the University's vulnerability to the physical impacts of climate change and a strategic approach for reducing these vulnerabilities. It will also identify supportive educational, research, and engagement efforts, as well as mechanisms for financing and tracking progress.

Task Force Timeline

- September 2019-January 2020: Pre-Planning Phase
  - January 24, 2020: Release of Pre-Planning Report

- February-May 2020: Phase 1 – Initial Working Group Planning
  - February 12-25, 2020: Initial Town Halls
    - New Brunswick, February 12
    - Piscataway, February 17
    - Camden, February 18
    - Newark, February 25
  - February 26-April 8, 2020: Interim Working Group Report Development
  - April 9-22, 2020: Interim Task Force Report Development
  - April 22-April 30, 2020: Public comment period on draft report
  - May 1-5, 2020: Interim report finalization
  - May 6, 2020: Final interim report delivered to President Barchi

- May-November 2020: Phase 2 – Sectoral Analyses
  - May-September 2020: Development of final working group reports
  - October 2020: Integration of working group reports and town halls on integrated working group reports

- November-February 2021: Phase 3 – Climate Action Scenarios Development
  - November 2020-January 2021: Development of Rutgers climate action scenarios report
  - December 2, 2020: Rutgers Climate Institute Symposium – Theme of universities as catalysts of societal climate action
  - January 2021: Public comment on climate action scenarios report
  - February 2021: Town halls on climate action scenarios

- March-June 2021: Phase 4 – Climate Action Plan Development
  - June 2021: Release of Climate Action Plan

1

Detailed Phase 2 Work Plans

Task Force Leadership

In addition to the work that will be completed by the working groups during Phase 2, the Task Force will complete the following activities:

1. Assemble a Student Advisory Panel: In response to the call for greater student engagement during the Town Hall meetings, the Task Force will assemble a Student Advisory Panel. The Panel will serve as a liaison between the Task Force and the Rutgers student community. The Panel will be chaired by the 5 student Task Force members and additional members will include proportional representation from each Chancellor's unit.

2. Hire a social media intern: Given the need for social distancing, the Task Force will rely heavily on social media to communicate with the Rutgers community and beyond. The intern will manage communication via multiple social media platforms to maximize engagement with a broad range of stakeholders.

WG 1: Energy and Buildings

Establishing a Baseline

The overall energy consumption of each campus is generally well understood, and greenhouse gas emissions estimates are preliminarily established for the New Brunswick, Camden, Newark, and RBHS campuses. To supplement the preliminary baseline, the Working Group will perform the following tasks during Phase 2:

1. Generate an off-campus housing inventory: The Working Group will use Rutgers records to identify off-campus households. This effort could also be used to identify likely commuting routes. Alternatively, if a commuting survey is done, questions about off-campus housing can be included.
2. Generate an inventory of facilities controlled by third parties.
3. Perform energy audits: Facilities will work with PSE&G state programs to conduct building-level energy audits. The database of Rutgers buildings and their characteristics will provide a prioritized list of buildings to audit.
4. Develop a RFP for baseline greenhouse gas inventory: The Working Group will draft a request for proposals for a consultant by September to conduct an official third-party study of Rutgers baseline greenhouse gas emissions. This study will provide a more detailed and disaggregated estimate of contributions to Rutgers greenhouse gas emissions beyond general sources along with recommended actions.

Identifying Potential Climate Solutions for Investigation

In the Energy and Buildings Interim Status Report, several ideas for action and exemplars were complied. From this list, the Working Group will identify solutions appropriate for

further assessment with regard to the Rutgers context. Additionally, the Working Group will be identifying key low-cost awareness and educational initiatives to increase energy use awareness and conservation actions by faculty, staff and students.

Assessing Potential Climate Solutions

1. RFP for Metering: The Working Group will write a request for proposals to have all campus buildings metered to identify the costs and next steps for this high priority action to manage building energy.
2. Equipment retrofit/replacement: Rough initial estimates of potential savings via equipment retrofit/replacement will be determined using the database of Rutgers buildings and their characteristics. (Mike Kornitas, Mollie Passacantando).
3. Energy upgrades: Facilities will be working with PSE&G state programs to assess incentivized building upgrades based on building-level energy audits.
4. Assessment of cost/benefit of new construction standards (Jen Senick, Clint Andrews, Rutgers Center for Green Building)
5. Assessment of clean power purchasing options for Rutgers (Rachael Shwom)
6. Assessment of Rutgers potential and cost/benefit analysis for building more low carbon power generation capacity including thermal storage water tanks, ground source heat pump systems, and additional solar capacity (Dunbar Birnie, Mark Rodgers, Amy Wang, utilities/facilities representatives)
7. Assessment of building modeling/shifting automation: Mike Kornitas will work with Mohsen Jafari on predictive energy modeling of buildings. It will be a tool to predict if equipment in the building is failing by monitoring.

WG 2: Transportation

To fully devise realistic policies to decarbonize transportation at Rutgers, the Transportation Working Group sees several key tasks that are required, some of which can be completed during Phase 2. These include the collection of data, analysis of that data, and writing up results. This work will seek to identify ways to reduce carbon emissions associated with commuting and university travel for business. The collection of survey data will be coordinated with other work groups so that only one survey instrument is distributed.

Establishing a Baseline

1. Conduct a survey of university faculty, staff, and students: To understand current (or pre-COVID) travel to campus, the Working Group will conduct a survey. This will be aimed at gathering data on frequency and distance of travel to campus (from home locations), the travel mode used (car, bus, shared rides, walking, etc.), and for those driving, what type of vehicle is used. We will also collect data on evaluating working at home during the lockdown and include questions on how this will influence future travel decisions, post-COVID.
2. Calculate impact of university business travel: University business travel can be determined by reimbursement records. This will allow the Working Group to estimate carbon associated with air travel and other ground travel. Travel reimbursed directly

by other agencies can be gathered from our survey. As part of this analysis the Working Group will determine the cost of requiring purchase of carbon off-sets and also the feasibility of reducing travel and conducting more business virtually. The survey will also collect data on university business travel.

3. Evaluate parking data: Data on parking will be needed to evaluate how many faculty, staff, and students purchase parking and how much each individual pays for parking. This data will include revenue from tickets. This can be collected both in the survey and from administrative records.

Identifying Potential Climate Solutions for Investigation

A preliminary review of climate action plans from other universities yielded some common activities proposed by universities to reduce their carbon footprint. A list of these solutions can be found in the Transpiration Interim Status Report. The Working Group will identify 2-3 specific areas within transportation that have high impact potential on the university's carbon emissions, such as parking management. They will research one or two institutions within each of these topics that have successful programs to learn about implementation and current operations.

Assessing Potential Climate Solutions

1. To determine what incentives can be provided for employees and students to change behavior, the survey will include stated preference questions (i.e., hypothetical travel choices). This will allow us to examine incentives focused on parking policy. This can include a parking cash-out analysis, free parking for those with battery-electric vehicles, and variation in parking charges.
2. The data collection will provide both a baseline of current behavior and will allow the Working Group to assess possible policy solutions. These include:
    a. What policies the university can pursue to increase the use of battery-electric vehicles by faculty/staff/students?
    b. What are the financial implications for the university of providing charging infrastructure and parking incentives?
    c. How satisfied are faculty/staff/students with increased telecommuting and on-line education?
    d. What is the feasibility for reducing university business travel and the financial implications of purchasing carbon off-sets?

Implementation

This work will be overseen by Bob Noland who has experience in transportation and energy surveys, with assistance from other faculty in the task force. Rachel Shwom has also conducted similar work. The Working Group will coordinate the data collection across work groups. Resources will be required to hire student research assistants over the summer.

Work beyond Phase 2

It is likely that additional time will be needed to collect data and conduct the analysis. A reasonable deadline for completing this would probably be Jan 2021. Additional work with the community to build and expand additional safe bicycle lanes. Planning assistance could be provided by a Bloustein studio course. This would take additional time beyond the final deadline of this report.

WG 3: Food Systems

Establishing a Baseline

1. Calculate Scope 3 GHG emissions from Rutgers Dining and non-Rutgers Dining food systems. To complete this task, the Working group will:
    a. Use SIMAP to generate an estimate of greenhouse gas emissions based on Rutgers Dining data from FY19.
    b. Estimate the carbon footprint of the average meal in FY19 based on the number of meals served (6,267,210 in FY19).
    c. Contact Gourmet Dining and develop a method to share data and to evaluate efforts to reduce greenhouse gas emissions with assistance from the Climate Task Force leadership team. Websites for the company and its parent group will also provide information. If needed, the Working Group will develop a confidential Qualtrics survey to request specific information needed for SIMAP food calculations that can be shared with outside vendors such as Gourmet Dining in order to collect data.
    d. Work with Rutgers procurement to obtain data on Rutgers purchases and to identify main catering vendor.
    e. Work with Rutgers procurement to get data on Rutgers purchases of bottled water and will estimate the carbon footprint of these purchases.
    f. Hire students to assist with SIMAP calculations for non-Rutgers dining contributions, especially for Newark and Camden Campus Dining Services.
2. Collect information on educational and research efforts underway at Rutgers involving food systems and climate: The Working Group will compile the information on courses, on and off-campus trainings, and research projects related to food systems and climate, sustainability and resiliency

Identifying Potential Climate Solutions for Investigation

In addition to the exemplars discussed in the Food Systems Status Report, the Working Group will identify potential solutions for food systems in times of shock. This will be done by completing the task explained below. The assessment of these potential solutions will likely happen in coordination with other working groups.

1. Collect information on climate resiliency and economic impacts of disruptions in the food Systems to better understand food system resiliency and economic weakness and strengths of Rutgers Dining as well as other local food vendors and food businesses.

The Working Group will compile the following information on impacts of disruptions on food systems

a. Impact on Rutgers Dining: Compile lessons learned from Super Storm Sandy and other natural disasters (lack of payment being and economics are important issues).
b. Impact on Rutgers Dining: Compile lessons learned from COVID-19.
c. Impact on Rutgers Dining: Compile lessons learned from food donations to local food pantries.
d. Impact on Rutgers Farmer's market and food production
e. Economic Impacts: Supply chain impacts and preparation needed: short and long-term impacts (work with other WG; WG3 may need assistance from the Office of Research Analytics.)

Assessing Potential Climate Solutions

1. Make recommendations for new initiatives for teaching, research, and university operations involving food systems and climate. The Working Group will identify gaps and opportunities at Rutgers for teaching and research in the area of food systems, and climate neutrality and resilience. This will include, but is not limited to:
    a. food waste reduction
    b. food recovery and potential benefits to local communities
    c. influencing student food choices in Dining Halls to reduce carbon footprint while also ensuring healthy eating
    d. anaerobic digestion and composting of food waste
    e. water quality and climate impacts
    f. sustainable food production
    g. food production on campus including technological innovation for urban food production and plant breeding opportunities
    h. food storage technologies to reduce energy for heating and cooling
    i. food-energy-water nexus
    j. local food system resiliency and economic opportunities

    The Center for Food Systems Sustainability at the Institute for Food, Nutrition and Health, and Rutgers Dining will be the main group to continue this work beyond Phase 2.
2. Develop guidelines for educational and informational campaigns to reduce greenhouse gas emissions. The proposed campaigns will share best practices and to empower Rutgers community members—students, staff and faculty-- to make personal changes to reduce their food carbon footprint and to gauge where there could be the most impact in reducing GHGs. These efforts could also be shared with community members and alumni. The Working Group will:
    a. Compile best practices used by and use at Rutgers dining for reducing greenhouse gas emissions
    b. Research and develop an icon-based messaging system to direct students to lower carbon footprint menu items.

c. Propose a Rutgers student competition to build a marketing campaign for Rutgers Dining to promote what is already being done, and what can be done, though Rutgers Dining to reduce food's carbon footprint.
d. Compile best practices that individuals can use to reduce their food carbon footprint while also maintaining a healthy diet.
e. Develop a question for a larger community survey (IRB approved) to get feedback from Rutgers members, especially students, on what information would be most helpful to them to reduce their dining carbon footprint and to also find out their likelihood of using/implementing change.

Rutgers Dining will be the main group to continue this work beyond Phase 2.

WG 4: Supply Chain and Waste Management

Establishing a Baseline

1. Develop a baseline of supply chain and procurement data in accordance with a recognized standard or acceptable practices (e.g. National and/or International standards e.g. EPA EPP and/or ISO 20400) integrating GHG Protocol Scope 3 criteria (baseline boundaries will be established as part of the assessment)
    a. Procurement criteria should assess what suppliers do for emissions and waste management

Identifying and Assessing Potential Climate Solutions

1. Evaluate feasibility and make determination on Zero Waste vs. Circular Carbon Systems (more complicated)
2. Conduct waste characterization study and analyze emissions avoided from waste minimization, recycling and composting. Target future actions based on the studies.
3. Analyze and implement options: greater availability of recycling and compost bins in bathrooms and common spaces; hand dryers or compost bins to reduce paper towel waste; green purchasing program to reduce life-cycle waste of common products. Key foci:
    a. Immediate changes with impact
    b. Product Purchases- sustainable vendor identification
    c. Waste Management and Recycling
    d. Behavioral Changes within the University
    e. Supply Chain sustainability and waste audit
    f. Database of climate neutral specifications
4. Develop guidelines for policy
    a. Develop guidelines for a waste minimization policy (using zero waste or equivalent standards)
    b. Develop guidelines for a Green Purchasing policy (utilizing GHG Protocol Scope 3 criteria and EPA/EPP and/or ISO 20400 Standards and/or recognized practices)
5. Develop best practices for Marketing and Communication Plan
6. Develop best practices for Educational/Training Program Plan

WG 5: Land Use and Offsets

Establishing a Baseline

1. Inventory of present on-campus ground maintenance (Patrick Harrity, Brian Clemson).
2. Inventory of present farm operations and maintenance (Paul Gottleib, Peggy Brennan, Fiona Sergeant).

Identifying Potential Climate Solutions for Investigation

The Working group has reviewed the plans from a number of other Big 10 and peer institutions; a summary table of their proposed actions related to the topic of land use and offsets has been included in the Land Use and Offsets Status Report. The general assessment of the Working Group is that while other institutional plans have individual strengths, Rutgers can be a leader by taking a more comprehensive approach.

Assessing Potential Climate Solutions

1. Undertake initial analysis of baseline and enhanced carbon sequestration opportunities on University properties (Rick Lathrop, Karina Shafer, Myla Aronson, Panos Georgopulos).
2. Investigate existing off-site carbon offset programs as a supplementary means of achieving carbon neutrality, as well as mechanisms for campus departments and organizations to purchase offsets and develop an implementation plan if proven feasible (Marjorie Kaplan, Laura Schneider, Alvin Chin, Julia DeFeo).
3. Develop guidelines to strengthen adherence to the planning principles and sustainability framework already embodied in the University Physical Master Plan – Rutgers 2030 for future land use development/redevelopment intended to minimize energy demands and maximize carbon sequestration. Ensure that Significant Capital Projects are designed and implemented with appropriate landscape/tree plantings, and site improvements (David Schulz, Frank Wong).

Beyond Phase 2

1. Undertake a sustainability planning efforts for:
    a. campus green spaces (Patrick Harrity, Brian Clemson);
    b. NJ Agricultural Experiment Station Farms (Paul Gottleib, Peggy Brennan);
    c. Forests (Hutcheson Memorial Forest, EcoPreserve, Helyar Woods) (Rick Lathrop, Karina Shafer, Myla Aronson).

The plans will include an assessment of existing carbon stocks (i.e., carbon stored in plant biomass and soils), baseline rates of ongoing carbon sequestration and potential for enhanced carbon sequestration (i.e., additional carbon stored above and beyond the baseline), design principles and best management practices. The potential amount of additional carbon stored and the funding needed for inventory, planning and implementation will be estimated.

WG 6: Climate Preparedness

The Working Group's major tasks are as follows (details and data sources for each task are included in Part II):

1. Development of a climate change risk profile for Rutgers' three campuses and off-campus sites.
2. Assessment of climate change exposures and impacts at Rutgers by sector and activity.
3. Identification of climate change vulnerabilities by group (student populations, faculty and staff, and local communities).
4. Investigation of lessons from other universities for climate change preparedness.
5. Description of current strategies at Rutgers for climate change preparedness, including case studies of off-campus sites.
6. Examination of COVID-19 response for lessons related to climate change preparedness planning.
7. Identification of options and strategies for Rutgers to enhance preparedness.

Purpose
Each of the above tasks is designed to answer the working group's charge questions. Each will be written up as a main section of the final report.

Implementation
We have not yet allocated tasks to members of the working group. We plan to do this after classes are finished (a meeting will be scheduled for early to mid-May). The working group will continue meeting regularly over the summer months to ensure that each task is on track. We have requested support for two graduate assistants who will coordinate the collection and analysis of the physical and social data for the study.

Beyond Phase 2
We do not plan to extend the work beyond September 30 unless the COVID situation prevents completion of the above tasks.

WG 7: Climate-Positive, Equitable Economic Development

Identify strategies for incorporating the concept of climate-positive, equitable economic development among the working groups.

- Consider how Triple-Bottom Line Development actions can be incorporated into strategies being developed by the other working groups to address climate change in a way that creates equitable prosperity.
- Identify strategies for Procurement and other relevant Rutgers units to integrate corporate social innovation (CSI) concepts within innovative business models to achieve positive societal impact, while advancing the success and sustainability of the enterprise.
- Engagement with community-level organizations and local governments that are working towards the broad goals of climate-positive, equitable economic development .
- Explore concept of Carbon Credits that can benefit distressed communities. A Carbon Pricing Affinity Group within the University Climate Coalition (U3) has reconvened recently. How can this be implemented at Rutgers.
- Explore development of a RU program that focuses on working with local communities and businesses (i.e. agriculture) in climate resiliency planning.

- This work will be conducted by WG 7 sub-task 1 led by Jessica Paolini.

Achieving/contributing to climate-positive, equitable economic development through functions of the university.

- There are dozens of well-established research centers and faculty research programs at Rutgers that are relevant to developing a climate-positive, socially equitable set of institutional policies and actions. Develop a plan for better integrating these efforts.
- Further work will be conducted to generate a comprehensive assessment of current Rutgers assets and in-depth research of actions taken or programs implemented by other comparable institutions - nationally and internationally.
- There are outstanding examples at non-profits, US and international universities that can serve as models for Rutgers. Identify criteria for deciding which strategies best align with the mission and capabilities of Rutgers.
- Develop a simple methodology for analyzing and measuring carbon consequences of research activity.
- Develop NJAES research farm sustainability plan; create plan for establishing Living Labs; develop a model to estimate carbon footprint of the research farms
- This work will be conducted by WG 7 sub-task 2 led by Peggy Brennan-Tonetta.

Aligning Rutgers climate-positive, equitable economic development efforts with, and make contributions to state policies for the broader economy.

- There are numerous current state-level initiatives which have been identified, but additional work is needed to develop a comprehensive list of current and relevant efforts, and to identify policy gaps and best practices for addressing such gaps.
- Policy recommendations will be developed for the state for incorporating climate-positive, equitable economic development into state energy policy.
- This work will be conducted by WG 7 sub-task 3 led by Carl Van Horn.

PART II:

WORKING GROUP INTERIM STATUS REPORTS

II.1. Energy and Buildings

In February 2020 Working, Group 1 was established with the charge to focus on: 1) electricity and heat generation, 2) energy and water consumption by University owned and leased buildings, and 3) energy and water consumption by off-campus housing and other buildings used by the University community. The Working Group was also charged to pay special attention to the relative roles of on-campus energy and utility supplied energy and methane leakage.

Working Group 1's remit includes both strategies to reduce greenhouse gas emissions associated with energy and buildings, and the resilience of energy infrastructure to change impacts. In addition to University operations, the working group was charged with considering cross-cutting themes related to teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Current state of knowledge and efforts

This section provides perspective on the current state of knowledge and efforts around managing buildings and energy. Under Rutgers University's COVID-19 operating procedures buildings are in the process of being locked down. Because most Rutgers buildings lack state of the art building controls or energy management systems, there is little way to manage buildings remotely. Improving energy management through building controls and management systems provides an opportunity to improve occupant comfort and increase ability to manage energy use under sudden new conditions such as pandemic or natural disaster.

First, we know each campus's total energy use and have made estimates of each campus's greenhouse gas emissions from direct energy use. We know how much energy is produced by our campus production sites and how much energy we purchase from outside electricity producers like PSE&G, and from those numbers we can estimate greenhouse gas emissions from our energy system. Rutgers has some data on specific building's energy use. We have very little knowledge on energy end use in buildings. Below is a summary of the current state of knowledge and efforts for 1) existing campus energy production and campus electricity purchasing, 2) energy and water consumption by university own and leased buildings, and 3) energy and water consumption by off-campus housing and other buildings used by the University community.

Electricity and Heat Generation: Existing Campus Energy Production and Campus Electricity Purchasing

As discussed above, we generally have a good estimate of the amount of energy produced and electricity purchased by Rutgers and their associated greenhouse gas emissions. For example, Rutgers-New Brunswick purchases about 70% of its electricity from PSE&G. The remainder comes from natural gas boilers, furnaces and co-generation plants (approximately 25%) and from solar (approximately 5%). Rutgers' solar facilities are on 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. These solar facilities reduce annual utility costs by about $1.3 million a year, reduce carbon dioxide emissions by about 8,700 tons a year, and allow Rutgers to earn Solar Renewable Energy Certificates. In addition to the renewable electricity from solar, Livingston campus also hosts another renewable energy facility, in the form of a geothermal bore field that heats and cools the Rutgers Business School building and provides 700

refrigeration tons (2.5 MW) of heat-extraction power. Across all Rutgers campuses, the largest on-campus electricity generation facilities are the Busch/Livingston and RBHS-Newark cogeneration plants, which together produce approximately 157 million kWh/year. The cogeneration plants are undergoing upgrades to increase the efficiency by which they convert their natural-gas fuel to electricity and heat by 50%.

Table 1: Rutgers–New Brunswick Energy Greenhouse Gas Emissions FY2019

Source	CO_2 (tonne)	CH_4 (kg)	CH_4 (t CO_2e)	N_2O (kg)	N_2O (t CO_2e)	Total (t CO_2e)
Co-gen Electricity	30,959	3,080	86	62	16	31,061
Co-gen Steam	40,863	4,066	114	81	22	40,999
Other On-Campus Stationary	73,394	7,302	204	146	39	73,637
Purchased Electricity	53,372	4,547	127	596	158	53,658
T&D Losses	2,739	233	7	31	8	2,754

Table 2: Rutgers-Camden Energy Grenehouse Gas Emissions FY2019

Source	CO_2 (tonne)	CH_4 (kg)	CH_4 (t CO_2e)	N_2O (kg)	N_2O (t CO_2e)	Total (t CO_2e)
Other On-Campus Stationary	5,154	513	14	10	3	5,171
Purchased Electricity	8,298	707	20	93	25	8,342
T&D Losses	426	36	1	5	1	428

Table 3: Rutgers-Newark Energy Greenhouse Gas Emissions FY2019

Source	CO_2 (tonne)	CH_4 (kg)	CH_4 (t CO_2e)	N_2O (kg)	N_2O (t CO_2e)	Total (t CO_2e)
Other On-Campus Stationary	10,286	1,023	29	20	5	10,320
Purchased Electricity	21,976	1,872	52	246	65	22,094
T&D Losses	1,128	96	3	13	3	1,134

Table 4A: Rutgers Biomedical and Health Sciences – Newark Energy Greenhouse Gas FY2019

Source	CO_2 (tonne)	CH_4 (kg)	CH_4 (t CO_2e)	N_2O (kg)	N_2O (t CO_2e)	Total (t CO_2e)
Co-gen Electricity	11,955	1,189	33	24	6	11,994
Co-gen Steam	25,949	2,582	72	52	14	26,035
Other On-Campus Stationary	10,631	1,058	30	21	6	10,666

Purchased Electricity	43,019	3,665	103	481	127	43,249
T&D Losses	2,208	188	5	25	7	2,220

Table 4B: Rutgers Biomedical and Health Sciences – New Brunswick Energy Greenhouse Gas Emissions FY2019

Source	CO_2 (tonne)	CH_4 (kg)	CH_4 (t CO_2e)	N_2O (kg)	N_2O (t CO_2e)	Total (t CO_2e)
Other On-Campus Stationary	5,713	568	16	11	3	5,732
Purchased Electricity	9,514	811	23	106	28	9,565
T&D Losses	488	42	1	5	1	491

* t CO_2e is tonne carbon dioxide equivalent, using 100-year global warming potentials to convert non-CO_2 gases to CO_2 equivalents.

Energy and Water Consumption by University owned and leased buildings: Existing and New Construction

For most existing buildings owned and leased by Rutgers, energy consumption is known but is not consistently sub-metered at Rutgers. Water use at the building level is not known for most buildings. While we can track broad monthly commodity use categories by campus, our ability to track commodity use by building is limited. Rutgers facilities implement energy savings results in our daily operations and construction efforts but lack a comprehensive tracking strategy. Students are currently working with Mike Kornitas to build a database of buildings to help prioritize audits and retrofits.

Rutgers University has executed numerous initiatives to conserve energy. Upgrades such as premium motors, variable frequency drives, burners on gas boilers, and new lighting fixtures have been installed to improve energy efficiency. Energy efficiency upgrades require significant initial investments, which are justified by future energy savings. The "payback period" refers to the amount of time it takes for the savings of an upgrade to equal its total cost. To mitigate the initial investment costs associated with energy efficiency upgrades, Rutgers applied to incentive programs and received funding from several institutions. One such program, the New Jersey Clean Energy Program (NJCEP), provided Rutgers with $1,153,952 for a project costing $1,538,603, shortening the payback period to only 2.3 years. The project involved the installation of interior lighting upgrades, occupancy sensor controls, and high-efficiency motors for HVAC, vacuum, and domestic water supply systems.

In another case, Rutgers received funding from the American Reinvestment and Recovery Act (ARRA) to install burners on gas boilers that supplied heat to the Eco Complex office. The burners allowed the gas boilers to use carbon-neutral landfill gas for about 80% of operating hours, saving $104,600 annually. ARRA contributed $63,100 to the project, reducing the total cost to $115,000 and the payback period to just over a year.

Some project managers are already being realigned with the focus of decreasing use. The facilities Mechanical/Electrical/Plumbing (MEP) project group is evaluating existing and proposed projects to define commodity and emission savings. The group is managed by John Fritzen, PE, Director of MEP projects who holds a Master of Science in Energy Management.

For new construction Rutgers employs a design/construction project management group with a focus on the development of projects intended to reduce consumption. Rutgers also designs and constructs to standards that meet at least the U.S. Green Building Council's

guidelines for LEED-rated Silver buildings, which serves to reduce our overall carbon footprint, thereby promoting energy conservation in accordance with building codes.

Energy and water consumption by off-campus housing and other buildings used by the University community

Approximately 26,000 (57 percent) of students live off campus though it is difficult to speak to how many houses in the immediate surrounding area of New Brunswick this is given many have roommates or live at home with family. Since 2009, New Jersey Public Interest Research Group Student Chapters has Energy Service Corps program, a joint program with Americorps, to educate people about how they can decrease their energy use. NJPIRG Student Chapter's interns and volunteers set out to reduce energy use in the community through education, media campaigns and basic audits in homes, small businesses, and public buildings.

Analysis Needed to Plan Future Efforts

Electricity and Heat Generation: Existing Campus Energy Production and Electricity Purchasing And Existing Campus Electricity Purchasing

- A complete inventory of Rutgers' greenhouse gas emissions from each campus.
- We don't measure the exact energy quantities used in the chilled water and hot water loop systems. Flow meters and temperature meters need to be installed and monitored. Until then, there is already aggregate information that might still be informative for projecting and sizing other energy additions and needs on campus.
- Assessment of potential to build additional renewable energy on campus.
- Assessment of low carbon power purchasing options

Energy and Water Consumption by University owned and leased buildings: Existing Building Energy Use And New Construction Building Energy Use

For Existing Buildings:

- An identification of hotspots in terms of highest emitting buildings, and buildings with the highest energy costs. Initial energy audits can be focused on these buildings.
- Initial energy audits will identify projects. The scope and budgetary cost will be identified for each proposed project, including implementation costs, life cycle costs, payback period, and return on investment. We will investigate potential funding and loan sources such as: federal grants, NJ Infrastructure Bank Loans, PSEG and other commodity provider loans and grants, NJ Clean Energy Program grants and rebates, a new Rutgers "Green Revolving Fund" or other financing structure.
- A complete inventory will be completed with help of an external consultant, but more detailed information on building consumption will need to come from the installation of meters.
- Facilities will need to develop and implement a system that tracks efforts to reduce the building carbon footprint.

For New Construction:

- Cost/benefit analysis of building to different levels of code and green building standards to reduce building carbon

- Assessment of off-campus student locations (might be part of the commuter assessment) to assess number of households and average greenhouse gas emissions and water use in households.

Resources Needed for Additional Analysis

To improve energy management at Rutgers, perhaps the most significant resources needed are additional person-hours. As noted in the Pre-Planning Report, a consultant will need to be hired to perform a comprehensive greenhouse gas analysis to establish the baseline. An RFP will be written and sent out by September 2020.

Additional personnel will be needed to manage or install equipment, analyze new data, and provide reports. The committee has also identified that audits of buildings need to be done to assess opportunities for energy upgrades. This may be completed via external consultant or partner with organizations such as the Center for Advanced Energy Systems in which students perform building assessments.

Modeling and/or measurement and verification is needed to assess energy and water reductions from renovation, building envelope upgrades, equipment replacement and repair, and equipment maintenance. Data could be collected and maintained using the facilities' work management system.

To support the implementation of the climate action plan, Rutgers needs to install remote read meters on all buildings served by Rutgers commodity loops, including heated water, chilled water, electricity, and domestic water. Updated metering will improve the reliability of the data of commodities consumed per building, allow measurement of existing and improved energy use, and allow plant and energy managers to assess building and plant performance.

Ideas for Action and Exemplars

Category of Action	Description of Action	Exemplar
Low Carbon Energy Production	Add thermal storage water tanks in conjunction with campus building energy components (chilled water and hot water loops). Heat can be added or removed to the loops with electrically driven heat pumps having coefficients of performance significantly greater than 1. Can be coupled with solar energy.	University of South Coast (Australia): https://www.usc.edu.au/explore/usc-news/news-archive/2019/august/usc-unveils-a-new-way-to-power-universities
Low Carbon Energy Production	Install ground-source heat-pumped systems much more widely. These are proven and also connect well with building energy systems that require chilled and hot water loops.	DOE Energy Demonstration Projects https://www.energy.gov/eere/ geothermal/ground-source-heat-pump-demonstration-projects 700 refrigeration tons (2.5 MW) of geothermal was installed to heat and cool the business school building on Livingston Campus.

Low Carbon Energy Production	Install more solar on campus. This can be strategically placed for dual space use: over parking lots (as we have some) and over geothermal fields.	Rutgers University has implemented almost 10MW of solar along with geothermal. The university can replicate both on other campuses
Low Carbon Energy Production	Low Carbon Power Purchasing Agreement	Again looking at Solar the University can go into different flavors of PPAs
Energy Demand-Side Projects	Metering and monitoring of all utilities	Rutgers can continue to build out its metering and monitoring systems
Energy Demand-Side Projects	Building controls and automation- Upgrade building automation to real time monitoring and scheduling	Though the University has DDC systems in place it needs to be expanded the systems University wide along with a single front end monitoring system
Energy Demand-Side Projects	Conservation retrofits – conduct an energy audit, calculate energy savings of planned work, recommend additional measures like lighting sensors and efficiency retrofits, HVAC efficiency, envelope improvements – cladding, windows, roofs	Rutgers has done a number of energy efficiency projects utilizing the New Jersey Clean energy program
Energy Demand-Side Projects	Operations and maintenance practices - Utilities will develop a training program for plant operators and building maintenance mechanics to focus on energy management.	Rutgers will utilize its demand side management program to make enhancements to the system to take advantage of PJM programs
Energy Demand-Side Projects	Time of use shifts - changes in class times, buildings	The University has implemented a new scheduling system. The next step is to integrate the scheduling system with the building monitoring system to have real time control of occupied and unoccupied spaces
Energy Demand-Side Projects	Behavioral Approaches - work energy use behaviors integrated into trainings, student orientations Training and dissemination of information - REHS (fume hoods), signage for behavioral changes and crowdsourcing of inefficiencies	University student Eco-Reps to help promote energy awareness and reducing energy consumption in dorms and other buildings (and to engage peers in the climate action plan in general). University of Pennsylvania https://www.sustainability.upenn.edu/ students/student-eco-reps
Energy Demand-Side Projects	Retro-commissioning	The University commissions all new buildings and major renovations. With real time monitoring we can do continuous retro commissioning. Older buildings can also be re-commissioned to its design intent
New Construction	Standards for Design and Construction of New Buildings and Renovations	https://ipo.rutgers.edu/pdd/university-design-standards

Integrating into Research and Education

There are several research groups across the university working on energy analytics for buildings and smart metering. These groups will most likely be more than happy to cooperate

with facilities to assess and test different ways of improving the existing buildings energy consumption profiles from low hanging fruits to advanced controls. For instance, Mohsen Jafari's group in Industrial & Systems Engineering have developed EnergyPlus models of several buildings at Rutgers, including the new engineering building, nursing school, CORE and CAIT and BME buildings. Except for the engineering building, the rest of the models are not validated due to lack of high-resolution data. In addition, asset condition data can also be used in conjunction with these models to correlate energy consumption with maintenance and asset management schemes at Rutgers. Carbon capture and sequestration is another potential arena of research – specifically opportunities to advance or implement pilot projects around carbon capture for natural gas burning equipment. These are just examples, and several research groups from across campus can participate in this. These initiatives can also be used for educational purposes through integration in undergraduate/graduate coursework, raising the awareness of these issues across campus.

Engagement Plan

Buildings and their use are intimately entailed in people's daily work routines. Engaging users in crowdsourcing inefficiencies and trying to align efficiency and conservation with other objectives will enable buildings to work optimally. Students, faculty and staff can play an important role as their commitment to making a difference. Integrating conservation education and outreach in other efforts, such as peer networks, orientation, trainings, and building signage.

The City of New Brunswick has already implemented a renewable energy program for residents via energy aggregation (https://renewablenb.com/). The task force could engage with them to learn more about the program, and see if there is interest in aggregating Rutgers' energy load with the remaining energy load in New Brunswick (i.e. commercial and government buildings) for electricity supply or through a renewable power purchase agreement. Rutgers could also potentially work with New Brunswick on a community solar program that could be used not only by Rutgers but also help small businesses in the area access renewable energy, since installing solar on their buildings could be challenging. The task force should explore partnerships with the surrounding community in greenhouse gas reduction and renewable energy. We will need to engage state entities for funding and to align the university with the State's Energy Master Plan.

Rutgers is also a part of NJ Higher Education Partnership for Sustainability (NJ HEPS), American Association for Sustainability in Higher Education, the Big 10 utilities group, and the UN US Sustainability Group.

Cross-Working Group Interactions

The energy and buildings group identified six groups where interactions should be considered.

1. Transportation: If transportation is looking at electric chargers for commuters or electrifying buses it would change the load profile and demand for energy at Rutgers
2. Food Systems: Food service use of energy and water in preparation of food
3. Land use and Offsets: As buildings may be shut down or campus land us is consolidated it will impact energy use. New building siting should optimize use of existing energy plants. Land use can also help evaluate space for energy storage (thermal, battery) and onsite renewable energy generation.

4. Climate Preparedness: The energy system is susceptible to peak demand issues and storm interruptions as climate change worsens. Options for reliability and resilience of the system may be increased by generators, underground transmission, and increased load responsiveness. ?
5. Supply Chain and Waste Management (Procurement): Integrate energy efficiency of items purchased. Work with procurement on investigating power purchase agreements.
6. Green Revolving Fund action team: The energy and buildings committee's analysis should provide lists of potential projects that could be completed using the green revolving fund. We will also identify alternate funding sources such as rebates, grants and loans, participate in the development of a green revolving fund or other RU fund sources.

Critical Next Steps for Working Group 1

1. RFP for baseline carbon: The committee will draft a request for proposals for a consultant by September to conduct an official third-party study of Rutgers baseline greenhouse gas emissions. This study will provide a more detailed and disaggregated estimate of contributions to Rutgers greenhouse gas emissions beyond general sources along with recommended actions.
2. RFP for Metering: The committee will write a request for proposals to have all campus buildings metered to identify the costs and next steps for this high priority action to manage building energy.
3. Energy audits and upgrades: Facilities will be working with PSE&G state programs to conduct energy audits and incentivized building upgrades.
4. Awareness and educational initiatives: Committee will be identifying key low cost opportunities to increase energy use awareness and conservation actions by faculty, staff and students.

II.2. Transportation

Our primary purpose is to detail the work the transportation group will complete by September 2020 and further into the next academic year. We have listed information on current programs and facilities that are already in place at Rutgers as well as exemplars of policies implemented at other peer institutions. We have included a detailed plan of potential work, including data requirements.

Key Messages

1. Enhanced telecommuting and on-line learning can reduce transportation emissions; lessons learned from COVID-19 provide an opportunity to understand how both intercampus and commuting travel can be reduced.
2. Commuting travel is a major component of carbon emissions. Policies to encourage faculty, staff, and students to convert to battery-electric vehicles are needed (and parking policies are good option for providing incentives).
3. University business travel can be reduced by more on-line communication and by purchasing carbon off-sets for air travel.
4. Planning and working with the community to create a network of safe bicycle lanes is crucial to increase active travel and micromobility use.

Current programs and activities at Rutgers

- All buses currently have bicycle racks.
- There is an existing bicycle rental system.
- A proposed E-Scooter and E-Bike share system with planned implementation in the Fall of 2020.
- Commuter students and residents can only park on one campus and must use the buses to get to other campuses.
- New course scheduling system is aimed at reducing peak usage of bus system.
- Rutgers University Institutional Planning and Operations recognizes the value of existing transportation resources, such as parking, and seeks to minimize the impact on those resources while planning new development or redevelopment by taking a balanced approach.
- Master planning efforts as well as the design of new facilities reflect maximizing the benefits of circulation and transportation infrastructure while identifying and enhancing existing infrastructure where connections to transit stops, bicycle paths, bicycle racks and sidewalks may not exist.

Exemplars

A cohort of universities joined in the American College and University Presidents Climate Commitment in 2007, resulting in a large set of university carbon neutral plans published in subsequent years. Many of these plans cite 2020 or 2025 as their target year for achieving carbon neutrality. Our Working Group reviewed these plans from selected peer institutions, as well as

more recent carbon neutral plans, focusing on large public universities with multiple campuses. Our researchers will follow up with 3-4 peers to document best practices and lessons learned during implementation.

A preliminary review of these plans yielded some common activities proposed by universities to reduce their carbon footprint:

- **Walking, Bicycling, and Micromobility:**
  - Walking escort service
  - Repair stations for bicycles
  - Showers and clothes locker facilities
  - Secure and dry storage areas
  - Provide free or reduced cost bicycle helmets and locks
  - Provide bicycle lessons
  - Locating bicycle racks at transportation hubs
- **Travel Demand Management:**
  - Incentives for persons who use cars only occasionally
  - Maintain, enhance, and market existing public transit discount programs
- **Education and Outreach:**
  - Requiring a course on the environment/climate change as a condition of graduation
  - Incentivize the creation of sustainability courses by faculty
  - Comprehensive marketing of alternative transportation services on campus, especially presentations at orientations for students and employees (not just flyers or packets)
  - Education and outreach to faculty and staff about the carbon footprint of university travel
  - "Commute Concierge" service to assist faculty, staff, and students with planning an alternative-mode commute that fits their schedule and travel constraints.
  - "Ambassador" programs with individuals who promote their alternative-mode commute.
- **University Travel:**
  - Tracking and capping university-sponsored travel
  - Promote options for regional (over national) conferences, teleconferences, and off-setting programs (voluntary or compulsory).
- **Transit:**
  - Replacing university vehicles with hybrid, alternative-energy vehicles, etc.
  - Replace campus bus fleet with electric or alternative fuel (e.g., waste-sourced biodiesel)
- **Other:**
  - Ensuring that the local community has good schools, daycare so that faculty and employees want to live nearby
  - Encourage and support telecommuting

The group will identify 2-3 specific areas within transportation that have high impact potential on the university's carbon emissions, such as parking management. We will research

one or two institutions within each of these topics that have successful programs to learn about implementation and current operations.

Commuters who drive alone are large contributors to Rutgers' carbon footprint within the transportation sector. The focus of this research should be on outcomes achieved by the initiatives outlined in these reports (not just on the plans themselves), especially as they include driving alone. For example, Stanford University has decreased the share of commuters who drive alone from 69% in 2003 to 43% in 2016. They employ a range of travel demand management (TDM) initiatives to achieve this, including bike share, car share, carpooling and vanpooling, transit discounts, and a range of incentives. Some of these programs have been in place for decades but have benefited from renewed marketing pushes that dramatically changed program uptake in the university population. For instance, Stanford has had a "Commute Club" program, in which members forgo a parking pass and are offered incentives for alternative modes. The program began in 2005 but was integrated into employee orientation in 2015. Enrollment grew from 22% of commuters to 35% as a result of this enhanced marketing.

Working Group Work Plan

Our proposed work plan is designed to obtain the necessary data to fully analyze options for effective policies to decarbonize commuting trips and other university travel. Some of this data may be available from administrative records and additional data may require a representative survey of faculty, staff, and students. While some of these tasks can be completed during summer 2020, the bulk of the analysis will take at least a year to complete, assuming adequate resources are available.

Data and information needs

We have identified data that will be needed to assess current GHG emissions and what will be required to develop plans to reduce these. A survey was conducted by Robert Laumbach in 2015 that gathered data on faculty and staff commuting which has some useful information. There are additional means to collect data on faculty and staff, as well as students. Administrative data on faculty / staff residential addresses and their primary work location can be used to estimate travel to campus. This will not account for those who do not travel five days a week, which we can estimate from the survey data. Student residential location and parking locations can be used for similar estimates. What this approach may miss is part-time lecturers and other adjunct staff, but we need to determine this. We may also be able to obtain commuting estimates from NJTPA's travel demand model. **Resources:** Development of a survey to faculty, staff, and students plus analysis of data. About ½ year of student time.

Our analysis will also include:

- **Faculty and staff travel**: Reimbursement records with information on airline flights and other travel can be used to estimate this. What it will not include is faculty or staff travel reimbursed by outside agencies and this will need to be collected via a survey. **Resources:** This will largely depend on the quality of the reimbursement data. If a survey is also conducted, this will take longer. Probably ½ year of student time.

- **EV charging data**: Rutgers currently has very few EV charging point and these are far and few between. We need data on how many faculty/staff have battery-electric vehicles that they would use for commuting if charging is readily available (or perhaps they still use them but charge at home). **Resources:** Can be combined with a larger survey.
- **Data and information on NJ Transit student passes**: Currently about 800 students, on average, obtain discounted NJ Transit passes. What are the discounts that students receive? How are these distributed between the campuses? **Resources:** Staff time to collect and report data.
- **Current parking policies and cost of parking**: Data and information is needed on how many faculty/staff/students purchase parking. How much does this cost and what are constraints in union contracts? How much revenue is received from tickets? **Resources:** Staff time to collect and report data.
- **Future development plans at Rutgers**: Need information on future development and determine how this may affect inter-campus travel. **Resources:** Could be a studio project at Bloustein.
- **Other Rutgers vehicles**: Need an inventory of fleet, including type of vehicle, fuel used per year. Are there options for electrification? **Resources:** Staff time to collect and report data.
- **Bicycle and walking infrastructure**: Information on what currently exists and what current plans are both on and off-campus. This will require working with community partners. **Resources:** Could be a studio project at Bloustein.

Additional analysis required

- **EV incentives analysis:** Our analysis will need to focus on what university policy can achieve. Probably the most fruitful approaches involve incentives to purchase and use an EV. This can be done by increasing charging points, and perhaps giving incentives, such as free or reduced parking rates, to EV users. Analysis will need to be undertaken to determine the likelihood that faculty/staff/students will respond to such a policy. This would involve a stated preference survey that is representative of various segments of the Rutgers community. Subsequent analysis would result in developing models that can be used to test different incentive (or disincentive) policies. **Resources:** Probably one-year of a Grad Student.
- **Parking Cash-out:** Study a parking cash-out program in which members of the Rutgers community receive a cash payment in lieu of a subsidized parking spot. Those who forego a parking pass (because they commute by public transit, walking, or cycling) would keep the cash, while those who park would apply it towards their current parking fee. These payments could be equal to the average per-parking space subsidy, or an estimate of the per-parking space costs of constructing additional parking on campus. Analysis is needed to determine any costs associated with this policy and any legal or contract restrictions on implementing it. **Resources:** Staff time to collect data and 3 months student research time for analysis.
- **Rutgers Buses:** While on-campus buses are a small component of Rutgers transportation emissions, they are highly visible and progress on this can serve multiple objectives, perhaps maybe leading to improvements for all. The main issue is conversion to electric buses. The technology is likely not currently suitable for this given the

Northeast's climate and the load that Rutgers buses transport. NJ Transit will be deploying electric buses in Camden in 2021, and this will be an opportunity to learn from their experience for the feasibility of a conversion at Rutgers. We will also need to be aware of technology improvements that may occur over the next five years. Other possibilities for improving the bus system should be explored, in particular dedicated bus lanes. **Resources:** Review the implementation in Camden (Minimal resources). Consider a report on future technologies (Student or staff time, two months, but probably better as an on-going assessment).

- **SB 2252:** Establishes goals and incentives for increased use of plug-in electric vehicles in NJ. https://www.njleg.state.nj.us/2018/Bills/S2500/2252_U2.HTM We will need to review the implications for Rutgers, and this will be useful for pushing some of the EV policies. **Resources:** University counsel to review and provide recommendations.
- **Enhanced telecommuting:** Many faculty have partially telecommuted for many years. However, the current COVID19 crisis is providing a unique learning experience in the feasibility of enhancing telecommuting and on-line teaching. Globally, this crisis has resulted in substantial drops in carbon emissions, especially from the transportation sector. Is this a feasible long-term strategy for an academic institution? How will intellectual exchange be affected if telecommuting is enhanced? What are the potential decarbonization benefits? **Resources:** Relevant questions can be added to our faculty/staff/student survey.
- **Fleet decarbonization:** Based on collecting fleet inventory data for university vehicles, we will assess the feasibility of electrification. This will require analyzing the travel patterns of these vehicles and how frequently they are used. **Resources:** 2 months student research time.
- **Offsets for university travel:** Many other universities provide carbon offsets for travel, especially for air travel. As this will add to total travel costs we will assess what the additional costs are. This will be broken down by funding sources to determine if it affects travel associated with grant-funded research, student-supported travel (including study abroad), and other travel funded from administrative accounts. **Resources:** 4 months student research time.

Engagement Plan

The University currently engages with the appropriate local, county, state, and federal entities to ensure that improvements the University undertakes receives buy-in and is in line with improvements those agencies have planned. As a result of our well-developed existing working relationships, the University is often invited as a stakeholder to provide comment to local, county, state, and federal projects. During this process, the University seeks to ensure elements that promote complete streets and enhance transit connections are reflected in designs.

Easy Wins

There are several relatively simple "easy wins" that could be accomplished rapidly. These primarily focus on providing members of the Rutgers community better information on alternatives to vehicle use for the journey to Rutgers and for trips within the campuses. These include:

- Integrate the Rutgers bus networks into Google Maps and other online mapping platforms, which would enable those traveling to and within Rutgers campuses to quickly ascertain the combination of public transit lines (for instance, a NJ Transit bus line to a NJ Transit rail line to a Rutgers bus line) that will provide the fastest trip time. By doing so, some commuters may learn that traveling to campus by transit is feasible for them. An added benefit of integrating the Rutgers bus networks into online mapping platforms is that users of these mapping systems will see that for some trips, walking may be the fastest option, providing relief to our often-overcrowded buses.
- Providing information on carpooling options. The local transportation management associations (e.g. Keep Middlesex Moving) currently provide this type of information, but it is not widely disseminated.
- Provide new members of the Rutgers community (incoming students, new faculty and staff) information on alternative modes of travel, including public transit, walking, and cycling. Many universities provide such a "welcome guide" to encourage greater use of low-carbon modes.
- Install wayfinding signage on campus, with estimated walk times to common destinations to encourage more walking. This may have the added benefit of relieving the bus system.

II.3. Food Systems

Current Status: Food Systems at Rutgers

An overview of food service available to Rutgers faculty, students and staff is summarized in Table 3.1. Food is abundant at Rutgers through Rutgers Dining Services, food trucks, retail outlets; food vendors in campus student centers; Gourmet Dining LLC in Newark, Camden and athletics concession stands; farmer's markets, bodegas, grocery stores, and restaurants in local communities. Catering vendors also provide food to campus. While food for purchase is abundant, not everyone has the economic means to access food and as such, student food pantries are included in Table 3.1. Additionally, many people bring food from home to consume on campus but the extent to which is done is currently unknown.

Table II.3.1. Rutgers Food Service Operations

New Brunswick/Piscataway
• **Rutgers Self-Operated Dining Services Operates** o 4 Student Board Dining Halls o Rutgers Catering o Central Commissary o Central Bakery o 16 Retail Operations o 3 Food Trucks • **Additional On-Campus Operations Include** o 10 Student Center Retail Operations o 8 Retail Operations at "The Yard" o 3 Retail Operations at Livingston Plaza o Rutgers Athletics Concessions (Gourmet Dining) o Rutgers Athletics Training Table o Rutgers Hillel o The Chabad House o 300+ Vending Machines o Mason Gross Café 52 o Zimmerli Cafe o School of Pharmacy Coffee House • **Off Campus Food Service Includes** o Twin Oaks Caterers o Food Architects o Numerous unapproved caterers o Numerous restaurant delivery options o Groceries brought to University Apartments o Groceries brought to University Residence Halls o F/S Brown Bag Lunches

Newark
• 1 Gourmet Dining Operated Dining Hall • 3 Gourmet Dining Retail Operations • 18 Off Campus Locations accepting Raider Dollars • Gourmet Dining Catering • Food Trucks all around Campus • Numerous unapproved caterers • Numerous restaurant delivery options • Groceries brought to University Apartments • Groceries brought to University Residence Halls • F/S Brown Bag Lunches
Camden
• 1 Gourmet Dining Operated Dining Hall • 5 Gourmet Dining Retail Operations • Gourmet Dining Careering • Food Trucks all around Campus • Numerous unapproved caterers • Numerous restaurant delivery options • Groceries brought to University Apartments • Groceries brought to University Residence Halls • F/S Brown Bag Lunches
Student-Specific Food Pantries
• **New Brunswick**: Student Food Pantry (http://ruoffcampus.rutgers.edu/food/; 39 Union Street, New Brunswick; COVID-19 temporary location at the Graduate Student Lounge, College Ave Student Center) • **Newark**: PantryRun (https://myrun.newark.rutgers.edu/pantryrun; Paul Robeson Campus Center, room 226; operating during COVID-19) • **Camden:** RU Student Food Pantry https://wellnesscenter.camden.rutgers.edu/node/318 (Student Wellness Center, 2nd Floor, Student Center; by appointment).
Farm Markets*
• Cook's Market, Rutgers Garden • New Brunswick Community Farmers Market
*No data collected from Camden or Newark Campuses

Rutgers Food Systems: Rutgers Dining

Rutgers Dining, an enterprise unit on the Rutgers- New Brunswick Campus, is at the forefront of campus dining and has been so for over 30 years. Sourcing of food is primarily local and is guided by reducing the environmental impact of all decisions related to food, packaging, serving and waste options. For example, Rutgers dining works with vendors to minimize packaging waste and recycles cardboard associated from packaging.

On a regular day during the semester, Rutgers Dining Services serves approximately 33,000 meals on the New Brunswick campus and has an annual budget of Rutgers Dining budget of $82,464,486 (FY19). Rutgers dining captures a lot of information on their meals and food procurement. For example, in FY 2019, 6,267,210 meals were served. These meals include food served in dining, retail and catering operations. Rutgers owns 28 vehicles which are used to move food and people around campus. Food is purchased though a single procurement office from approved vendors who deliver food to campus every day. What Rutgers Dining does not know is the energy use at each of its locations.

Rutgers Dining Overview (FY19)

Rutgers Self-Operated Dining Services Operations

- Budget: $82,464,486
- Meals per day: 33,000
- Meals per year: 6,267,210
- Employees: 1724 staff and 806 hourly workers
- 28 Vehicles
- Single procurement office

Serving:

- 4 Student Board Dining Halls
- 16 Retail Operations
- 3 Food Trucks
- Rutgers Catering
- Central Commissary
- Central Bakery

Prior to ramping down operations due to COVID-19, approximately 2000 staff and hourly student workers prepared and serve these meals. In FY19 staffing levels were: 1724 staff and 806 hourly workers). With COVID-19, approximately 200 meals are being served each day (as of March 27, 2020) and this number is ramping down as people leave. Food is now takeaway with social distancing principles implemented at the two dining locations currently open.

Rutgers dining remains flexible during COVID-19 despite the challenges of anticipating food needs. Rutgers dining is prepared to scale up food preparation and delivery as campus dorms are converted to housing for healthcare workers or others.

Meals prepared by Rutgers Dining Services are prepared in dining facilities across the five campuses and served in dining halls, retail operations, catering venues, and via takeout.

Other Vendors

As of April 1, the subcommittee has not made direct contact with other food vendors including Gourmet Dining Operations. Gourmet Dining's parent company, Compass Group, lists healthy, environmental and sustainable practices.

Many food vendors are small companies and the COVID-19 impact and shutting down of food services may cause great economic harm and possibly insolvency. The long-term impact is currently long-term but there is concern regarding resiliency and the ability of small food vendors to continue to operate after COVID-19.

Rutgers Food Systems: Food Security, Food Production, and Campus Farms

Food Security

In response to the increasingly recognized level of food insecurity among students across the nation, and at Rutgers-New Brunswick, the Rutgers Student Food Pantry (RSFP) located on the College Avenue campus, opened in 2016 to provide non-perishable food items to Rutgers students. Expanding on their services, in 2017 the RSFP established a partnership with the New Brunswick Community Farmers Market (NBCFM) to provide students receiving nonperishable foods with vouchers redeemable for fresh produce at the NBCFM during the months of June – October. This increased not only fresh fruit and vegetable access, but also a degree of shopping normality among RSFP clients. Importantly, the partnership between the RSFP and NBCFM connects students with locally grown produce, which inherently represent a reduction in "food miles," or how far food has travelled from point of production to intended recipient, and thus also a reduction in GHGe associated with the food system. In 2019, this partnership expanded to include the Rutgers Gardens Cook's Market as an additional redemption site for produce vouchers, even further increasing student food access while decreasing additional produce food miles.

The New Brunswick Community Farmers Market (NBCFM) and Cook's Market at Rutgers Gardens are two farmers markets affiliated with Rutgers-New Brunswick. Both seek to provide a mechanism through which local farmers and food producers can sell their products directly to consumers, reducing the miles necessary for their food products to travel before reaching intended consumers. Cook's Market operates on Fridays, nearly year-round, in Rutgers Gardens, and supports approximately 10 – 20 farm and food vendors. At peak season, the NBCFM, which operates from June – October, is open four days per week at three different locations in the City of New Brunswick, offering hyper-local options for shoppers to attend the market. Four produce vendors, as well as multiple prepared food vendors, participate with the NBCFM during the course of the seasons.

Food Production

As New Jersey's Land Grant Institution, Rutgers University is home to numerous farm operations and food production programs. Food production on campus includes both production operations located on Cook Campus of Rutgers-New Brunswick, as well as extensive operations maintained throughout the New Jersey Agricultural Experiment Station (NJAES) at various field sites in New Jersey (Table 3.2). While some of the food produced on university land is directed toward research purposes, much is available for direct consumption by affiliated personnel, including students, and/or the general public through various availability channels. Incorporating food produced on campus into the consumption stream, either through partnerships between campus farms and Dining Services, or by way of the relationship established between the Rutgers Gardens Student Farm and the Rutgers Student Food Pantry, will help to directly reduce the GHG level of the campus food supply. Thinking large scale, however, the demand of Dining Services likely exceeds the production capacity of the campus

farms. An exceptionally important function of the campus farms is that of student education regarding food production, agricultural systems, and the implications for global climate solutions. Our campus farms provide an unparalleled teaching and learning opportunity, which is already utilized by many of the faculty for various courses (Table 3.2).

Food is also produced for animals on Rutgers land. Corn is raised to feed a small herd of beef cattle located at the Cook Campus Farm and incorporated into the Animal Sciences curriculum.

Table II.3.2. Food production operations affiliated with Rutgers University

Site/Project Name	Program Affiliation	Foods Produced	Food Recipients/User
Rutgers-New Brunswick Cook Campus			
New Brunswick Community Farmers Market Urban Gardens	Rutgers Cooperative Extension	Diversified vegetables, fruit, herbs; Eggs	Community gardeners; community volunteers
Rutgers Gardens Youth and Volunteer Gardens			
Rutgers Gardens Student Farm	School of Environmental and Biological Sciences	Diversified vegetables, fruit, herbs	Rutgers University Student Food Pantry
New Jersey Agricultural Experiment Station			
Middlesex County EARTH Center	Rutgers Cooperative Extension	Diversified vegetables, fruit, herbs	Master and community garden programs, donations, research
Philip E. Marucci Center for Blueberry and Cranberry Research and Extension	New Jersey Agricultural Experiment Station	Blueberries, cranberries	
Rutgers Agricultural Research and Extension Center (RAREC)	New Jersey Agricultural Experiment Station	Vegetable crops, tree and small fruits	Research; (donations?)
Rutgers University Center for Sustainable Agriculture (Snyder Research and Extension Farm)	New Jersey Agricultural Experiment Station	Vegetable crops, tree and small fruits	Research; donations Rutgers Dining - apples

Rutgers Food Systems: Water Quality

Through the Climate Task Force Town Hall meetings, we learned that members of the Rutgers community have concerns with water quality which results in the purchasing of bottled water and generation of plastic waste. Some buildings have water filling stations—we have not quantified how many yet-- but many buildings do not. Concern was especially high on the Newark and Camden campuses.

Rutgers Food Systems: Food Waste

Food waste is reduced at many Rutgers dining halls through the implementation of trayless dining and self-serve, allowing for variable portion sizes. But as students shared in the Town Hall meetings, a lot of food still goes to waste.

Current Status: Greenhouse Emission from Food Purchased By Rutgers Dining

SIMAP has been used to calculate emissions for some of the food procured for Rutgers Dining. This information is incomplete but currently estimates Scope 3 emissions at

approximately 5% of the total GHG emissions for Rutgers. Data was collected from Rutgers Dining in the follow food categories, for purchases in FY2019. Items with the highest carbon footprint were initially used in the SIMAP calculations. The current GHG calculations are a rough estimate and more work needs to be done to finalize this number. This number is considerably less that the global average which suggests that the food system may not yield a lot of additional GHGe savings due to practices that are already in place.

Current Status: Big 10 comparison

Rutgers along with the University of Michigan are leaders in the Big10 in making changes to its dining services. Both schools are active members in the Menus of Change Research Collaborative. The University of Maryland is also working toward more sustainable dining.

Exemplars

A summary of initiatives that have been implemented can be found in Table 3.3. In 2012, Rutgers Dining joined Menus of Change (https://www.menusofchange.org/), a culinary group committed to transforming campus dining to provide health and sustainable food options. Menus of Change was founded by the Culinary Institute of America and the Harvard T.H. Chan School of Public Health and now has approximately 48 members institutions. Rutgers has become a leader in the Menus of Change Research collaborative, a university dining services collaborative focusing on changing campus dining to reduce the environmental impact of dining while improving the nutrition and taste of campus food. The Menus of Change principles guide menu development in some of the Rutgers Dining Halls including Harvest Café at the Institute for Food, Nutrition and Health.

Table II.3.3. Initiatives from Rutgers Food Dining Service to reduce environmental impact

Sourcing

• Procurement contracts
  o specify local requirements
  o if it is being harvested in NJ, cannot accept it from anywhere else
  o By-catch for fish (garbage fish)

Menu Planning

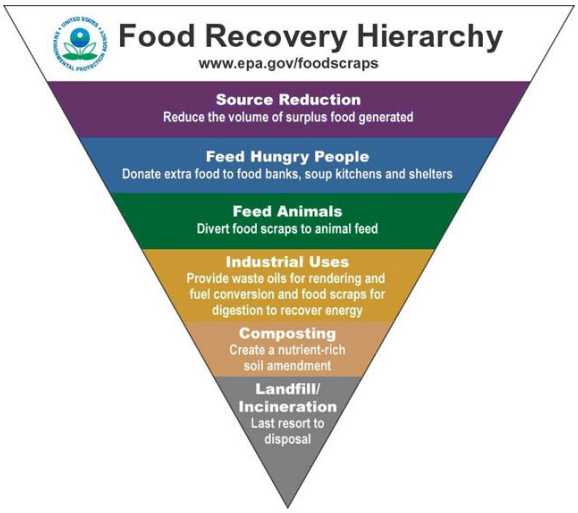
• Chef and dietician meal planning
• For some operations, Menus of Change (Healthy and Sustainable Dining) 10 guiding principles apply (From: https://www.menusofchange.org/principles-resources/moc-principles/) :
  o Transparency around sourcing and preparation.
  o Buy fresh and seasonal, local and global.
  o Reward better agricultural practices
  o Leverage globally inspired, plant-forward culinary strategies.
  o Focus on whole, minimally processed foods.
  o Grow everyday options, while honoring special occasion traditions.
  o Lead with menu messaging around flavor.
  o Reduce portions, emphasizing calorie quality over quantity.

○ Celebrate cultural diversity and discovery. ○ Design health and sustainability into operations and dining spaces. • Harvest Café to develop menu items under Menus of Change Research Collaborative initiative
Serving
• Self-serve • Flexible portion sizes • Trayless dining • Limited takeout options • Water bottle provided to meal plan recipients • Plates and cutlery • Reusable bags for takeout
Food and Packing Waste Reduction
• Food Recovery Hierarchy (see Fig. 3.X) • Vegewatt machine to convert waste oil to energy • Feed food waste to animals (Busch Dining) • Composting (8 aerobic digesters) • Packaging minimization (bulk packaging); recycling of box; manufacturers meet RU specifications
Other
• Research on food preference students (healthy dining team)

Food Waste

Food Waste reduction is a strategy that can reduce greenhouse gas emissions. The Food Recovery Hierarchy (Fig. 3.X) is already used to guide practices for food recovery in some locations at Rutgers. For example, Busch dining food scraps are picked up by a pig farmer to feed to his animals. This arrangement dates back to horse-and-cart days.

Figure II.3.1. Food Recovery Hierarchy (Source: EPA)



Work Plan

What we would like to know

1. Where should we draw the boundaries for analysis?
    a. Are restaurants on the Yard, Rutgers emissions for scope 1 purposes?
    b. What should we collect for outlying stations?
2. What is the carbon footprint from Rutgers Dining?
    a. GHGe from Rutgers Dining for FY19 procurement
        i. Further analysis using SIMAP is required for Rutgers Dining Services. The has been generated by Rutgers Dining and this analysis is underway.
    b. Estimate the average GHGe per person for FY19.
    c. Compare SIMAP's data analysis with that of Poore and Nemecek to estimate the range of error in our reporting. (Optional)
    d. Obtain data on food waste and analyze the different waste streams.
        i. What goes where?
        ii. Where is the most waste?
        iii. What can be done to minimize waste
    e. Energy usage
        i. Identify areas for measurement of energy usage that would assist in decision making
            1. Vehicles
            2. Refrigerators/Freezers
3. Should Rutgers invest in an anaerobic digester for organic (food and landscaping) to energy production?
    a. Could this facility provide teaching and research benefits?
    b. Could this facility reduce other costs?
4. Water and waste production
    a. Collect data on water filling stations with help from facilities.
    b. Obtain data on water usage (bottled vs. filtered) in Rutgers Dining.
    c. Gather data on water bottle purchases from outside vendor using procurement data.
    d. Work with outside food vendors to gather data of water bottle purchases.
    e. Determine if there are recycling data on water bottle disposal.
5. How much food is served on campus by outside vendors?
    a. We plan to determine if data can be collected from Gourmet Dining and analyze this data. Data may need to be purchased.
    b. Need to know the number of meals served, food purchased, food waste generated
    c. Back-up plan: Use the average GHGe per person calculated for Rutgers Dining.
6. What estimates can be made for the associated GHGs for the outside vendors?
    a. Need to know the number of meals served, food purchased, food waste generated
    b. What sustainability practices do vendors adhere to?
    c. Method: Website evaluation, Informational phone calls, requests for data.
    d. Back-up plan: Use the average GHGe per person calculated for Rutgers Dining.
7. How much food is produced on campus farms?
    a. Collection of data from NJAES sites

b. To what extent could food produced on the Rutgers farms meet the demand of dining services on a select/seasonal basis?

8. What courses are currently teaching food systems curriculum?
    a. Review of master class list and Rutgers websites using search terms "food", "agriculture" "eating" etc.
    b. Of these, which are using campus or other local farms? Which farms?
9. Climate Resiliency issues for Food Systems (with WG7)
    a. Impacts of disruptions on food systems
        i. Impact on Rutgers Dining: Compile lessons learned from Super Storm Sandy and other natural disasters (lack of payment being an important issue).
        ii. Impact on Rutgers Dining: Compile lessons learned from COVID-19
        iii. Impact on Rutgers Dining: Compile lessons learned from food donations to local food pantries
        iv. Impact on Rutgers Dining: Compile lessons learned from Super Storm Sandy and other natural disasters (lack of payment being an important issue
        v. Farmer's market
        vi. Economic Impacts; Supply chain impacts and preparation needed: short and long-term impacts

Engagement Plan

Engagement may be challenging over the next few months due to COVID-19. One of our group (Xenia Morin) has been asked to serve on the State Food Waste Advisory group and will use this platform to engage with some stakeholders. We will continue to develop this engagement plan as it is still unclear where the boundaries for engagement lay for this group. Some guidance is requested.

Easy Wins

Six main area that are likely to have an impact from the food systems:

1. Develop a marketing plan to communicate and promote Rutgers Dining Hall successes for already reducing their GHGes.
    - Possible outcome: more students buy a meal plan; more students become educated about ways to reduce GHGe and environmental impact.
2. Develop a marketing plan to communicate and promote courses that focus on agriculture, food systems and sustainability.
    - Possible outcome: more students enroll in classes and become active on campus.
3. Energy audit of dining halls.
    - Facilities could work with Rutgers Dining to select sites for energy monitoring that are not currently monitored. Monitoring could be done on a per equipment bases or on a facilities basis.
    - Possible outcome: Purchase of new energy efficient equipment to reduce energy costs.
4. Develop and rollout a Food Education Campaign for Rutgers Community Members:

- Create a website to help Rutgers community members determine their carbon footprint, including their food footprint.
- Using the Healthy Dining Team, and others, to expand food education for students on campus. Healthy eating should also be emphasized along with cooking skills, shopping skills, menu planning, portion sizes and environmental impact of foods. Labeling products in the dining hall.
- Using Rutgers Extension, expand and highlight food education beyond campus.
- Possible outcome: people save money, eat more healthily, and reduce GHGs

5. Develop a Food Waste Reduction Education:
   - Develop a campaign to reduce food waste for Rutgers students, faculty and staff as well as alumni. The EPA's Food Recovery Challenge (https://www.epa.gov/sustainable-management-food/food-recovery-challenge-frc) will soon to be adopted by the state (personal communication from the state) and should be rolled out to faculty and staff at Rutgers.
   - Develop a website and/or app around food surplus donation options at Rutgers.
   - Develop a campaign to reduce food waste by students in the dining hall, in residence halls and in their homes. Healthy eating should also be emphasized along with cooking skills, shopping skills, menu planning, portion sizes and environmental impact of foods.
   - Develop a website and/or app around food surplus donation options at Rutgers.
   - Add aerobic food digesters to more dining facilities, where applicable.
   - Possible outcome: people save money, increase food security, and reduce GHGs
6. Develop a Water Audit and Education Plan in conjunction with facilities.
   - Develop a Water Plan.
     i. Where are people buying water for offices?
     ii. What is the issue with water quality? Taste? Concerns about lead-contamination? Other?
     iii. Where could water filling stations be easily installed?
     iv. Purchase and install water filling stations
     v. More bottle recycling education.
     vi. Purchase and deliver Rutgers-branded reusable water bottles to those who are near water filling stations to encourage use.
   - Potential outcome: by adding more water filling stations departments could reduce water costs and reduce costs for delivery, waste/recycling removal. Decrease of GHGs through decrease water delivery, decreased water bottle disposal, decreased pollution and clean up costs.

Cross-Working Group Interactions

The work of this committee overlaps with many of the other committees: WG4 Supply Chain. Additional work needs to be done with WG6 climate resilience and WG7 Positive economic development. The current economic situation makes it very difficult to create an economic model

COVID-19 Considerations

Most of food service is customer focused and cannot be done as a remote operation. People are needed to prepare the food and serve the food. We are also learning that there is a lack of information on the number of people who need food service and where they are located during the COVID-19 crisis. This makes planning much harder and can drive up costs. Joe Charette, director of Rutgers Dining, predicts that food service delivery may be changed for the long term due to the social distancing practices that have been implemented. Changes in delivering food service has led to more take out options and to changes in the way that food is served. Delivery/take out options may expand. These practices have increased food and packaging waste but have also protected workers and customers alike. There are likely to be trade-offs between health and environmental impact. Food surplus from Rutgers Dining has been delivered to local pantries and food banks or cooked or stored for future waste to reduce food waste. More storage capacity would have helped to make the transition easier at the beginning of the shutdown when orders were still coming to campus.

Rutgers Dining is operating has reduced its operation to two locations and feeds considerably fewer people. New protocols have been implemented for food service workers and customers. All meals are now takeout and pre-packaged. Approximately 200 meals are served daily but the numbers are hard to predict as people are asked to move off campus. It is unclear if transportation is an issue to getting to these food locations. Plans are in place to feed COVID-19 quarantined individuals on campus and others who may use the dorms.

According to their websites, student food pantries remain open on all three campuses. The New Brunswick Food Pantry changed location and delivery method to accommodate social distancing requirements. Approximately 120 student per day are served via this pantry. Local food pantries all over the state are in need of donations as many people seek food as their incomes are cut.

The food supply chains remain good but the whole restaurant and food services industry is heavily impacted as people across the state are asked to stay home. It is unclear if smaller companies will survive the COVID-19 stay at home period as many restaurants are closed or are unable to make up income from takeout service.

It is much harder to get student input as students are no longer using the dining facilities.

Gourmet Dining LLC's website is down and we are unclear how easy it will be to reach the group.

The current economic situation makes it very difficult to create an economic model for climate-smart investments in the food system.

II.4. Supply Chain and Waste Management

What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?

Rutgers University's profile of greenhouse gas emissions associated with the supply chain and waste management will be determined using a life-cycle approach. One method considered is the Greenhouse Gas Protocol. Alternative methods will be reviewed.

Greenhouse Gas Protocol as one possible method to determine GHG emissions: The method categorizes greenhouse gas emissions from the supply chain and waste as Scope 3 emissions. Scope 3 emissions refer to all indirect emissions (see Figure 1). In other words, emissions other than Scope 1 (fuel burnt on campus for building heating and fleet transportation) and Scope 2 (emissions from off- campus sources to produce electricity and steam used on campus). According to the Corporate Value Chain (Scope 3) Accounting and Reporting Standard of the GHG Protocol, Scope 3 is comprised of 15 categories[16]. For the purposes of the Supply Chain and Waste Stream working group the 3 most important categories to consider are:

- Category 1: purchased goods and services (which includes food)
- Category 2: capital goods (construction and other real estate assets)
- Category 3: waste generated in operations.

Three possible methods to assess waste management approaches at Rutgers University are the Waste Reduction Model (WARM), the Solid Waste Optimization Life-Cycle Framework (SWOLF) and the Environmental Assessment for Environmental Technologies (EASETECH) model.

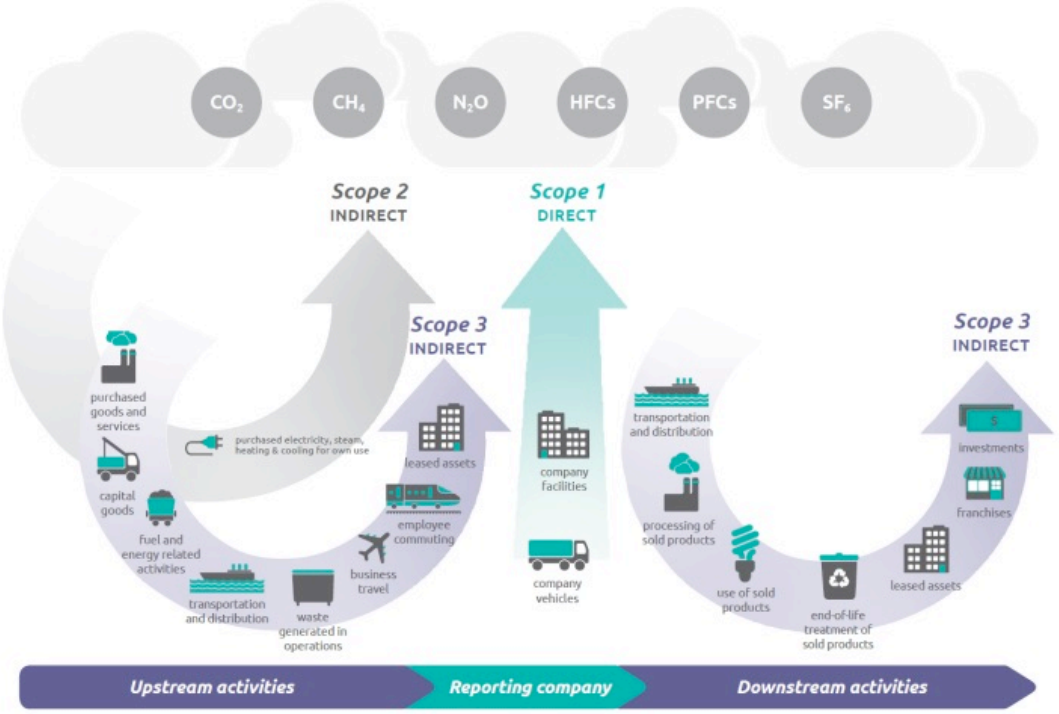
The WARM model was developed by USEPA[17]. It is a streamlined model with a limited inventory of greenhouse gas emissions and energy impacts. The SWOLF model was developed by NC State University[18]. It is multi-stage life-cycle optimization model accounting for changes in solid waste generation, composition, policy as well as changes to the energy system over time. The EASTECH model, a bottom up model, was developed by the Technical University of Denmark for environmental technologies[19].

Supply chains are complex, being comprised of a large network of entities responsible for the conversion of raw materials into products, and the transportation and delivery of these products to our end users. Calculating the GHG emissions associated with a diverse supply chain can be a highly complex undertaking full of uncertainties. Therefore, data gaps and uncertainties will be identified, data collections be proposed, and limitations be identified.

[1] http://www.ghgprotocol.org/standards/scope-3-standard

[17] see https://www.epa.gov/warm/versions-waste-reduction-model-warm#15, accessed 2/26/20
[18] see https://jwlevis.wixsite.com/swolf/resources, accessed 2/25/19
[19] see www.easetech.dk, accessed 2/26/20)

Figure II.4.1. Overview of GHG Protocol Scopes and Emissions Across the Value Chain (Source: GHG Protocol - Corporate Value Chain (Scope 3) Accounting and Reporting Standard)



What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?

Various universities have employed various approaches to reducing greenhouse gas emissions embodied in procurement and greenhouse gas emissions associated with waste management. These approaches will be compared and the ones applicable to Rutgers University will be identified. The comparison will also include how other universities identified impactful approaches and what metrics they selected to measure progress.

University	Neutrality Target	Supply Chain – Waste Highlights
Michigan State University	-	Could Not Identify
Northwestern University	2050	Could Not Identify
Ohio State University	2050	Research Initiatives Only and Recycling Standards
Penn State University	-	Zero Waste Strategy, Recycling and Fleet Mgt
University of Illinois @ UC	2050	Zero Waste SWATeam
University of Maryland CP	2050	Guidance and Policies (Link)
University of Michigan	Under Evaluation	Purchasing (Paper) and Recycling Standards
University of Minnesota TC	2050	Purchasing (Paper) and Waste/Recycling Emissions

A survey/outreach to our Big 10 peer colleagues on their sustainability projects will provide multiple projects that we can consider emulating to kick start some of the short term projects.

Examples

- Penn State measure their fleet emissions based on mileage driven, https://www.npr.org/2019/10/04/764637564/how-penn-state-is-cutting-greenhouse-emissions-in-half-and-saving-money
8. Wisconsin has implemented reusable "to go" container in their dining halls etc. https://www.housing.wisc.edu/about/sustainability/food/

What approaches is Rutgers already pursuing?

The status of the supply chain management and waste management at Rutgers will be summarized based on existing reports. The guiding principles of current management will also be outlined.

Dining Services is committed to diverting food waste from landfill to other options. All these options are more expensive than just having the waste classified as landfill. The three options in order from most to least expensive are

1. Removal by WM to their facility where it is anaerobically processed. Once processed it can safely be added to a sewage treatment plant which collects methane and uses that gas for energy generation.
2. Removal by a farmer who uses the food as livestock feed.
3. Bio-digesters in the dining halls that process the food waste into a liquid so it can be safely fed into the local sewer system.

Dining Services currently uses option 2 and 3 but is in the process of transitioning completely to option 3. Bio-digestion was initiated as an option 5 years ago. It was hoped that it might be a more economical option. Economical it was, and is with the transportation cost of $0, but unreliable, breakdown prone and smelly, too. Only with the latest, third generation of technology have enough of the drawbacks been eliminated for us to decide to make the substantial investment in equipment and resources. *Note: WG4 will commence research to incorporate this and other waste strategies into our GHG reporting.*

What are the most compelling and impactful approaches Rutgers could pursue?

- The working group will propose guiding principles and define when an approach is considered impactful. Examples are: Lowest greenhouse gas emissions at reasonable costs? Lowest environmental impacts? A circular carbon economy (transformation of the linear make-it /use-it/dispose-it pathway to a circular resource recovery pathway can be an effective pathway for mitigating climate change within a lower-carbon economy)? Zero waste?
- To measure progress internationally accepted accounting and reporting standards to the Rutgers supply chain-to-waste process need to be defined.
- To document progress in management of solid waste through community education, strategic purchasing, appropriate infrastructure, and proper disposal, strengthened by relevant and accurate metrics.
- Collaborations with the broader community will be identified.

- We should incorporate the linkages to the UN Sustainable Development Goals[20] on climate change and sustainability; there are several common threads and represents a broader community engagement.
- This working group will incorporate sustainability as a foundational block of the program. All climate change initiatives have an underlying thread of sustainability.
- From an implementation and optics perspective, promotion of sustainability programs can be articulated at a local level and may present easier wins that in aggregate contribute to macro climate change programs.

Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

- Establish a University-wide enforceable policy for the procurement of environmentally responsible products and services; with the ability to quantify the GHG data associated with all purchases.
- Establish Sustainability as a university-wide initiative that is policy enforceable and requires every unit to develop plans and report as part of their budgetary cycle (Performance / funding tied to progress)
- Procure goods and services that cause less harm.
- Adding a sustainability and climate change component to each category of sourcing and procurement transactions.
- Quantify the number of green products purchased on campus.
- Improve sustainable purchasing requirements in future contracts.
- Support sustainable food purchasing.
- Improve marketing and awareness of available green products.
- Work with regional partners to negotiate sustainable products into future contracts and large-scale purchases.
- Implement a life cycle cost (financial and environmental) analysis for the purchase of any major energy or water using products
- Procure cleaning and janitorial products that are Green Seal™ or UL Environment (EcoLogo)™ certified and/or meet similar criteria for cleaning and janitorial products.
- All campus-standard computers purchased meet the ePEAT Gold, Silver or Bronze Standard and at least EnergyStar 4 standard.
- All appliances and electronics procured are EnergyStar rated
- Monitor and transition the acquisition of lab, research, medical and dental equipment and supplies towards environmentally responsible products and follow these products through proper waste management strategies.
- When appropriate, have RBHS/Rutgers Procurement representatives attend quarterly meetings with key suppliers.

[20] https://www.un.org/sustainabledevelopment/climate-change/

- As part of the evaluation, establish with vendors a set of sustainability indicators not only for end-products but for processes, packaging and delivery.
- Identify opportunities to purchase products and services that are produced and sold by businesses with strong environmental management standards, policies, and practices.
- Leverage key suppliers to help Procurement perform green assessments, given their expertise and insights into best practices across higher education and other industries. For example, Thermo Fisher could perform an onsite assessment of Rutgers' campus labs to measure energy output from equipment such as freezers and hoods.
- For durable goods, e.g. dorm and office furniture, it should be the University's standard practice to prioritize reused and refurbished items for small projects within the university.
- For large projects, that is major renovations and construction of new buildings, the recommendation is for Rutgers IPO and Procurement to work with vendors in identifying and procuring sustainably sourced items.
- The recommendation is for our Procurement & Sourcing professionals to design awareness and engagement programs to effectively direct administrators and other employees towards sustainable products and/or lower need of supplies.
- Implement a comprehensive University source reduction & reuse policy and program (see attached document for potential guidance)
  See Appendix VI

Conclusions

While the ultimate goal should be for full environmentally responsible supply chain-to-waste reduction and resilience as an institution, this is neither fiscally nor logistically feasible on an immediate timescale. Instead, a sequential timeline for GHG identification certification of individual supply chains, waste flows, facilities, buildings, and programs should be approved and implemented. In addition to clear feasibility benefits, an advantage of this approach is that certification of individual supply chains, waste flows and sites will spur movement toward programs such as circular carbon systems or Zero Waste goals across the University system.

COVID-19: Rutgers' Supply Chain Risk and Disruption

COVID-19 could be the major supply chain disruption that finally forces many universities, governments, companies, and entire industries, to rethink and transform their global supply chain model. This has also major implications with the development of our climate action plan working group strategy. The current COVID-19 crisis has exposed the vulnerabilities of many organizations, especially those who have a high dependence on global markets to fulfil raw materials or finished products requirements.

"China's dominant role as the "world's factory" means that any major disruption puts global supply chains at risk. Highlighting this is the fact that more than 200 of the Fortune Global 500 firms have a presence in Wuhan, the highly industrialized province where the outbreak originated, and which has been hardest hit. Companies whose supply chain is reliant on Tier 1 (direct) or Tier 2 (secondary) suppliers in China are likely to

experience significant disruption, even if, according to the most optimistic reports, conditions approach normalcy in China by April."[21]

The Rutgers CAP WG4 Team can investigate and develop the following strategies into our CAP (with GHG impacts):

- Incorporate COVID-19 (or similar critical health impacts) symptoms and prevention into our supply chain/waste management educational, contingency and resiliency plans
- Research and develop strategies for our Tier 1 supplier risks
- Conduct global-to-local supply chain scenario planning
- Understand the demand impact specific to our operations and academic mission
- Confirm short-term demand-supply synchronization strategy
- Develop strategy to activate multiple local and extended supply networks
- Understand and activate alternate sources of supply for all critical or high-risk supply chains
- Identify and develop local manufacturers into the new localized supply chains
    - To produce products and receive RU waste feedstock
- Update inventory policy and planning parameters
- Enhance inbound materials visibility (develop receivables reports)
- Prepare for future campus-wide closures and the supply disruptions that come with these changes
- Obtain visibility into our suppliers' production scheduling; demonstrate supply chain agility and leadership
- Evaluate alternative outbound waste management options and secure market capacities
- Evaluate alternative inbound logistics option (with health risk protections utilizing time sensitive modeling)
- Open multiple channels of communication with our user departments; identify and contingency plan with key user departments quarterly
    - Conduct regular supply chain contingency planning
- Re-engineer and integrate the RU supply chain-to-waste calculation (minimize inputs in order to eliminate or repurpose our outputs as feedstock for RU future procurements-create new markets)

Looking ahead: the imperative for a new supply chain model

A decades-long focus on supply chain optimization to minimize costs, reduce inventories, and drive up asset utilization has removed buffers and flexibility to absorb disruptions and COVID-19 illustrates that many companies are not fully aware of the vulnerability of their supply chain relationships to global shocks.

Investment in new supply chain technologies* that dramatically improve visibility across the end-to-end supply chains is a strategic key. The traditional linear supply chain model is transforming into digital supply networks (DSNs), where functional silos are broken down and

[21] Kilpatrick, J., Barter, L. (2020). "COVID-19 Managing supply chain risk and disruption" Deloitte Development LLC. Deloitte Design Studio, Canada. 20-6536T

organizations become connected to their complete supply network to enable end-to-end visibility, collaboration, agility, and optimization.[22]
**Leveraging advanced technologies such as the Internet of Things, artificial intelligence, robotics, and 5G, DSNs are designed to anticipate and meet future challenges*

1
2
3

[22] Kilpatrick, J., Barter, L. (2020). "COVID-19 Managing supply chain risk and disruption" Deloitte Development LLC. Deloitte Design Studio, Canada. 20-6536T

II.5. Land Use and Offsets

As the State University as well as a Land Grant Institution, Rutgers University has facilities spanning the state that include 91 discrete locations over 6,000 acres. While many of these locations are quite urban in character (i.e., many of the office buildings and health care facilities associated with Rutgers Biomedical and Health Sciences), Rutgers manages over 4,000 acres of farms, forest, and wetlands. Within the three main campuses of Camden, Newark and New Brunswick are lawns, treed areas and landscaped spaces covering over 500 acres. These more than 4,000 acres of "green space" land should be factored into any plan for the University to reach carbon neutrality by 2050. Accordingly, we propose that the University reduce greenhouse gas emissions associated with University land use and maintenance, increase carbon storage and reduce methane emission on University land, reduce the University's energy demand through enhanced design of future land use development, and develop mechanisms to offset University emissions.

Current Status

The following are some selected programs already in place.

- Present University policy requires that all capital projects incorporate perennial plantings capable of significant annual biomass development, and minimize extents of managed lawn, thereby reducing fertilizer input as well as mowing; and,
- A sustainability plan for NJ Agricultural Experiment Station (NJAES) research farms is under way.
- A deer management program has been initiated on University owned forests, to reduce deer population numbers and thereby promote a healthier, more diverse, and fully stocked forest that can fix and store more carbon.

Exemplars

We have reviewed the plans from a number of other Big 10 and peer institutions; their proposed actions related to the topic of land use and offsets is summarized in Table II.5.1. Our general assessment is that while other institutional plans have individual strengths, Rutgers can be a leader by taking a more comprehensive approach.

Working Group Work Plan

Working Group 5 has developed a list of potential actions that deserve further investigation and consideration, as well as a time table outlining actions to be taken in the short term (i.e., needed by September 2020 for the Plan development) vs. longer term (i.e., that will take 1-2 years to more fully develop).The bulk of the Short Term actions entail a more detailed inventory of existing land maintenance practices and a prioritized set of actions that can be taken to reduce carbon emissions, along with estimates of the monetary resources needed to initiate the recommended management actions.

In the longer term, we propose that the University embark on a more comprehensive sustainability planning effort that goes beyond impacts to carbon cycling but also includes nutrients, water and biodiversity. There should be separate plans for 1) the three main campuses;

2) New Jersey Agricultural Experiment Station farms; and, 3) University owned forests (e.g., Ecopreserve, Hutcheson Memorial Forest, Helyar Woods, as well as woodlots on NJAES farms). These sustainability plans will provide an estimate of the potential amount of carbon that can be sequestered (by 2050), the management actions required, as well as the monetary resources needed for planning and implementation. More broadly, these plans will assess "carbon defense" strategies designed to maintain the existing stores of carbon in the soils, above- & below-ground plant biomass, and "carbon offense" strategies designed to promote enhanced carbon capture potential (i.e., additional amounts above and beyond baseline conditions).

We propose that when planning for future land use development and/or redevelopment, that the University follow the planning principles and sustainability framework embodied in the University Physical Master Plan - Rutgers 2030 to minimize energy demands and maximize carbon capture potential of campus green spaces (i.e., build up, not out, and return unused space to green space). Existing efforts of using the campus as a Living Laboratory to teach sustainability design and best management practices should be strengthened.

We define a carbon offset as an additional reduction to already existing mechanisms in emissions of carbon dioxide or other greenhouse gases made in order to compensate for emissions made as part of University-related activities. In the Short term, we propose to investigate the feasibility of existing off-site carbon offset programs as an additional means of achieving carbon neutrality. Simultaneously, we will propose policies and mechanisms for campus departments and organizations to purchase carbon offsets. Longer term, the University should investigate the establishment of new off-site carbon offset programs here in the State of New Jersey in collaboration with other state and local partners.

Engagement Plan

On-Campus engagement will be accomplished as a Task Force-wide initiative, while for our off-campus engagement we propose to work through our strong existing network of statewide partners as we embark on this planning effort. For example, partners include but are not limited to : the New Jersey Department of Agriculture; NJ Farm Bureau; NJ State Forest Service; USDA Natural Resources Conservation Service; Duke Farms,; NJ Audubon; NJ Conservation Foundation; Northeast Organic Farming Association, Greater Newark Conservancy, to name a few.

Easy Wins

The following actions will be undertaken within next 6 months:

1. Planting 300 – 600 seedling trees at Busch regional stormwater basin.
2. Convert approximately 8.8 acres of maintained lawn to eco/low/no mow on Livingston District at corner of Joyce Killmer Avenue and Rd 3.

Cross-Working Group Interactions

While there are a number of overlap with the other six working groups, a few are highlighted below:

- WG1 Energy and Buildings: strategic use of trees and alternative paving materials to reduce urban heat island effect;

- WG2 Transportation: integration of enhanced pedestrian and bike pathways into campus landscape;
- WG3 General Supply Chain and Waste Management: optimize on-campus reuse of leaf/wood matter;
- WG4 Food System: enhance connections between Rutgers farms and food services;
- WG6 Climate Preparedness: promote climate resilient forests, farms and campus landscapes;
- WG7 Climate Positive Economic Development: make NJAES research farms a positive case study in promoting sustainability.

Table II.5.1. Land Use and Offset actions proposed by other Big 10 and peer institutions plans

Actions	Cornell	Michigan	Ohio State	Illinois	UMD	U. Wash.	OSU	Princeton	U. Penn.
Land Use actions									
	X								
Develop estimates of carbon-capture potential on University lands	X				X	X			
Afforestation - tree/shrub planting	X	X	X	X	X			X	
Active forest/tree management for enhanced carbon sequestration but promote storm resiliency	X								X
Soil remediation to enhance carbon storage	X			X					
Determine economic feasibility of management actions to increase carbon capture									
Actively seek public/private funding	X								
Monitor regulatory environment and carbon markets	X					X			
Reduce carbon emissions of landscape management practices									
Increase eco/low mow zones and low maintenance lawns	X			X				X	

and sustainable plantings									
Reduce lawn area					X			X	X
Increase sustainable plantings					X				X
Replace equipment with low emission models									
Reduce building energy use by strategic planting of trees and shrubs									
Reduce Agricultural land emissions									
				X					
convert some portion of cropland to Ag forestry				X			X		
	X						X		
Integrate Teaching									
Campus as Living Laboratory to promote teaching and research on sustainability	X							X	
Offsets									
Investigate mission-linked offsets and develop criteria for offset purchases	X	X	X	X		X			
Allow campus units to voluntarily purchase offsets				X					
Local or regional linked mission offsets	X			X					

Working Group 5: Land Use & Offsets work plan

As part of the Final Plan to be submitted in September 2020, we will examine and prioritize the following list of potential actions. In particular, we will assess:

1. What new information is required, and how will it be obtained?
2. What additional analyses are required?
3. What resources are required to do these additional analyses?

1. <u>Reducing greenhouse gas emissions associated with University green space land use and maintenance</u>

Short term (by September 2020)

- Inventory of present on-campus ground maintenance:
  - energy use (i.e. gallons of fuel consumed);
  - # of gas vs. electric equipment and vehicles;
  - Fertilizer use;
  - area of existing/previously identified candidate areas for low mow zones and/or tree/shrub planting;
  - existing woody material/leaf/compost practices.

- Inventory of present farm operations and maintenance:
  - Energy consumption from utility bills; data on gasoline consumption in vehicles and equipment may be possible
  - Acres planted in perennials;
  - Remote sensing data on land cover;
  - Head of livestock on the Cook Campus teaching farm;
  - No machinery or vehicles are currently powered by electricity, as this energy source presents special challenges in a rural setting.

Long term (after September 2020)

On campus grounds

- Undertake a campus green space sustainability planning effort that includes carbon emission reduction goals and best management practices, e.g.
  - Increasing low-maintenance turf care (reduced fertilizer/herbicide, irrigation and mowing) and/or switch to low maintenance turf varieties;
  - Replacing gas engine with lower emitting electrical battery powered machinery, increasing electric vehicle charging stations;
  - Reducing turf area and replace with low-maintenance perennial/shrub/tree plantings, eco-mow zones;
  - Establish management program for the campus urban forest to enhance forest health and vigor.

- Estimation of potential amount of emission reductions, additional carbon stored and $ needed for planning and implementation.

Off campus facilities (i.e. NJ Agricultural Experiment Station Farms and Research Stations)

- Complete a sustainability plan for NJAES research farms. See full description in interim report of Working Group 7;

- Proposed initiatives to achieve reduction of greenhouse gas emissions will focus on improved soil and livestock management to reduce greenhouse gas emissions;
- Explore altering guidelines on vehicle fleet to prioritize hybrid vehicles and better understand the hurdles for using electric equipment in a rural setting (e.g., high vehicle miles travelled and few commercial charging stations).

2. Increasing carbon dioxide storage on University land by increased carbon sequestration in soils and woody vegetation

Short term (by September 2020)

- Undertake analysis of enhanced carbon sequestration opportunities on University properties
  - Identify "vacant" tracts of land suitable for afforestation/reforestation, including stormwater management basins;
  - Estimation of potential amount of additional carbon stored.

Long term (after September 2020)

- Undertake a campus green spaces sustainability planning effort that includes an assessment of existing carbon stocks (i.e., carbon stored in plant biomass and soils), baseline rates of ongoing carbon sequestration and potential for enhanced carbon sequestration (i.e., additional carbon stored above and beyond the baseline), design principles and best management practices, e.g.
  - Reduce traditional lawn; Consider greater deployment of Rutgers-developed slower-growing varieties of turfgrass
  - Planting more trees and shrubs
  - Replace annual plantings with perennials/grasses/shrubs
  - Replant eco/low mow zones with perennial meadow species
  - Install vertical gardens in area-limited locations
  - Increase on-site management of leaf litter/wood chips (shredding, compositing);
  - Increase milling of trees removed from campus for usable lumber;
  - Investigate tree plantings within parking lots to reduce urban heat island effect;
  - Investigate incorporating paving materials with high sun reflectance index and "low carbon" concrete materials into university projects;
  - Investigate the potential of creating a campus native tree/shrub nursery as part of the Campus as Living Laboratory teaching program.
- Undertake a farm sustainability planning effort that would reduce the greenhouse gas emissions (carbon and methane) from agricultural activities and better sequester carbon. Such a plan will include assessment of existing carbon stocks (i.e., carbon stored in plant biomass and soils), baseline rates of ongoing carbon sequestration and potential for enhanced carbon sequestration (i.e., additional stored carbon expected above present baseline rates).
  - A sustainability plan for NJAES research farms is already under way. See full description in interim report of Working Group 7;

- Major goals of current farm sustainability plan include better carbon sequestration, reduction of fertilizer use per acre, and demonstration and extension of best management practices;
- NJAES cannot commit to any change in plantings, including trees, shrubs, or permaculture, that are inconsistent with its ongoing research projects or with the stewardship plan described in the WG7 interim report.

- Undertake a forest sustainability planning effort that includes assessment of existing carbon stocks (i.e., carbon stored in plant biomass and soils), baseline rates of ongoing carbon sequestration and potential for enhanced carbon sequestration (I.e., additional carbon stored above and beyond the baseline) carbon sequestration goal, and best management practices, e.g.
  - Maintaining existing tree/forest cover and health as a form of "carbon defense";
  - Proactive management of forest lands to enhance carbon sequestration.
- Estimation of potential amount of additional carbon stored and $ needed for inventory, planning & implementation for all of the above sustainability planning efforts. Where possible, we propose to capitalize on on-campus and external groups (e.g., NJ Forest Service, Master Gardeners, non-profit organizations) and grant programs for support in procuring trees, planting and maintenance.

3. <u>Reducing the University's energy demand and emissions through land use planning and design</u>

Short term (by September 2020)

- Refer to planning principles and sustainability framework already embodied in the University Physical Master Plan – Rutgers 2030 for future land use development/redevelopment intended to minimize energy demands and maximize carbon sequestration (I.e. curtail low-rise sprawl development, in favor of developing higher density, mixed-use buildings around transit hubs & return unused space to green space).
- Ensure that Significant Capital Projects are designed with appropriate landscape plantings, tree plantings, and site improvements, as well as energy saving building features. Monitor the implementation of Significant Capital Projects to ensure that these elements are not downsized or eliminated from the project scope as part of a "Value Engineering" process.
  1. All capital projects are required to be reviewed by University Landscape Architect (ULA);
  2. All capital projects are to provide landscaping, including perennials, shrubs and tree plantings that provide aesthetic and ecological function;
  3. All capital projects are required to incorporate perennial plantings capable of significant annual biomass development, and minimize extents of managed lawn, thereby reducing fertilizer input as well as mowing;

4. Plant material is to be selected based upon being non-invasive, hardy for the climatic and USDA hardiness zone, perennial and resistance to deer browse;
5. Replace trees removed by Grounds because of disease or damage at a 1:3 ratio.

Long term (after September 2020)

- Proactively redesign/redevelop parts of campus that are energy inefficient;
- Develop plans for
  - Strategic exterior tree planting for shading and wind break to reduce heating/cooling costs;
  - Increased amount of indoor plants.

4. Offsetting University emissions

Short term (by September 2020)

- Investigate existing off-site carbon offset programs as a supplementary means of achieving carbon neutrality;
- Investigate the establishment of University on-site vs. new off-site carbon offset programs (in collaboration with other state partners);
- Investigate mechanisms for campus departments and organizations to purchase offsets and develop an implementation plan if proven feasible.

Long term (after September 2020)

- Use of solar panels (over parking lots) as a form of offset.

5. Cross-cutting themes, related to teaching & research

Short term (by September 2020)

- Outreach and coordination/integration of efforts with neighboring communities

Long term (after September 2020)

- Expand on role of campus as a Living Laboratory for teaching and research purposes:
  - Establish a sustainable landscape practice course that includes a service learning aspect;
  - Offer credit to students for implementing, maintaining, assisting in carbon offset programs (e.g. tree planting);
  - Develop internships for students in sustainability (e.g. Newark sustainability major / SEBS sustainability minor).
- Expand on use of NJAES personnel & facilities around the state as a vehicle for broader outreach;
- Encourage Rutgers Turfgrass Center research into additional sustainability features for its turfgrass varieties, for multiple applications.

6. Cross-cutting themes, post-COVID-19

Long term (after September 2020)

- The remote education, remote office work, and significant socio-economic effects of the current COVID-19 pandemic will offer insight and opportunities that may not have been considered if there were no disruption. Once the crisis is over, all Working Group will re-assess their respective plans and ask the following questions:
  - What has been learned as a result of the pandemic and its effects?
  - What ideas, once not likely to be considered, now might be logical?
  - Given the fiscal constraints that the pandemic will create, how will the plan need to be changed?
  - How might the university come back stronger in the long term?

Livingston:
Joyce Killmer Ave / Rd 3 - 8.8 acres convert to no/low mow

Livingston:
Stormwater Basin @ Beck - 2 acres reforestation/ afforestation/habitat enhancement

II.6. Climate Preparedness

Key messages

1. Enhancement of preparedness for both extreme weather and climate events and long-term climate change stresses is a key step for building climate resilience at Rutgers.
2. Key steps for enhancing preparedness include reduction of climate risks, management of impacts, and support to vulnerable populations.
3. Rutgers' on-going response to the COVID-19 pandemic offers lessons for identifying vulnerable groups and for ensuring continuity of the University's research, teaching, and service missions in the face of disruptive climate events.

Climate preparedness requires understanding of critical climate change risks and identification of actions and strategies to reduce exposure and impacts of those risks. The climate preparedness workgroup will conduct a comprehensive analysis of climate-related risks, vulnerabilities, and adaptation strategies pertinent to Rutgers University. The analysis will include: 1) identification of current and projected climate-related stresses affecting Rutgers' campuses and communities, based on historical climate and weather data and existing climate projections; 2) assessment of exposures of university assets, locations, populations, and functions to these stresses; 3) examination of current capacities to respond, cope, and manage these stresses; and 4) recommendations for options and strategies to enhance resiliency. In addition to Rutgers' four main campuses, the assessment will include the university's field stations and research sites located throughout the state, clinical facilities that are associated with RBHS, and surrounding communities and commuter-shed regions. In light of the on-going COVID-19 crisis, the working group will also conduct a preliminary examination of the lessons from Rutgers' COVID-19 response for enhancing climate preparedness and ensuring continuity of Rutgers' teaching, research and service missions in association with both short-term extreme events and long-term evolving situations. This on-going crisis offers potentially valuable insights into critical exposures, vulnerabilities, and areas where new forms of resilience-building is needed.

The working group assessment will require a variety of different forms of primary and secondary data. The group has ready access to all necessary weather and climate data as well as climate projections via the Office of the New Jersey State Climatologist (ONJSC), the Rutgers Climate Institute (RCI), and Rutgers Institute of Earth, Ocean and Atmospheric Sciences (EOAS). If conditions permit collection of social data during summer 2020, the group will conduct a stakeholder-based survey of critical climate exposures, response capacities, and resiliency options and strategies. Stakeholders to be included in the survey will 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. Ensuring broad and inclusive participation from all four campuses and outlying stations is critical for an effective stakeholder-based process. In the event that it is not possible or advisable to collect new human subjects data, the group will rely on the existing knowledge-base of the workgroup and the larger task force team to develop the working group report.

The proposed work plan and outline for final report of Working Group 6, is as follows:

1. **Introduction**

This section will discuss the urgent need for enhanced climate change preparedness at Rutgers. It will summarize insights from the Town Halls held during February 2020, as well as other physical and social data collected, and it will discuss the need for effective communication protocols. The section will also briefly discuss insights and lessons from how Rutgers is responding to COVID-19 for climate preparedness.

a. Urgency of climate preparedness
b. Insights from town halls
c. Necessary and effective communication protocols
d. Climate preparedness amidst a global pandemic

2. **Development of climate change risk profile.**

This section will describe key climate-change related extreme events and long-term changes affecting New Jersey, including those affecting New Brunswick, Camden, Newark campus regions and surrounding communities and off campus facilities and sites.

a. Extreme events
b. Long-term changes

3. **Assessment of climate change exposures and impacts**

This section will describe potential climate change exposures and impacts for key sectors at Rutgers and for major types of activities.

a. Impacts by sector (health, water, energy, communication/IT, transportation, housing, food, sports and recreation, agriculture, fisheries, natural resources and land use)
b. Impacts by activity (teaching/learning, research, service)

4. **Identification of climate change vulnerabilities**

This section will examine vulnerabilities of student populations, faculty, and staff and local communities.

a. Students (general, specify vulnerable groups): e.g., students who live in unairconditioned dormitories; international students; students that commute; students with mental and physical health challenges
b. Faculty and staff (general, specify vulnerable groups): e.g., workers involved in the food supply chain; maintenance and repair workers; janitorial staff; professors and instructors that commute
c. Local communities (general, specify vulnerable groups): renters, immigrant populations, low-income residents, small business owners, rural vs urban, coastal vs inland

5. **Lessons from other universities for climate change preparedness**

This section will review plans and strategies for climate change preparedness among other universities in the region and in the Big Ten in order to identify lessons that may be relevant for Rutgers.

6. Description of current strategies at Rutgers for climate change preparedness

This section will describe current efforts to ensure that Rutgers is prepared for climate-related extreme events both on and off campus. The section will include several case examples of ongoing efforts to enhance climate preparedness for off campus sites.

a. Office of Emergency Management (lessons from Sandy have been largely incorporated into day-to-day activities)
b. Other units at Rutgers, e.g. Environmental and Occupational Health Sciences Institute, ONJSC, RCI, EOAS
c. Case examples of climate risks and preparedness at off-campus research sites;
    a. Jacques Cousteau National Estuarine Research Reserve and Rutgers Marine Field Station
    b. Haskin Shellfish Research Laboratory
    c. Meadowlands Environmental Research Institute

7. Lessons from COVID-19 response for climate change preparedness planning

This section will discuss emerging lessons from the ongoing COVID-19 response for climate change planning at Rutgers.

a. Necessity of energy and communication infrastructure: COVID-19 reveals the roles of communication infrastructure and energy infrastructure that are key for continuity of the university's research, teaching, service missions. This suggests that ensuring continuity of energy/communication infrastructure from outages should be a high priority. Immediate concerns about risks of power outages from extreme events. Longer-term concerns about evacuation planning amidst continuing need for social distancing.
b. Significant impacts on research activities suggests a need for additional planning for research continuity in order to prepare for closures of labs, cancellation of international and domestic travel, postponement of face-to-face human subject research.
c. Significant impacts on teaching activities: rapid shift to online instruction; limitations of online delivery
d. Significant impacts on service activities: cessation of many public programs, etc.
e. Uneven vulnerabilities and impacts among student populations. The shutdown of campus and shift to online instruction is particularly challenging for a number of groups, including:
    a. students who are food and housing insecure
    b. student who have lost on-campus employment and off-campus jobs
    c. international students who are not able to return home
    d. students who lack internet or computer access at home
    e. students who take on additional family or work responsibilities
    f. essential staff who need to continue coming to campus

8. Identification of options and strategies for Rutgers to enhance preparedness

This section will identify a broad set of strategies to enhance preparedness at Rutgers.

a. Monitoring of changing climate risks (e.g. flooding, sea level rise, heat)
b. Enhancing climate/weather risk communication

c. Ensuring continuity of teaching, research and service
d. Reducing vulnerability of particular groups
e. Adaptation planning by campus-community region
f. Adaptation planning at off-campus research sites
g. Adaptation planning by sector
h. Recommended additions/enhancements

9. Recommendations for immediate actions

This section will recommend immediate and near term actions to enhance climate change preparedness at Rutgers.

II.7. Climate-Positive, Equitable Economic Development

Working Group 7 has been tasked with providing input on three broad topics:

- Define a concept of climate-positive, equitable economic development that can be applied to task force efforts – what does it mean to be a good steward of the environment and equity while considering economic development strategies for the university and broader economy?
- How can we achieve/contribute to climate-positive, equitable economic development through functions of the university?
- How do the Rutgers climate-positive, equitable economic development efforts align with/contribute to state policies for the broader economy?

Working Group 7 will function as a resource to Working Groups 1-6, assisting with the identification of economic opportunities generated in the transition to a carbon neutral university, and recommending equitable programs and policies for preparing the Rutgers community and campus communities (i.e. individuals living in NB, Piscataway, Newark, Camden) to take advantage of such opportunities and to connect to state government climate policies and initiatives.

The team considered the following in developing this interim report:

- What programs/activities are already in place at RU? (i.e. social/equity oriented economic development programs)
- How can we engage external stakeholders, such as surrounding communities, state entities, local organizations, etc. in regards to our topic area?
- Identify prior approaches - examples of what other universities are doing, identify exemplars; What are opportunities and challenges for adopting these approaches at Rutgers?
- Develop a menu of options to pursue in more detail for the final report, which will be due in September
- Identify cross cutting areas with other working groups (i.e. improving economic development opportunities may involve improving public transit).

1. **Defining a concept of climate-positive, equitable economic development that can be applied to task force efforts. Specifically, what does it mean to be a good steward of the environment and equity while considering economic development strategies for the university and broader economy?**

A primary task of the working group is to define the concept of ***climate-positive, equitable economic development***.

In pursuit of climate-positive, equitable economic development, Rutgers University will implement policies, programs and projects that accelerate 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.

Economic development refers to both a process and a goal. A *process* of incremental economic development of New Jersey's current fossil-fuel driven patterns of production, trade and

consumption will not be sufficient to avert the catastrophic effects of climate change. Instead, what is required is nothing less than the structural *transformation* of the economy to one that is *climate positive*. **A climate-positive economy produces net-negative carbon emissions and is resilient to climate and related impacts and shocks.**

As a normative and policy *goal*, economic development broadly refers to a process of improvement in social well-being. As a desired social end, development must be sustainable and fair. *Sustainable economic development* leads to improved capacity to meet the needs of the present generation without degrading the ecosystem services essential to the capacity of future generations to meet their own needs.[23] Sustainable economic development promotes environmental stewardship and the conditions for public health. The APLU definition cited above points to the role of the university in creating the conditions for "sustainable growth" in the capacity to contribute to the "advancement of society".

In order to be equitable, climate-positive economic development (or any activity) must be fair in two primary dimensions: distribution and participation.[24]

Distribution concerns how the total 'economic and social costs and benefits' are divided among different social groups.

'Do No Harm': An equitable distribution does not significantly add to the burdens or risks of marginalized or vulnerable people, nor unfairly burden any social group. Any unavoidable harms should be mitigated or compensated.

'Fair share': An equitable distribution of benefits first meets the needs of marginalized or vulnerable people and, wherever feasible, provides opportunity for all.

Participation concerns the role and influence in decision-making processes (i.e., power) exercised by different social groups.

'Fair voice': Equitable participation in economic development means all social groups have a meaningful opportunity to participate in decision-making concerning the policies and rules governing the economy.

'Fair shot': Providing fair opportunity to for all to participate in economic development may require deliberate action to remove obstacles facing particular groups and to compensate for past discrimination they may have faced.

In addition, equitable development at one scale does not have negative downstream effects on others. As the state university, the primary scale of action for Rutgers is New Jersey. In addition, Rutgers bears a responsibility to assist in the economic development of the communities where its campuses are based: New Brunswick, Newark and Camden. Rutgers economic activities will thus 'do no harm' to the surrounding communities and, wherever possible, will support opportunities for local businesses, employment, workforce development, public transportation, facilities, the arts, civic life and many other factors that contribute to a vibrant local economy and resilient community. With its size and geographic footprint, Rutgers can serve

[23] The World Commission on Environment and Development, *Our Common Future*, 1 edition (Oxford ; New York: Oxford University Press, U.S.A., 1987).

[24] This definition of equity is a simplified version of the framework presented in: Melanie McDermott, Sango Mahanty, and Kate Schreckenberg, "Examining Equity: A Multidimensional Framework for Assessing Equity in Payments for Ecosystem Services," *Environmental Science & Policy* 33 (November 1, 2013): 416–27, https://doi.org/10.1016/j.envsci.2012.10.006.

as a case study and model of how a major public university or other large public institutions can catalyse the transition of a sprawling megalopolis to a climate-positive economy. Through its global academic networks, Rutgers can link and contribute to national and worldwide efforts to combat climate change.

There is a direct connection between social well-being and climate-positive development that embraces, but also surpasses, 'the economic.' For development to be climate-positive it must produce a state economy and local municipalities that are resilient to the impacts of climate change. For it to be equitable, it must leave no one behind. The *social* elements of resilience are critical (and often overlooked). Economic development that is climate positive will foster social resilience by building social capital (skills and networks), public health, public education and social solidarity in ways that support factors critical for climate change mitigation and adaptation, such as innovation, collective problem-solving, collective action and social 'safety nets' that protect the vulnerable.

Wherever possible, the economic investments made by Rutgers to promote carbon-neutrality and climate resilience will also benefit surrounding municipalities. For example, providing:

- community resilience in the form of charging stations for bikes, scooters, cell phones, wheelchairs, and medical devices;
- bus rapid transit (dedicated lanes and signal priority) for Rutgers' fleet of electric buses with free or subsidized travel for community members.

Our concept was informed by, but does not rely on, an assessment of what other Universities are doing. Integrating efforts to address climate change with economic development goals is an idea that appears in the carbon neutrality plans of universities, in the economic development strategies of U.S. cities, and in the frameworks of global organizations. There is no standard, widely accepted definition of this topic. Our concept reflects the unique position and potential of Rutgers and its carbon neutrality actions (2nd largest employer in New Jersey; land-grant institution; deep and broad expertise in climate science and related disciplines).

2. Rutgers' Role in achieving/contributing to climate-positive, equitable economic development through functions of the university.

In 2017, the OECD published the report "Investing in Climate, Investing in Growth", concluding that initiating measures to tackle climate change into regular economic policy will have a positive impact on economic growth over the medium and long term (OECD, 2017). Integrating this economic perspective into climate change mitigation measures is an important task for all economic actors to ensure the economic aspect of their triple bottom line (Elkington, 1998). Additionally, climate-positive economic development helps to create the conditions for sustainable development and scale up infrastructure investment to sustain growth and development, promotes an inclusive transition, and fosters climate equality. As institutions of education and economic actors embedded in their communities, universities also must reflect on their role in modeling climate positive transition, identifying and implementing possibilities to promote these objectives.

Considering the breadth of their operations, universities have different options to advance climate-positive, equitable economic development, most prominently in education, research, and their own operations. These measures have been initiated by many universities and advanced by students, researchers, and the institutional leaders. This includes everything from lectures, conferences, and activism on climate change mitigation to the introduction of measures to reduce

plastic waste and support recycling on campus grounds or in the region. However, universities can also relate their actions to the broader economic development on a national or international level. In order to do so, universities are preparing and beginning to implement climate action plans, connecting with other institutions and actors from the private industry.

Programs/activities are already in place at Rutgers

There are dozens of well-established research centers and faculty research programs at Rutgers that are relevant to developing a climate-positive, socially equitable set of institutional policies and actions. These resources are coordinated at various levels throughout the university by deans, Institute directors, the Office of Research and Innovation in the Rutgers-New Brunswick Provost's office, the Office of Research and Economic Development, and other administrative units, to foster a forward-looking research agenda via cross-school collaboration, seed funding, and extramural grant support. Rutgers is also a member of the Association for the Advancement of Sustainability in Higher Education and the University Climate Change Coalition.

A list of Rutgers assets is provided in Appendix VIII. This is only a sample of the existing Rutgers assets, and further work is needed to generate a comprehensive assessment of current assets that can be leveraged for this initiative.

Stakeholder Engagement

- There are initiatives at the community-level that are working towards the broad goals of climate-positive, equitable economic development (though the organizations may categorize or define their goals using different terminology). The organizations leading these initiatives are potential partners and resources to the Working Group. Below is a sampling of these initiatives.
    - **Lincoln Park Coast Cultural District, Inc.** (LPCCD) in Newark: A non-profit 501C (3) organization with a mission to plan, design and build a comprehensive arts and cultural district in the Lincoln Park/Coast area of the City of Newark
        - *Lincoln Park Fossil Free Learning Lab*: LPCCD facilitates urban agriculture, sustainable design, energy efficiency, home energy audit and renewable technology workshops to underprivileged and/or unemployed constituents of New Jersey communities.
        - *Green Neighborhood Pilot Project*: Through this federally funded project, LPCDD installs energy efficiency measures and provides targeted weatherization services, with a goal to reduce utility costs for local residents while simultaneously reducing carbon emissions.
    - **Camden SMART Initiative** in Camden: Oversees a comprehensive network of green infrastructure programs and projects (including green infrastructure workforce training programs) for the City of Camden; A collaboration between the City of Camden, Camden County Municipal Utilities Authority, Cooper's Ferry Partnership, Rutgers Cooperative Extension Water Resources Program, New Jersey Tree Foundation, NJ Department of Environmental Protection, and Camden residents

- **PowerCorps Camden** in Camden: PowerCorps Camden members are a team of young leaders from Camden City serving to tackle pressing environmental challenges in their community; Projects aim to improve storm water management, clean and green vacant lots, improve community space and parks for Camden's young people, and revitalize public land in the city
- **Cooper's Ferry Partnership**: private, non-profit corporation dedicated to planning and implementing high-quality urban redevelopment projects to revitalize the City of Camden
- **New Brunswick Tomorrow (NBT)**: For more than 40 years, NBT has driven social revitalization for the city by taking on the issues that matter most to city residents and families.
  - New Brunswick Ciclovia: Launched in 2013 as a collaborative partnership by J&J, the City of New Brunswick, NBT, and Rutgers to encourage community members to embrace active living. During Ciclovia, the streets become car-free to create a new healthy, sustainable and vibrant city street experience.
  - Economic Development: Through the Esperanza Neighborhood Project, NBT supports French Street area businesses through enhanced marketing, technical assistance, and targeted deployment of beautification funds. NBT has assisted in the creation and implementation of Mercado Esperanza, a flexible community marketplace celebrating the food, arts and culture of New Brunswick and its diverse Latino community.
- **Sustainable Jersey**: A nonprofit organization that provides tools, training, and financial incentives to support communities as they pursue sustainability programs, and a Sustainable Jersey certification program to recognize municipalities that are leaders in sustainability
- **New Jersey Sustainable Business Registry**: Created to recognize and promote sustainable businesses, nonprofit organizations and higher education institutions across the state. The registry is open to companies of all types and there is no cost to join.

- Each Rutgers Working Group should identify whether the implementation of any of its recommended actions should be tracked because of its potential for information transfer through the Climate Change Resource Center.

- Meet with local organizations such as New Brunswick Tomorrow and engage them in the planning process. NBT has tremendous connections with the local community and could inform the equitable considerations of our work.

- It is important that community members are involved in helping to figure out how to create more green jobs so that they aren't the recipient of certain choices made at the university (from Town Hall). They should be presented with opportunities for upward mobility and fair wages through union jobs, job-training and upskilling (e.g., for construction and retrofitting, maintenance, etc.).

- Governor Murphy has designated May 11 as Economic Development Day in New Jersey. The SEBS/NJAES Office of Economic Development and Innovation has been in contact with NJ EDA about organizing an event. It is proposed that that this event be used to engage with both internal and external stakeholders on the topic of Climate-Positive, Equitable Economic Development. Presentations about the CTF effort, activities already going on at RU in this area, related state policies/programs presented by someone from the state, and targeted discussion with the audience. (to be pursued in 2021)

- RU emergency preparedness system should expand to local communities; it is important to make sure we reach disenfranchised people who aren't already part of groups, perhaps by working with social workers, etc.; if we only work with non-profits, businesses, etc. in local community, we are still missing people (From Town Hall)

- Collaborate with Sustainable Jersey to provide more empirical impact data and visibility for their programs-within Rutgers/NJ

- Deepen collaboration with I-Corps to foster promising clean-tech innovations

- Meet with local organizations such as Coopers Ferry Partnership and engage them in the planning process. CFP has tremendous connections with the local community and could inform the equitable considerations of our work.

- In Camden we partner with the other Eds and Meds, we could propose a larger effort that includes all the other organizations in Camden.

Prior Approaches

Examples of actions taken by other comparable institutions are provided below. Additional research is needed to expand the list, and criteria developed for deciding which strategies best align with the mission and capabilities of Rutgers.

- UC Santa Barbara: Environmental Humanities Institute: white paper on Nearly Carbon Neutral (NCN) conferences https://hiltner.english.ucsb.edu/index.php/ncnc-guide/

- University of Maryland Francis King Carey School of Law: Developing a climate adaptation finance toolkit for communities

- University of Colorado: Eco-Visits program trains students to conduct energy audits and install energy-saving upgrades; students living off-campus can access free energy audits

- Cornell University: One of the first universities in the country to integrate sustainability management tools into a university management academy; University leadership receives training in triple bottom line decision making

- Cornell University: Cornell Global Labor Institute works with trade unions to solve major environmental (and other) challenges, such as climate change

- University of Pittsburgh- "Building Beyond the Campus: Leveraging Partnerships and Creating Connection" SCUP – Virtual Mid-Atlantic Regional Conference *Joe Reagan (Exec VP, Wexford Science + Technology)*. Aim to create a "Knowledge Community":
    - Old Paradigm was: Suburban, Car-centric, "Disintegrated" – to protect intellectual property, Homogenous, Inflexible, Dull
    - The new vision is: Urban, Pedestrian, "Integrated", Diverse, Adaptable, Inspiring
    - Elements of a thriving knowledge community: Univ Engagements, Finance, Community inclusion, Built env – streetscapes, etc, Corporate, Innovative infrastructure – shared office, shared labs, lots of amenities, Programing – brings people together, formal or informal activity: lunch and learn, etc.

- Northern Arizona University: Partners with the community to provide opportunities for students in the green economy, such as through its ongoing support of the Coconino County Sustainable Economic Development Initiative

- Harvard University: Green Revolving Fund provides up-front capital for projects that reduce the university's environmental impact, Ivy Plus

- Princeton Sustainability https://sustain.princeton.edu/. Princeton has an office of Sustainability with a full-time Director

- NJIT https://csla.njit.edu/programs/ess

- NJIT https://centers.njit.edu/research-areas/sustainable-systems/

- NJIT https://njit.campuslabs.com/engage/organization/green

- Stockton University https://stockton.edu/sciences-math/sustainability.html

- University of Michigan https://seas.umich.edu/

- University of Michigan http://sustainability.umich.edu/

- Babson College https://www.babson.edu/about/sustainability/

- Association for the Advancement of Sustainability in Higher Education (Rutgers is a member): https://www.aashe.org

- Higher Education Sustainability Initiative: https://sustainabledevelopment.un.org/sdinaction/hesi

- International Universities. So far, there is no comprehensive overview of best practices and leading institutions that deal with climate positive economic development in the European context. The level of engagement varies greatly across universities, and often it

is hard to analyze the thoroughness and consequence with which universities accept and approach their responsibilities. Additionally, there is no comprehensive guideline how this responsibility can be approached best. Therefore, initiatives such as the European Climate Knowledge and Innovation Community (Climate-KIC), founded and funded by the European Institute of Innovation and Technology, an EU institution, have started to connect actors and build a knowledge base. However, universities still act and report mainly on their own behalf. For example:

- Oxford https://www.sbs.ox.ac.uk/research/centres-and-initiatives/skoll-centre-social-entrepreneurship

- IARU International Alliance of Research Universities: campus sustainability initiative launched at Copenhagen COP: http://www.iaruni.org/sustainability

- University of Northern British Columbia: Collaboration with the Prince George Chamber of Commerce's Chamber Carbon Action Plan - through the project, the chamber pairs businesses with students (most come out of a Carbon and Energy Management class) who create carbon footprint analyses to internationally recognized standards. The students interact directly with the businesses to understand their operational realities, and earn valuable experience, contacts and skills. The chamber also facilitates project funding and generates publicity around the initiative.

Menu of options to pursue in more detail for the final report (due in September).

- International Models: Working Group 7 proposes the analysis of a network of core partners of the Climate-KIC and the initiative itself, focusing on the initiative's and partners' activities related to economic development in a broader sense. This assessment will mainly focus on the innovation programs of the KIC that seek to assist actors working on economic solutions to climate change issues and is mostly carried out by the partner institutions themselves. In order to analyze engaged European universities in-depth, only a part of the roughly 20 core partners will be selected, ensuring the inclusion of different countries, institution sizes and academic focuses. These universities include the Technical University of Berlin (Germany), Chalmers University of Technology (Sweden), Technical University of Denmark, Utrecht University (Netherlands), and Wageningen University (Netherlands). Additionally, the analysis will include overarching initiatives that these actors are a part of, such as the European Climate Research Alliance or the Graphene Flagship. In the form of a case study, the activities of these institutions over the last five to ten years will be presented, relating them to the national and supra-national environment they operate in. Last, the actions will be evaluated for their successes and failures, drawing conclusions for best-practice approaches that might be adopted by more educational institutions.
- Explore concept of Carbon Credits that can benefit distressed communities. A **Carbon Pricing Affinity Group** within the University Climate Coalition (U3) has reconvened recently. How can this be implemented at Rutgers?
- U3 has launched a Climate Solutions Acceleration Fund for small projects ($5K-$10K) to advance cross-sector (campus and external partners) climate action**.** As a UC3 member, Rutgers submitted in application in March 2020. Rutgers proposed to use the funds as a planning grant to work in partnership with the urban communities that host

our three primary campuses (Newark, Camden, New Brunswick, New Jersey) to undertake collaborative town-gown climate change planning that (a) advances the university's plan on carbon neutrality and climate resilience; (b) Strategy 6 of the state Energy Master Plan to support Community Energy Planning and Action in Underserved Communities; and (c) that results in improved health equity outcomes, particularly for goals associated with outcomes identified in Healthy New Jersey 2030.

- Recommend or require every unit to do a comprehensive energy audit or inventory of carbon-footprint of all types of research activity undertaken at the university, from labs to conference and research travel. Provide simple methodology for analyzing and measuring carbon consequences of research activity.
- In-depth research of actions taken, or programs implemented by other comparable institutions and identification of criteria for deciding which strategies best align with the mission and capabilities of Rutgers.
- Explore job creation outcomes as a result of Rutgers adoption of climate positive practices, i.e. prioritizing hiring of employees from local community.
- Investigate if economic impact analysis of Rutgers purchasing, building requirements, HR changes can be conducted (possibly IMPLAN analysis).
- Explore and leverage existing partnerships with companies in NB, Camden and Newark (Prudential, etc) to implement climate positive, equitable economic development strategies. (from Town Hall)
- Explore RU program development that focuses on making local communities and businesses (ie agriculture) more climate resilient.
- Creation of a portal for communities to access resources at RU (expertise) that can assist them in developing climate action plans.
- Creation of new green businesses from RU technologies; locate a green business incubator in the campus communities (from Town Hall)
- Develop student-led/faculty advised green tech investment fund to support student-driven sustainability-oriented venture
- Work with non-profits/state to establish micro-loan program for small businesses to help them develop/implement green practices (from Town Hall)
- Explore corporate sponsored research collaborations/contract research with companies seeking green/clean chemistry innovation
- Entrepreneurship Coalition – work with/create student entrepreneurship in green/clean concepts

Identify cross cutting areas with other working groups (i.e. improving economic development opportunities may involve improving public transit).

- Jobs: create majors that train students for climate jobs in the future and also provide training for green jobs (Job creation mentioned numerous times in Town Hall meetings); train/develop career development professionals to identify/"socialize" these opportunities with students as part of ongoing corporate relationships

- Develop Tech Advance type program in ORED that focuses on climate positive technology development and commercialization.

- University should use its considerable purchasing power to support "green things". Companies that do business with Rutgers should be required to meet certain sustainability thresholds. There also needs to be transparency around purchases. Clear, transparent guidelines will help. The triple bottom line approach should influence these guidelines. (from Town Hall)

- Land use and planning – NJAES research farm sustainability planning; creating Living Labs; estimating carbon footprint of the farms.

- Build a circular economy within the campus. There are no No-packaging/refillable shops/ consignment stores. Job creation opportunity (from Town Hall)

- Work with the business of fashion folks regarding reusable clothing. Could be used both by the community & by RU. Job creation opportunity (from Town Hall)

- Workshops for students and community on how to build / do things in sustainable ways (e.g., make your own paper, reusing glass & clothing) – could perhaps open a store to sell wares produced this way. Potential for job creation (from Town Hall)

3. How do the Rutgers climate-positive, equitable economic development efforts align with/contribute to state policies for the broader economy?

In thinking about the unique position and possibility for Rutgers to impact the broader economy, it is useful to document alignment with current state-level climate change and economic development initiatives, and to recognize opportunities for influencing future policy directions. Some current state-level initiatives are described below, but additional work is needed to develop a comprehensive list of current and relevant efforts, and to identify policy gaps, and best practices for addressing such gaps.

- **New Jersey Energy Master Plan**: The Murphy Administration describes clean energy as "vital for our future from both an economic development and environmental sustainability policy perspective". Through Executive Order 28, Governor Murphy set an ambitious goal of **100% clean energy by 2050**. The seventh strategy of the state Energy Master Plan is: **Expand 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.** Specific elements include:
    - Establishing a clean energy job training program to assist current New Jersey workers to pivot their skills as necessary to meet changing industry needs and a vocational training program to establish a pipeline of well-qualified, modern energy specialists
    - Establishing a Clean Energy New Technology Innovation Center and other state-level resources to support research, development, and commercialization for promising and emerging clean energy innovations

    - Establishing a green buildings hub to develop workforce training, awareness and education for builders, architects, contractors, engineers, real estate agents, and code enforcers to address the lack of awareness, education, training, and accessibility of recently developed and emerging-market technologies and appliances that can create barriers to both the implementation of building efficiency measures and building electrification.
- As part of the development of the Rutgers Plan, the Heldrich Center for Workforce Development and the School of Management and Labor Relations can provide each Workgroup with assistance in identifying the extent to which any proposed action has the potential to offer specific workforce development opportunities as part of the state's clean energy workforce policies/programs. Similarly, the Rutgers Office of Research and Economic Development can provide each Workgroup with assistance in identifying any actions for which there is the potential for emergence of technological innovations. These efforts should be communicated by the university to the Governor's office to identify opportunities for collaboration during the implementation of the Rutgers Plan.
- As part of the completion of the Rutgers plan, the university should identify specific actions that will involve pilot and demonstration projects that can serve to inform and scale up state policy. These efforts should be communicated by the university to the Governor's office to identify opportunities for collaboration during the implementation of the Rutgers Plan.

- **Offshore Wind**: Nation's largest single solicitation of 1,100 MW awarded in June 2019; Pipeline of 3,500 MW by 2030 signed into law
    - **New Jersey Offshore Wind Supply Chain Registry:** Allows companies to publicly indicate their interest and ability to supply components and services for US East Coast offshore wind projects; Serves as a resource for companies looking to buy from and partner with New Jersey-based firms.
    - **Wind Innovation & New Development (WIND) Institute:** Public-private partnership will serve as a hub for research, innovation, and workforce development for the offshore wind industry

- **Solar:** 300+ operating grid-level solar installations; #3 ranking in ease with which companies can procure renewable energy in the U.S.

- **Electric Vehicles:** 310+ electric vehicle charging stations; 840+ electric vehicle charging outlets
    - **Partnership to Plug-In**: A first-of-its kind partnership to register 300,000 electric vehicles by 2025

- **Energy Storage**: New Jersey is one of only six states with an energy storage target over the next decade (2,000 MW by 2030); There are currently eight operational energy storage projects

- **Green Buildings:** New Jersey is the first state in the U.S. to require* new construction projects to consider climate change impact (*for projects seeking Department of Environmental Protection permits)

- **Environmental Justice and Equity**:
  - **New Jersey Executive Order 23** (2018) recognizes 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." A 2019 analysis by the Rutgers Bloustein School indicates that, of the 2,010 Census Tracts in New Jersey, 160 have a 25% or greater distribution of environmental factors per square mile than the statewide average and 94% of those tracts have a high population that is low-income and high minority.
  - Implementation of the actions in the University's Carbon Neutrality and Climate Resilience Plan can provide a valuable opportunity for the University to demonstrate its commitment to equity and the concepts in Executive Order 23 by considering any potential community environmental justice issues in development of the plan and by seeking opportunities to have elements of the plan, and its implementation, provide environmental and climate change benefits to the communities in which university facilities are located.
  - The state **Energy Master Plan** has several specific commitments that are focused on directing clean energy efforts to low and moderate income and Environmental Justice communities:
    - Increase clean transportation options in low- and moderate-income and environmental justice communities
    - Develop a comprehensive Community Energy Plan program in concert with local community groups to identify energy needs and establish ways to participate in and benefit from the clean energy transition at the local level, prioritizing education and incentives in low-income and environmental justice communities
    - Maximize solar rooftop and community solar development in urban and low- and moderate-income communities using the local workforce
    - Prioritize energy efficiency programs in low- and moderate-income and environmental justice communities
  - The **Health in All Policies** (HiAP) goal of the Murphy Administraion seeks to integrate health considerations into policymaking across sectors to improve the health of all communities and people. HiAP often has a strong focus on integrating health considerations into sectors that represent social determinants of health that drive many health inequities. HiAP was a significant component of the health transition plan, with support from the state's public health community.
  - Rutgers' Bloustein School is New Jersey's leading practitioner of Health Impact Assessment (HIA. Bloustein recently undertook a rapid HIA of New Jersey's draft Energy Master Plan during the EMP comment period on behalf of the New Jersey Climate Change Alliance. With support from the Murphy Administration, the Bloustein School currently has a HiAP proposal pending with the Robert Wood Johnson Foundation.
  - Rutgers Bloustein School experts can conduct a rapid Health Impact Assessment in fall 2020 on draft actions to be included in Working Group Reports to demonstrate the value of using health and health equity as a factor in selecting final actions.

- **HR 763**
  - Sustainability work within carbon dividend legislation

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Examples of opportunities for the Rutgers Climate Action Plan to contribute to broader state policy

Timeframe	Possible Action for Rutgers Plan	Important Background	State Policy Impact
Short Term	**Health in All Policies** - Rutgers Bloustein School experts conduct a rapid Health Impact Assessment in fall 2020 on draft actions to be included in Working Group Reports to demonstrate the value of using health and health equity as a factor in selecting final actions.	• Health in All Policies (HiAP) is a goal that seeks to integrate health considerations into policymaking across sectors to improve the health of all communities and people. HiAP often has a strong focus on integrating health considerations into sectors that represent social determinants of health that drive many health inequities. • Health Impact Assessment (HIA) is one tool to achieve HiAP. HIA is a process that is designed to use evidence to predict potential health outcomes of a decision in a "non-health" decision also with a focus on disproportionate health outcomes on different racial, income, geographic and other groups. • The Rutgers Bloustein group is New Jersey's leading practitioner of HIA. In consultation with New Jersey public health leaders and national HIA experts, it recently undertook a rapid HIA of New Jersey's draft Energy Master Plan during the EMP comment	The outcome of this action is that it can provide tangible support to broader state policy by documenting health and health equity outcomes of specific climate change and climate resilience actions that are likely to be elements of the Murphy administration policies. Additionally, this action can also provide demonstration value of concepts of integrating health and health equity considerations into other sector decision-making such as energy, transportation and buildings, all of which are stated goals of the Energy Master Plan.

		period on behalf of the New Jersey Climate Change Alliance. • HiAP is a policy area that the Murphy Administration has been wanting to invest in since inauguration and it was a significant component of the health transition plan, including with significant support from the state's public health community. With support from the Murphy Administration, the Rutgers Bloustein School currently has a HiAP proposal pending with the Robert Wood Johnson Foundation. • Rutgers currently has a contract with a national HiAP leader to advise the university on strategies it can undertake to better position the university to be a national leader on advancing a Culture of Health.	
Short and Mid-Term	**New Jersey Climate Change Resource Center** – Each Rutgers Working Group will identify whether the implementation of any of its recommended actions should be tracked because of its potential for information transfer through the CCRC as suggested in three possible areas.	• In January 2020, Governor Murphy signed a law establishing the New Jersey Climate Change Resource Center at Rutgers University. The CCRC is charged with using impartial and actionable science to advance government, public, private and nongovernmental sector efforts to adapt to and mitigate climate change. • With this mission, the CCRC provides a valuable platform for Rutgers to deliver specific "lessons learned" from the implementation of its actions to inform broader state and local policies both with regard to climate mitigation and resilience. • Tasks that the CCRC are statutorily charged with that may be most informed by "lessons learned" from the Rutgers experience with implementation of its actions include: a. developing and delivering technical guidance to practitioners to enhance	The actions to be contained in the Rutgers plan have the potential to spearhead new and innovative climate change mitigation and resilience strategies. Documenting what works and transferring that knowledge in practical ways to inform state and local public policy, as well as the intended practitioners served by the CCRC, can be a strong partnership with the CCRC.

		adaptation, mitigation, and resilience in the public, private, and nongovernmental sectors; b. undertaking pilot projects that can be replicable throughout the State and that demonstrate effective mitigation strategies or reduce the risks facing populations most vulnerable to climate change; c. enhancing the State's capacity to address climate risks and impacts through outreach training, engagement, and education of policymakers, practitioners, the media, and other key stakeholders. • It is important to emphasize that the connection between the Rutgers Plan and the CCRC should emphasize using the CCRC as a mechanism to assist with disseminating practical state and local policy and program and technical "lessons learned" from Rutgers' *development* and *implementation* of actions in its Plan.	
Short and Mid-term	**Environmental Justice and community-based efforts** – Each Rutgers Workgroup will consider opportunities for their recommended actions to contribute to improvements in Environmental Justice and low and moderate income communities in the regions in which Rutgers will seek opportunities to develop and implement actions in ways that involve partnerships with communities in which Rutgers facilities are located. This may include conducting demonstrating and piloting "town-gown" community-based energy/climate change planning partnerships similar to the community	• New Jersey Executive Order 23 (2018) recognizes 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." • 2019 analysis by the Rutgers Bloustein School indicates that, of the 2,010 Census Tracts in New Jersey, 160 have a 25% or greater distribution of environmental factors per square mile than the statewide average and 94% of those tracts have a high population that is low-income and high minority.	Implementation of the actions in the University's Carbon Neutrality and Climate Resilience Plan can provide a valuable opportunity for the University to demonstrate its commitment to Environmental Justice and the concepts in Executive Order 23 by considering any potential community Environmental Justice issues in development of

	energy planning initiatives outlined in the EMP or mirroring other EMP concepts to "jumpstart" them as Rutgers-community partnerships.	• The state Energy Master Plan has several specific commitments that are focused on directing clean energy efforts to low and moderate income and Environmental Justice communities: o 1.1.7 Increase clean transportation options in low- and moderate-income and environmental justice communities o 6.1.1 Develop a comprehensive Community Energy Plan program in concert with local community groups to identify energy needs and establish ways to participate in and benefit from the clean energy transition at the local level, prioritizing education and incentives in low-income and environmental justice communities o 2.3.3 Maximize solar rooftop and community solar development in urban and low- and moderate-income communities using the local workforce o 6.1.3 Prioritize energy efficiency programs in low- and moderate-income and environmental justice communities • Rutgers University has facilities that are located in communities that have disproportionate environmental burden, low income and high-minority populations.	the plan and by seeking opportunities to have elements of the plan, and its implementation, provide environmental and climate change benefits to the communities in which university facilities are located. Such actions can provide an important leadership role statewide and also reinforce that the concepts in Executive Order 23 are practical and manageable even by large anchor institutions.
Mid-term	**Information sharing with other public entities about climate change strategies** – The final Rutgers Plan will include a commitment to have the university be a partner to share information with other state and local entities, including public	• Many states that are climate change leaders often complement their climate change policies with some sort of state "lead by example" policy in which the Governor directs adoption of climate change mitigation and/or resilience efforts be adopted for state buildings	The Rutgers Carbon Neutrality and Climate Resilience Plan may provide valuable insights for state and local governments as well as other public academic

	academic institutions, about Rutgers' efforts. The final Rutgers plan will outline a specific action plan for a communication effort and knowledge transfer effort with other state and local public entities as well as other public academic institutions.	and operations. The New Jersey Energy Master Plan includes such provisions with regard to climate mitigation components related to state buildings, such as: o 3.3.4 – Build state-funded projects and buildings to a high performance standard; o 3.3.5 – Improve energy efficiency in, and retrofit state buildings to, a high performance standard; o 4.1.1. – Electrify state facilities • Some states also "lead by example" with regard to climate resilience. See: here. • However, Executive Order 89 (2019) does not include similar provisions with regard to climate resilience. • Public institutions (state and local governments, public colleges and universities) face particular constraints in management of assets most notably financial constraints.	institutions in terms of assessing climate impacts to public assets and developing plans to enhance resilience recognizing the constraints of operating in the public sector; this may also inform overall emerging state resilience policy. The Rutgers Plan may also provide the state and local government and other public academic institutions with insights with regard to climate mitigation strategies as well.
Short and mid-term	**Contributing to Clean Energy Economy** – As part of the development of the Rutgers Plan, the Heldrich Center for Workforce Development and the School of Management and Labor Relations will provide each Workgroup with assistance in identifying the extent to which any proposed action has the potential to offer specific workforce development opportunities as part of the state's clean energy workforce policies/programs. Each Workgroup should also be charged with identifying opportunities for each of its actions to align with valuable undergraduate research, scholarship, and experiential field and teaching	• The seventh strategy of the state Energy Master Plan is: Expand 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. Specific elements include: o Establishing a clean energy job training program to assist current New Jersey workers to pivot their skills as necessary to meet changing industry needs and a vocational training program to establish a pipeline of well-	There appears to be tremendous opportunity to connect the technological and workforce innovations that can emerge from the Rutgers Carbon Neutrality and Climate Resilience Task Force actions to inform policies and programs associated with state efforts/policies to "incubate" clean energy technologies and state efforts/polices to prepare and train a clean energy workforce.

	experiences especially in STEM fields and with ideas for attracting students who are underrepresented in STEM disciplines. Similarly, the Rutgers Office of Research and Economic Development will provide each Workgroup with assistance in identifying any actions for which there is the potential for emergence of technological innovations. These efforts will be communicated by the university to the Governor's office to identify opportunities for collaboration during the implementation of the Rutgers Plan.	qualified, modern energy specialists. o Establishing a Clean Energy New Technology Innovation Center and other state-level resources to support research, development, and commercialization for promising and emerging clean energy innovations. o Establishing a clean buildings hub to develop workforce training, awareness and education for builders, architects, contractors, engineers, real estate agents, and code enforcers to address the lack of awareness, education, training, and accessibility of recently developed and emerging-market technologies and appliances that can create barriers to both the implementation of building efficiency measures and building electrification. • Two signature initiatives of the current Governor is tuition free community college and the Garden State Guarantee that, will offer students with household incomes less than $65,000 zero tuition after exhausting other sources of aid. With these efforts, there is the potential for a greater number of students, including non-traditional students, to enter college for two-year degrees and four-year degrees.	Additionally, the two Governor's programs provide an important pathway for Rutgers to introduce underrepresented student populations to educational opportunities that can be associated with development and implementation associated with the Carbon Neutrality and Climate Resilience Plan including valuable undergraduate research, experiential learning, and field experiences.
Short and mid-term	**Identification of demonstration and pilot green building projects to inform state policy** – As part of the completion of the Rutgers plan, the university will identify specific actions that will involve pilot and demonstration projects that can serve to inform scale up of state policy.	• The state Energy Master Plan makes a significant commitment to reduce energy consumption and emissions from the building sector. The long-term vision is a fully electrified building sector, with shorter-term efforts including	The Rutgers Plan for Carbon Neutrality and Climate Resilience will offer innovations that can serve as demonstration and pilot efforts to inform scale-up of policy development in

	These efforts will be communicated by the university to the Governor's office to identify opportunities for collaboration during the implementation of the Rutgers Plan.	o Partnerships for building demonstration projects; o Expansion of current incentive programs; o Establishment of new building and appliance codes; o Pilot efforts for alternative rate designs to promote electric vehicle charging.	implementation of the Energy Master Plan.
Mid and long-term	**Consideration of policy implications of remote and telework experiences** – Explore the incorporation of a provision in the Rutgers Plan for Carbon Neutrality and Climate Resilience to evaluate the energy and climate emissions impact of the university's experience of remote and telework experiences under the current management of COAD-19.	• Historically, the subject of telework and remote work arrangements for public employees has been one that has been "taboo" as part of state efforts to reduce energy consumption due to concern about labor implications.	Somewhat separate from the Rutgers Plan for Carbon Neutrality and Climate Resilience, the University's current experience managing the COAD-19 virus provides a valuable opportunity for evaluation of effective policies for remote and telework arrangements which has historically been a policy arena that the State of New Jersey has been unwilling to consider as part of its own efforts to reduce energy consumption. With a proper overlay of energy and climate emissions evaluation overlay, the university's current experience could serve as a valuable demonstration project to inform state policy.

APPENDIX I: Task Force Charge

Human-caused climate change is a scientifically validated reality that is already harming lives and livelihoods in New Jersey and around the world. The nations of the world have agreed to take actions to limit further warming, including bringing net global carbon dioxide emissions to zero in the second half of this century. Achieving these objectives requires active participation from all major institutions. Rutgers is already a national leader in the scholarly study of climate change, but as a university community, we can and must do more. It is our duty to leverage our collective expertise as scholars and educators to address the climate crisis in New Jersey and around the world, including in our own operations.

Today I am announcing the creation of the President's Task Force on Carbon Neutrality and Climate Resilience. I am charging this task force to develop a comprehensive climate action plan for the university to consider. It will analyze greenhouse gas emissions at Rutgers University and advise the university on solutions to reduce the University's greenhouse gas footprint that are environmentally sustainable, fiscally responsible, scalable, and engage the broader community.

I expect this task force to develop and recommend a plan for Rutgers to achieve carbon neutrality across our institution. The task force must first define carbon neutrality within the context of the university community. Then, it is tasked with outlining scenarios, timelines, and key benchmarks for achieving this goal on as rapid a timeframe as is possible.

In addition, the Task Force will examine Rutgers' own exposure to climate change impacts. I expect it to look especially for approaches to reducing the university's vulnerability to these impacts.

As representatives of the State University of New Jersey, this task force is also charged with engaging the broader community in its work. Scholars, students, staff, state and local government, alumni, and business partners—all these groups present insight and perspectives that can contribute to achieving the goal of carbon neutrality and enhancing Rutgers' contribution to climate-positive economic development in New Jersey.

In developing its recommendations, this task force must give careful consideration to fiscal responsibility and to achieving our goal in a manner that balances the urgency of emissions reduction against the viability of our educational mission as a public university.

The committee will be responsible for recommendations across the scope of greenhouse gas emissions reduction, including carbon emissions, sources of energy, institutional practices, facilities, transportation, and behavioral change. Its work will consider greenhouse gas emission reductions at all university locations.

To lead this important task force, I have appointed Professors Robert Kopp and Kevin Lyons as co-chairs. Dr. Kopp is a professor in the Department of Earth and Planetary Science at the School of Arts and Sciences—New Brunswick and director of the Rutgers Institute of Earth, Ocean, and Atmospheric Sciences. Dr. Lyons is associate professor of professional practices at Rutgers Business School–Newark and New Brunswick and an associate director of the Rutgers Energy Institute. They will work closely with Senior Vice President for Academic Affairs Barbara Lee and Executive Vice President of Planning and Operations Tony Calcado to constitute the membership of the Task Force. I have requested that they report back on their preliminary findings by Spring 2020.

Robert Barchi, President
September 24, 2019

APPENDIX II: Working Group membership

Working Group 1: Energy and Buildings
Rachael Shwom, co-chair (SEBS)
Mike Kornitas, co-chair (IPO)
Clint Andrews (Bloustein)
Laura Berman (IPO)
Holly Berman (Bloustein)
Dunbar Birnie (SOE)
Kathleen Black (EOHSI – RBHS)
Janice Davey (IPO)
Ahmed Ezzat (SOE)
John Fritzen (IPO)
Carol Hazlet (PSE&G)
Boyd Moore (IPO)
Mollie Passacantando (SEBS)
Nirav Patel (Honors College – NB)
Shailesh Patel (IPO)
Mark Rodgers (RBS – Newark)
Kinan Tadmori (SGS – NB)
Glenn Vliet (IPO)
Amy Wang (SEBS)

Working Group 2: Transportation
Bob Noland, co-chair (Bloustein)
Jack Molenaar, co-chair (IPO)
Angie Bonilla (Housing and Residence Life – Newark)
Jon Carnegie (Alan M. Voorhees Transportation Center – NB)
Amy Davidow (SPH – RBHS)
Anne Gutsick (University Finance and Administration)
Robert Laumbach (SPH – RBHS)
RJ Palladino (NJ Transit)
Jeff Perlman (North Jersey Transportation Planning Authority)
Benedetto Piccoli (CAS – Camden)
Kelcie Ralph (Bloustein)
Mike Smart (Bloustein)
Jenn Stuart (IPO)
Hao Wang (SOE)
Ellen White (Bloustein)

Working Group 3: Food Systems
Xenia Morin, co-chair (SEBS)
Joe Charette, co-chair (NB)
AJ Both (SEBS)
Harrison Chiu (SAS – Newark)
Elizabeth Demaray (CAS – Camden)
Shauna Downs (SPH – RBHS)
Matan Dubnikov (SEBS)
Lauren Errickson (NJAES/SEBS)
Sarah Johnson (CAS – Camden)

Ian Keith (Rutgers Dining Services – NB)
Rachael Shwom (SEBS)
Ashley Silvera (Procurement Services – RBHS)
Lisa Tenore (Rutgers Dining Services – NB)

Working Group 4: Supply Chain and Waste Management

Kevin Lyons, co-chair (RBS)
Nimish Patel, co-chair (Procurement)
Wes Coleman (Procurement Services)
Elizabeth Demaray (CAS – Camden)
David Dehart (IPO)
Serpil Guran (Rutgers EcoComplex)
David Haines (IPO)
Gary Kovach (Finance – RBHS)
Uta Krogmann (SEBS)
Julie Lawson (RWJMS – RBHS)
Laura Lawson (SEBS)
Joe Martin (CAS – Camden)
Mark McLane (IPO)
Vincent Nacco (SDM – RBHS)
Alma Ortiz (Procurement Services)
Marie O'Toole (School of Nursing – Camden)
Jack Schrum (Dining Services – NB)
Matthew White (RBS – Newark)

Working Group 5: Land Use and Offsets

Rick Lathrop, co-chair (SEBS)
David Schulz, co-chair (IPO)
Myla Aronson (SEBS)
Alvin Chin (Bloustein)
Brian Clemson (IPO)
Julia DeFeo (CAS – Camden)
Panos Georgopulos (SPA – RBHS)
Paul Gottlieb (SEBS)
Pat Harrity (IPO)
Marjorie Kaplan (Rutgers Climate Institute)
Karina Schäfer (SAS – Newark)
Laura Schneider (SAS – NB)
Fiona Sergeant (SEBS)
Frank Wong (IPO)

Working Group 6: Climate Preparedness

Steven Keleman, co-chair (IPO)[25]
Robin Leichenko, co-chair (SAS)
David Robinson, acting co-chair (SAS)

[25] Steve Keleman was originally co-chair of Working Group 6, but due to the demands of managing the COVID-19 emergency has temporarily stepped down from that role.

Francisco Artigas (SAS – Newark)
Lisa Auermuller (NJAES)
Brian Buckley (EOHSI)
Tony Broccoli (SEBS)
David Bushek (SEBS)
Patricia Findley (SSW – NB)
Panos Georgopulos (SPH – RBHS)
Jeffrey Issler (IPO)
Marjorie Kaplan (Rutgers Climate Institute)
Laura Landau (SAS – NB)
Ric Marlink (RWJMS – RBHS)
Mark McLane (IPO)
Kathe Newman (Bloustein)
Nancy Pontes (School of Nursing – Camden)
Ashaki Rouff (SAS – Newark)
Alejandro Ruiz (IPO)
Brigitte Schackerman (SEBS)
Jennifer Schrum (SSW – NB)
Roger Wang (SOE)
Roger Wang (RBS – NB)

Working Group 7: Climate-Positive, Equitable Economic Development

Carl Van Horn, co-chair (Bloustein)
Peggy Brennan, co-chair (NJAES)
Jeanne Fox (Former President of the New Jersey Board of Public Utilities)
Noa Gafni (RICSI – Newark)
Gregory Gamble (Economic Development – Camden)
Jeanne Herb (Bloustein)
Leonie Kattermann (Bloustein)
Bob Kopp (SAS)
Elayne P. McClaine (Middlesex County New Jersey Small Business Development Center)
Melanie McDermott (TCNJ/SEBS)
Gary Minkoff (RBS – NB)
Jessica Paolini (NJAES/Bloustein)
Amy Rowe (NJAES)
Lynne Trabachino (EOAS)
Henry Turner (SAS – NB)

APPENDIX III: Working Group Charge Questions

Working Group 1: Energy and Buildings

Working Group 1 focuses on electricity and heat generation; energy and water consumption by University owned and leased building; and energy and water consumption by off-campus housing and other buildings used by the University community. Particular concerns the Working Group should pay attention to include:

- The relative roles of on-campus energy and utility-supplied energy
- Methane leakage associated with natural gas usage

The working group's remit includes both strategies to reduce greenhouse gas emissions associated with energy and buildings, and also the resilience of energy infrastructure to climate change impacts. In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?
- What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing?
- What are the most compelling and impactful approaches Rutgers could pursue?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 2: Transportation

Working Group 2 focuses on on-campus transportation, commuting, and University travel.

The working group's remit includes both strategies to reduce greenhouse gas emissions associated with transportation, and also the resilience of transportation networks to climate change impacts. In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?
- What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing?
- What are the most compelling and impactful approaches Rutgers could pursue?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
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- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 3: Food Systems

Working Group 3 focuses on approaches to reducing greenhouse gas emissions embodied in food consumed on campus, as well as approaches to facilitating such reductions in the broader community. In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?

- What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing?
- What are the most compelling and impactful approaches Rutgers could pursue?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 4: Supply Chain and Waste Management

Working Group 4 focuses on approaches to reducing greenhouse gas emissions embodied in procurement and greenhouse gas emissions associated with waste management, as well as approaches to facilitating such reductions in the broader community.

In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?
- What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing?
- What are the most compelling and impactful approaches Rutgers could pursue?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 5: Land Use and Offsets

Working Group 5 focuses on:

1. approaches to reducing greenhouse gas emissions associated with University land use and maintenance (including both on campus grounds and at off-campus facilities, such as New Jersey Agricultural Experiment Station Farms and Research Stations),
2. approaches to reducing the University's energy demand through land use,
3. approaches to increasing carbon dioxide storage in University-owned land through increased carbon sequestration in soils and woody vegetation, and
4. other approaches to offsetting University emissions.

In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of greenhouse gas emissions and physical climate risks associated with the working group's topical domain?
- What universities or other comparable institutions are leading on the working group's topical domain, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing?
- What are the most compelling and impactful approaches Rutgers could pursue?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are the associated emissions reduction and resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?

- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?
- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 6: Climate Preparedness

Working Group 6 focuses on resilience of the University, its outlying facilities, and surrounding communities to higher temperatures, more intense precipitation, and higher sea levels. The working group should be sure to consider responses to both acute physical risks (e.g., heat waves, severe storms) and chronic risks (e.g., routine flooding of coastal facilities).

In addition to University operations, the working group should also consider cross-cutting themes related to: teaching; research; campus culture, engagement, and behavior; climate-positive economic development; and equity.

Questions the Working Group should address include:

- What is the profile of physical climate risks at Rutgers?
- What are the key impacts associated with these risks for the university's research, teaching, and service missions?
- Which populations and groups at the Rutgers are most vulnerable to these risks?
- What universities or other comparable institutions are leading on climate preparedness and resiliency, what approaches are they employing, and what progress have they made?
- What approaches is Rutgers already pursuing to enhance preparedness and resiliency?
- What are the most compelling and impactful approaches Rutgers could pursue to enhance preparedness and resiliency?
- Are there approaches with a clear financial case and low institutional barriers that could reasonably be commenced before the completion of the climate action planning process?

For each proposed approach, consider:

- What are their associated resilience improvements; financial costs and savings; educational, research, and culture benefits; and other co-benefits?
- How would the proposed approach be implemented, and on what timescale?
- What research and planning is needed to implement the approach?
- How would progress be evaluated?
- What are the roles associated with University leadership, chancellor-level units, and other key players?
- Beyond financials, what are the institutional, organizational and cultural challenges associated with implementation, and how might we overcome them?

- What strategies should be employed to ensure the participation and accountability of the full university community?
- To what extent would the approach engage Rutgers' external stakeholders and catalyze broader, climate-positive economic development in New Jersey?
- What equity considerations need to be addressed and managed, how will this be done, and who needs to be involved?

Working Group 7: Climate-Positive, Equitable Economic Development

Working Group 7 focuses on defining the concepts of climate-positive economic development and equity as they should be used by Working Groups 1-6 in their deliberations.

Specific questions the Working Group should address include:

- What is a concept of climate-positive, equitable economic development that can be applied to task force efforts? What does it mean to be a good steward of the environment and equity while considering economic development strategies for the university and broader economy?
- How can Rutgers achieve/contribute to climate-positive, equitable economic development through functions of the university?
- How do the Rutgers climate-positive, equitable economic development efforts align with/contribute to state policies for the broader economy?

Insights generated on these topics will aid Working Groups 1-6 as they seek to incorporate climate-positive economic development considerations into their plans.

APPENDIX IV: Utilities Department Support for Climate Action Plan Development and Implementation

Recent Projects

Facilities has been pursuing projects and actions that reduce commodity use and emissions while improving operability and functionality of Facilities equipment and lighting systems for many years. A few recent examples include:

- Upgrading two major power and heat generating turbine plants in Newark and Piscataway to increase capacity, reduce emissions, reduce water use and improve reliability. The combined project budget of almost $90 million is funded by Federal grants, NJ Infrastructure Bank Loans, PSEG loans, and RU funds.
- Using funds from the Large Energy User Program (LEUP, part of the NJ Clean Energy Program), we replaced 846 light fixtures, 549 occupancy sensors, and 278 motors at a total cost of almost $2M, half of which was obtained from LEUP, the remainder from RU funds.
- Installing electric meters on 19 chillers to allow monitoring and assessment of functionality as well as to allow segregation of electric usage of the chillers from the buildings in which they reside. The cost of this $700,000 project was covered by our energy conservation fund which in turn is funded by equipment rebates acquired by Utilities as well as funds from participating in a demand response program.
- Installing two solar farms, using government issued credits to fund the construction and maintenance through a public/private partnership.

Funding – "Green Revolving Fund"

As noted in these examples, funds have been provided from government and public utility grants and loans (in part from the Societal Benefits paid in each utility bill) and operating and project funds. According to the Pre-Planning report, representatives from the Task Forces, Finance, and IP&O will develop a clear system for financing such investments that are high-ROI, energy-saving and emissions-reducing. These projects will have a maximum payback period of not more than 5 years, with preference for quicker returns, as determined by the committee. A strategy will be developed to initially fund approved projects through the university's internal bank and or other possible available funding sources. Over time measurable savings from these initial projects will be reinvested into a "Green Revolving Fund" or other similar funding structures for future projects. The success of this strategy will be dependent upon energy data collection and development of suitable energy savings projects.

Actions

To support the anticipated goals of the Climate Action Plan, and to upgrade more of our facilities, we will continue to pursue similar projects with defined energy and costs savings plans. We will extend our efforts to building and plant maintenance and repair. We will improve documentation of work completed and energy saved and focus on operational improvements. These three general areas of action are further defined below and will be included in our contribution to the Energy and Building Working Group section of the Climate Action Plan.

Action Plan

1. Data collection and management

To support the development and implementation of the CAP, and to track our efforts, Utilities will develop and implement a system that records our efforts to reduce our footprint. We will

record the reduction of commodity use and emissions resulting from renovation, building envelope upgrades, equipment replacement and repair, and equipment maintenance. Data will be collected and maintained using Facilities' CWMS.

Utilities will install remote read meters on all buildings served by Rutgers commodity loops, including heated water, chilled water, electricity, and domestic water. Updated metering will improve the reliability of the data of commodities consumed per building, allow measurement of existing and improved energy use, and allow plant and energy managers to assess building and plant performance. Funding will be required to accomplish this metering program.
In addition, Utilities will retain and manage the consultant to measure greenhouse gases as noted in the Pre-Planning Report for the CAP.

2. Define Proposed Projects

Utilities will develop and maintain a revolving list of ongoing and planned projects:

- For construction/mechanical projects already in progress, evaluate for sustainability and develop additional measures to reduce commodity use and emissions
- Develop projects specifically designed to improve operational performance, reduce emissions, and reduce commodity use.

The scope and budgetary cost will be identified for each proposed project, including implementation costs, life cycle costs, payback period, and return on investment. We will investigate potential funding and loan sources such as:

- Federal Grants
- NJ Infrastructure Bank Loans
- PSEG and other commodity provider loans and grants
- NJ Clean Energy Program grants and rebates
- Rutgers' new "Green Revolving Fund" or other financing structure

Project data will be collected and maintained using Facilities' CWMS, including proposed funding sources and rebates, status of projects, and energy reduction.
Some project managers are already being realigned with this focus in mind. Our Mechanical/Electrical/Plumbing (MEP) project group is evaluating existing and proposed projects to define commodity and emission savings. The group is managed by John Fritzen, PE, Director of MEP projects who holds a Master of Science in Energy Management.

3. Identify Areas of Potential Operational Improvements

Utilities will develop a training program for plant operators and building maintenance mechanics to focus on energy management. We will investigate the graphic web interfaces that allow easy access to system performance, and evaluate a retro commissioning program to reset building controls to original design standards intended to save energy. This will require adoption/acceptance by building occupants with a top down approach to enforcement.

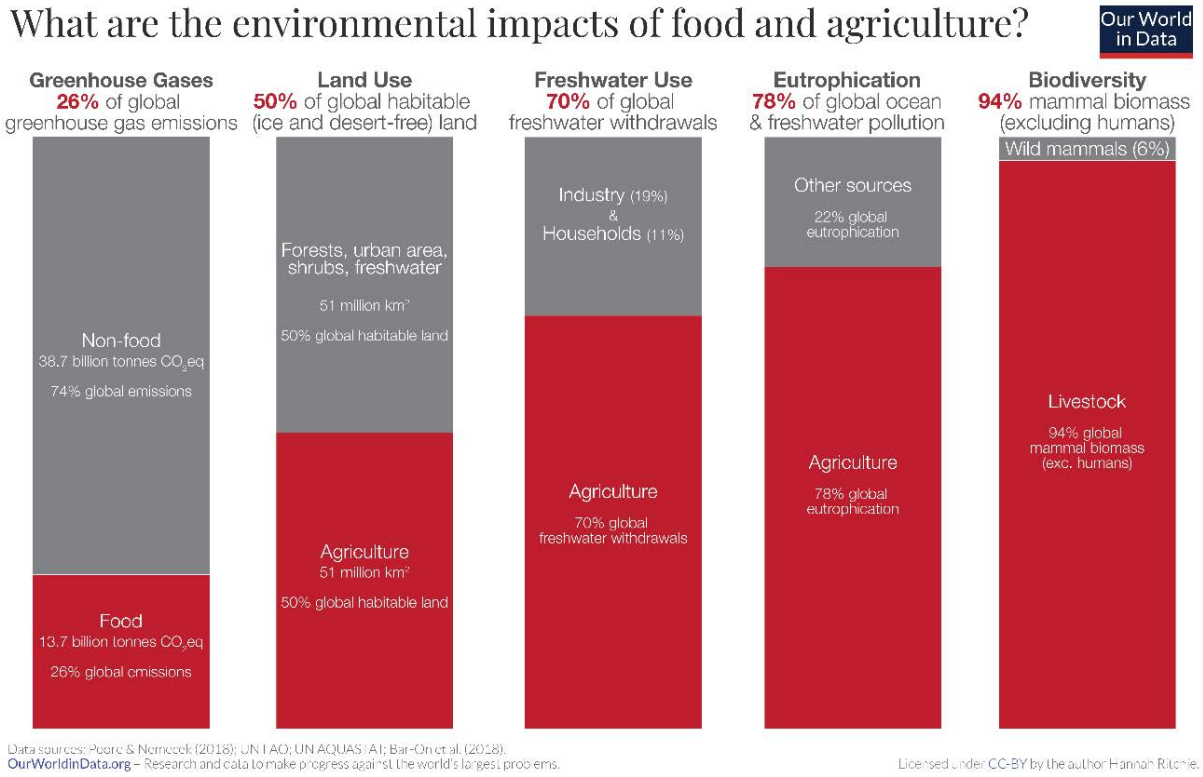
Next Steps

- Further define the scope of each of the action items.
- Define resources required for both data management and energy monitoring personnel and new equipment.
- Participate in the Energy and Buildings working group to prepare Facilities portion of the University's Climate Action Plan.

APPENDIX V: Background on food system impacts on climate change, environment and health

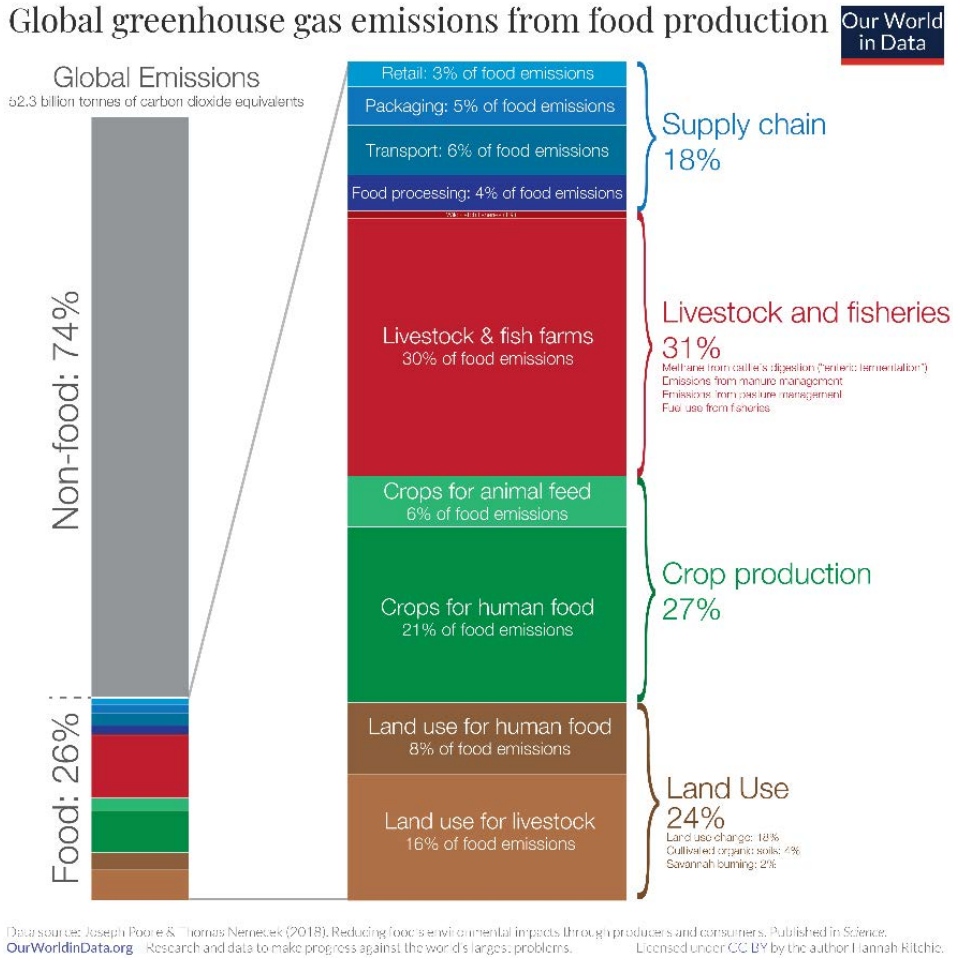
Approximately 26 % of global greenhouse gas emissions (GHGs) are associated with food production (see Figures V.1 andV.2). But it is not enough to consider only the GHGs because there are also other environmental impacts of food production. These include, but are not limited to, food production's impact on land use, freshwater use, eutrophication of waterways, and impact to biodiversity. (Figure V.1). Our ability to engage in climate resiliency depends also on understanding many of these environmental impacts and how climate change impacts these environmental factors with freshwater availability being a major consideration.

Figure V.1. Source: Ritchie and Roser, Jan 2020, Environmental Food Impacts of Food Production, Our World in Data (https://ourworldindata.org/environmental-impacts-of-food)



According to Poore and Nemecek (2018), approximately 26% of global food production associated GHGs can be broken down into emissions derived from supply chain (18%), livestock and fisheries (31%), crop production (27%) and land use (24%) (Figure V.2).

Figure V.2. Global greenhouse gas emissions from food production. Source: Ritche, Dec. 2019, Environmental Food Impacts of Food Production, Our World in Data (https://ourworldindata.org/environmental-impacts-of-food) based on data from Poore and Nemecek (2018).



The carbon footprint of food (GHGe emissions) varies significantly based on food type, production methods, and supply chain (Poore and Nemecek, 2018; Figure V.3 and Figure V.4). Consideration of the warming contributions by short-term (methane) and long-term (carbon dioxide) gas emissions may influence decisions regarding reductions in greenhouse gas emissions at Rutgers (Figure V.3). While food products are compared on a per kilogram basis, it is also important to consider the quantities consumed.

The move to more plant-centered dining has significant greenhouse reduction implications (see Figure V.3, V.4 and V.5). Carbon dioxide emissions are significantly less for many plant-based foods with many plant-based foods contributing one-tenth the GHGe emission of animal products. Beef cattle raised for meat has the highest carbon footprint with contributions from both carbon dioxide and methane emissions (Fig. V.3). The majority of beef-associated GHGes come from the farm, but a significant portion of GHGs are also associated with land use change (Fig. V.4). Interestingly, cattle used in dairy production carry a significantly lower carbon footprint (Figs. V.3. and V.4).

The American diet is high in animal protein consumption (meat, eggs, dairy and seafood), and therefore it is important to consider the cultural and health impacts that changing diets may

have when taking GHGes into account. According to the United Nations Food and Agriculture Organization (FAO), in 2009 the United States availability of meat and dairy protein sources per capital greatly exceeded world averages while availability of eggs and seafood was similar to China but still above world averages (see Fig. V.5). This abundance of meat and dairy is something that many Americans take for granted. If we wish to reduce our GHGes, consideration of reduction of animal protein intake must be considered.

Reducing animal protein causes anxiety for many. Figure V.6 provides a summary of the GHGes associated with different protein sources. It is important for the public to understand that plant-based food products contain protein and that they maybe be consumed and provide a nutritious diet.

In general, healthy foods tend to be associated with lower GHGe (Figures V.7, V.8, and V.9). However, there are some exceptions (e.g., sugar-sweetened beverages) (Clark et al., 2019, https://www.pnas.org/content/pnas/116/46/23357.full.pdf). Shifting diets towards more plant-based diets can lead to significant reductions in GHGe. There is evidence to suggest that shifting towards a plant-based diet can improve nutrition outcomes and reduce the risk of non-communicable diseases (Tillman & Clark, 2014); however, not all low carbon footprint diets are health promoting. For example, a review of the literature conducted by Payne et al., (2016) found that lower GHGe diets may not have benefits for nutrition and health given that they are often high in sugar and low in micronutrients. Thus, it is important to consider the quality of the plant-based foods that consumers are shifting towards when promoting this type of diet to reduce GHGe.

Figure V.3. Global greenhouse gas emissions from food production with and without methane. Source: Ritchie and Roser, Jan 2020, Environmental Food Impacts of Food Production, Our World in Data (https://ourworldindata.org/environmental-impacts-of-food)

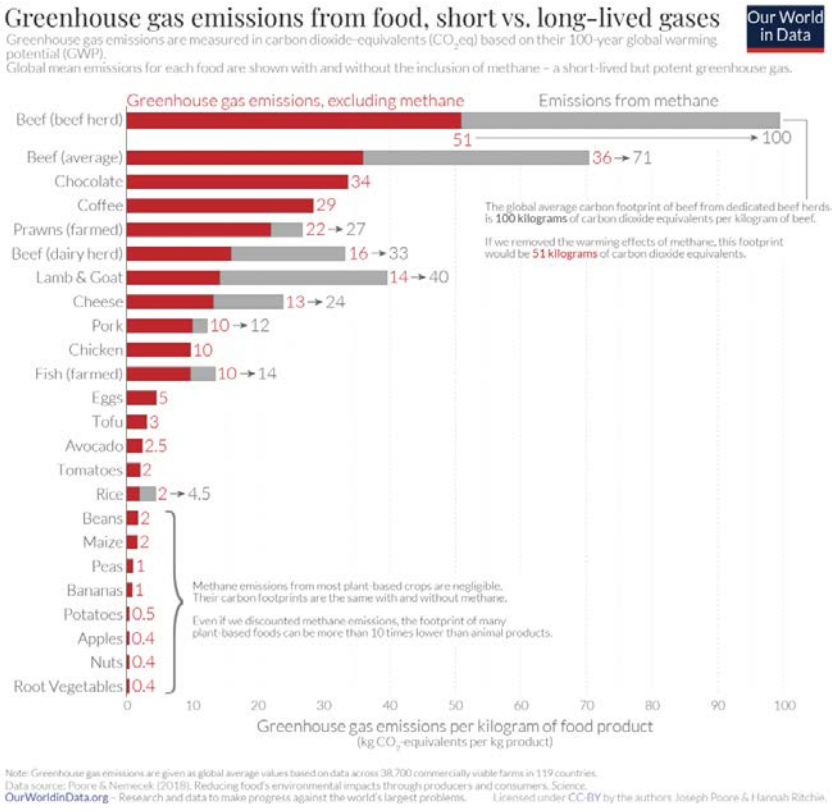


Figure V.4. Global greenhouse gas emissions from food production. Source: Ritchie and Roser, Jan 2020, Environmental Food Impacts of Food Production, Our World in Data (https://ourworldindata.org/environmental-impacts-of-food)

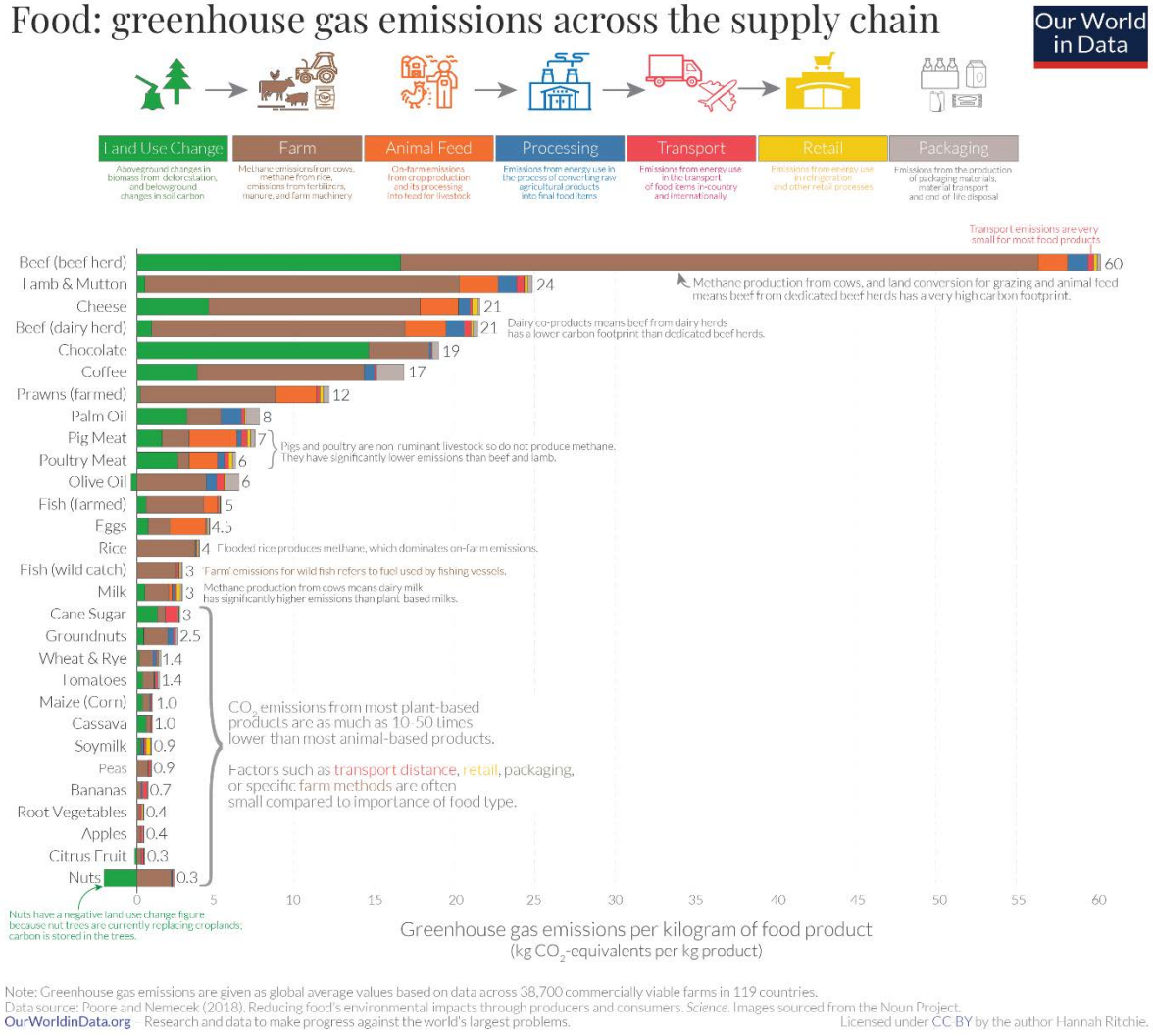


Fig. V.5. Comparison of average per capital availability of animal products. Reproduced From Neff (2014) Introduction to the U.S. Food Systems. Original data from FAO (2013).

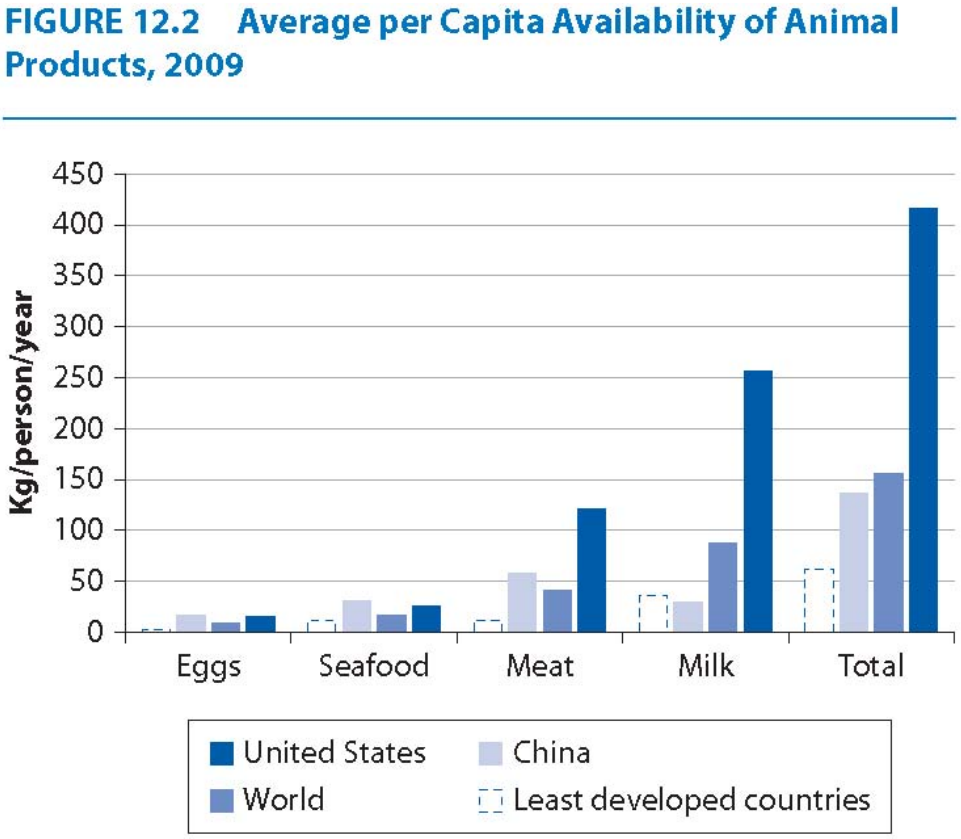


Figure V.6. The move to more plant-centered dining has significant greenhouse reduction implications. Global greenhouse gas emissions for protein food production. Source: Ritchie and Roser, Jan 2020, Environmental Food Impacts of Food Production, Our World in Data (https://ourworldindata.org/environmental-impacts-of-food)

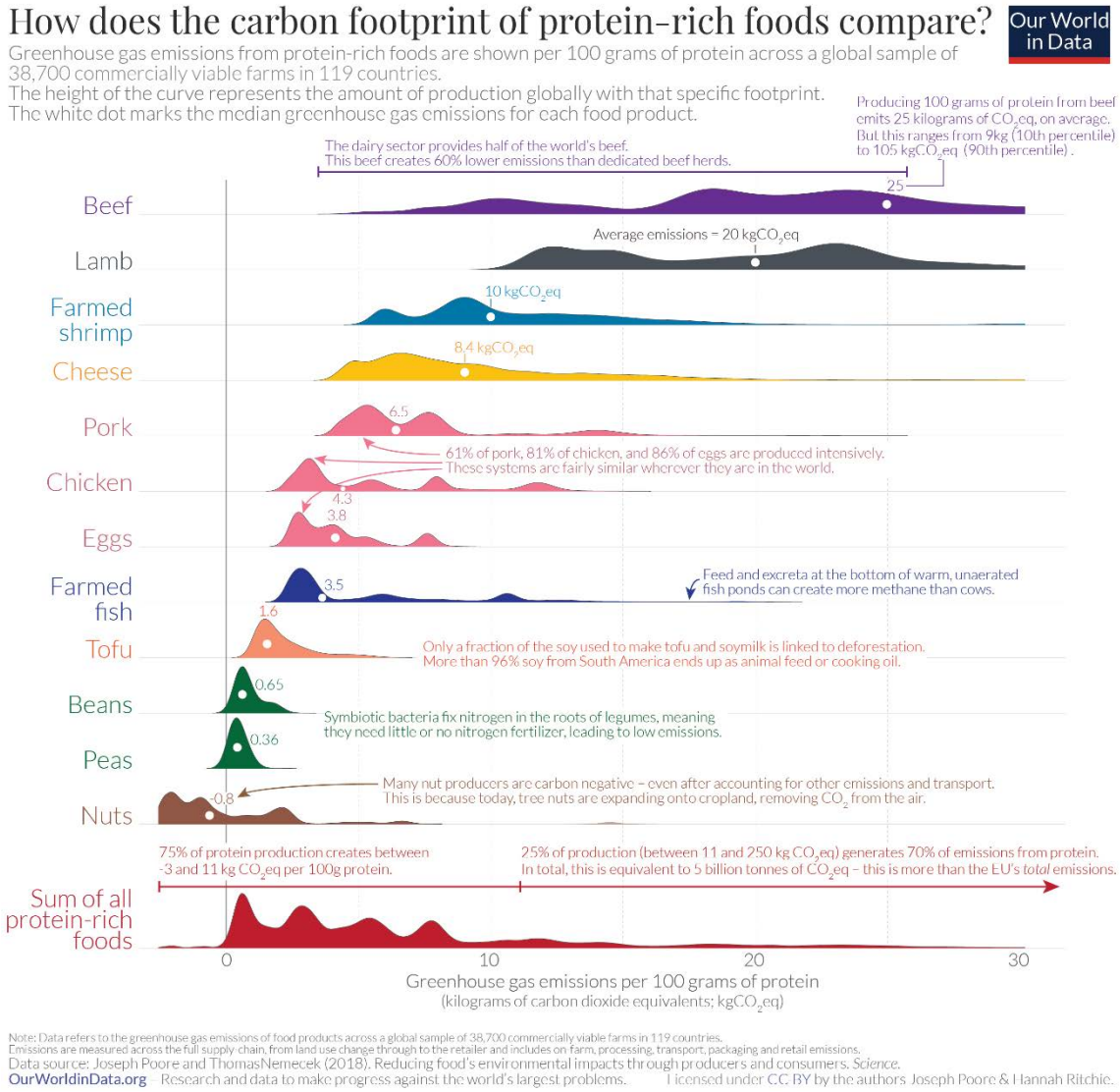


Figure V.7. Relative environmental Impact per serving of food. Source: Clark et al., 2019 (https://www.pnas.org/content/116/46/23357/tab-figures-data)

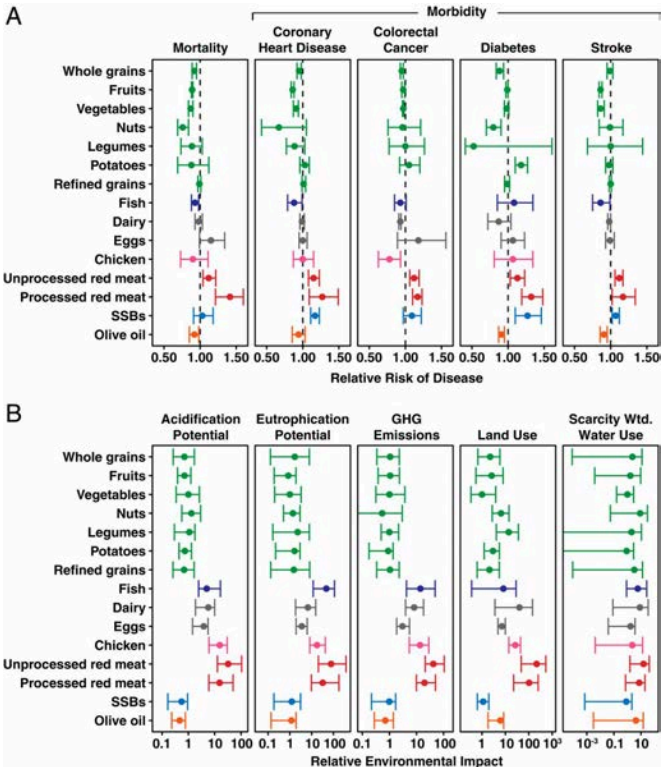


Figure V.8. Relative environmental Impact per serving of food. Source: Clark et al., 2019 (https://www.pnas.org/content/116/46/23357/tab-figures-data)

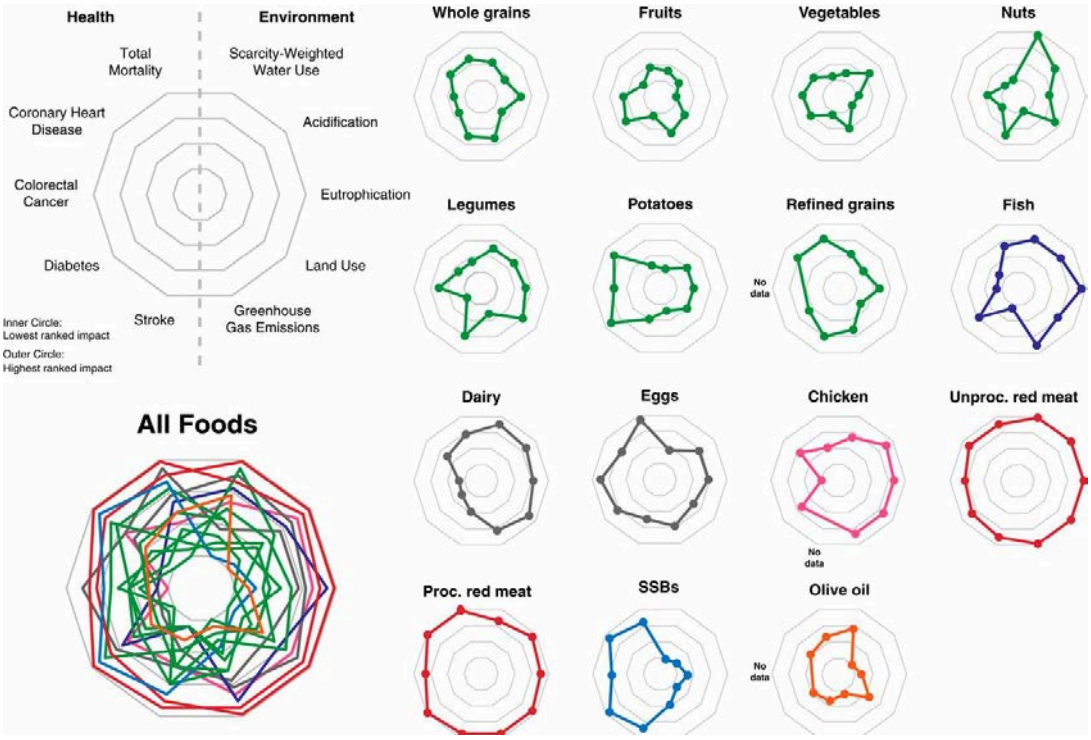
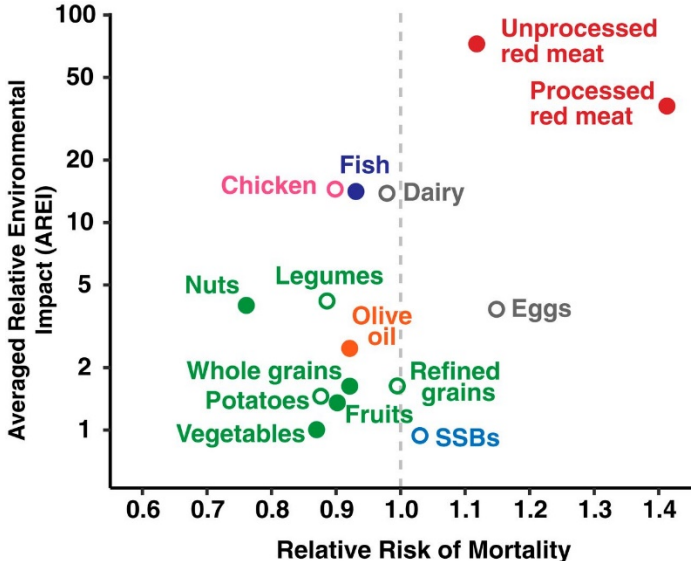


Figure V.9. Relative environmental Impact and relative mortality risk. Source: Clark et al., 2019 (https://www.pnas.org/content/116/46/23357/tab-figures-data)



Food Production and Food Waste

Globally, 30-40% of food is lost or wasted and never consumed. This shocking statistic has lead the U.S. Federal Government through a joint effort between the Environmental Protection Agency (EPA) and U.S. Department of Agriculture (USDA), to set a goal of reducing food waste across the country by 50% by 2030 (https://www.usda.gov/foodlossandwaste). Soon the state of New Jersey will also finalize its draft food waste reduction plan (https://www.nj.gov/dep/dshw/food-waste/).

Food waste contributes to greenhouse gas emissions and reductions in food waste has been proposed as an important way to reduce GHGes by the EPA ((https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy) and Project Drawdown (https://drawdown.org/solutions/reduced-food-waste) and others and thus, should be considered an important part of any climate action plan.

APPENDIX VI: Supply Chain supporting documentation

Zero Waste – Circular Carbon System Concept

Zero waste, circular carbon systems what are we current doing what are we currently generating. The emerging Circular Carbon Economy Concept (CCEC) refers to an "economic system based on reuse of products and raw materials and the restorative capacity of natural resources." CCEC also attempts to minimize value destruction in the overall system and maximize value creation. The goal is to counteract depletion of natural resources, reduce GHG emissions and use of hazardous substances, eliminate waste, and make a complete transition to renewable and sustainable energy supplies". Therefore, promoting combined understanding of

circularity and a lower-carbon economy as "**circular carbon economy**" and transforming the linear make-it /use-it/dispose-it pathway to a circular resource recovery pathway can be an effective pathway for mitigating climate change within a lower-carbon economy. The circularity approach redefines waste as a "resource" and feeds the resource back into the economy efficiently. In order to integrate components of waste there is need for innovative circular carbon systems and technologies.

Currently, Rutgers campus generated waste is either landfilled or incinerated with the linear make-it/use-it/ dispose-it approach. Reduction of waste generation is an important tool but also there is an urgent need to create holistic solutions to this ever-growing waste disposal problem. The problem, if not resolved, will be even greater in coming years.
Especially two lines of waste streams can help Rutgers University to reduce its GHG emissions related to waste disposal. These waste streams are Rutgers cafeteria generated organic waste and Rutgers created plastic waste.

Rutgers University's dining halls create approx. 2,000 tons of organic waste per year. Presently, some food service operations aerobically digest the food waste before disposal into the wastewater system. Some portion of the organic food waste is being picked up by a local pig and cattle farmer and utilized as feed for the animals. Rutgers Dining Services has concern that the pig farmer may not continue to receive the waste and this underlines the importance of a sustainable need for a holistic solution to utilize food waste to generate low carbon electricity and produce low- carbon organic fertilizer. Rutgers campuses can demonstrate such conversion by utilizing state-of-the-art anaerobic digestion technology that food waste can be converted into low-carbon energy and low-carbon fertilizer as one of the emerging "Circular Carbon Systems." With this approach, Rutgers University can achieve and demonstrate micro-circular economy application by a circular carbon system of anaerobic digestion and reduce its carbon footprint.

Rutgers University's plastic waste generation amount is not known currently. Before setting goals, it is essential to create a reliable baseline data on plastic waste generation. Performing a quick waste audit will enable University decision makers and researchers to understand how much plastic waste we generate, how much of it is recycled and how much plastic waste is mixed with regular MSW and ends up in landfills or incinerators. Then university researchers can suggest technologies to convert waste plastics back into the plastic manufacturing, fuel and materials production.

These approaches will also set an example to communities statewide on diverting organic waste and plastic waste from landfill cells and potentially being incinerated.

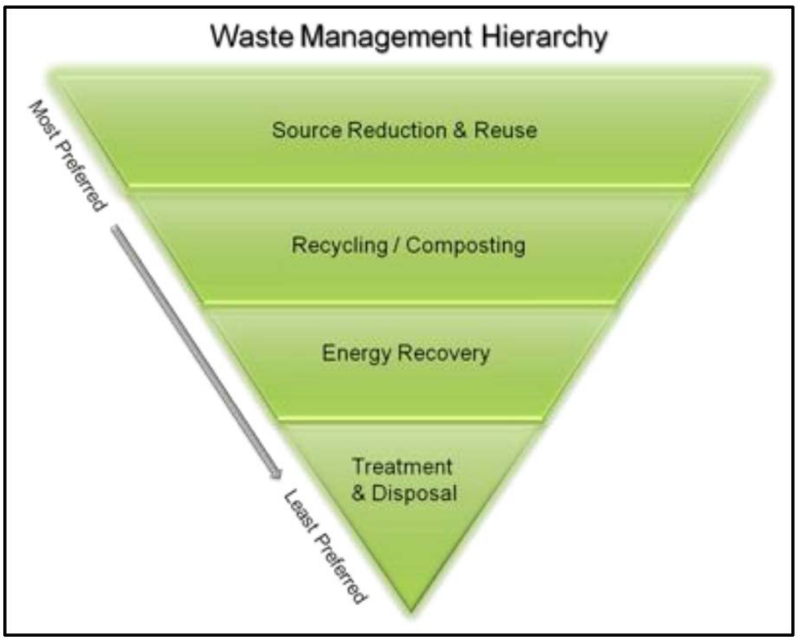
- Help mitigate climate change;
- Promote how innovative waste management approaches by utilizing circular carbon systems can serve as an integral component in achieving micro-circular carbon economy at Rutgers;
- Create multidisciplinary cutting-edge research and internship opportunities for Rutgers faculty and students respectively;
- Create a new role for Rutgers University setting an example for promoting Circular Carbon Economy to achieve sustainable future by researching, and demonstrating circular carbon systems to transform the University campuses and the society for a better future;
- This kind of a research center can provide Rutgers a bigger leadership role not only locally and regionally but also nationally and internationally.

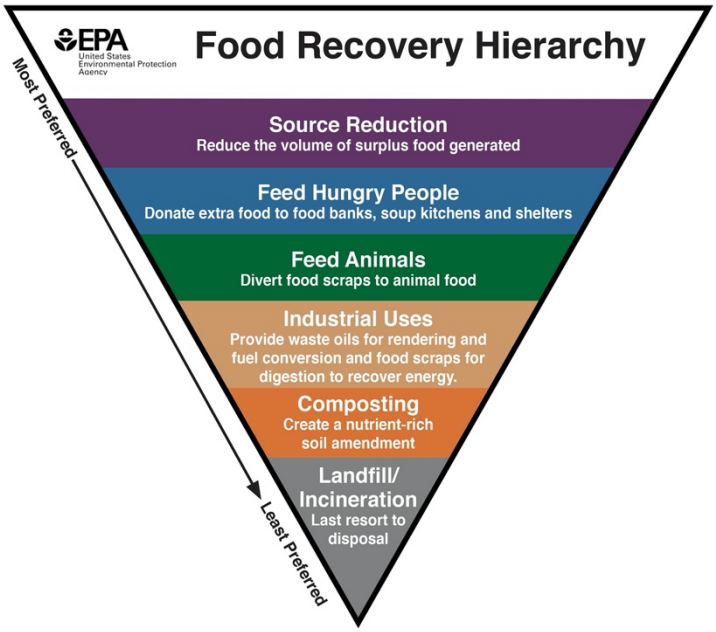
At a broad level what is required of the University will be to establish a commitment to implementing an integrated approach to waste minimization and diversion that will improve the University's waste minimization and diversion efforts. The University should develop a more robust infrastructure to accommodate additional recycling and waste bins, as well as a behavioral change program to engage the Rutgers Community.

Strategies other institutions have used to minimize waste and increase recycling rates include combinations of the following:

- Provide collocated recycling and waste receptacles only.
- Policies for online course materials, assignments, and testing to reduce printing.
- Provided paperless tools and workflows.
- Annual public waste audits as part of community education programs.
- Eliminating disposable to-go containers and tableware.
- Provide floor-by-floor recycling infrastructure as piloted at Warren to all the large dorms.
- Hand dryers in lieu of paper towel dispensers.
- Extend the practices above to all Rutgers sponsored public events (Sports, Rutgers Days, Big Chill etc)

Source Reduction & Reuse Strategy





Source reduction & Reuse (reusing, donating items, buying in bulk, reduced packaging) - Needs further investigation for RU - The bulk of emissions from the solid waste management sector come from upstream emissions, which are the emissions associated with the manufacture and transport of all the materials within the solid waste stream generated at the University. Reducing the total amount of materials entering the waste stream could significantly reduce the amount of campus emissions by reducing the emissions associated with creating the product upstream as well as the emissions associated with managing the product once it becomes waste downstream.

Establish firm targets once baseline data is available and incentivize change.
Examples – Potential approaches

- Decrease influx of new non-reusable materials through campaigns, working with dining services and other groups across RU.
- Goals:
  - Reduce paper waste __% by 2025
  - Reduce plastic waste __% by 2025
  - Reduce waste upstream emissions ---% by 2025
- Strategies:
  - Add composting as a recyclable waste stream to overall reduce the amount of food waste by _____ ○
    - Includes working with Facilities Services towards creating composting sites for soil enrichment and fuel for an anaerobic digester
  - Establish a program to capture clothing, household items, furniture, appliances, and other items that departing students leave behind. Items are to be collected, clothing and furniture are donated to local nonprofits, and other items are cleaned and stored in trailers for sale the following semester

- Create and implement a marketing campaign that informs students of options to purchase things in bulk
- Establish a bulk purchasing option for students to use personal containers and purchase bulk quantities within the dining hall by 2025
- Establish policy requiring professors to accept student work electronically when applicable by 2025
- Establish policy of using china and flatware whenever possible to avoid the use of disposables. When disposables must be used, products offered are biodegradable/sustainable products made from paper, corn or potatoes by 2025
- Establish policy of purchasing 100 percent recycled, non-chlorinated paper products, and purchasing those products, as well as food items and cleaning supplies, in bulk to reduce the quantity of packaging material by 2025
- Ban the sale of any drink sold in a plastic bottle by 2035

Recycling (increase) and redirecting organic waste to composting, aerobic and anaerobic digestion and energy production. Ultimately, it is necessary to reduce the actual amount of waste being created and brought onto the campus as a whole, however this initiative is substantially more difficult to tackle, and until it is tackled there will continue to be waste on the campus that could be properly recycled.WG4 will work the food systems working group (WG3) on these goals**.**

- Identify strategies to reduce emissions associated with disposal and add to recycling/composting emissions credits. The emissions credit associated with recycling comes from reducing the upstream emissions of future products that are produced from recycled material instead of virgin materials. The composting emissions credit comes from the carbon storage associated with application of compost to soils.
- Take a look at findings from baseline GHG inventory- the amount of recyclable materials ending up in the solid waste.
- Improve the amount of visible and easily accessible recycling by increasing recycling efforts at move in/move out, having large recycle bins on each residence hall and parking garage floor, and ensuring individual recycle bins in each residence hall room.
- Explore partnership with City Camden/New Brunswick/Newark to identify best off-site composting and anaerobic digester opportunities.
- Goals:
  - Reduce recyclable materials from stream entirely by 2025
  - Reduce contamination in recycle receptacles entirely by 2025
- Strategy
  - Brand a campus wide recycling mascot to aid educational campaigns
  - In several phases the recycling access should be updated
  - The first phase will involve labeling current unidentified receptacles as "Recycling" and "Trash" and ensuring that there are no stand-alone trash receptacles inside academic buildings
  - The first phase also includes the introduction of large 96 gallon roll away bins to each floor of each residence hall:
  - All spaces being used for multiple purposes should be appropriately fit with an equal number of recycling bins and trash receptacles so that there are no stand-alone trash receptacles.

- Academic Building commons areas should be appropriately fit with equal numbers of recycling bins and trash receptacles.
- Equal trash and recycling bins should be represented in each room – within classrooms/office spaces
- Connect with and educate maintenance staff to establish a protocol for properly moving recycling and other waste items to the correct mass collection points
- Notify and educate resident hall assistants during the summer about incoming recycling programs
- Partner with city for an initial mass recycling effort to occur during move-in to prevent the excessive packaging from new residents entering the trash streams
- Establish and maintain a partnership with the City
- Establish mass recycling efforts at the beginning and end of semesters
- Residents should be provided recycling receptacles and have their recycled materials collected
- Drop off location for commuter students, staff, and faculty, in a drive up fashion to allow for quick drop off of recyclable materials should be established for any campus user that is currently unable to obtain recycling within their residences
- Remove at least 50% of trash receptacles across campus, making recycling the first option and forcing trash to be the most difficult option when putting something into the waste stream
- Provide rinse stations in various locations near prominent recycling centers for users to prevent contamination

- Composting (need space, equipment, staff)
  - Many faculty, staff, and students also bring their own food from outside sources whether that be from home or food establishments, again, leaving the hands of the consumer and entering the waste stream on the campus. Much of this organic waste can be diverted from inefficient end points by being composted or diverted to other organic waste streams Diverting organic materials, specifically food waste, to composters will eliminate a substantial portion of waste being taken to landfills, and substantially reduce methane emissions and also will act as a carbon sequestration.
  - Goal
    - Divert at least __% of organic materials to composting or aerobic or anaerobic digestion facilities (on and off campus) by 2030
  - Strategies
    - Evaluate opportunities for composting, aerobic and anaerobic digestion
    - If feasible, establish a relationship with a composting facility, and create a plan to introduce composting to the campus
    - Obtain compost and food waste collection bins and strategically place them across campus with uniform signage for ease of understanding amongst campus users
    - Create and implement a marketing plan to educate all campus users about food waste reduction, composting and other food waste options
    - Obtain and continuously use an anaerobic biodigester to convert organic waste into biogas to be used for other energy measures

APPENDIX VII: Background on Climate Change and Development

The background section includes examples of how various actors discuss the linkages between climate change and the economy.

Definitions

- The International Economic Development Council (the largest professional organization for economic developers globally) defines **economic development** as "A program, group of programs, or activities that seeks to improve the economic well-being and quality of life for a community by creating and/or retaining jobs that facilitate growth and provide a stable tax base".
- The Association of Public & Land-Grant Universities and the University Economic Development Association cite the following definition: "Economic development is the means to achieve sustained increases in prosperity and quality of life realized through innovation, lowered transaction costs, and the utilization of capabilities towards the responsible production and diffusion of goods and services… [it] is essential to creating the conditions for economic growth and ensuring our economic future" (Feldman, et al. (forthcoming)). And the role of higher education in economic development is "In higher education, economic development means proactive institutional engagement, with partners and stakeholders, in sustainable growth of the competitive capacities that contribute to the advancement of society through the realization of individual, firm, community, and regional-to-global economic and social potential" (Association of Public & Land-Grant Universities and the University Economic Development Association).
- There are various definitions that incorporate "economic development" but take a broader view of the overall goals of "development. These include but are not limited to:
    - **Sustainable development**: Economic development that is conducted without depletion of natural resources
        - In the context of higher education, Valezquez, et. al. define a **sustainable campus** as "A higher education institution, as a whole or in part, that addresses, involves and promotes, on a regional and global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles."
    - **Smart growth**: A range of strategies for planning and building cities, suburbs, and small towns in ways that protect the environment and public health, support economic development, and strengthen communities.
- The U.S. EPA describes **equitable development** as "strategies [that] help low-income, minority, tribal, and overburdened communities participate in and benefit from decisions that shape their neighborhoods and regions."
- There is overlap among definitions. For example, the U.S. EPA uses the phrase "**equitable and environmentally sustainable development**". This phrase recognizes linkages between environmental justice, smart growth, and equitable development goals and principles. They all aim to create communities that are healthy,

environmentally sustainable, and economically vibrant. They also seek to empower residents to shape development where they live.

- The term "**climate positive**" is also referred to as carbon negative, meaning that greenhouse gas emissions are below zero (i.e. going beyond net zero to remove additional carbon dioxide from the atmosphere). A range of actors, from cities to corporations, have adopted this terminology:
    - The **C40** Climate Positive Development Program serves as a model for cities to grow in environmentally sustainable and economically viable ways. Developed by the C40 Cities Climate Leadership Group, in partnership with the Clinton Climate Initiative and the U.S. Green Building Council, the program aims to create "large-scale models for urban development that reduce greenhouse gas emissions below zero in an economically viable manner."
- Companies such as North Face, H&M and IKEA market products as being "climate-positive", meaning that the carbon footprint of their product is carbon negative.
- It is worth noting that some institutions take a broader view of the phrase "climate positive". **NYU**'s carbon neutrality plan includes a discussion of the school's aspiration to be "climate positive". Essentially, the transition to carbon neutrality should not just be a goal to do "less bad", but to "leave the planet in a better condition for future generations".

Concepts

Triple-Bottom Line Development

Actions to address climate change can create prosperity. You do not need to choose between economic growth and combatting climate change – they can be achieved together.

Triple-bottom line development emphasizes the importance of balancing three different bottom lines: a social bottom line referring to the benefit of communities and workers, an environmental bottom line referring to the health of the planet, and an economic bottom like referring to the ability of a business to continue to exist and fulfill its obligation to the social and environmental bottom lines.

At the global level, the United Nations Sustainable Development Goals (SDG) is a triple-bottom line approach that focuses on people, the planet, and prosperity. The SDGs "are the blueprint to achieve a better and more sustainable future for all." They are designed to address global challenges, including climate change, but also poverty, inequality, environmental degradation, peace and justice.

The Organisation for Economic Co-Operation and Development (OECD), an intergovernmental economic organization with 36 member countries seeks to promote economic growth, prosperity, and sustainable development. The OEDC advises that major economies in the world can boost their "long-term economic growth" with policies that "lower greenhouse gas emissions and boost resilience to climate change impacts". They therefore urge a "combination of pro-growth and pro-environment policies".

At a more local level, the 10-year vision (2020-2030) for the Pittsburgh region is described as a triple bottom line approach that encompasses thriving people, quality of place and a strong, inclusive economy. Quality of place focuses on "collaborative efforts to chart the region's path to a low carbon future" and to "eliminate non-inclusive economy".

Corporate Social Responsibility

In a complex and ever-changing world, stakeholders expect more from the business world than ever. Today's corporations need to have a social purpose — not only for their license to

operate but also because, as studies show, socially responsible businesses outperform their peers. Corporate leaders are developing innovative business models to solve social challenges and positively impact their bottom line. To solve today's most pressing challenges, businesses and non-profit organizations need to do well while doing good.

Corporate social innovation (CSI) integrates a company's full range of capabilities and assets within innovative business models to achieve positive societal impact while advancing the success and sustainability of the enterprise. Rather than a piecemeal approach, CSI is the integration of philanthropy, corporate social responsibility, shared value creation, and social advocacy into a coherent overall strategy designed to achieve maximum social impact through effective and sustainable business practices. Through philanthropy, corporations provide direct donations or in-kind support. Through advocacy, corporations have the capacity to shape public policy. Through corporate social responsibility programs, corporations use their many resources toward the benefit of society. Through shared value creation, firms develop profitable new products and services that address unmet societal needs. Corporate social innovation integrates these four pillars into a coherent strategy that provides a positive impact on society and business' bottom line.

APPENDIX VIII: Rutgers Assets to Support Climate-Positive, Equitable Economic Development

The list of below is only a sample of the existing Rutgers assets, and further work is needed to generate a comprehensive assessment of current assets that can be leveraged for this initiative.

- **New Jersey Agricultural Experiment Station (NJAES):** Delivers solutions to current and future challenges relating to agriculture, fisheries, food, natural resources, environments, public health, and economic, community, and youth development; Offices in all 21 counties of NJ; Extension specialists who engage directly with farmers; An important goal of NJAES is to spur and support economic development in the state; Engaged in addressing climate change, for example, through research collaboration with Duke Farms.
    - **Climate Smart Agriculture and Working Lands Initiative for NJ** - New program being launched led by the NJAES in conjunction with the NJ Climate Change Resource Center. The Initiative's goal is to explore solutions for reducing greenhouse gas emissions and enhancing climate resiliency related to NJ production agriculture (including terrestrial agriculture and aquaculture) as well as within NJ forests through applied research, development of best practices, and disseminating information to agricultural producers, foresters, land managers, and decision makers. This effort will improve the economic viability of NJ farms through better soil and water management, while improving resiliency to climate change.
    - **NJAES Research Farms as Models for Sustainable, Climate Positive Agriculture-**

NJAES is planning to transform NJAES research farms across the state into models for best practices in soil health/management practices, water management and climate change mitigation in collaboration with relevant state/federal agencies such as NRCS. The implementation work is just beginning. Horticultural Farm III on Ryders Lane will be the first farm to have such a plan. NJAES leadership has plans to do the same with as many of the NJAES research farms as practical over the next several years. The ultimate goal is to use the research farms as educational sites for farmers to learn how to adapt sustainable practices to their own farm operations, resulting in many cases in cost savings, as well as climate positive outcomes. Understanding the importance of climate mitigation through sustainable management practices such as improvement and restoration of soil quality, can also have the benefit of raising crop productivity rates and revenue returns which are essential to the success of broad adoption of these practices.

In addition to the educational aspects of the farms, they are primarily sites for field trials for plant breeding research. An example of a new crop bred at NJAES that will benefit NJ growers, while also having a climate positive impact, are hazelnuts. Hazelnuts lead the way in low input farming, using less water and sequestering more carbon than annual crops, while reducing soil erosion. Additionally, since healthy hazelnut trees can produce nuts for decades, they provide multi-generational family farm income opportunities.

- **NJAES Sustainable Livestock and Manure Management**

The NJAES maintains a significant livestock operation on Cook Campus for teaching and research purposes. These include: cows, horses, pigs, chickens, goats, and sheep. The Animal Sciences Department and Animal Care Unit are committed to using these animals to educate students and farmers in sustainable animal agriculture practices. As a case in point, over a year ago NJAES decided to no longer maintain a dairy herd and moved to a small beef herd that is used for teaching purposes only. The animals are being raised sustainably by grass-feeding and using rotational grazing.

- **Rutgers EcoComplex, Clean Energy Innovation Center**: A business incubator for clean energy companies; Services include a proof of concept center and accelerator program which provides state-of-the-art lab space, technology verification and engineering support, regulatory and permitting guidance, and technical training (located in Bordentown)
- **The Food Innovation Center** has a unique food business incubator and accelerator that is a unit of NJAES. The Center supports established early stage entrepreneurs and existing food companies from concept to commercialization. The team provides business, marketing, food safety, product design and scale up expertise within FDA and USDA certified facilities to help companies successfully build and grow their business. The center works with companies seeking to design foods for the future with an eye toward sustainability and social equity, such as the Impossible Burger.
- The **Rutgers FlexFarm** project led by A. J. Both (Environmental Sciences) and Xenia Morin (Plant Biology) is pioneering sustainable urban agriculture and food sources.

- **The Rutgers Institute of Earth, Ocean, and Atmospheric Sciences** – The modern era of human history is a planetary era. Addressing challenges like climate change, biodiversity loss, and the perturbation of global biogeochemical cycles requires an integrated program of Earth system science that advances both the fundamental scientific understanding of our home planet and also the knowledge and perspective needed for regional and planetary environmental stewardship. In order to address these needs, building upon the quarter-century history of the Rutgers Institute of Marine and Coastal Sciences, the Rutgers Institute of Earth, Ocean, and Atmospheric Sciences (EOAS) was created in 2014-2015 to link the Earth system science disciplines at Rutgers more tightly together.
  - EOAS's mission is to cultivate a university-wide, interdisciplinary community for research, education, and public and policy engagement about the past, present and future of the Earth system, including the hydrosphere, cryosphere, geosphere, atmosphere and biosphere, and humanity's dependence and impacts upon them.
  - In particular, EOAS aims to strengthen Rutgers as a nationally leading public institution in research, education, and public and policy engagement that (1) advances the scientific understanding of the past, present and future of the Earth system, and (2) builds the knowledge and perspective needed for equitable state, national and global stewardship of a healthy, sustainable and resilient planetary environment.

- Toward these ends, EOAS has supported over sixty graduate research assistants and fourteen postdoctoral associates; supported a variety of seed research and teaching initiatives; organized events to foster ideation of new research and teaching initiatives; brought thought-leaders with a variety of perspectives to campus; provided a platform for faculty and student scientists to collaborate with stakeholders in the Raritan watershed and throughout New Jersey; engaged in communications activities to elevate the profile of Rutgers Earth system science research and training; and provided professional development trainings to graduate students in the Rutgers Earth system science community.

- **The Rutgers Energy Institute** is engaged in four principal areas of activity: education of undergraduate and graduate students; pioneering research; outreach to the community to share information and engage the public; and policy advice to government, business, and civic leaders who require current knowledge about energy use, alternatives, and innovations to guide decision-making and public planning. Each of these four areas is critical to the overall mission of the institute: to foster both fundamental and applied scientific research and policy research to develop sustainable energy production compatible with economic growth and environmental vitality.

- **The Rutgers Climate Institute** is a University-wide effort to address one of the most important issues of our time through research, education and outreach. The Institute draws upon strengths in many departments at Rutgers by facilitating collaboration across a broad range of disciplines in the natural, social and policy sciences. The Institute is guided by the following goals:
  - To understand the mechanisms that drive global and regional climate change;
  - To understand the human and social dimensions of climate change, including how social, economic, political, cultural, and behavioral factors drive climate change, shape vulnerabilities, and condition response strategies;
  - To study the impacts of climate change, particularly its effects on densely populated, coastal regions;
  - To inform and educate society about the causes and consequences of climate change.

  The Institute promotes understanding by seeking funding opportunities for research and related activities, building research capacity through collaborative research proposal development, organizing working groups, and providing networking opportunities. It fosters outreach and education through public forums and by providing opportunities for affiliates to communicate research findings and expertise to a range of constituencies including the general public, students, educators, policymakers, governmental and non-governmental organizations, and other interested parties. With the Edward J. Bloustein School of Planning and Public Policy, the Institute co-hosts the New Jersey Climate Climate Change Alliance (NJCCA).

- **New Jersey Climate Change Resource Center** – The New Jersey Climate Change Resource Center (CCRC) was created at Rutgers by an act of the Legislature and was signed into law by Governor Murphy on Jan 21, 2020. The Center, led by Jeanne Herb (Bloustein) and Marjorie Kaplan (SEBS), has a goal to carry out collaborative and

interdisciplinary research, analysis and outreach activities that will help New Jersey adapt, mitigate and prepare for climate change. The CCRC provides a valuable platform for Rutgers to deliver specific "lessons learned" from the implementation of its actions to inform broader state and local policies both with regard to climate mitigation and resilience. Tasks that the CCRC are statutorily charged with that may be most informed by "lessons learned" from the Rutgers experience with implementation of its actions include: a. developing and delivering technical guidance to practitioners to enhance adaptation, mitigation, and resilience in the public, private, and nongovernmental sectors; b. undertaking pilot projects that can be replicable throughout the State and that demonstrate effective mitigation strategies or reduce the risks facing populations most vulnerable to climate change; c. enhancing the State's capacity to address climate risks and impacts through outreach training, engagement, and education of policymakers, practitioners, the media, and other key stakeholders.

- **Rutgers University Sustainability Committee -** The University Sustainability Committee's mission is to organize and articulate sustainable practices and principles in education and research, and in our university operations, with the goal of reducing our impact on the environment as we fulfill our expanding mission as a comprehensive public research university. Vice chairs are Michael Kornitas and Kevin Lyons. The Committee was established in 2005 to engage the University Community and to advise senior administration on a wide array of sustainability issues. It has been charged with:
    - Recommending appropriate policies for sustainability
    - Assisting with identifying suitable projects for sustainable initiatives
    - Assisting with completing a sustainability audit of the university
    - Recommending appropriate goals
    - Assisting with preparing an annual report on our achievements

- **Rutgers Institute for Corporate Social Innovation**: Housed in the Rutgers Business School, the mission of the Institute is to educate current and new generations of business leaders to integrate social innovation into their business strategies. Led by Michael Barnett, Jeana Wirtenberg, and Noa Gafani.

- **ORED - Office of Research Commercialization** protects and helps to bring to market, Rutgers discoveries such as climate technologies with commercial applications. As an example, Rutgers Distinguished Professor of Materials Science and Engineering, Dr. Richard Riman, is an entrepreneur and founder of Solidia Technologies, a Piscataway-based company that patented a process for producing cement with 70% fewer emissions; Solidia was recognized as a Global Cleantech 100 company.

- **Rutgers Office(s) of Economic Development**: On all 3 campuses; These offices work to build relationships with a wide range of businesses and organizations with the goal of enhancing the economy of their respective regions and the state.
  <u>Camden</u>
    - The Camden Office of Economic Development seeks to develop opportunities to engage new audiences in the growth of our host city, and to increase Rutgers–Camden's services to the State of New Jersey and the City of Camden.

- The office works to build relationships with a wide range of businesses and organizations with the goal of enhancing the economy of the greater Camden region. Based on the successful models of other urban universities, the Rutgers–Camden Office of Economic Development seeks to encourage retail growth and other forms of investment in our neighborhood and city by:
- Utilizing the intellectual and physical assets of Rutgers to support and grow the economic development activity in Camden and neighboring regions.
- Partnering with public, private, and non-profit organizations with a shared goal of creating a knowledge-based economy that will attract businesses that support and benefit from the research and activities at Rutgers–Camden.
- Strengthening the relationships between local industries and academia.
- Promoting the current and potential workforce in the region.
- Participating in strategic neighborhood revitalization efforts in the City of Camden.
- Seeking to improve the economic well-being and quality of life of the City of Camden.

<u>New Brunswick</u>

- The NJAES Office of Economic Development works to create an engaged university that is an integral part of the regional economy, local communities and industry attraction/retention efforts in the state. The office provides strategic direction for catalyzing entrepreneurship, boost research funding, increase the competitiveness of New Jersey industry, attract new companies to the state, and increase internship and job prospects for students and New Jersey workers. The team also manages physical infrastructure resources that strengthen and enable university, industry and government collaborations.

<u>Newark</u>

- The Center for Urban Entrepreneurship & Economic Development (CUEED) in the Rutgers Business School Newark, is the first center of its kind in the nation to integrate scholarly works with private capital, government, and non-profit sectors to develop citywide resources and bring renewed economic growth and vitality through urban entrepreneurship. CUEED promotes and fosters a new generation of urban entrepreneurs who actively seek socially conscious urban renaissance.

- **New Jersey Small Business Development Center at Rutgers New Brunswick**: Provides comprehensive assistance to small and medium businesses to maximize opportunities for growth and generate economic impact statewide; Helped launch the NJ Sustainable Business Registry. This program featured environmental responsibility for small businesses and offered a Registry of those firms exhibiting best practices http://registry.njsbdc.com/about . It is no longer funded but reinitiating funding for this program should be pursued.

- **NJ Small Business Development Center (NJSBDC) at Rutgers-Camden** is part of a statewide network that provides comprehensive consulting services and educational opportunities to Small Business owners and potential owners throughout the State of New

Jersey. The NJSBDC at Rutgers-Camden serves Burlington, Camden, Gloucester and Salem Counties, with several convenient training and counseling locations.

- **Entrepreneurship Coalition** provides a one-stop shop for students who want to further explore their innovative ideas. Supported by the Rutgers NJAES Office of Economic Development and Innovation, the Coalition is a multi-disciplinary group of staff, faculty, and students working together to support, strengthen, and promote entrepreneurship and innovation. It also organizes and promotes activities that offer experiential learning and networking opportunities. Examples include the Innovation and Entrepreneurship Expo, I-Corps and Student Competitions.

- **Makerspace,** a program of the Division of Continuing Studies**,** is a collaborative workspace designed for students, faculty, and staff from all academic disciplines who love to learn, design, and create.

- **Environmental Justice Action Group** organized by the Rutgers School of Social Work, the group is connected with the Council on Social Work Environmental Justice Task Force. The Action Group was recently formed (2019) and hopes to galvanize a group of concerned activists within the University, the field of social work, and community partners to focus on various environmental issues to achieve a vision of eco-resilience.

- **Institute for Food, Nutrition, and Health** includes several related programs. The newly formed **Center for Food Sustainability** (directed by Jim Simon) and the work of IFNH Director Maria Gloria Dominguez Bello, whose international work on food systems, culture, and the gut biome involves many international partnerships and relations with impactful research institutes.

- **Public-Private Community Partnership Program** at Rutgers Business School, directed by Kevin Lyons focuses demonstrating the potential of enhancing opportunities of communities through sustainable strategic on-off campus partnerships for local income enhancement, sustainable livelihoods and participatory development across all sectors and topics. An example is the economic development program in Newark to stimulate "buy local" program via Newark anchor institutions.

- S**upply Chain Archeology/Green Supply Chains** – Rutgers Business School, directed by Kevin Lyons focuses on organizational sustainability criteria (using Sustainable Development as a point of reference) integrated into the 'upstream' supply chain management/procurement process and decision-making of public and private agencies, organizations and corporate entities to improve financial and environmental performance, while addressing ethics, social regeneration, resource/waste impacts and economic development concerns (e.g. the 'triple bottom-line').

- **Bloustein School of Planning and Public Policy** has several research Centers and Institutes focusing on environmental planning and economic development:

  - **Rutgers Center for Green Building** http://rcgb.rutgers.edu Faculty Director Clint Andrews and Executive Director Jennifer Senick, CEEP (Frank)
  - **Rutgers Center for Energy, Economic, & Environmental Policy** http://ceeep.rutgers.edu Faculty Director Frank Felder
  - **Environmental Analysis and Communications Group**, http://eac.rutgers.edu/staff/ Faculty Director Clinton Andrews, Executive Director Jeanne Herb

- **Department of Human Ecology** in SEBS has faculty working on relevant topics:
  - Ethan Schoolman works on food sustainability and local food systems.
  - Pam McElwee is a 2019-20 Carnegie Fellow for her work on landscape reclamation and climate change after war in Vietnam. She also collaborates with Kevon Rhiney (Geography, below). She is also involved in Southeast Asia climate and coastline research more generally.
  - Karen O'Neill is sociologist working on coast lines in NJ and elsewhere.
  - WIlliam Hallman and Jeanne Herb (Bloustein) run a noted Science Communication program that produces curricular materials and is involved in public outreach.

- **Department of Geography** (SAS) has several researchers working on sustainability and environmental justice, such as Robin Leichenko (also co-director of the Rutgers Climate Institute), Andrea Marston, Kevon Rhiney (Jamaica and the Caribbean) and Willie Wright.

- **Mason Gross School of the Arts** has artists who work on problems of environmental crisis, notably Atif Akin (Art and Design), who works on nuclear waste and nuclear sites.

- **Rutgers Center for Urban Research and Education** has two key missions, to encourage, facilitate and promote research on urban issues by Rutgers-Camden faculty and their collaborators around the nation; and to help train the next generation of urban scholars by providing opportunities for students to become involved with ongoing research projects.