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Assessing Pathways toward a Carbon Neutral, Climate Resilient Rutgers

Prof. Robert Kopp and Prof. Kevin Lyons, co-chairs

President's Task Force on Carbon Neutrality and Climate Resilience

November, 2020

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President's Task Force on Carbon Neutrality and Climate Resilience

- **RELATED:** We Need You to Help Create Our Climate Action Plan (January 2020)

September 24, 2019

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:
Task Force Established

Task Force Goals

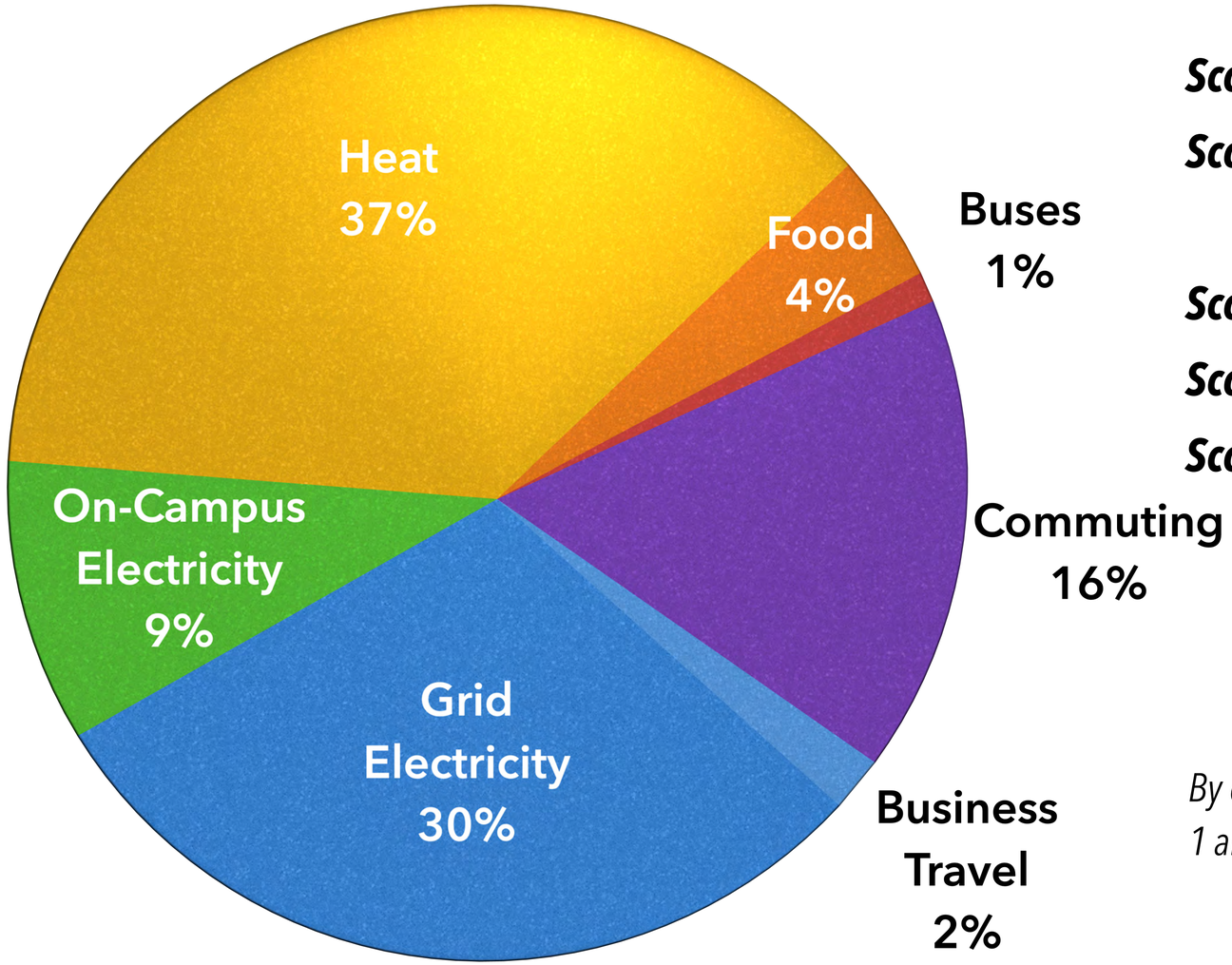
Develop Rutgers' strategies for

1. *Carbon Neutrality:* contributing to achieving global net-zero carbon dioxide emissions

2. *Climate Resilience:* Enhancing the capacity of the university and the State of New Jersey to manage the risks of a changing climate

Where do Rutgers' greenhouse gas emissions come from?

FY 2019: about 470 thousand tonnes



Scope 1 (on-campus electricity, heat, transit): *222 thousand tonnes*

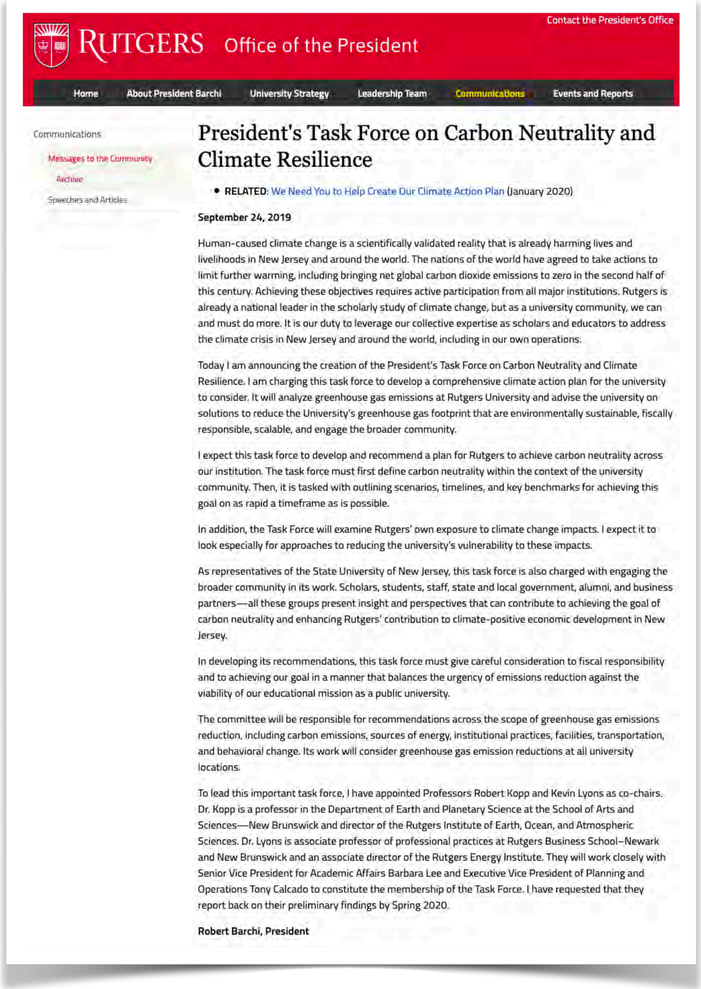
Scope 2 (grid electricity): *142 thousand tonnes*

Scope 3 indirect travel emissions: *87 thousand tonnes*

Scope 3 food supply chain emissions: *roughly 20 thousand tonnes*

Scope 3 other supply chain emissions: *currently unquantified*

By comparison: New Jersey in 2018 emitted 97 million tonnes, so Rutgers's scope 1 and 2 emissions are about 1/260th of statewide emissions.



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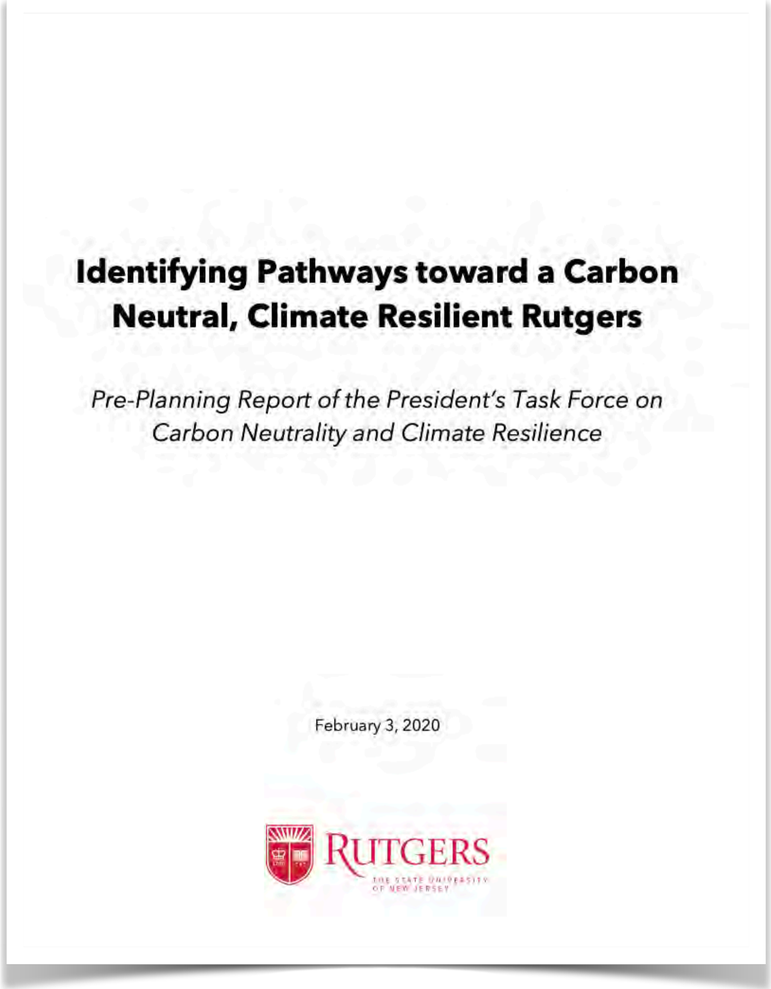

Identifying Pathways toward a Carbon Neutral, Climate Resilient Rutgers

Pre-Planning Report of the President's Task Force on Carbon Neutrality and Climate Resilience

February 3, 2020

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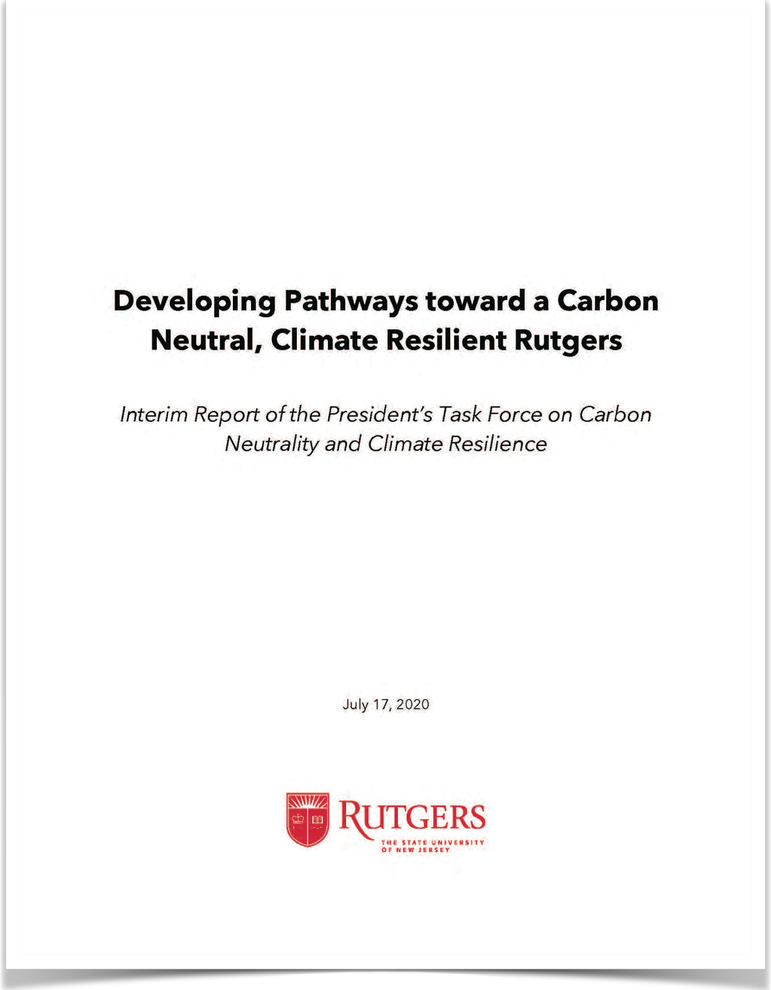
February 3, 2020:
Pre-Planning Report



Developing Pathways toward a Carbon Neutral, Climate Resilient Rutgers

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

July 17, 2020

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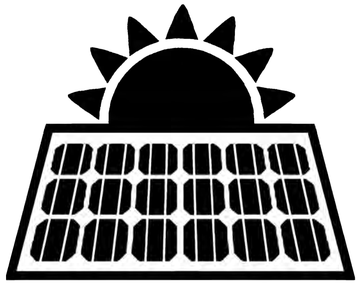
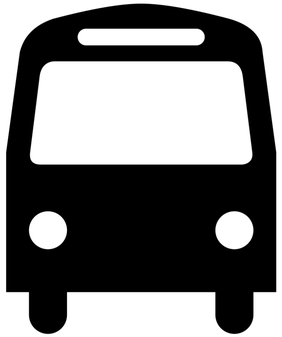
July 17, 2020:
Interim Report

Phase 2 Working Groups (through November 2020)

- Establishing a baseline inventory of University greenhouse gas emissions, climate vulnerabilities, and ongoing climate-related activities
- Identifying potential climate solutions for investigation
- Assessing potential climate solutions – the "lego blocks" that will be used to compose the Climate Action Plan



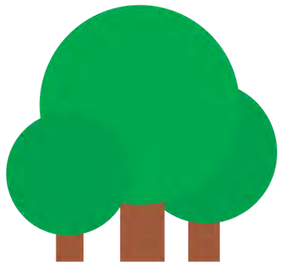
1 Energy and Buildings



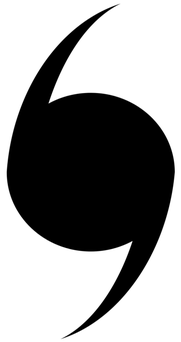
2 Transportation

3 Food and Water

4 Supply Chain



5 Land Use and Offsets



6 Climate Preparedness

7 Climate-Positive, Equitable Economic Development

Phase 3: Scenario Development (Dec 2020—Mar 2021)

- How do we put the "lego blocks" identified in Phase 2 together?

- Scenarios defined by different combinations of ambition, solutions, and fiscal assumptions (austerity vs. stimulus)
- For each scenario, 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?

Phase 4: Climate Action Plan (Apr-Jun 2021)

- Present a set of recommended climate action strategies and implementation mechanisms for the University
  - Ambitious, yet achievable and feasible, timeframe and pathway for achieving carbon neutrality, including intermediary targets and governance mechanisms
  - Key metrics for assessing the University's vulnerability to the physical impacts of climate change and a strategic approach for reducing these vulnerabilities.
  - Supportive educational, research, and engagement efforts, as well as mechanisms for financing and tracking progress.

- To be presented to President Holloway and the Boards in June 2021

Town Hall Goals

- Update on the sectoral analyses of the different Phase 2 working groups (the "lego blocks")
- Help come up with visions for the endpoint for Phase 3 scenario analysis
  - What is the carbon-neutral, more climate-resilient Rutgers we are aiming for?
  - In phase 3, the Task Force will figure out how to put the lego blocks together to get to these endpoints.

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WG1: Buildings & Energy

Clinton Andrews, Michael Kornitas & Rachael Shwom, co-chairs

Working Group Membership

Holly Berman
Laura Berman
Dunbar Birnie
Kathleen Black
Janice Davey
Ahmed Ezzat
John Fritzen
Carol Hazlet
Boyd Moore
Mollie Passacantando
Nirav Patel
Shailesh Patel
Mark Rodgers
Kinan Tadmori
Glenn Vliet

November 11, 2020

Baseline Emissions from Buildings & Energy

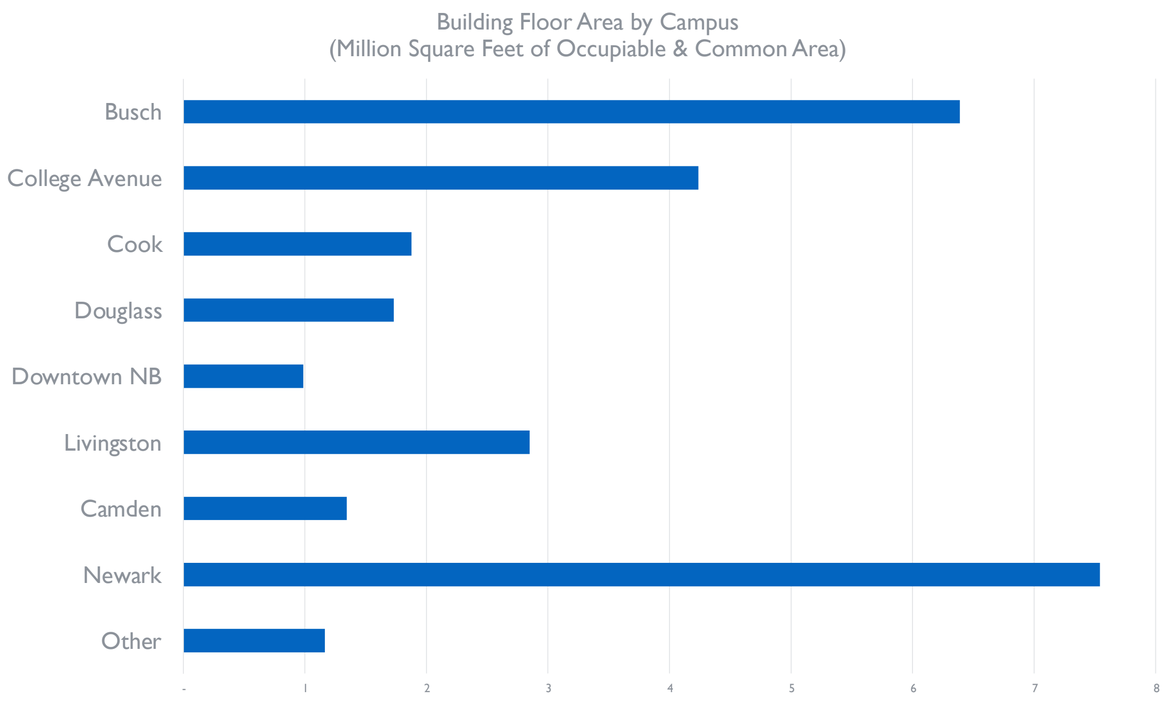
Table I.2.1. Preliminary FY 2019 Scope 1 and 2 Greenhouse Gas Emissions Inventory
(tonnes carbon dioxide-equivalent emissions)

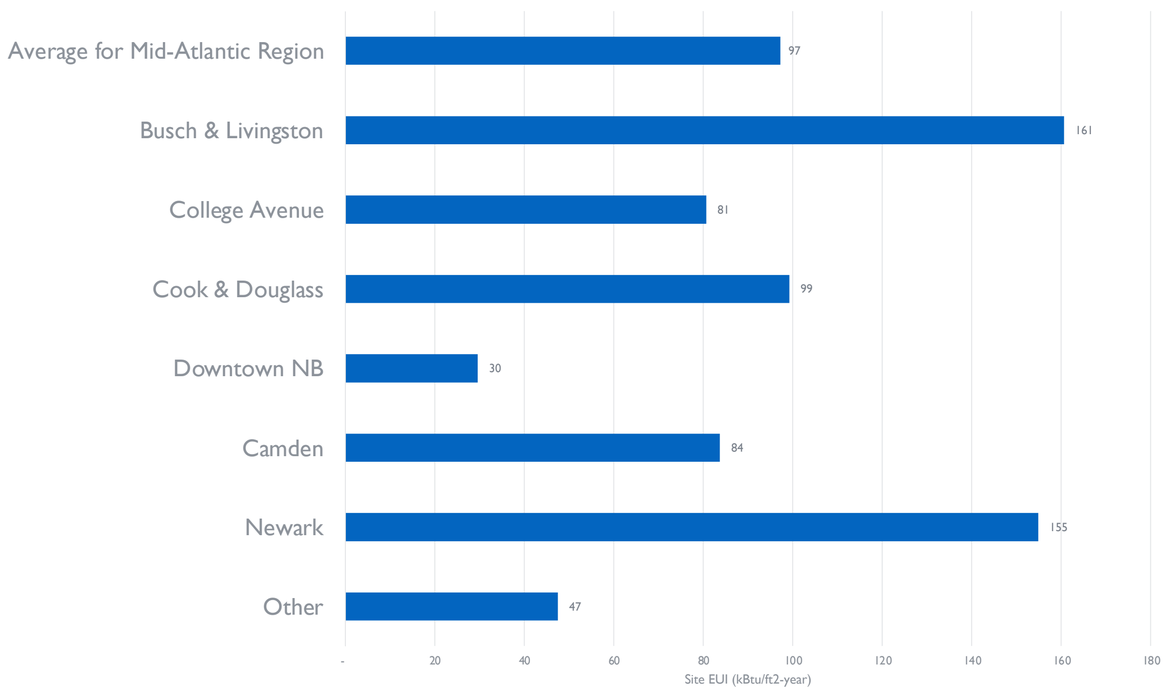
Scope	Source	Camden	New Brunswick	Newark	RBHS		Total
					Newark	N.B.	
1	Co-Generation Electricity	0	31,061	0	11,994	0	43,055
1	Co-Generation Hot Water	0	40,999	0	26,035	0	67,034
1	Other On-Campus Stationary	5,171	73,637	10,320	10,666	5,732	105,526
2	Purchased Electricity	8,342	53,658	22,094	43,249	9,565	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.

- 700+ buildings with 28 million square feet
- A majority of the building stock was built between 1970 and 1987, although some are much newer and others date back more than 200 years.

Energy Use = Floor Area x Energy/SF





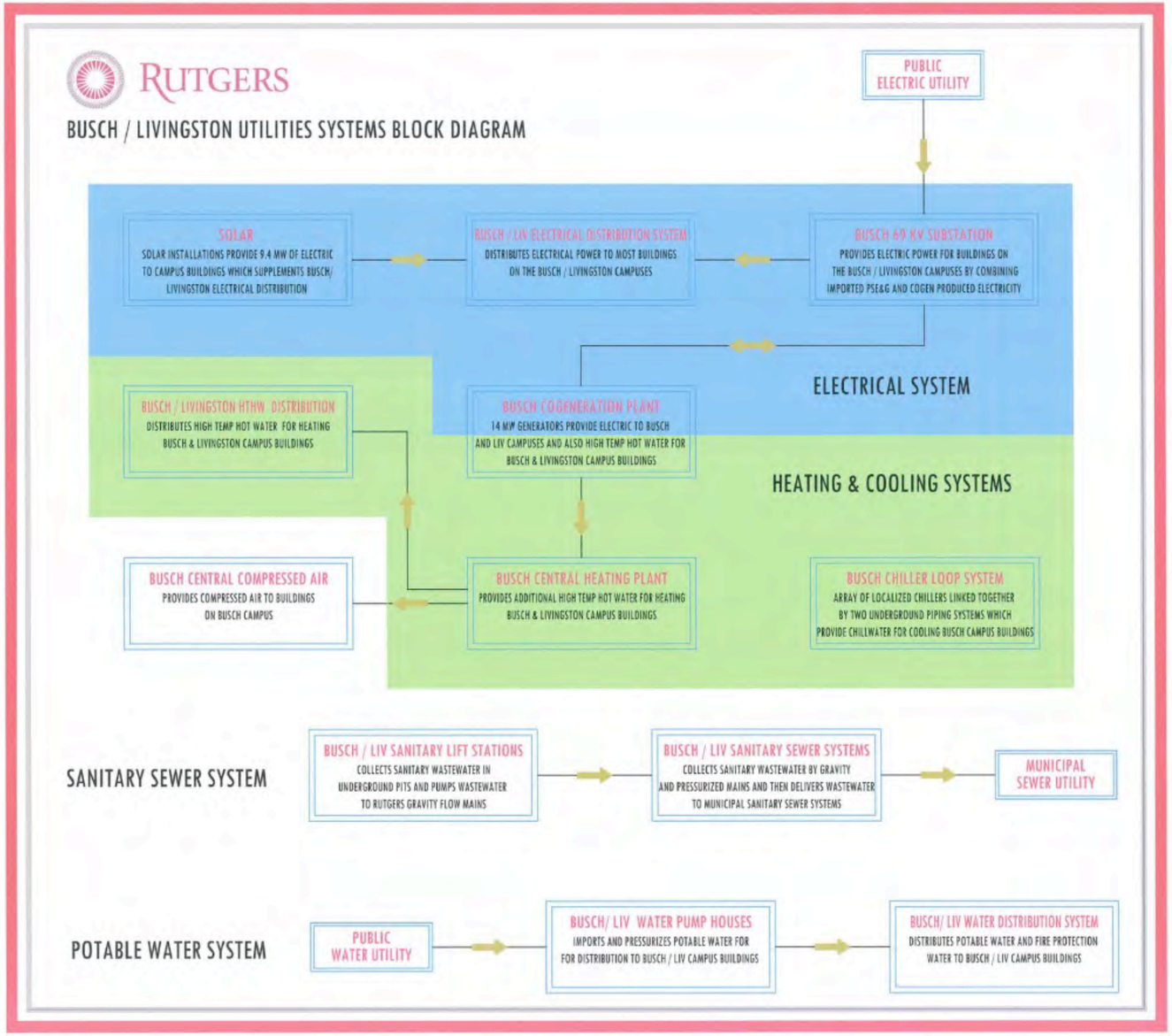
- Busch and Livingston campuses, including RBHS Piscataway, together have the highest energy utilization index at 161 kBtu/sqft-year, followed by Newark (which includes RBHS Newark) at 155 kBtu/sqft-year.
- The non-science campuses are much less energy intensive.
- The university-wide energy utilization index is 126 kBtu/sqft-year, higher than the average for commercial buildings in the Mid-Atlantic region.

Potential Solutions

- **Energy Audits**: Building-by-building assessments of cost-effective measures.
- **Carbon Footprint Analysis**: Hire a consultant do produce an in depth baseline carbon footprint analysis.
- **Building Standards**: Update building design standards.
- **Metering, Monitoring & Control Systems**: Assess controls for buildings and central energy systems. Install electricity, heating hot water, and chilled water meters in individual buildings served by district energy systems.
- **Power Purchase Agreements**: Purchase clean, renewables-based electricity from outside parties for delivery using existing utility lines.

Assessment of Solutions

- **Energy audits**: State programs can help pay for it. Much work already done.
- **Carbon footprint analysis**: A straightforward consulting task.
- **Building standards**: Only affects new construction.
- **Metering, monitoring & control systems**: Expensive but needed.
- **Power purchase agreements**: Low short-term financial burden.



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Supply Chain and Waste Management

Kevin Lyons, Ph.D., Nimish Patel, and Wes Coleman, co-chairs

Working Group Membership

Kevin Lyons, Co-Chair, Rutgers Business School (RBS)
Nimish Patel, Co-Chair, University Procurement Services
Wes Coleman, Co-Chair, University Procurement Services
David Dehart, IPO
Elizabeth Demaray, CCAS
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David Haines, IPO
Gary Kovach, RBHS
Uta Krogmann, SEBS
Julie Lawson, RWJMS
Jeremy Lessing, RWJ/RBHS
Joe Martin, CCAS
Dhavani Mashru, RBS
Mark McLane, IPO
Alma Ortiz, UPS
Marie O'Toole, Camden SON
Jack Schrum, Facilities RU Dining
Matthew White, RBS

November, 2020

Inventory of Baseline Emissions (Scope 3)

- **What is needed for Scope 3 supply chain/procurement emission analysis:** Indirect Emissions from Rutgers activities occurring from sources that we do not own or control. These are usually the greatest share of the carbon footprint, covering emissions associated with business travel, procurement, waste and water. *Source: GHG Protocol*
- **Supply Chain Emissions:**
  - Given the depth, complexity, and absence of data required to determine GHG emissions from the supply chain/procurement function, the working group devised recommendations based on environmental or sustainability goals that are in the interest of the University to achieve—largely to reduce its waste and environmental footprint—but for which the impact on carbon emissions cannot be quantified.
- **Waste Management Emissions:**
  - Using EPA formulas we were able to determine our waste management/recycling emission data:
    - During the last five fiscal years, Rutgers has recycled (on average) over 65% of our waste stream; over 102,147.59 tons of recyclables and 52,445.48 tons of municipal solid waste.
    - Based on our five-year data Rutgers saved 321,764.91 metric tons CO2 equivalent by recycling 102,147.59 tons of recyclables

Potential Solutions (Short-Term)

	From (years)	From (years)	Solution
Short Term	0	1	Develop Paper Reduction Program, Establish paper specs and reduce options for paper purchasing to meet RU specifications
Short Term	0	1	Create an awareness campaign for sustainability, waste reduction and recycling for all students, faculty and staff
Short Term	0	1	Eliminate plastic bags in all retail and foodservice establishments in campus facilities **(will be supported via NJ State Law)**
Short Term	0	1	Reach out to incoming students early by making sustainability (recycling) information at orientation available and/or as a topic for 1-hr courses (For Freshman)

Potential Solutions (Long Term)

- **Construction:** Attain LEED Gold Certification for all major new construction and renovation projects on campuses, while diverting at least 90% of construction waste from landfills. A goal regularly achieved on LEED projects at Rutgers.
- **Consumable and durable goods:** Work with current and future suppliers to enhance the sustainability characteristics of current and future consumable products. Develop awareness and engagement programs for employees to manage demand.
- **Food:** Build on strong current efforts on food, including reducing post-consumer waste and increasing sustainability
- **Waste:** Establish a goal of "Zero Waste" (90% diversion of non-hazardous waste from incinerators and landfills)

Assessment of Solutions

1) **FURNITURE:** Institutionalize policy to prioritize used and refurbished furniture. Develop furniture guidelines to be included in the Project Planning and Delivery document.
2) **CONSUMABLE GOODS- SUPPLY SIDE:** Rutgers Procurement and the University Sustainability Committee to work with individual vendors to enhance the sustainability characteristics of products and services
3) **CONSUMABLE GOODS- DEMAND SIDE:** create demand management programs such as awareness and engagement initiatives targeting departments and administrators
4) **ANALYTICAL/CURRICULAR CAPACITY BUILDING:** Develop the capacity on campus for research and curriculum in life cycle and embodied carbon analysis

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WG5: Land Use and Offsets

Richard Lathrop and Frank Wong, co-chairs

Working Group Membership

Myla Aronson
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Panos Georgopoulos
Paul Gottleib
Patrick Harrity
Marjorie Kaplan
Karina Schäfer
Laura Schneider
Fiona Sergeant

November, 2020

Inventory of Baseline Emissions

Rutgers manages nearly 500 of campus green space, 1,500 acres of farm land, 2,500 acres of forest land and over 600 acres of wetlands.

- Land Use

Campus grounds and New Jersey Agricultural Experiment Station (NJAES) Cook Campus farm

  - New Brunswick complex – 335 acres of turf
  - RU Golf Course – 52 acres (rough,/fairways/greens)
  - 306 acres of farmlands
- Emissions information only available for the RU Golf Course and Cook Campus NJAES Farms operations and maintenance practices.
  - Total emissions estimate: 541 MT/year
- Primary sources of emission
  - Gasoline/diesel usage
  - Other energy consumption
  - Fertilizer usage
  - Head of livestock and manure production

Potential Solutions

- Conversion of high maintenance turf areas to eco mow zones 25 acres converted summer of 2020 on NB campus to reduce fossil fuel emissions, fertilizer/herbicide use.
- Transition existing gas powered campus grounds maintenance equipment to electric.
- Afforest (plant trees) "vacant" campus lands to increase C storage.
- Proactive management of RU owned forest lands (~3000 acres) to maintain, if not enhance, carbon storage (i.e., a carbon "defense" strategy).
- Reduce emissions and increase C storage on NJAES Farms and Research Stations through enhanced management.
- The planning principles already embodied in the *University Physical Master Plan – Rutgers 2030 provides a framework* to minimize energy demands and maximize carbon sequestration
- Increase use of low-carbon cement/concrete in future campus development projects.
- Offset University emissions through purchase of carbon offsets as an additional means of achieving carbon neutrality.

Assessment of Solutions

- 25 acres of the NB campus lawns identified for conversion to eco-mow zones (initiated in Summer 2020).
  - Greater C storage benefit would be achieved by planting the right mix of grasses and forbs.
- Identified 80 acres of farmland, 15 acres of campus lawn and 32 acres of forest gaps for afforestation/reforestation for a sum total of approx. 3,977 Mg C or 14,680 MT eCO2.
  - To be successful requires careful site prep, subsequent stewardship and $.
- Ensure Significant Capital Projects are designed to minimize energy demands and maximize C capture of campus green spaces.
  - Requires monitoring implementation to ensure desired elements aren't downsize or eliminated.
- The Offset Network provides an existing collaboration of higher educational institutions that Rutgers could participate in.
  - This voluntary approach provides an alternative pathway for Rutgers to realize voluntary offsets for up to 30% of our Scope 3 emissions through peer-verified offset projects.

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Climate Positive Equitable Economic Development

Carl Van Horn, Peggy Brennan-Tonetta, and Jessica Paolini, co-chairs

Working Group Membership

Jeanne Fox
Noa Gafni
Gregory Gamble
Jeanne Herb
Elayne McClaine
Melanie McDermott
Gary Minkoff
Amy Rowe
Lynne Trabachino
Henry Turner

November, 2020

Definition

- This concept informed the activities of all working groups.

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

Rutgers Program Assessment

- Rutgers has many established programs and initiatives that are relevant to developing a climate-positive, socially equitable set of institutional policies and actions.

- These resources vary in scale and scope.

- There are less than a dozen programs of 50+ included in our assessment that cross-over/cover two or more topics (such as social equity and economic development or climate change and economic development).

Community Program Assessment

- There are initiatives at the local-level in our host communities that are working towards the broad goals of climate-positive equitable economic development.

- The organizations leading these initiatives are potential partners and resources to the Task Force.

- Pursuit of in-depth engagement with host-community programs is needed.

State Policies

- There are significant opportunities to link Rutgers' efforts to larger state policy goals, and effect transformation towards a climate-positive equitable economy.

- The Task Force should become engaged in the development/ implementation of such state policies, such as the Energy Master Plan and New Jersey's Global Warming Response Act 80x50.

National and International Programs

- Climate-positive actions at selected universities, cities, and states were identified and evaluated for their successes and failures.

- Useful examples of solutions are found among the APLU Innovation & Economic Prosperity award winners and within localities that pursue climate change goals through an equity lens and in partnership with academic institutions (ex. Resilient Los Angeles).

- Several trends were observed internationally such as: universities are engaged in economic development, attracting new companies to their host communities and developing infrastructure to withstand climate shocks; many projects are aimed at transitioning the biggest polluters (heavy industries) towards climate-friendly practices/policies.

Recommendations

- Based on extensive research, we proposed three areas of potential climate solutions for the Task Force to explore:
  - Resiliency (encompassing environmental justice and public health);
  - Business/Economic Development; and
  - Integration/ Coalition Building.

Resiliency

- Undertake collaborative climate change planning and implementation in partnership with the urban communities that host our three primary campuses, which:
  - advances the university's plan on carbon neutrality and climate resilience;
  - advances the state Energy Master Plan to support Community Energy Planning and Action in Underserved Communities; and
  - results in improved health equity outcomes, particularly for goals associated with Healthy New Jersey 2030.

Business/Economic Development

- Build on our role as an anchor institution through investments in infrastructure, research, and programs and partnerships with locally-based businesses to support a climate-positive transition.

- Specific economic development initiatives may encompass but are not limited to: green business incubation, clean energy workforce development, student entrepreneurship, impact investing.

Integration/Coalition Building

- Establishment of a Rutgers Sustainability Office is recommended to organize and oversee implementation of actions recommended by the Task Force.

- Office could play a role in bringing together existing Rutgers programs that are focused on climate change, social equity, inclusion and diversity, and economic development.

- This can foster greater disciplinary cross-over that broadens program scope to include climate-positive equitable economic development considerations.