Transforming Climate Change Scholarship at Rutgers-New Brunswick

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The Challenge of Climate Change Scholarship

The Earth's climate reflects a complex interplay among the atmosphere, ecosystems, oceans, human activity, and the solid earth. Insightful and actionable climate change scholarship demands interdisciplinary approaches and Rutgers must organize to undertake state-of-the art integrated approaches to studying climate change. Recognition that human-generated greenhouse gas emissions have increased to the extent that the climate is fundamentally shifting into new and largely unknown states has served as a sobering yet catalyzing moment across these disciplines. The need to provide a scientific understanding of the Earth's dynamic climate future, and to what extent this future will transform Earth's ecological, social, and economic systems, sit at the forefront of each discipline today. **It is only through an all-hands-on-deck approach that we, as Rutgers climate change scholars, can provide the deep scientific understanding, improved predictive capacity, and meaningful responses and solutions needed to meet the challenge of climate change.**

Rutgers-New Brunswick faculty are increasingly combining their expertise to grow new knowledge, understand the range of climate change impacts, and develop innovative and equitable climate change mitigation and adaptation solutions. Scholars within engineering innovate and expand technologies in renewable energy and carbon capture. Physical and life scientists unravel the complex interconnections among Earth's physical, geochemical, and biological systems. Social, economic and behavioral scientists, along with scholars in law and policy, seek to understand how Earth's changing climate affects society, policy and governance. Scholars and practitioners in the arts and humanities raise awareness, foster new understandings and engagement, and inspire action around climate change. Addressing climate change requires novel combinations of disciplinary approaches that can identify and achieve technological, ecological, social, and policy solutions to slowing the rate at which greenhouse gases are emitted into the atmosphere, and inspiring and guiding the responses of society to the current and pending impacts of climate change. Simply put, no single approach or disciplinary perspective to confronting the climate change challenge will work in isolation as the task is too large and complex for silver-bullet solutions. **The way forward is to strategically 'blend' disciplinary tools, Rutgers communities, and their perspectives, and to foster a convergence of ideas that begins to match the scale and urgency of the climate crisis.**

How does Rutgers-New Brunswick create a cultural and administrative environment that can fully embrace and facilitate this level of interdisciplinary scholarly convergence? How can Rutgers-New Brunswick faculty, staff, and students best serve the needs of the state's citizenry, industry, and decision makers as we collectively look to reduce greenhouse gas emissions and adapt to the worst of climate change impacts, while also identifying opportunities to enhance resiliency of our social and ecological systems? How can Rutgers-New Brunswick faculty, staff and students tell the story of how our planet, and our relationship to it, is changing in the wake of climate change? The University is facing similar questions as it addresses pressing concerns about poverty, illness, and racial injustice. In the remainder of this proposal, we describe our vision of how existing Rutgers efforts in this multidisciplinary space can be reimagined and invigorated to address the multi-faceted challenges of climate change.

The Rutgers Climate and Energy Institute

We propose the establishment of the **Rutgers Climate and Energy Institute (RCEI)** with a mission that serves to elevate the local, national, and international profile of Rutgers-New Brunswick (RU-NB) as a locus for climate change scholarship and outreach. This new institute takes full advantage of existing climate, renewable energy, and earth system science programs, while expanding the range of disciplinary perspectives brought to the task. This series of ambitious and wide-reaching goals generate the following mission statement:

The mission of the Rutgers Climate and Energy Institute is to contribute to a resilient, equitable, and sustainable climate future. This mission is achieved by connecting faculty, staff, students, and stakeholders through transformative climate change research, innovation, education, and outreach.

The Rutgers Climate and Energy Institute will be a force multiplier that enables RU-NB to make significant advances in producing the knowledge needed for a resilient, equitable, and sustainable climate future beyond the current situation, communicating that scholarship to the public, and inspiring climate action. Our vision for RCEI capitalizes on our existing reputation in climate change scholarship and builds toward the creation of a truly multi-disciplinary community of climate change scholars. RCEI will support, coordinate, generate, and communicate the broad range of climate change scholarship that takes place across the Rutgers-New Brunswick campus.

The formation of RCEI allows **streamlining of climate change and renewable energy communication functions; and the creation of a physical and virtual spaces for faculty, staff, students and stakeholders to create, find and use climate change resources at RU-NB.** Importantly, a clear RU-NB 'home' for climate change scholarship embodied by RCEI enables **increased RU-NB investments to be directed toward their greatest effect**, and for philanthropic **investors to more easily identify where their interests and goals will be amplified**.

The Rutgers Climate and Energy Institute will include the scholarship themes of earth systems, innovation-technology, and human dimensions of climate change. RCEI will support convergence and synthesis efforts within each theme while providing mechanisms for connections across themes that advance new ways of thinking about and communicating climate change impacts, adaptation, and mitigation. We envision that these three core themes will be the heart of RCEI with Area Leads representing each. However, scholarship clusters within these thematic areas are expected to change over time in tandem with evolutions of climate change scholarship and faculty expertise at Rutgers-New Brunswick.

RCEI is confronted with a real and formidable task of organizing faculty, students and staff around salient themes within climate change scholarship. We propose a 'federal-state' organizational structure where higher-level (federal) administrative, communication, outreach, and philanthropic tasks are handled by the Director of RCEI and a dedicated staff. Three Area Leads, each overseeing the broad thematic areas of earth systems, innovation-technology, and human dimensions will coordinate and galvanize research focused on scholarly synthesis and convergence, effective communication of climate change scholarship, and knowledge co-production with stakeholders and industry. We envision that within these three themes research clusters and working groups will organize around focused and highly topical scholarship areas such as climate-biodiversity feedbacks, climate justice, carbon capture technology, development of renewable energy and storage, climate forecasting, the art of climate change, and building resilient infrastructure, among several others. **Dividing the organizational tasks of RCEI into a 'federal-state' governance model provides a needed organizational structure and common identity within and outside of RU-NB, while allowing scholarship investments to be nimble enough to track rapid advances in climate change scholarship.**

This organizational structure will: (1) reduce administrative and funding complexities so that barriers to faculty, staff, and student engagement in climate change research are lowered or removed, (2) create the day-to-day opportunities for faculty, staff, and students to more fully integrate their expertise across the wide array of disciplinary approaches to the climate change challenge, and (3) streamline the feedback between scholarship and its application through building lasting relationships between Rutgers' scholars, practitioners, students, industry, and the public.

We propose RCEI will engage in the following initiatives:

(1) provide resources and staffing to support ideation sessions, seed grants, interdisciplinary synthesis, and outreach events that galvanize scholarly efforts across RU-NB to move ideas into action;

(2) deliver resources, space, and staffing support for research groups that are engaged in grant writing, or similar efforts, that will fund innovative convergent climate change scholarship;

(3) provide post-grant communications support and meeting spaces that facilitate realization of grant proposal goals and increase the impact of funded scholarship;

(4) develop an inviting and convenient physical space at RU-NB that can house RCEI and provide a potent symbol of what we can achieve under its mission;

(5) create a climate change and renewable energy postdoctoral fellows program that supports under-represented groups in climate scholarship, facilitating their advancement as impactful climate change scholars;

(6) establish an artist-in-residence program that allows artists to fully engage within a research team helping the group to conceptualize ideas that lie outside the scope normally defined by the

sciences and open the field of climate change science to questions that might otherwise go unasked;

(7) foster and support the development of new cross-school, interdisciplinary educational opportunities

(8) engage and sustain climate change and renewable energy education, scholarship and outreach partnerships with industry, government, and stakeholders within New Jersey;

Investment in RCEI emphasizes that RU-NB is in step with peer R1 universities that have recognized the importance of large-scale environmental issues by establishing centers and institutes similar to what we are proposing here. Although these centers and institutes differ in their details, all of them include elements of the broad thematic areas of climate change, energy, and earth system science that are within the scope of RCEI.

These include:

Purdue University, Institute for a Sustainable Future

University of Minnesota, Institute of the Environment

Columbia University, Climate School

North Carolina State University, North Carolina Institute for Climate Studies

Penn State, Institutes of Energy and Environment

Princeton University, High Meadows Environmental Institute

Princeton University, Andlinger Center for Energy and the Environment

Stanford University, Stanford Doerr School for Sustainability

UCLA, Institute of the Environment and Sustainability

University of Delaware, Gerard J. Mangone Climate Change Science and Policy Hub

University of Florida, Florida Climate Institute

University of Virginia: Environmental Resilience Institute

University of Wisconsin, Center for Sustainability and the Global Environment

A Strong Foundation

Rutgers-New Brunswick is home to world-leading faculty in the disciplines interwoven in climate change scholarship with almost 250 faculty from across the university identifying as having climate change or renewable energy as a part of their scholarship or outreach interests. Over the past two decades, subsets of these faculty have organized under existing institutes and centers and achieved considerable success in climate change and renewable energy scholarship,

outreach and education. It is imperative that our effort to realize a broader climate change scholarship mission acknowledges and builds upon these successes.

Three existing institutes have organized students, faculty, and staff in the disciplinary space envisioned for RCEI: the Rutgers Climate Institute (RCI), the Rutgers Energy Institute (REI), and the Institute for Earth, Ocean, and Atmospheric Sciences (EOAS). The history and goals of these existing institutes are briefly described below.

The origins of the Rutgers Climate Institute date back to two climate change-related initiatives formed in 2006, one based in the School of Environmental and Biological Sciences and the other based in the School of Arts and Sciences. RCI-affiliated faculty perform research in areas as close to home as the Raritan River and the Jersey Shore, and as far away as Tanzania and Indonesia. Their scholarly interests, to name just a few, include such topics as mechanisms of sea level rise, economic risks of climate change, consequences of climate change for human health and well-being, effects of media coverage of climate change on public opinion, and social adaptation and vulnerability to climate change.

The Rutgers Energy Institute was also formed in 2006 and has a mission to foster both fundamental and applied scientific research and policy components to develop sustainable energy production compatible with economic growth and environmental vitality. To do so, REI brings together experts from academic units and research centers across internal Rutgers boundaries to develop strategic teams to work on developing renewable, alternative energy sources. REI has six foci: (1) catalysis as a basis for carbon capture technology; (2) bioenergy and bioproducts; (3) nanomaterials; (4) photovoltaics and energy storage; (5) carbon-negative technologies; and (6) energy economics, environment, and policy systems. These foci are fertile ground for convergence scholarship and are critical to decarbonizing energy supplies.

Established in 2014, the mission of the Institute of Earth, Ocean and Atmospheric Sciences is to cultivate a university-wide, interdisciplinary community for scholarly leadership, innovative research, education, and public policy engagement about the past, present and future of the Earth system, including the solid Earth, ocean, atmosphere, and biosphere. EOAS has invested in (1) advancing the scientific understanding of the past, present and future of the Earth system and (2) building the knowledge and perspective needed for equitable state, national, and global stewardship of a healthy, sustainable, and resilient planetary environment.

A Dynamic Future

Building on this foundation, we propose a new organizational structure. **With the founding of RCEI, RCI and REI will be fully subsumed and cease to exist as independent units at Rutgers. Elements of EOAS will move into RCEI, however it will remain an independent institute with a mission and structure shifting toward the continuing interests and needs of its associated faculty.** This proposed reorganization, when fully resourced, will enable RU-

NB to embark upon a dynamic future for climate change scholarship and outreach described below.

RCEI as an Integration Hub

RCEI will foster collaboration and amplify the vast climate scholarship being conducted at RU-NB facilitating or sponsoring several highly successful existing or new programs. For example, RCEI will organize the annual Rutgers Climate Symposium, which has run since 2006 (annually since 2011), bringing together climate scholars and students from throughout our region with the goal of creating communities of practice and generating novel interdisciplinary research efforts. In addition, RCEI will serve as the New Jersey liaison for the U.S. Department of Agriculture's Northeast Climate Hub, which connects stakeholders to climate-related resources, and works to fill information gaps where needed. RCEI will serve as an integrative force across existing and emerging research centers and initiatives such as the green building, energy policy, and climate adaptation projects at the Center for Urban Policy Research, low-carbon infrastructure planning at the Voorhees Transportation Center, the New Jersey Climate Change and Land Management Initiative, and the NOAA RISA Consortium for Climate Risk in the Urban Northeast.

RCEI will be a facilitating partner for existing efforts to connect faculty with stakeholders throughout New Jersey. For example, RCEI will aid in connecting researchers from across the university to existing support resources for management and policy in the context of climate change such as Rutgers Ocean Adapt fisheries data portal and the New Jersey Green Building Manual. RCEI will provide a mechanism to leverage and utilize Rutgers' world leading field observational networks that are critical to observing changing systems such as the New Jersey Weather and Climate Network, the Center for Remote Sensing and Spatial Analysis, and the Center of Ocean Observing Leadership. Similarly, RCEI will facilitate connections across RU-NB to the vital work of the New Jersey Climate Change Alliance, a nonpartisan collective of leading organizations with a presence in New Jersey that share the goal of advancing science-informed climate change strategies and policy at the state and local levels. RCEI can also facilitate cross-campus connection to the New Jersey Climate Change Resource Center at Rutgers, which was established by statute in January 2020 and has been provided with a state appropriation to Rutgers for its support.

RCEI as a Scholarship Hub

We propose several new initiatives that directly address the RU-NB master plan goals of scholarly leadership, innovative research, and increasing faculty diversity. We propose dedicated sources of annual funding that will support groups of faculty, staff, and students engaged in convergence research related to climate change and renewable energy scholarship. These funds target stages of scholarship progression from synthesis and ideation, to securing needed funding, and finally to ensuring funded work is impactful. To do so, RCEI will provide space, staffing resources, and funds that allow interdisciplinary faculty groups to develop and coalesce around shared scholarship interests, devote their unfettered attention to developing multidisciplinary and convergence funding proposals, and ensuring that funding enabled by RCEI achieves its expressed goals and is broadly communicated to interested industries, stakeholders

or the public. We note that support for this investment is critical if Rutgers faculty are to compete successfully for the growing number of funding initiatives in climate change and renewable energy scholarship where expertise across a broad array of disciplines is expected, as exemplified by programs such as Critical Aspects of Sustainability Innovative Solutions to Climate Change, Regional Innovation Engines Program, and Organismal Response to Climate Change. In addition, with recent passage of the Bi-Partisan Infrastructure Bill, Inflation Reduction Act, and other Federal investments in climate resilience and renewable energy, RCEI will play a key role in enabling faculty to access these funding sources and transform this funding into actionable and impactful outcomes for New Jersey and the nation.

RCEI can play a pivotal role in training, attracting and retaining a diverse set of climate change and renewable energy scholars at RU-NB. RCEI will accomplish this goal through two initiatives. First, we propose a Postdoctoral Fellowship program that supports diverse scholars with interests in climate change and renewable energy scholarship, and that RCEI provides a mentoring and collaboration structure that allows these Fellows to engage with each other and affiliated faculty to achieve their scholarship and professional development goals. This program will follow successful models such David H. Smith Post-Doctoral Fellows and the Global Change Postdoctoral Fellowship at the Arnold Arboretum of Harvard University, and seek to identify and develop future leaders and entrepreneurs in climate change and renewable energy scholarship. Second, we propose that RCEI serves as a formal mentoring, connection, and retention hub for climate change and renewable energy cluster hiring efforts. Building a community of young and diverse faculty within climate and renewable energy ensures that RCEI, and participating RU-NB Schools, stay at the forefront of these quickly evolving fields. Within both initiatives, we see RCEI leadership and affiliated faculty as providing the dynamic and engaged community of scholars that can accelerate success for young scholars and new faculty, and ensure they are participatory and productive members of the RU-NB community.

RCEI can substantially increase climate change community engagement by becoming a central locus for research-to-application efforts within industry, state government, municipalities, and stakeholder groups. RU-NB serves a critical role as the institution charged with moving innovative and novel research into practical applications that benefit New Jersey residents. The importance of this mission cannot be understated in the context of likely impacts of climate change on New Jersey communities, and the need to provide the technological innovations that allow residents to thrive within a novel climate future and de-carbonized energy future. We propose that the investment in RCEI leadership and staff serves as a mechanism for RU-NB to consistently engage partners in industry, state agency, and stakeholder groups to address their needs and concerns related to climate change. Providing this level of regular community engagement is fundamental to RU-NB efforts to become a strong and effective partner in addressing the climate change challenge within the state. In addition, investment in RCEI staff provides a ready 'bridge' between stakeholders and faculty research initiatives allowing grant-funded engagement of the former in climate change scholarship, including the co-production of knowledge. For example, RCEI can provide the recently established Offshore Wind Energy Collaborative a mechanism to reach across RU-NB Schools to galvanize new research collaborations in this domain, and to communicate the impact of RU-NB off-shore wind scholarship on citizens of New Jersey and the nation.

RCEI as a Communication Hub

As climate change impacts worsen over time, and the global energy economy moves toward decarbonization, it will be of paramount importance to effectively communicate the value and impact of climate change scholarship at RU-NB. Equally important is the ability of Rutgers faculty to innovate climate change communication modalities, finding ways to reach populations that remain under-engaged in addressing climate change or responding to a changing energy economy. RCEI will have a dedicated communications staff member that is consistently engaged with the scholarship the institute facilities, as well as the broader climate-related scholarship impacts of faculty across RU-NB. However, in keeping with its mission to realize high visibility and impact, RCEI will serve as communication hub that engages with scholars across RU-NB in their efforts to invite participation by communities that have lacked access to the natural environment and that have been excluded from discussions of climate change thus far. For example, RCEI staff and resources will support programs, such as a **Mason Gross Climate Change Artist-in-Residence program,** that can serve to communicate climate change scholarship effectively through visual design, sound and music, theatrical imagining and performance, installation (e.g., in cooperation with Zimmerli Art Museum), narrative and documentary film, and dance and movement. Such an engagement between science and art in the service of broad-based communications represents a globally unique element to RCEI that places it out in front of peer institutions.

Integration with Other Offices and Centers

RCEI will need to coordinate effectively with other offices and centers at Rutgers. Integration or articulation with each of these existing entities poses unique challenges, which we address here.

The newly formed Office of Climate Action leads the development of implementation plans for university climate action and the creation of systems to hold Rutgers accountable for its progress toward achieving carbon neutrality by 2040. The activities of this office span all Rutgers campuses (New Brunswick, Camden, and Newark) and its outlying research stations. It seeks to mobilize faculty, students, and staff to realize an ambitious agenda that will increase the energy efficiency of Rutgers facilities, spur the development of climate-neutral transportation and operating systems, and utilize campus spaces as 'living laboratories' for climate change education and research. The Office of Climate Action is also engaged in efforts to partner across the sector to advance higher education's role in climate action.

RCEI clearly must articulate smoothly with the activities of the Office of Climate Action as they share the mission to confront the challenge of climate change. However, the central mission of RCEI is scholarship and innovative research, whether that is realized as faculty-led convergence scholarship initiatives, interdisciplinary synthesis, or innovating at the science-art nexus of climate change. We anticipate that some of this scholarship will take full advantage of the activities of the Office of Climate Action (e.g., using facilities innovations as research subjects or campus initiatives to communicate about climate change). While we see much potential for research conducted through RCEI to contribute to efforts to achieve carbon neutrality globally, we see the Office of Climate Action as the entity responsible for moving Rutgers University toward carbon

neutrality and exploring a more climate-sustainable way for higher education to do business for the next century. As such, the missions are distinct, with RCEI providing Rutgers a scholarship presence on a global stage and the Office of Climate Action leading efforts to promote emissions reductions and carbon neutrality within Rutgers and the importance of higher education institutions moving toward models of sustainability.

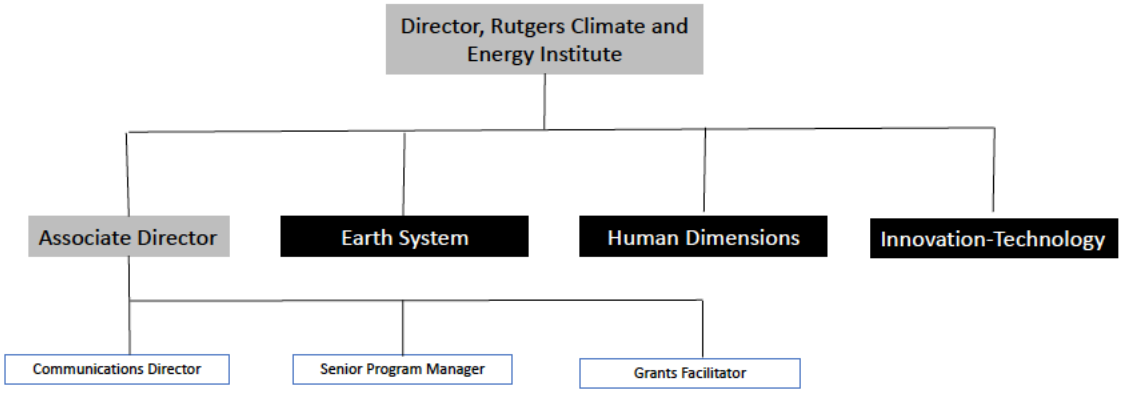
Efforts to create an institute or center that explores the two-way connection between health care and climate change are currently under development, in connection with Rutgers Biomedical and Health Science (RBHS). Due to its formative state, we cannot highlight differences in mission between RCEI and this health institute as clearly as we can for the Office of Climate Action. Nevertheless, the two groups have a shared mission of scholarship involving climate change, and there are several faculty and outreach elements within RCEI that explicitly consider the effect of climate change on health and opportunities for renewable energy justice. RCEI has a remit that includes the schools and departments within the New Brunswick Chancellor-Provost's office, and cannot adequately incorporate the many links between climate and health as can an institute that is situated within RBHS. However, the two institutes will certainly share a subset of faculty and will likely find common ground where resources can be combined to incentivize cross-institute collaborations.

Leadership and Governance

Leadership of RCEI will consist of a **Director** and a team of three **Area Leads**, each of whom represent the themes of Earth systems, innovation-technology, and human dimensions of climate change and renewable energy. The Director should maintain a 50% administrative and 50% research appointment at the Full Professor level with tenure residing within an appropriate department and School. This apportionment of job duties reflects the large time commitment the Director must make to RCEI in order to realize the outcomes described above. Having the Director maintain active research, and acknowledging this commitment in their job description, ensures that Rutgers can attract and retain individuals who are global leaders in climate change scholarship. We see a research-active Director as critical to their ability to identify and support cutting-edge interdisciplinary research themes, creating and maintaining necessary professional networks that will benefit RCEI, and give them needed credibility with funding sources when seeking support for RCEI initiatives. The Director should serve in 5-year intervals that follow the review and evaluation of Institutes and Centers at Rutgers-New Brunswick, with appointment/re-appointment determined by the RU-NB Chancellor-Provost, participating RU-NB Schools, with input from RCEI affiliated faculty. Each Area Lead should serve in 3-year intervals with appointment/re-appointment determined by the Director with input from RCEI affiliated faculty. Each Area Lead should receive administrative support through their home Schools to recognize that their role in RCEI requires a significant time investment. Area Leads are expected to maintain close relationships to RCEI faculty within a research theme, and theme-associated Schools, Departments and Centers. Area Leads are also expected to work across themes to connect faculty to emerging climate change or renewable energy scholarship teams, or co-create ideation session, workshops or symposia that drive innovation and synthesis. The Director and Area Leads together form a **Scholarship Board** that determines how to allocate staff and converge research investments.

RCEI will also maintain an **Administrative Board** that is composed of the Director and staff of RCEI, and Deans (or their designates) from each participating RU-NB School. This board is charged with providing input on funding initiatives, philanthropy, and increasing articulation of RCEI with other climate change initiatives across Rutgers University units. This board also provides direction as to the role of RCEI in emerging cross-School needs in graduate or undergraduate education, communications, outreach, state appropriations, and industry connections.

Finally, we expect that the Director will be supported by a group of dedicated **high-level staff**. These positions are: (1) Associate Director that assists the Director in administrative functions such as budgeting, coordination and delivery of assessment and other documentation, stakeholder engagement, maintaining contacts and attending events across RU-NB, and interfacing with industry and state government officials, (2) Senior Program Coordinator who oversees events planning, coordination and execution of events, organizing and overseeing working group meetings and access to RCEI spaces, (3) a Communications Director that creates media content of RCEI scholarship and outreach programs, maintains and updates websites, creates materials related to events (e.g., art installations) and serves as a liaison to the Rutgers office of communication, and (4) a Grants Facilitator who assists RCEI faculty in identifying grant opportunities, and providing RCEI-funded faculty groups with pre-award grant assembly and a smooth grant submission process.



Potential organizational chart for the Rutgers Climate and Energy Institute. The Director is supported by an Associate Director (gray boxes) and three staff (white boxes) that enable the core functions of RCEI including outreach, scholarship and communication. Three Area Leads (black boxes) recognize and incentive scholarship clusters within each of the three core themes of earth systems, innovation-technology and human dimensions of climate change.

During the initial meetings with RU-NB faculty, especially those associated with RCI, REI and EOAS, we will identify individuals who are best suited to contributing to RCEI and invite these individuals to become members. We will also keep an open call for other faculty who may be

interested in joining RCEI, with an annual, open-to-all, symposium with short ("lightning") presentations as a way to identify faculty who would benefit from membership, and vice versa. We envision selective faculty membership to ensure an active, lean and highly integrated and engaged team of scholars. RCEI affiliated faculty will be asked to take part in governance and to lead specific initiatives. Affiliation will be assessed every 5 years by the Director and Area Directors, with input from RCEI faculty (e.g., a membership committee), to ensure that faculty participation in RCEI activities remains consistent. We consider this more selective approach to faculty membership to be superior to simply creating a long list of members who may or may not make meaningful contributions to RCEI activities.