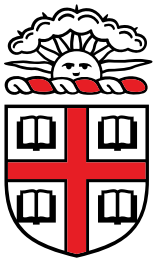

BROWN

Brown University

SUSTAINABILITY STRATEGIC PLAN

March 2021

OFFICE OF THE PRESIDENT
BROWN UNIVERSITY

CHRISTINA H. PAXSON, PRESIDENT

March 5, 2021

Dear Members of the Brown Community,

Brown University has a long-standing commitment to mitigating the effects of campus operations on the natural environment. Over the past two decades, our efforts have included taking ambitious actions to reduce greenhouse gas emissions and minimize our energy footprint, instituting changes to facilities and infrastructure, establishing new approaches to sustainable investing, and forming partnerships in the region to confront issues of climate resilience — all while advancing education and research about sustaining life on earth. But we can and must do more.

With broad scientific consensus emphasizing the need for urgent action, organizations around the world must commit to transformative change to safeguard the natural Earth systems upon which all life depends. The acceleration of climate change, pollution and biodiversity loss constitutes a defining challenge in the 21st century.

The Brown University Sustainability Strategic Plan is our response to this challenge. This strategic plan articulates concrete goals for creating a more sustainable campus, as well as specific targets for reaching those goals. We approach sustainability as an institution of higher education that is deeply committed to confronting society's most vexing challenges with an approach rooted in critical thinking, data analysis and cultural understanding.

Unlike sustainability plans that institutions developed for decades based on the notion that we simply must "do better," this is a sustainability plan for a net-zero era. The plan focuses on the real impact we can make to reduce greenhouse gas emissions, nutrient pollution, human health impacts, water quality impacts and biodiversity loss. It also recognizes that there is no shortage of work to be done. Therefore, the priorities established in the plan are based upon the gravest threats and Brown's ability to effect change. We are focused on meeting ambitious but attainable targets, with metrics against which to measure our progress.

The plan builds on years of previous work. With commitments to wind and solar projects designed to offset all on-campus electricity use, the University in 2019 set the aggressive goal to cut greenhouse gas emissions by 75% by 2025, and to achieve net-zero no later than 2040. By early 2020, the Brown Investment Office had sold 90% of all of its financial investments in companies that extract fossil fuels (liquidating the remainder), and committed to using the University's leverage as an investor to actively encourage others to do the same.

In addition, Brown's most important contributions to creating a more sustainable future continue to be through its teaching and research. The sustainability strategic plan, which was finalized through a community engagement process, arises directly from the values that underpin our mission to prepare students to lead purposeful lives and contribute solutions to complex problems as we work toward a more equitable and just society. Last year, the University launched the Climate Solutions Initiative, working to advance the abilities of universities, cities, regions and countries to adopt pragmatic solutions to climate change, while a new Climate Solutions Lab will harness faculty brainpower to provide analysis and train the next generation of climate action leaders.

Our greatest asset in achieving Brown's ambitious sustainability goals is the depth of the commitment of members of the Brown community. I thank our students, faculty, staff, alumni and friends of Brown for your dedication to building a sustainable future. I am excited to share Brown's plan as we embark on the next step in addressing this urgent challenge.

Sincerely,

Christina H. Paxson
President

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The Values Underpinning the Plan

If Brown University is to fulfill its mission "to serve the community, the nation and the world," it must lead by example in addressing its impact on the environment and the impact of the services it provides. In the 21st century, with climate change, the potential loss of a quarter of the world's species, and social inequality linked to differential exposure to environmental threats, it is essential that we make rapid strides toward greatly diminishing Brown's environmental footprint while promoting positive impactful change.

First, it is important to define the term sustainability, which is much used but variously defined and contentious. For the purposes of this strategic plan, sustainability at Brown means ensuring the operations of the campus do not impair the ability of future generations (at Brown, in our community and around the world) to rely on the environmental benefits that are available today. Further, it requires that our research, teaching and community engagement increasingly incorporate sustainability solutions as an essential component of fulfilling the University's mission.

Brown's commitment to sustainability arises from several core values. First, we recognize that the future of life on Earth will be irreversibly changed in this century without a dramatic shift in the way people go about their daily lives and the way organizations do business. At the broadest level, this requires reducing Brown's environmental footprint. In addition, it is critical to the educational mission of Brown that we prepare students to lead useful, purposeful lives, and that our community of scholars and researchers contributes knowledge that identifies solutions to complex problems. In our times, that means advancing education and scholarship about the sustainability challenges impacting the lives of people around the world today, and the ways in which we can overcome them. Finally, we recognize that a sustainable world is one where people can live in safe and healthy environments, and thus our research, teaching and actions should promote this overarching value.

Brown recognizes that sustainability is closely linked with issues of equity and social justice. These values are at the core of Brown University's intellectual culture and are embedded within several themes in *Building on Distinction: A New Plan for Brown*, the University's strategic plan that launched in 2014. In that plan, we are called to create "scholarship and public discourse on institutions and ideas that promote social justice and economic prosperity domestically and internationally." Similarly, we commit to "promote creative critical thinking and informed public dialogue about the most challenging questions facing humanity." And within the theme of Sustaining Life on Earth in the strategic plan, we are asked to "understand the determinants of environmental change, alter norms of human behavior, [and] consider ethical issues related to sustainability, and develop sound environmental policies." Attention to ethical issues will help to ensure that environmental policies developed by Brown under this Sustainability Strategic Plan are informed both by rigorous scholarship and by the goal of equitable and just reduction of environmental harms.

This plan recognizes that there are an uncountable number of sustainability challenges faced by society, but also that there are financial, time and effort trade-offs associated with the prioritization of any action over another. In developing the plan, it was important to assess which issues demand immediate action, and which are less critical. The assessment of trade-offs sets the tone for this Sustainability Strategic Plan. Rather than establish a broad range of efforts that, while important in shifting culture and behavior, may have moderate levels of impact that are difficult to demonstrate, Brown recognizes that our actions must lead to rapid, substantial and quantifiable mitigation of the degradation of the most critical environmental services upon which all life depends (stable climate, clean air and water, stable ecosystems).

Being accountable to this principle of quantifiability is an essential part of this strategic plan. We recognize that, in choosing objectives based on Brown's ability to take action and achieve mitigation, the University must have mechanisms in place to monitor and ensure progress. The Implementation and Governance section of this plan, therefore, outlines distinct mechanisms by which we will ensure the objectives will perfuse the specific actions discussed in the plan. This includes the designation of new Equity and Social Justice Representatives to ensure that alignment with the values of equity and justice are part of current operational planning, implementation and assessment.

Purpose of this Sustainability Strategic Plan

The goal of this document is to establish long-term objectives, articulate specific goals, and guide the University in making its decisions regarding sustainability. The strategic plan identifies the objectives that will serve as the areas of focus for Brown's sustainability efforts. In establishing priorities, this document is a departure from the broad range of initiatives that have characterized sustainability efforts at Brown in past decades. The plan articulates the problems we need to tackle first and move most quickly on, based on the scale of the problem and Brown's ability to effect change.

This Sustainability Strategic Plan is a critical first step, because there are many topics that fall under the broad heading of sustainability, and meaningful action requires prioritization. This plan articulates the aspects of campus sustainability that will be the focus of our most intensive efforts as a community. It strives to reflect Brown's community values vis-a-vis sustainability as they were articulated during the drafting, public comment and revision stages of early drafts of this document. It also strives to rely on scientific evidence that illuminates the challenges that are most imminent, and which present the gravest threat to human well-being.

Given Brown's educational mission, this Sustainability Strategic Plan, as well as its implementation, must be guided by our scholarship about human societies and the environment. This scholarship underpins the principles by which we have established sustainability-related goals and provides evidence upon which we can prioritize our actions. Our actions will thus contribute to our educational mission by providing a campus laboratory for understanding the challenges and opportunities in moving complex organizations toward a more sustainable future.

Following the adoption of this strategic plan, Brown will undergo a process of translating its ambitious objectives into concrete actions, moving toward an operational phase. Assistant Provost for Sustainability Stephen Porder, Director of Sustainability Jessica Berry and Professor of Environment and Society Leah VanWey will convene a steering committee to oversee progress toward stated goals, collection of new data and the setting of new goals as we reach the goals stated in this document. This steering committee will have wide representation from campus constituencies and will charge several ad hoc and standing committees with specific activities. The Implementation and Governance section of this document contains more detail about this structure.

This Sustainability Strategic Plan is envisioned as a living document. Specific activities will be continually updated under the leadership of the steering committee, and the high-level goals in the plan will be formally revisited at least every five years as we make progress toward our goals, and new scholarship and technologies become available. In identifying the five areas of focus for Brown's sustainability efforts, a key priority was to establish goals against which Brown could quantify and measure progress. For each of the five areas, this plan articulates the following:

- the importance of the topic to sustainability;
- the interplay between these topics and Brown's operations or academic mission (either directly or indirectly); and
- Brown's overarching goals and next steps in these areas.

Not all of the priorities articulated in this strategic plan are discussed with the same level of detail. These differences represent the current status (as of the writing of this plan) of Brown's information gathering and development of a path forward. For example, greenhouse gas (GHG) reduction has been the focus of a major University effort for more than a decade, and the time and financial commitment Brown has invested has led to a well-crafted GHG reduction plan (albeit with more to do). In contrast, while there is recognition that the global loss of biodiversity is a substantial threat to environmental sustainability, Brown has less information on what steps it can take to most effectively reduce its contribution to this problem. Thus, while next steps for GHG reduction are clear, this plan acknowledges that more information will be required before concrete actions on biodiversity preservation can be implemented. The other goals listed in this strategic plan fall somewhere between these two extremes. For each, this document articulates specific goals and a timeline to reach them.

SUSTAINABILITY OBJECTIVES

The financial and logistical reality is that not all issues of sustainability can be addressed simultaneously, and the scientific reality is that not all sustainability challenges are equally well studied, of equal urgency, or even have agreed-upon solutions. Brown will focus on measurable objectives in five areas of major sustainability challenges facing the world today. More detailed explanation of the rationale for selecting these five areas can be found in Appendix A. They are presented here in an order that reflects a combination of the urgency of the problem, our level of knowledge about the efficacy of potential solutions and Brown's ability to implement those solutions.

1. **Greenhouse gas emissions and climate change:** Achieve a 75% reduction in campus emissions (Scope 1 and 2) by 2025 — from a 2018 baseline — and net-zero emissions by 2040. Quantify Scope 3 emissions and develop a plan for reduction by 2023.
2. **Nutrient pollution:** Achieve a 15% reduction in Brown's nitrogen and phosphorus footprint by 2025, and a 25% reduction by 2030.
3. **Human health impacts:** By Fiscal Year 2024, reduce or eliminate the use of many potentially toxic chemicals and decrease noise and air pollution on campus, and by Fiscal Year 2025 determine the extent that climate change could impact the health of Brown students, faculty and staff.
4. **Water impacts:** Determine whether the benefit of stormwater reduction and grey water recycling is sufficient to divert funding from other priorities.
5. **Biodiversity loss:** Develop a process by which to incorporate biodiversity impacts into purchasing decisions.

This strategic plan puts action on climate change at the top of the priority list based on the criteria of urgency and practicability. Brown took its first steps on greenhouse gas reduction in 2008 by pledging to cut emissions to 42% below 2007 levels by the year 2020. and this Sustainability Strategic Plan describes our path to achieve net-zero campus emissions no later than 2040. The prioritization of climate action also reflects the understanding that climate change mitigation is a key issue of environmental inequality — the poorest people on earth, who have done the least to cause climate change, will suffer first and have the fewest resources with which to adapt. This plan also recognizes that climate change is not the only issue to address, and applies the same criteria — urgency and ability to effect change — to prioritize other key components of the transition to a more sustainable campus.

Education and Community Engagement

While education and community engagement are not listed among the five core objectives for mitigating Brown's effect on the natural environment, this strategic plan recognizes that they are essential to all sustainability efforts. Changing campus operations and campus culture is one of many ways to effect change. As Brown University is both a research and teaching institution and also one of the largest employers and landowners in Rhode Island, a key element of our efforts will be supporting education in our communities, and sharing sustainability lessons learned with local, national and international entities working toward similar goals.

As we work toward each of the plan's five objectives, Brown will expand upon its already diverse range of research and educational opportunities focused on sustainability challenges. These challenges will be faced by everyone, in every discipline, in the coming decades. The University highlighted this reality by identifying "Sustaining Life on Earth" as a central academic theme of Brown's strategic plan, *Building on Distinction: A New Plan for Brown,* launched in 2014. The Office of the Provost continues to work toward developing increased coursework on sustainability, and integrating sustainability more broadly in the day-to-day experience of life at Brown. The Office of the President continues to dedicate substantial funding to activities supporting resilience and greenhouse gas reductions in the greater Providence area. Our lasting global contribution arises from the actions we take, as well as the curriculum and programming that give our community evidence-based and equity-focused tools with which to make our future more sustainable.

As with "sustainability," the word "community" requires definition in the context of our efforts. We define community here as our campus-based community of faculty, staff and students. But the plan recognizes that Brown is embedded in, and is a vital part of, the community of Providence, Rhode Island, and beyond. While this Sustainability Strategic Plan focuses most on our campus community, we recognize that solutions to the sustainability challenges articulated in this plan cannot be achieved by Brown alone.

Ongoing sustainability efforts beyond the campus include myriad projects by faculty, staff and students: working with city and state leaders on renewable energy guidelines; providing input on legislation; developing stakeholder engagement around resilience in the face of sea level rise in Rhode Island; remediation of hazardous sites and identification of emerging contaminants; and exploring heating/cooling systems for the Jewelry District in downtown Providence that are less energy-intensive. In addition, education efforts include the production of a faculty/student-reported radio podcast that is broadcast weekly on Rhode Island's public radio station to educate the public on sustainability concerns and issues. Each of these efforts has received financial, logistical and staff support from the University, and the University will continue to promote these types of projects. They are critical to the mission of translating knowledge to action.

Basis for Selecting the Plan Objectives

As stated previously, this plan strategic recognizes that there are an uncountable number of sustainability challenges faced by society, but also that there are financial, time and effort trade-offs associated with the prioritization of any action over another. Brown identified its objectives based on an assessment of the scale of an environmental problem and the University's ability as a campus community to effect change.

1. Reduce Greenhouse Gas Emissions

The secretary-general of the United Nations, António Guterres, summarized decades of scientific research with a brief statement in March 2018: "The most systemic threat to humankind remains climate change." The scientific consensus is that the threat will take myriad forms. Unchecked warming will bring extreme heat and drought that threatens food production across the globe. Vanishing mountain glaciers will leave hundreds of millions of people without reliable fresh water. Sea level rise will inundate major coastal cities, including Brown's home of Providence. The threats are pervasive and unprecedented in the history of modern society.

Human-caused global climate change is a result of anthropogenic greenhouse gas emissions. Scientists predict that the world's current emissions trajectory, absent a rapid switch to renewable electricity and elimination of fossil fuel combustion by mid-century, will almost certainly result in global average temperatures that will have devastating effects on human well-being and the environment. The consequences will be severe, even assuming middle-of-the-road emissions scenarios that result in 2-3°C (3.6-5.4°F) global average temperature increase. The emissions contributing to this threat globally come from the combustion of fossil fuels for electricity and heat (25%), transportation (15%) and industry (15%), with additional substantial emissions associated with deforestation (estimated at 10% to 15%) and agriculture (about 10%), as well as other minor contributors.

To have a reasonable chance of averting catastrophic climate change, the Intergovernmental Panel on Climate Change asserts that global emissions of greenhouse gases must peak now, and reach zero by mid-century. Brown makes GHG emissions reduction, therefore, the first pillar of our Sustainability Strategic Plan, and is moving to rapidly reduce emissions in accordance with the magnitude of the threat.

2. Reduce Nutrient Pollution

According to the U.S. Environmental Protection Agency, nutrient pollution is one of America's "most widespread, challenging and costly environmental problems." While nutrients such as nitrogen and phosphorus are essential elements for life, excess nutrient export from agriculture, sewage and fossil fuel combustion creates algae-choked waterways, carcinogenic drinking water in marginalized communities, unhealthy air and acid rain. It also depletes stratospheric ozone and contributes to global warming.

Most livestock produced in the U.S. are fed grain, and those grains require large areas of fertilized land. The nutrients in fertilizer are lost to the environment at every step of the production process and before animal products ever reach the table. Of 100 units of nitrogen fertilizer added to crops, only four units of nitrogen are consumed in the red meat that makes it to the table. The rest is lost to the environment before it reaches a human mouth. In addition, the production of nitrogen and phosphorus fertilizers is a fossil fuel-intensive process that contributes to climate change directly. Therefore, seeking to minimize nutrient overuse and pollution through University practices and purchases is integral to Brown's sustainability goals. The University's focus is to reduce Brown's waste of two major nutrients that are also significant pollutants: nitrogen and phosphorus.

3. Safeguard Human Health

There is considerable evidence that chemical additives used in consumer products, food processing/packaging, cleaning supplies and building materials can adversely affect human health. Over 80,000 chemicals are used in industry or commerce and few have undergone comprehensive pre-market toxicity testing. Yet, evidence suggests that many of these chemicals have deleterious effects on an array of health outcomes, including cancer, obesity and cardiovascular disease. Of particular concern is exposure of vulnerable groups, such as pregnant women and nursing mothers. However, virtually everyone is exposed to at least one of these chemicals on a daily basis given their prevalence in so many products.

In addition, exposure to outdoor and indoor air pollution such as particulates and mold are known health risk factors that Brown can and will move to reduce. Brown also will accelerate the process of preparing its infrastructure for the coming extreme heat and storm events that lie in our future.

4. Reduce Water Use and Impacts

Freshwater resources are increasingly threatened by overuse and pollution. Upstream from the point of consumption, fresh water must be purified or chemically treated before distribution to end users; both processes are energy- and/or materials-intensive. Downstream from Brown, water is treated at Fields Point, which then releases treated water to Narragansett Bay. In Providence, as in many urban settings around the world, stormwater runoff is combined with sewage prior to treatment. As impervious surfaces proliferate in urban settings, stormwater greatly increases the amount of water that needs treatment. During large storms, local treatment facilities can be overrun, and raw sewage released directly into Narragansett Bay. With climate change, large storms are projected to increase in frequency and/or intensity, and Brown can help mitigate this problem through stormwater reduction.

In addition, minimizing the amount of water that needs to be treated reduces greenhouse gas emissions. In the Providence area, treated water is released into Narragansett Bay, while the sludge is trucked to a disposal facility. A large amount of fossil energy is then expended to incinerate water-saturated sludge before it is spread over landfill space, all with associated greenhouse gas emissions. Brown is connected to the city's wastewater stream, so any University reductions in water use and/or stormwater runoff will reduce the strain on treatment facilities and the emissions associated with them.

5. Curb Biodiversity Loss

The United Nations has reported that the combination of climate change, habitat loss, pollution and ocean acidification is accelerating the rates of species extinction worldwide. Biodiversity is essential to many ecosystem services upon which society depends — from crop pollination to water purification to oxygen production. The drastic declines in biodiversity erode the foundations of the economies, livelihoods, food security, health and quality of life for populations around the globe. Brown's biggest lever for reducing its negative impacts on biodiversity comes through reducing its impact on climate and the land required for food production, and by sourcing purchases with the preservation of biodiversity in mind.

1. Reduce Greenhouse Gas Emissions

Objective Brown is committed to reducing its campus greenhouse gas emissions (Scope 1 and 2) by 75% by 2025, and to net-zero by 2040.

For the purposes of tracking and reduction, GHG emissions are categorized into three "scopes":

Scope 1 emissions are associated with combustion of fossil fuels on campus. At Brown, Scope 1 emissions are primarily (about 70%) generated at the central heating plant (natural gas); in free-standing combustion furnaces (largely natural gas, some oil); and, to a much lesser extent, by the University's vehicle fleet (gasoline). In 2018, Brown's Scope 1 emissions were 29,101 MT CO_2eq (metric tons of CO_2 equivalent).

Scope 2 emissions come from fossil fuel combustion that occurs off site, but which produces energy that Brown consumes. Scope 2 emissions from Brown result from our purchase of electricity, which, in the New England regional grid, is produced primarily by the combustion of natural gas. As of 2018, Brown's Scope 2 emissions were 22,024 MT CO_2eq.

For both Scopes 1 and 2, Brown is developing its greenhouse gas emissions inventory in accordance with The Climate Registry, with a registry-approved third-party verifier to track our progress toward emissions reductions. The Office of Sustainability will host a GHG emissions inventory webpage that will identify the University's operational and organization boundaries, associated emissions and other relevant data.

Scope 3 emissions are indirect emissions. These include upstream emissions (such as the emissions associated with materials purchased), downstream emissions (such as emissions associated with waste), and emissions associated with University-related activities (such as faculty, student and staff travel). Importantly, Scope 3 also includes methane leakage associated with natural gas extraction, transport and combustion. Methane is the major constituent of natural gas and is also a potent greenhouse gas. Indeed, it is likely that methane leakage from the natural gas supply chain that feeds Brown's heating systems and the power plants that produce our electricity is one of Brown's largest Scope 3 sources. Thus, a reduction in Scope 1 emissions via the elimination of natural gas combustion on campus, and replacement of natural gas-fired electricity with renewables, will have the co-benefit of large reductions in Scope 3 emissions.

Greenhouse Gas Reduction Goals and Next Steps

In February 2019, Brown committed to eliminating its campus greenhouse gas emissions on a timeframe aligned with the 2050 target established by international scientific consensus. Brown pledged that campus emissions (Scopes 1 and 2) will reach net-zero by 2040, with a 75% reduction by 2025, from a 2018 baseline. This effort is likely to cost the University around $200 million over that time, and as such represents Brown's largest-ever investment in sustainability. This investment is indicative of Brown's belief, based on scientific consensus, that climate change is the greatest threat to sustainability in the 21st century.

In accordance with the goal of net-zero campus emissions by 2040, Brown announced in January 2019 the signing of multi-year agreements for two renewable energy projects that are expected to produce enough renewably generated electricity to offset all on-campus electricity use. One of those projects, a wind farm in Texas, began delivering power in late spring 2020, and is expected to offset 30% of Brown's electricity emissions annually. A second project, a 50MWdc solar farm in Rhode Island, is expected to be online within Fiscal Year 2022 and will offset the other 70% of annual electricity emissions. This means Brown will achieve net-zero Scope 2 emissions, a ~50% reduction in campus emissions relative to a fiscal 2018 baseline. Recognizing that off-site renewable purchasing still requires dependency on the local fossil fuel-powered grid, Brown will work to incorporate energy storage as it becomes feasible over the coming decade to move from "net-zero" to true zero emissions.

The University has also developed a high-level master plan to eliminate fossil fuel emissions from Brown's existing central heating plant. By or before 2025, the University will either: 1) convert the central heating plant to burn recycled biofuel as a primary fuel, avoiding the use of fossil fuels and methane leakage associated with natural gas, and avoiding competition for food crops associated with first-use biofuels; or 2) enter into a renewable natural gas power purchase agreement that will offset the University's natural gas usage until we fully decarbonize the central heating plant on or before 2040.

These solutions are viewed as transitional, recognizing that recycled biofuel is not available at the volume or scale needed to ensure its long-term supply, and that a power purchase agreement still requires that natural gas is delivered to campus along

with its associated impacts. However, either approach will produce a large reduction (~25% or more) in campus greenhouse gas emissions relative to the 2018 baseline, and allow Brown time to renovate building infrastructure. This will enable the creation of spaces that can be heated by renewable electricity-powered, high efficiency heat pumps. This conversion, and then switching to renewable electricity-powered heating in the central heating plant, will eliminate about 70% of Brown's Scope 1 emissions.

The last 30% of the campus's Scope 1 emissions comes almost entirely from heating the estimated 140 buildings that are not connected to Brown's central heating plant. In eliminating combustion, these are likely to be the most costly (on a dollars-per-unit greenhouse gas reduction basis). The University is exploring several options for heating these buildings, and, over time, Brown will work to eliminate their emissions through targeted renovations and life-cycle replacements that allow the transition to heat pump, non-combustion heating powered by renewable electricity. If any "off-loop" buildings (structures heated separately from the central heating loop) retain on-site combustion by 2040, the University is committed to purchasing carbon offsets for those emissions, but Brown's expectation is that emissions will have been dramatically reduced or eliminated by that time.

Brown's vehicle fleet also contributes to Scope 1 emissions, and while the amount is very small (<1% of total emissions), a fossil fuel-based fleet is a visible reminder of our reliance on fossil energy. The University is already installing additional electric vehicle charging stations on campus and will phase out combustion vehicles in favor of electrics over the next five to 10 years. Coupled with renewably sourced electricity, this will eliminate emissions from the vehicle fleet.

In addition to procuring renewable fuels, energy efficiency is key to achieving emission-reduction goals. Brown has already made substantial investments in reducing energy demand and remains committed to additional infrastructure changes. Since 2008, Brown has invested over $50 million in the Energy Conservation Initiative program. These investments include LED replacement, heat recovery, and building automation systems, as well as real-time energy performance monitoring that allows operations staff to continuously maintain equipment and identify opportunities for efficiency. These investments have resulted in significant financial, energy and emissions savings.

Another important energy efficiency approach is the incorporation of energy standards into Brown's formal building standards to ensure the University invests in energy-efficient equipment, employs sustainable construction practices and considers energy-reduction goals during every step of the building process. All of these methods and programs will continue to be essential in preparing the campus for the eventual transition to renewable-driven heating that will require more efficient buildings than much of the current campus infrastructure.

Finally, in 2018 President Christina H. Paxson tasked a committee with exploring Scope 3 emissions and recommending next steps. That committee made steps toward quantifying Scope 3 emissions, which includes the difficult task of deciding which emissions to count in this broad category, and how to reduce them. As an example of this complexity, there is near universal agreement that faculty and staff travel for University business falls in the University's Scope 3 emissions. Currently, the best estimate is that faculty and staff travel contributes ~5,000 MT CO_2eq to University emissions (~5 times smaller than Scope 1 emissions). The University is exploring ways to reduce this travel, but much of it is central to Brown's mission of research and teaching. Accepting that some air travel will remain necessary, questions include whether the University should purchase offsets for this travel; how those offsets would be vetted; and whether, instead of buying offsets, the University should allocate those funds toward investment in more rapid Scope 1 and 2 reductions.

As another example, there is no consensus on whether student travel to and from campus, both during the academic year and for summer programs, constitutes Scope 3 emissions of the University or, instead, of the individuals traveling. Brown greatly values its diverse community, drawn from around the world. But preliminary estimates of emissions associated with student travel to and from campus suggest the emissions are about twice that of faculty/staff travel (~10,000 MT CO_2eq) and, if included, would dramatically increase the cost of offsets to the University. If this number is included in Scope 3 calculations, the University would need to ask questions similar to those around faculty and staff travel, regarding what to do with the money charged for student flights.

These are just two of a great many considerations related to University operations. Despite these complexities, it is clear the University needs to better quantify Scope 3 emissions and develop a target and timeline for reducing them. The discussion around Scope 3 emissions will continue at Brown with the expectation that Scope 3 emissions will be quantified, and emissions reductions targets articulated, by 2023. In order for this to happen, the University needs to do the following: a) agree on the operational and organizational boundary for Scope 3 emissions in the absence of universally agreed-upon standards (as exist for Scopes 1 and 2); and b) agree on strategies to reduce these emissions.

2. Reduce Nutrient Pollution

Objective Brown is committed to a minimum reduction of nutrient pollution (specifically nitrogen and phosphorus) by 25% by the year 2025, and by 50% by 2030.

Brown was one of the first schools to join the Nitrogen Footprint Project. This internationally supported project aims to reduce global nitrogen pollution by developing a nitrogen calculator by which institutions can track, measure and ultimately set reduction goals for nitrogen use. As a result, Brown has quantified nitrogen flows through campus. By far the largest use of nitrogen, and loss of nitrogen to the environment, comes from Brown's food purchases, which make up about 85% of Brown's nitrogen footprint. The purchase of red meat (beef and pork) constitutes about 20% of Brown's nitrogen footprint, and dairy makes up another estimated 15%.

Non-food components of Brown's nitrogen footprint include the use of fossil fuels for utilities and transportation, among other uses, but these are small relative to the footprint of food products. Thus managing nitrogen losses will require careful attention to the types of food brought to campus. Such vetting and focus on plant-based meals is already underway, and collaborations between Brown Dining Services, third-party vendors and the Office of Sustainability will increase in the coming years.

As of now, there is no agreed-upon phosphorus footprint calculator, and thus Brown has not yet quantified its phosphorus footprint. However, there is every reason to expect it to be similar to our nitrogen footprint, inexorably tied to food production and consumption, with red meat contributing the single largest percentage in the food category.

Nitrogen and Phosphorus Goals and Next Steps

Achieving meaningful reductions in Brown's nitrogen footprint will require reducing red meat consumption and supporting agricultural practices that minimize nutrient losses as food travels from farms to campus. This will have the added benefit of reducing greenhouse gas emissions, since red meat production is responsible for more greenhouse gas emissions than any other single component of food production. The Office of Sustainability and Brown Dining Services have already begun to focus on promoting plant-based meals.

Thus far, Dining Services has reduced an estimated 10% of red meat purchases since 2018, with little impact on student choice or satisfaction. For example, there is an all-vegan station at the largest dining facility, and a vegan and vegetarian entree option at every meal. While red meat is a small component of Brown's greenhouse gas emissions, it is a large component of the average American's emissions and of student emissions when they are on campus, so reducing meat consumption on campus has the added benefit of educating our students, staff and faculty about choices that have an impact on their carbon footprint. The University will also begin a more rigorous exploration of its phosphorus footprint, and an intern or staff member in the Office of Sustainability will begin this project in summer 2021.

Over the next two years, the steering committee (described in the Implementation and Governance section of this strategic plan) will work with the University offices charged with determining dining and catering menus to reduce red meat and dairy consumption on campus. The Office of Sustainability will provide support for this effort through community surveys to understand student and staff preferences; by exploring options for sustainable meat alternatives; and by leading educational campaigns around plant-based diets.

It is important to note that reducing red meat consumption is not the same as reducing protein availability. The goal is to transition to protein sources that keep nutritional value high and reduce nutrient pollution. With this in mind, Brown's objective is to reduce red meat consumption on campus by 25% by 2025. We believe this is achievable, and that lessons learned from this first step will allow a push to a 50% reduction, or beyond, by 2030. Achieving this goal will have the co-benefit of reducing greenhouse gas emissions associated with food consumption by an amount greater than the total emissions of Brown's vehicle fleet.

3. Safeguard Human Health

Objective 1 Brown will improve the health of the Brown community by reducing or eliminating the use of potentially toxic chemicals in building materials, dining services and supplies.

Objective 2 Brown will take steps to reduce on-campus air and noise pollution through targeted replacements or reducing the use of gas-powered vehicles or equipment.

Objective 3 Brown will work to determine the extent to which climate change could impact the health of Brown students, faculty and staff.

Chemical exposures:

Throughout building construction, renovation, management and landscape maintenance, Brown staff prioritize products and designs that have health benefits. For example, current building standards encourage flooring adhesives with low levels of volatile organic compounds, or VOC, and do not allow furnishings with chemical flame retardants. Brown strives to use cleaning products and landscape inputs with fewer negative impacts on human or environmental health. However, Brown possesses limited data on the extent of campus use of these products or their health and environmental benefits, making it difficult to decide which ones to eliminate, especially when better replacements are not always available. Fortunately, other universities, as well as independent organizations, are building a knowledge base and identifying chemicals to avoid. Brown's Office of Sustainability will continue to collaborate with these entities to develop best practices.

Noise and air pollution:

Noise and air pollution have well-documented acute and chronic health effects. Globally, air pollution is one of the leading modifiable causes of morbidity and mortality. Both air and noise pollution can adversely affect the respiratory, cardiovascular and endocrine systems, in addition to being annoyances. Both exposures often share common sources (e.g., gas-powered leaf blowers), making it possible to effectively mitigate the effect of both noise and air pollution through a single intervention. The extent to which these are pervasive problems at Brown has not been determined, and our next steps are to assess the scope of the problem and the possibilities for mitigation.

Climate change-related health effects:

Climate change presents a pressing challenge to the health and well-being of humans across the globe. There are myriad ways that climate change could directly or indirectly affect human health, including more extreme weather (e.g., heat waves), mold from excess moisture, resource scarcity (e.g., drought-related crop failure) and mass migration due to rising sea levels. The extent to which these factors will directly or indirectly affect the Brown University community is unclear, but it is apparent that the health of all who live and work at Brown is at risk. For instance, rising temperatures can increase the risk of heat-related illness, injury and death. And in regions with historical structures, mold in old buildings may worsen as a result of higher temperatures and increased large precipitation events associated with climate change.

Despite the dire situation we face with climate change, we have the opportunity to prevent climate-related health effects on the Brown campus with appropriate planning.

Human Health Goals and Next Steps

Over the next four years, Brown will take a series of steps to reduce the potential adverse health effects of exposure to chemicals used in building materials, dining services and supplies. First, we will develop a chemical "red list" that will include chemicals that should no longer be used in any of these operations. In tandem with this, we will provide a list of safe and effective alternatives (e.g., green cleaning products). Second, we will work with Facilities Management to identify ways to quantify the extent of pesticide and herbicide use on campus and identify ways to reduce their use through less toxic alternatives or other pest and landscape management strategies. Third, the University will undertake efforts toward ensuring that Brown Dining Services reduces the use of plastic, packaging and processed foods that might contain chemicals of concern. We will identify and provide lists of safer alternatives, or develop novel strategies that reduce chemical exposure and the use of single-serve items (e.g., providing reusable water bottles and compostable or recyclable serving ware).

Simultaneously, we will reduce air and noise pollution on campus through a series of actions. The University will conduct surveys with faculty, staff and students to identify locations on campus where noise or air pollution are perceived to be a

problem. Facilities Management will combine this information with its existing knowledge to develop an inventory of vehicles and equipment that are sources of these two pollutants. In collaboration with Facilities Management, and where feasible, the Office of Sustainability will guide targeted phaseouts of gas-powered equipment. The planning for the transition to electric vehicles has already begun and will accelerate as more vehicles reach the market. In addition, the University will identify maintenance practices that might be modified or eliminated to reduce noise and air pollution (e.g., leaf blowing). Finally, the Department of Public Safety and Facilities Management will develop a protocol to enforce Rhode Island state law regarding anti-idling policies in order to reduce unnecessary use of fossil fuels, air pollution and noise pollution.

Finally, the University will begin the long process of understanding and mitigating that which we cannot change, the rising threat of extreme heat and precipitation associated with the climate changes that are already underway. Brown has a campus characterized by a diversity of building types and ages, from University Hall (built in 1770) to Stephen Robert '62 Hall at the Watson Institute for International and Public Affairs (built in 2018). The campus encompasses former private residences as well as buildings intended for institutional use upon their original construction. This makes planning for campus resilience to climate change a challenging but essential first step in ensuring a healthy campus environment over the long term.

4. Reduce Water Use and Impacts

Objective Brown is committed to reducing its impact on water quality by addressing nonpoint source pollution (e.g., fertilizer and pesticide use) and by limiting the impervious surface space on campus.

In the city of Providence, home to the University, sewage treatment is targeted at some key pollutants (such as nitrogen), but many pollutants are discharged without removal, including phosphorus, carcinogens, medicines and synthetic hormones, among others. Therefore, reducing water use, and reducing stormwater runoff, are two of the most impactful steps the institution can take to lessen the negative effects of its water footprint.

Brown has made several investments in water use reduction, including the addition of grey water recycling, green roofs and condensate recovery in some buildings, as well as the introduction of trayless dining to reduce water for washing. In 2014, Brown's building codes were updated to include low-flow fixtures, and in 2017 Brown developed a Stormwater Master Plan to help inform campus development in a way that does not increase stormwater runoff. The Stormwater Master Plan views water management as a campus-wide, rather than site-by-site, goal. This thinking underlies the next steps proposed in this Sustainability Strategic Plan. Brown will consider the water footprint of the entire campus as the University moves toward a reduction in water use and an increase in water quality for the campus and the catchment into which Brown's wastewater flows.

Water Quality Goals and Next Steps

The Stormwater Master Plan establishes a framework for Brown to set measurable stormwater reduction goals but does not provide those goals. In order to develop them, Brown needs a better understanding of the amount and impacts of campus stormwater runoff. Over the next three years, the assistant provost for sustainability, in collaboration with the Office of Sustainability, will explore the environmental consequences of Brown's current stormwater management system and weigh the costs and benefits of changes to that system against other sustainability priorities. For example, one possible question is whether the cost of installing grey water recycling provides as much benefit to our community sustainability goals as spending an equivalent amount on more sustainably produced food, or better insulating our buildings to reduce heating and cooling demand.

If exploration of such questions reveals major environmental benefits to stormwater reduction (relative to other goals noted in this Sustainability Strategic Plan), Brown will take further steps toward mitigation. The Office of Sustainability will bring together University stakeholders from planning, design and construction, grounds, and other relevant partners to identify opportunities for stormwater reduction.

5. Curb Biodiversity Loss

Objective Brown will source materials used by the University with biodiversity preservation in mind, and reduce the purchase and disposal of materials overall to lessen the University's negative impact on biodiversity.

Biodiversity is included in this strategic plan because it is under unprecedented threat from human activity, and that threat, if left unchecked, will undermine human well-being. Brown's footprint on biodiversity comes largely through three avenues: 1) our greenhouse gas emissions; 2) our dietary choices (and thus the land required to support our diets), and 3) the materials we purchase and discard. Brown's greenhouse gas emissions have been addressed explicitly elsewhere in this Sustainability Strategic Plan. The impact on biodiversity of dietary choices and purchased materials comes from the amount of land and resources required to run Brown's campus. In some cases, purchasing substitutions can reduce negative effects on biodiversity, while in other cases the only way to reduce our impact is to purchase and dispose of less material.

Brown also has the opportunity to positively impact biodiversity through education. As our students leave campus and many assume leadership positions around the world, it is imperative that they understand the importance of biodiversity preservation and its intersection with expansive disciplines such as business, economics, political science, technology, humanities, medicine and others.

Biodiversity Goals and Next Steps

Brown will adopt the principles underpinning the international Convention on Biodiversity, which has been adopted by 195 countries and the European Union. The principles call on Brown to do the following:

1. address the underlying causes of biodiversity loss;
2. reduce direct pressures on biodiversity and promote sustainable use of resources;
3. improve the status of biodiversity by safeguarding ecosystems and species; and
4. enhance the benefits to our community from biodiversity and ecosystem services.

The science is clear that biodiversity loss is a global crisis, but Brown's contribution to that crisis is difficult to measure and reduce. However, there are specific actions Brown can take to achieve its goals. For example, addressing the importance of biodiversity and the impact of its loss with the campus community (part of principle 1, above) is critical to Brown's mission of educating useful citizens who purposefully work toward a better future. The University already offers several classes and public lectures on biodiversity, and we will continue to increase offerings in these areas.

Principles 2 and 3 — using resources sustainably and safeguarding ecosystems and species — require a change in the resources Brown uses and the purchasing decisions the University makes. Specifically, it will require making decisions with biodiversity in mind, targeting specific items with outsized impacts on biodiversity. Examples of such decisions include, but are not limited to: 1) eliminating the purchase of tropical hardwoods, recognizing that tropical deforestation is one of the primary threats to biodiversity on land; 2) working to reduce and eventually eliminate our use of products that are tied to the destruction of the most carbon-rich rainforests on Earth; 3) working to ensure that Brown's dining options are coming from the most sustainably sourced production systems; and 4) avoiding materials that bioaccumulate (become concentrated in predators, including humans) and pose a health hazard to people and wildlife.

Beyond adopting the Convention on Biodiversity principles, Brown will develop an overarching plan for reducing our impact on biodiversity. The assistant provost for sustainability will convene a committee to assess options for reducing Brown's impact on biodiversity, with the goal of producing recommendations by fall 2021. In addition, Brown will explore ways of increasing campus biodiversity. This includes planting pollinator-friendly habitats, reducing the amount of herbicides and pesticides used (which also has health benefits), reducing the use of lawn fertilizer and increasing perennial plantings. Many of these are local, low-cost and beneficial steps that will result in a more biologically diverse campus.

Educating About Sustainability

Brown's mission is "to serve the community, the nation and the world by discovering, communicating and preserving knowledge and understanding in a spirit of free inquiry, and by educating and preparing students to discharge the offices of life with usefulness and reputation."

As Brown confronts the challenges of institutional change to reduce its environmental impacts, realizing the University's mission requires all who live and work at Brown to build an understanding of the importance of a diminished footprint on the planet upon which we all depend. This requires educating members of the community to live differently than we have, to use materials differently and to dispose of things differently. It requires education about individual and collective impacts on the local and global environment, and how those impacts affect us all. And it requires teaching and learning about the ongoing sustainability and equity challenges the 21st century will bring.

Brown's commitment to education around issues in sustainability dates back several decades. Brown created one of the first environmental studies departments in the nation in the late 1970s, with students focused on service learning and environmental action. With the renovation of the building that became the Urban Environmental Lab in the early 1980s, the new academic concentration found a home. As the need for interdisciplinary environmental science became increasingly clear, Brown invested in additional scholarship and teaching, first through the Environmental Change Initiative, established in 1995, and later in the Institute at Brown for Environment and Society (IBES), established in 2014.

Through IBES, undergraduates can select from five tracks in environmental studies and sciences: Air, Climate and Energy; Conservation Science and Policy; Environment and Inequality; Land, Water and Food Security; and Sustainability in Development. IBES has partnerships with 15 academic departments at Brown, which promotes the exchange of ideas among undergraduate and graduate students in different disciplines with a common interest in environmental research. Beyond IBES, offerings in sustainability span the University, from physics to history and from anthropology to public health. Teaching and engaged scholarship about sustainability must continue to expand in an effort to include students from across all disciplines. Thus, a major focus in the operational phase for the sustainability objectives outlined in this strategic plan will be to help coordinate and enhance these educational offerings.

In addition, there are many opportunities to learn outside the classroom. Brown will use the ongoing changes to campus infrastructure as a living laboratory for understanding the challenges we all face in transitioning to a more sustainable future. As an example, members of the community can learn how the campus is heated and cooled, and what they can do to reduce demand for these energy-intensive processes. In the operational phase for execution of this Sustainability Strategic Plan (described below), the University will outline concrete steps that will be taken to enhance Brown's educational focus on sustainability.

IMPLEMENTATION AND GOVERNANCE

The operational implementation of Brown's sustainability objectives is expected to start in the Spring 2021 semester. This operational phase will take the goals articulated in the strategic plan and translate them into actions in three major categories:

1. campus operations;
2. education; and
3. engagement with the community beyond Brown's campus.

A governance structure of a steering committee, ad hoc working groups, and committees will guide the implementation of specific actions in each of these three areas and will interface with existing campus operational committees and processes. All of these structures are discussed further in this section of the plan.

The implementation will be led by a steering committee co-chaired by the director of the Office of Sustainability, assistant provost for sustainability, and other faculty and staff as needed. This steering committee will set specific goals in areas that currently do not have specific goals, interface with existing decision-making bodies across campus to oversee progress, and provide recommendations as needed to executive leadership on the prioritization of activities and goals. The steering committee will be composed of staff, faculty and students. It will include a designated Environmental Equity and Social Justice (EESJ) representative appointed by the Office of Institutional Equity and Diversity.

The steering committee will be supported by staff and student interns in the Office of Sustainability and will convene ad hoc working groups as necessary. It will meet at least quarterly and will report to the University's executive leadership at least once annually. Brown's executive leadership will be responsible for ensuring that the plan is reviewed and updated every three to five years.

Decisions that pertain to campus energy use, food options, landscape management, purchases, fleet vehicles, curriculum, community engagement, etc. are all levers the University expects to use to achieve the goals that flow from the articulated objectives. At the end of the operational planning phase, Brown will have an overarching Sustainability Action Plan that defines the University's scientifically-based objectives, maps these to operational, educational and community engagement opportunities, and provides a framework for focused sustainability action plans for relevant operational and academic areas across Brown.

1. Implementation: Changes to Campus Operations

The steering committee will work directly with regular decision-making bodies, and through ad hoc working groups, to refine and advance goals. The initial activities of the steering committee will focus on the objectives and next steps described above.

Reducing greenhouse gas emissions:

The steering committee will interface with Facilities Management through the existing decarbonization and capital planning groups to ensure that Brown is on track to meet its greenhouse gas emissions targets for Scope 1 and Scope 2. It will also charge an ad hoc committee with proposing protocols for measuring Scope 3 emissions, for later goal-setting by the steering committee.

Reducing nutrient pollution:

As noted above, Brown's nitrogen and phosphorus footprints are overwhelmingly associated with its food purchases. The steering committee will interface with existing dining planning procedures and expertise within the Office of Sustainability and Brown Dining Services to drive toward the 25% reduction in red meat consumption and the associated reduction in nitrogen and phosphorus pollution.

Safeguarding human health:

The steering committee will focus efforts initially on collecting information and setting specific goals related to chemicals hazardous to human health. It will convene an ad hoc working group to examine the red lists used by other organizations and recommend the appropriate approach for Brown. Simultaneously, the steering committee will work with Office of Sustainability staff and interns to assess the extent and locations of campus noise pollution due to leaf blowers and other maintenance activities, and then to set goals as appropriate.

Reducing water use and impacts:

In the coming one to two years, the steering committee will work with Office of Sustainability staff to collect information on campus stormwater impacts and, when ready, convene an ad hoc working group to set goals for stormwater runoff reduction.

Curbing biodiversity loss:

As indicated above, Brown's impact on biodiversity is largely through purchasing and follows complex supply chains linking our activities to the origins of elements of materials used on campus. The assistant provost for sustainability will lead an ad hoc working group to explore these linkages and develop recommendations for the steering committee to review and incorporate into prioritization by the end of 2022.

2. Implementation: Expansion of Education in Sustainability

Under the broad umbrella of the steering committee, the assistant provost for sustainability will lead the effort to increase research and educational opportunities in the area of sustainability. The assistant provost for sustainability is developing a new course on sustainability geared toward all incoming students and is spearheading the development of initiatives that bridge existing academic units to promote solutions to sustainability challenges (for example, the three-year Climate Solutions Initiative announced in September 2020).

In addition, the University will explore ways to stimulate behavioral changes in energy consumption, food choices and waste generation. Possible areas to explore include providing our campus with information about the carbon cost of different meal choices in dining halls, working with academic departments on methods to motivate reduced consumption, and incentivizing the purchase of recycled materials and the purchase of fewer materials overall. All of these educational initiatives will be explored in the context of rigorous scholarship and will leverage academic expertise on campus to develop innovative solutions.

In order to promote the inclusion of sustainability in the curriculum and daily life at Brown, the assistant provost for sustainability will establish a Committee for Sustainability Education, comprising designees appointed by the deans of Brown's academic schools and divisions (deans of the School of Engineering, School of Public Health, Biology and Medicine, and the Faculty) and by deans of our student constituencies (deans of the College, the Graduate School, and the School of Professional Studies), in addition to several faculty, students and staff with relevant expertise (nominated by the Faculty Executive Committee, Graduate Student Council, Medical Student Senate, Staff Advisory Council and Undergraduate Council of Students).

The committee will develop a plan for the diffusion of sustainability principles throughout course offerings at Brown. Within two years, this committee will present a list of concrete recommendations to the University's executive administrative leadership for their consideration.

3. Implementation: Engagement Beyond the Brown Campus

Much of this strategic plan is focused on actions for addressing sustainability objectives within the context of Brown's campus, but Brown is embedded in a larger community. As Brown is a major landholder, employer and stakeholder in Providence, it is clear that the University's efforts toward supporting a more sustainable world should not stop at the campus border.

Brown recognizes issues of inequality as a critical component of our research, teaching and practice. However, drafting community engagement goals that address the disproportionate impact of climate change on historically marginalized and vulnerable populations requires careful thought and partnership with community members and organizations, and reaches beyond the scope of this current plan.

The assistant provost for sustainability will convene a Community Engagement Committee to develop recommendations as to whether — and, if so, how — issues of environmental inequality beyond the borders of Brown's campus should be included in longer-term sustainability planning (beyond the actions of this Sustainability Strategic Plan). This committee will be chaired by Brown's assistant vice president for government and community relations. In addition to faculty and staff, this committee will include members nominated by key student constituencies (undergraduate, graduate, medical and professional), as well as representatives from campus organizations with expertise in environmental justice, community engagement and diversity and inclusion (e.g., Institute at Brown for Environment and Society, Swearer Center and the Office of Institutional Equity and Diversity).

Governance and Accountability

Oversight by the University's executive administrative leadership is one core element of the accountability structure established in this strategic plan to ensure the University's sustained efforts to meet its objectives. In addition, in order to support staff and administrators in their vital roles in overseeing long-term, complex changes to our operations and University policies, this plan puts forth a model for accountable governance that leverages Brown's existing strengths and personnel. The steering committee serves as a goal-setting and accountability body, with broad representation of staff, students and faculty, that regularly reviews progress within each of the objectives and recommends new goals to the University's executive leadership.

The breadth of membership of this committee, together with a designated member focused on environmental equity and social justice, will ensure that the specific goals within each objective represent the values of the Brown community, and that relevant campus units are held accountable for progress on these goals. This steering committee will be guided by the Community Engagement Committee in setting goals for Brown's approach to sustainability in the broader Providence and Rhode Island communities.

Conclusion

In 2014, Brown celebrated its 250th anniversary. This Sustainability Strategic Plan recognizes that, in the University's next 250 years, the campus will face unprecedented challenges in a rapidly changing environment. To continue to serve our community, the nation and the world, we will integrate sustainability into the physical, operational and intellectual fabric of our campus. This strategic plan is an important step toward achieving that goal. The work of administrative and academic departments across the institution will be essential for realizing the objectives and the vision put forth in this document.

APPENDIX A

Brief History of Sustainability at Brown

Brown has been a leader in environmental education and research for decades. The University developed one of the first environmental studies units in the country and made impressive strides toward energy efficiency on campus long before it was common. More recently, Brown made a major investment in environmental research and teaching through the creation, first, of the Environmental Change Initiative (established in 1995) and, subsequently, the Institute at Brown for Environment and Society (established in 2014). Together these efforts have added 20 environment-focused faculty to Brown since 2007.

In addition to an increase in research and teaching, in 2012 the Office of Sustainability convened the Sustainability Strategic Planning and Advisory Committee (SSPAC) to help decrease Brown's overall environmental impacts, promote community engagement and inspire innovation and excellence. The committee created five SSPAC working groups — Food, Energy & Water; Transportation; Waste & Recycling; and Environment, Health and Wellness — to ensure ongoing progress on sustainability efforts. Each group included faculty, students and staff, and several impactful initiatives arose from their work. These include composting and recycling programs that together divert one-third of Brown waste from the landfill; elimination of the sale and distribution of single-use plastic water bottles on campus; and the adoption of building standards that restrict furnishings with chemical-based flame retardants.

In 2017, the University made another major commitment to sustainability, convening two committees specifically to address the University's contribution to climate change. Shortly thereafter, the University was the first in the country to create an assistant provost-level position to oversee sustainability efforts from the Office of the Provost, and to work closely with the director of the Office of Sustainability in Facilities Management. A team of faculty, staff and students then worked to develop aggressive greenhouse gas reduction goals to present to University leadership and the Corporation of Brown University, Brown's governing body.

The most immediate outcome of those efforts came in February 2019, when Brown announced the aggressive goal to cut its campus (Scope 1 and 2) greenhouse gas emissions by 75% by 2025, and to achieve net-zero no later than 2040. Brown had previously pledged — in 2008 — to cut emissions to 42 percent below 2007 levels by the year 2020, and was nearing its goal in 2019. To meet the 2020 goal, the campus had switched from fuel oil to natural gas in its central heating plant, invested in energy-efficient LED lighting and launched a $24 million project to convert its steam-based central heating loop to hot water, among other undertakings.

The Brown Corporation approved the new goals to reach net-zero emissions as a cornerstone of Brown's efforts to create a more sustainable campus and confront what scientists have declared an increasingly dire threat posed by global climate change.

APPENDIX B

Development of this Sustainability Strategic Plan

This Sustainability Strategic Plan is the result of over a year of work by faculty, staff and students, and incorporates feedback from a wide range of people with a great diversity of interests and ideas. The first draft of the plan was written by Assistant Provost for Sustainability Stephen Porder, Director of the Office of Sustainability Jessica Berry and Professor of Environment and Society and Sociology Leah VanWey, with substantial input from a variety of subject matter experts on each topic. The draft plan was released for comment to Brown faculty, staff and students on Dec. 15, 2019, to kick off a community conversation as to what Brown, as an institution, values most in the area of sustainability, and what concrete actions and prioritizations should be made given the real constraints of time, money and personnel.

Assistant Provost Porder and Director Berry conducted a series of meetings and discussion sessions to receive feedback on the draft plan, including presentations to the following groups: the President's Executive Committee, Brown University Community Council, Chairs and Center Directors, and Faculty Executive Committee, as well as open public fora. In addition, an online comment form was available to the campus community until March 15, 2020. In total, 82 comments were received via online forms, emails and letters during the comment period (in addition to the comments voiced at the public fora).

Overall, many members of the community were pleased with the extensive work toward developing measurable actions for improving Brown's sustainability, with 76% of respondents saying they "agree" or "somewhat agree" that the strategic plan articulates the appropriate "values, metrics and targets for the Brown University community."

Despite the overall positive response, several respondents felt strongly that, rather than focus on quantifiable goals, the visioning should put more emphasis on less quantifiable objectives, such as social and economic sustainability. Most respondents urged Brown to make its goals more ambitious, specifically around Scope 3 emissions, and several faculty members challenged Brown to be bolder in its vision of leadership. Students were primarily concerned about the community beyond campus, asking Brown to consider important aspects of environmental justice and to consider itself in the context of the city and state in which the University is situated.

The engagement with the process clearly reflected the commitment of Brown's community to assist in expanding the plan's goals to make them a reality. In addition, many respondents, especially staff members, suggested ideas for how to make progress within each theme, or offered their help in achieving goals that were not originally articulated in the plan. This feedback was vital in shaping the plan as it is presented here.

Incorporating the Community's Feedback

In April 2020, Assistant Provost Porder convened a committee to analyze the community comments and reconsider aspects of the draft plan based on community feedback. The review committee consisted of Porder (chair), Berry, Professor of Neuroscience Carlos Aizenman, undergraduate students Emma Bouton (environmental studies) and Ariele Ladabaum (environmental science), Associate Professor of Public Health Joseph Braun, Professor of Sociology Scott Frickel, Professor of Earth, Environmental and Planetary Sciences Meredith Hastings, medical student Sarah Hsu, and graduate student Samantha Lash (archaeology/earth, environmental and planetary sciences).

Questions of equity, the definition of "our community," and local versus global engagement from the community feedback process forced the review committee to grapple with questions that underlie many of society's most pressing issues. The community feedback was critical for honing the stated goals and for widening the scope of this strategic plan to increase the focus on educational opportunities, both at Brown and in the wider Providence community. Reflecting this feedback, the plan now articulates a pathway toward Scope 3 emissions goals. It now also includes provisions regarding environmental equity, ensuring that each operational working group has a representative responsible for highlighting issues of equity and social justice in decision making. In addition to the operational working groups for the five objectives described in the strategic plan, there is also now direction for a committee focused on how Brown engages with its local community vis-a-vis issues of sustainability. These additions are substantial improvements that reflect community input and highlight the importance of an ongoing discussion of what Brown does and should emphasize in its path toward a more sustainable future.

After a month of discussion and revision, the review committee voted unanimously to approve a set of updates and submit the revised strategic plan to the president and provost for their approval. The document was presented to President Christina H. Paxson, Provost Richard M. Locke, and Executive Vice President for Finance and Administration Barbara Chernow for review in July 2020. After a pause for the University to support its community during the global COVID-19 pandemic, the plan was approved and released to the Brown community in February 2021.

Still, even as this Sustainability Strategic Plan reflects community input, it should be noted that there is not complete consensus as to what Brown's sustainability goals and priorities should be. Thus, it is important that dialogue around the ideas embedded in this strategic plan continues, and that future sustainability plans build upon the work of this document and reflect continued community engagement with this critically important topic.