

## Cover Letter

Dear Members of the Brown Community,

Brown University has been committed over the past two decades to mitigating the effects of campus operations on the environment. Nevertheless, accelerating climate change, pollution and biodiversity loss still constitute a defining challenge in the 21st century. With an ever-growing body of scientific evidence highlighting the need for urgent action, institutions and organizations around the world are called upon to ramp up their efforts to safeguard the planetary life-support systems upon which we all depend. In an effort to articulate Brown's vision for this effort, I have led a committee of Brown community members in for several months in working toward creating a draft Brown University Sustainability Plan.

This draft plan has been developed to facilitate a campus-wide conversation about the objectives and goals of the University's first long-term sustainability plan. It is a working document intended for comment by the Brown community; the input of Brown students, faculty and staff is vitally important for developing a plan that articulates our shared values and approach to meeting the challenge of living sustainably.

Comments on this plan can be submitted via an online form that will remain open until Feb 15, 2020, or by email to [sustainability@brown.edu](mailto:sustainability@brown.edu). In addition, I, along with members of the Office of Sustainability, will host a series of community discussions and fora to receive additional input. This draft Sustainability Plan will be revised by a committee consisting of faculty, staff and students who will take into account the community's input and careful consideration of how any new recommendations might be implemented. We expect the draft plan will then be finalized with approval from Brown's senior administration in spring 2020.

As you will read in the plan, this document strives to articulate our goals for a more sustainable campus, as well as specific targets as metrics toward reaching those goals. As such, it is only a first step in Brown's efforts to build a long-term sustainability plan. Subsequent work will involve translating the high-level visioning in this document into an operational plan with concrete action steps for achieving the sustainability objectives.

I would like to thank Director of the Office of Sustainability Jessica Berry and Dean of the School of Professional Studies Leah Van Wey, as well as the many members of the Brown community that contributed to the development of this draft plan. We look forward to your feedback.

Sincerely,



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**Brown University Sustainability Plan**  
**Draft for Community Input**  
**December X, 2019**

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## INTRODUCTION

Brown University has an opportunity to lead by example in addressing its impact as an institution on the environment and 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, realizing the University's mission "to serve the community, the nation and the world" requires rapid strides toward a greatly diminished environmental footprint.

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 organizations go about business. 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.

It's also essential to recognize that, in an era where it is easy to be overwhelmed by the sustainability challenges we face, every member of our community must be able to assess which issues demand immediate action, and which are less critical. This last point sets the tone for this draft plan. Rather than 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 new goals must lead to substantial, quantifiable mitigation of environmental harm.

This document is a departure from the broad range of sustainability initiatives that have characterized sustainability efforts on campus 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. Based on these criteria, this plan puts action on climate change at the top of the priority list. Brown took its first steps on greenhouse gas reduction in 2008, and this plan describes our path to net-zero campus emissions by 2040 at the latest. The prioritization of climate action also reflects the understanding that climate change mitigation is a key issue for environmental justice – the poorest people on earth, who have done the least to cause climate change, will suffer first and most from its effects. 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 structure our prioritization of other key components in the transition to a more sustainable campus.

This plan also reflects that we cannot do everything at once. 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 or of equal urgency. As outlined in this Sustainability Plan, we will focus on the following measurable objectives in five areas of major sustainability challenges facing the world today.

### **Sustainability Challenges and Brown's Objectives:**

- 1. Greenhouse gas emissions and climate change:** Achieve a 75% reduction in campus emissions by 2025, and net-zero emissions by 2040.
- 2. Nutrient pollution:** Achieve a 15% reduction in Brown's nitrogen and phosphorus footprint by 2025, and a 25% reduction by 2030.
- 3. Water impacts:** Over the next three years, determine whether the benefit of stormwater reduction is sufficient to divert funding from other priorities.
- 4. Biodiversity loss:** Over the next three years, develop a process by which to incorporate biodiversity impacts into purchasing decision. Immediately cease all purchases of tropical hardwoods, the extraction of which threaten the world's most diverse ecosystems.
- 5. Human health impacts:** Over the next three years, identify the most problematic and prevalent materials of concern and incorporate a "red list" into Brown's Building Standards and Purchasing Policies.

In addition to these objectives, Brown will expand upon its already diverse range of educational opportunities around these challenges, as they will be faced by everyone, in every discipline, in the coming decades. "Sustaining Life on Earth" is a central academic theme of Brown's strategic plan, *Building on Distinction*. Our lasting global contribution will stem from the local actions we take, and curriculum and programming that give our community evidence-based and equity-focused tools with which to make their future more sustainable.

### **Sustainability at Brown Today**

In February 2019, Brown announced the aggressive goal to cut its campus greenhouse gas emissions by 75 percent by 2025, and to achieve net-zero no later than 2040. The Corporation of Brown University approved the goals 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. The announcement built on more than a decade of concerted efforts to promote and maintain environmental sustainability both on campus and in the greater community. Through energy conservation, carbon emissions reduction, recycling and other sustainable practices across various University departments, Brown has been reducing its environmental footprint in order to preserve natural resources, promote environmental health and help mitigate global climate change.

In 2008, the University committed to cut greenhouse gas (GHG) emissions nearly in half from 2007 levels by 2020. Based on a conversion of Brown's central heating plant from oil to natural gas, a thermal efficiency upgrade that enables the plant to circulate hot water instead of steam, and a variety of campus energy efficiency projects, Brown is approaching that goal and working to move beyond it. This has been accomplished, in part, by the work of the Sustainability Strategic Planning and Advisory Committee

(SSPAC), which was convened in 2012 to decrease Brown's overall environmental impacts, promote community engagement, and inspire innovation and excellence. The committee spawned four 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 were accomplished out of their work. These included a dining composting program that diverts about 500 tons of organic material per year, the elimination of single-use plastic water bottle sales and distribution on campus, and the adoption of building standards that restrict furnishings with chemical-based flame retardants.

These initiatives paved the way for the development of an overarching sustainability plan to help establish long-term objectives, articulate specific goals, and guide the University in decision-making in sustainability. This document constitutes the first phase of developing such a plan for Brown.

### **Sustainability Plan Purpose**

The development of this document is considered Phase 1 of Brown's efforts to finalize a long-term plan for sustainability. The purpose of this plan is to establish the framework for efforts Brown will engage in as a community to promote the University's environmental sustainability. While there are many topics that fall under the broad heading of sustainability, 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 is meant to reflect Brown's community values, as well as the scientific evidence that illuminates those challenges that are most imminent, and which present the gravest threat to human well-being. The plan focuses on sustainability challenges identified by our community as the most pressing.

Establishing a set of core objectives and priorities is a necessary first step before building an operational plan for sustainability at Brown. This Sustainability Plan establishes *what* we will do, setting the stage for development of a subsequent operational plan to outline *how* we will do it. Given Brown's educational mission, this Sustainability Plan, as well as its successor operational plan, will be guided by our scholarship about humans and the environment. This scholarship underpins the principles by which we will establish sustainability-related goals and provides evidence upon which we can prioritize our actions. Our actions then 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. This Sustainability Plan is envisioned as a living document, which 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 — GHG emissions and their effect on climate change, nutrient pollution (nitrogen and phosphorus), water quality and use, biodiversity, and human health — a key priority was to identify goals against which Brown could quantify and measure progress.

For each of the five areas, this plan articulates the following:

1. the importance of the topic to sustainability;

2. how these topics play out in Brown's operations or academic mission (either directly or indirectly); and
3. Brown's overarching goals and next steps in these areas.

Following a rich community discussion and approval of a final plan, each sustainability objective will be linked to one or more operational areas on campus for community-led development of concrete goals, metrics and recommendations for initiatives to meet those goals. We have an ambitious vision to engage all members of our community in the implementation of changes to Brown's operations, campus culture and academics in furtherance of a commitment to addressing the largest sustainability challenges of the 21st century.

## SUSTAINABILITY OBJECTIVES

### 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.**

The Secretary-General of the United Nations, António Guterres, summarized decades of scientific research with a brief statement in March 2018: "The most systematic threat to humankind remains climate change." 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. And sea level rise will inundate major coastal cities, including Brown's home of Providence, among other effects.

Human-caused global climate change is first and foremost a problem of greenhouse gas (GHG) 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 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 midcentury (around the year 2050). Brown therefore makes GHG emissions reduction the first pillar of our sustainability plan, and is moving to rapidly reduce emissions in accordance with the magnitude of the threat.

## **Greenhouse Gas Emissions at Brown**

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); free-standing combustion furnaces (largely natural gas, some oil); and, to a much lesser extent, the University’s vehicle fleet (gasoline).

**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.

**Scope 3** emissions are considered 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 component 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 the 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 big reductions in Scope 3 emissions.

## **Greenhouse Gas Reduction Goals**

In Feb. 2019, Brown committed to eliminating our campus GHG emissions on a timeframe aligned with the 2050 target established by international scientific consensus. Brown pledged that campus emissions (Scope 1 + 2) will reach net zero by 2040, with a 75% reduction by 2025. 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.

## **Greenhouse Gas Reduction Next Steps**

In accordance with the goal of net-zero campus emissions by 2040, Brown announced in January 2019 signing multi-year agreements for two renewable energy projects that are expected to produce enough renewably-generated electricity to offset all on-campus electricity use. Both renewables projects, a solar farm in Rhode Island and a wind farm in Texas, are expected to be online within Fiscal Year 2023 and Fiscal Year 2021, respectively. This means Brown will be at “net-zero” Scope 2 emissions, a 50% reduction in campus emissions relative to a fiscal 2018 baseline. Recognizing 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 facility. By or before 2025, the University will convert the central heating facility 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. This solution is viewed as transitional, recognizing that recycled biofuel is not available at the volume or scale needed to ensure its long-term supply. However, the switch will produce a large (about 25%) reduction in campus GHG 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. Biofuel conversion, and then switching to renewable electricity-powered heating in the central heat plant, will eliminate about 70% of Brown's Scope 1 emissions.

The last 30% of the campus' Scope 1 emissions come almost entirely from heating the estimated 140 buildings that are not connected to the central heating facility. In eliminating combustion, these are likely to be the most costly (on a dollars-per-unit GHG 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. 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), the fleet is a visible reminder of our reliance (for now) 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 well in advance of 2040. Coupled with renewably sourced electricity, this will eliminate emissions from the vehicle fleet.

Finally, President Christina Paxson recently tasked a committee with exploring Scope 3 emissions and recommending next steps. Brown continues to work on this issue, and the discussion around Scope 3 emissions will continue in the coming years. We expect a plan for Scope 3 emissions to be included in future iterations of this Sustainability Plan.

## **2. Reduce Nutrient Pollution**

**Objective: Brown is committed to reducing nutrient pollution (specifically nitrogen and phosphorus) by 15% by the year 2025, and by 25% by 2030.**

According to the federal 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 agricultural, 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. 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. Our focus is to reduce Brown's waste of two major nutrients that are also significant pollutants: nitrogen and phosphorus.

### **Nitrogen and Phosphorus at Brown**

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%.

There are large nitrogen losses to the environment before animal products ever reach the table. 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. 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.

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, 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. Thus, food, and in particular red meat, is suspected to be the single largest component of Brown's phosphorus footprint.

### **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 GHG emissions than any other component of food production. 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 in the Office of Sustainability will begin this project in the summer of 2020.

Over the next two years, the Office of Sustainability will form a committee to explore ways to reduce red meat and dairy consumption on campus. The office will work with partners from across campus to conduct community surveys to understand student and staff preferences; work with Brown University Dining Services to enhance and market vegetarian and vegan options and promote their consumption relative to red meat; and explore options for meat alternatives as meat replacements.

It is important to note that reducing red meat is not the same as reducing protein availability. The goal is to transition toward 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 GHG emissions associated with food consumption by an amount greater than the total emissions of Brown's vehicle fleet.

### **3. Improve Water Quality**

**Objective: Brown is committed to reducing its impact on water quality through reduced non-point source pollution (reduction of fertilizer and pesticide use) and reduced coverage of impervious surfaces.**

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 GHG 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. Treatment is targeted at some key pollutants, but many are discharged without removal. Therefore, reducing water use, and reducing stormwater runoff, are two of the most impactful steps an institution can take to reduce its water footprint.

#### **Water at Brown**

Brown has made several investments in water-use reduction, including some buildings with grey water recycling and green roofs, condensate recovery, and the introduction of trayless dining to reduce water for washing. In 2014, Brown's building codes were updated to include low-flow fixtures, and Brown recently developed a Stormwater Master Plan to help inform campus development in a way that does not increase

stormwater runoff. The Stormwater Master Plan established a campus-wide credit and debit tracking system to address the requirements of the three regional authorities having jurisdiction over stormwater: The Rhode Island Department of Environmental Management, the Narragansett Bay Commission, and the City of Providence. Under the master plan, the requirements of all three agencies must be collectively met at all times, meaning that the credit tally for each agency must be even or positive. By providing the flexibility to construct stormwater treatment systems in locations remote from corresponding development projects, Brown's master plan eliminates compromises to stormwater treatment imposed by the constraints of any particular parcel.

### **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 of 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 greywater 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 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.

## **4. Curb Impacts on Biodiversity**

**Objective: Brown will reduce the amount of material that is purchased, source that material with biodiversity preservation in mind, and in particular avoid purchasing tropical hardwoods and reduce the use of palm oil (both major contributors to tropical forest loss and climate change).**

The United Nations has reported that the combination of climate change, habitat loss, pollution and ocean acidification are 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 erodes the foundations of the economies, livelihoods, food security, health and quality of life for populations around globe. Brown's biggest lever for reducing its negative impacts on biodiversity come through reducing its impact on climate and the land required for food production, and by sourcing purchases with the preservation of biodiversity in mind.

### **Biodiversity and Brown**

Brown's footprint on biodiversity comes largely through three avenues: our greenhouse gas emissions, our dietary choices (and thus the land required to support our diets), and the materials we purchase and

discard. The GHG emissions have been addressed explicitly elsewhere in this sustainability plan; the impact of the latter two avenues on biodiversity comes via the amount of land and resources required to run Brown's campus. In some cases, purchasing substitutions can reduce negative effects on biodiversity — for example, by not purchasing tropical hardwoods. In other cases, the only way to reduce our impact is to purchase and dispose of less material.

In addition, Brown's impact on biodiversity also comes through education. As our students leave campus and assume leadership positions around the world, it is imperative 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. These are:

- Goal 1: Address the underlying causes of biodiversity loss
- Goal 2: Reduce direct pressures on biodiversity and promote sustainable use of resources.
- Goal 3: Improve status of biodiversity by safeguarding ecosystems and species.
- Goal 4: Enhance benefits to our community based on 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 these goals. For example, Goal 1 above — mainstreaming biodiversity among the campus community — 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.

Goals 2 and 3 — sustainable use of resources and safeguarding ecosystems and species — require a change in the resources Brown uses and the purchasing decisions it makes. Specifically, it will require making purchasing decisions with biodiversity in mind, targeting specific items with outsized impacts on biodiversity. These purchasing decisions include, but are not limited to: 1) eliminating purchases 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 (see the goals in the "Human Health" objective below).

Brown will address issues related to biodiversity in ecosystems, which is Goal 4, by increasing the diversity of habitats on campus. This includes planting pollinator-friendly habitats, reducing the amount of herbicide and pesticide used (which also has health benefits, as discussed in the following section of the plan), reducing the amount of fertilized lawns, and increasing perennial plantings. These latter are local, low-cost and beneficial steps that will result in a more diverse campus.

## 5. Safeguard Human Health

**Objective: Brown will improve the indoor environment by making the campus more resilient to the increased moisture, flooding and mold our campus will experience as the climate changes. The University will also reduce the use of harmful materials on campus.**

The biophysical and built environment affects many aspects of physical health and mental health. While the largest health impacts of environmental change are addressed in previous sections of this Sustainability Plan, three direct threats can affect individual human health: increased exposure to extreme heat, poor air quality, and exposure to harmful materials contained in buildings. All have direct short-term impacts on the health and productivity of workers and learners. At the extreme, increasing temperatures and associated increases in ground-level ozone and other pollutants lead to poor outdoor air quality and more frequent hospitalizations. In addition, modern workplaces and residences are home to tens of thousands of chemicals with poorly understood and potentially serious lasting impacts on human health. These impacts include both physical illness and mental or behavioral changes that result from long-term exposure to high concentrations of industrial chemicals or other contaminants. And in regions with historic structures, mold in old buildings is likely to worsen as a result of higher temperatures and increased large precipitation events associated with climate change.

Prioritizing human health among Brown's sustainability goals recognizes that the design of the University's built environment can expose Brown community members to, or protect them from, environmental health hazards. This Sustainability Plan recognizes that issues of heat stress, air quality and outdoor pollution can affect the various efforts of students, faculty and staff to develop healthy lifestyles, balance academic and athletic pursuits, and achieve the highest levels of wellness and performance.

### **Sustainability and Health at Brown**

Brown has a campus characterized by a diversity of building types and ages, from University Hall (built in 1770) to Stephen Robert Hall at the Watson Institute of 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 an essential first step in ensuring a healthy campus environment.

Among the specific threats, one challenge associated with greenhouse gas emissions and other factors is outdoor air quality. While this is not entirely, or even predominantly, within Brown's control, initiatives to promote healthy behaviors can help people better cope with air quality challenges. Brown for years has promoted sustainability-conscious modes of transportation, including through partnerships with the Rhode Island Public Transit Authority, increasing presence of vehicle charging stations for electric vehicles and benefits for ride sharing. In the last five years, Brown has consistently reduced vehicular traffic at key campus intersections and promoted walking, biking and public transportation for commuters. The College Hill portion of campus is connected by a network of green spaces and pathways that promote walking and a connection to green landscapes. The Jewelry District portion of campus is embedded in a city network of walkways, green spaces and bikeways. And in new building design,

Brown aims to promote healthy behaviors and work environments through the positioning of stairs and connectivity between indoor and outdoor environments.

With the age of many of Brown's buildings, indoor air quality is increasingly an area of focus and attention, including occurrences of mold during particularly wet seasons. Throughout building construction, renovation, management, and landscape maintenance, Brown staff prioritize products and designs that have health benefits. For example, current building standards encourage low VOC flooring adhesives 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 has limited data on the extent of campus use of these products or their health and environmental benefits. In addition, while there is general agreement that exposure to various human-made chemicals is deleterious to human health, deciding which ones to eliminate is not straightforward, and better replacements are not always available. Fortunately, other universities, as well as independent organizations, are building a knowledge base or identifying chemicals to avoid. Brown's Office of Sustainability will continue to collaborate with these entities to develop best practices.

### **Sustainability and Health Goals and Next Steps:**

The first step in a plan that promotes sustainability and health is an integration of principles of healthy building and landscape design that encourages healthy behavior. We must also explicitly plan for a warmer and wetter climate. Many excellent practices are already used, but not formally codified in standards. Writing these standards will be the responsibility of Brown's Division of Facilities Management.

Beyond promoting healthy behaviors, the University can play a critical role in ensuring that the materials we use on campus are as benign as possible. Facilities Management will assess current practices and identify areas for improvement. This will include developing building, cleaning and landscaping principles. It will also include the development (and/or adoption) of a "red list" of products whose purchase which will be severely discouraged in the absence of compelling reasons for an exception (e.g., the "Chemicals of Concern" list developed by the U.S. Environmental Protection Agency). While it is not feasible to eliminate these products from existing buildings, it is possible to limit or eliminate their use during renovation and new construction. Brown expects to leverage the "red lists" and standards developed by other higher education institutions.

## **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 challenge 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 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 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 in the early 2000s, and later in the Institute at Brown for Environment and Society (IBES).

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, which promotes the exchange of ideas among undergraduate and graduate students in different disciplines with a common interest in environmental research. Teaching about sustainability, through IBES and other units on campus, will continue to expand in an effort to include students from across all disciplines.

In addition to classroom teaching, there are myriad opportunities to 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. First, all 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. The University will explore ways to stimulate behavioral changes in energy consumption, food choices and waste generation. Second, the consequences of individual choices can be made more apparent. As one example among many, the carbon cost of different meal choices could be made available to students in dining halls. As another, different ways of motivating less consumption could be explored in conjunction with departments (sociology, economics, etc.) that may not be engaged in campus sustainability but whose focus includes human motivations and theories of change. The purchase of recycled materials, and more important the purchase of fewer materials, could be incentivized in a variety of ways. All of these goals will be explored in the context of rigorous scholarship and will leverage the expertise on campus to develop with innovative solutions.

In order to establish the campus as a living lab, one in which sustainability is front and center for all members of our community, the Assistant Provost of Sustainability will establish a committee to prioritize and implement a series of campus-wide education programs that highlight the sustainability goals established in this plan. Working with the groups identified in the Next Steps section that follows, this committee will iterate with relevant stakeholders. The goal will be to engage with researchers and teachers on campus in order to develop an evidence-based program for education and motivating change.

## NEXT STEPS

Community engagement has been a hallmark for the successful development and implementation of major initiatives affecting the Brown community. The development of this Sustainability Plan constitutes Phase 1 of efforts to identify and form consensus around the priority areas for Brown's investment and action toward greater environmental sustainability.

The next phase of work — Phase 2 — will involve translating the principles and high-level objectives in this document into a concrete university-wide plan. The Sustainability Planning Committee that drafted this Sustainability Plan will work with key administrative leaders to map Brown activities that have high priority impacts onto operational areas of the University. Operational 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.

Within each of the operational areas, the Sustainability Committee will then convene working groups — with faculty, staff and student representation — to develop sustainability action plans by area. The key stakeholders are expected to represent the following areas of the University:

- Campus Life (including student organizations)
- The College
- Dining
- Environmental Health & Safety
- Facilities Management
- Office of the Provost
- Purchasing
- Transportation

At the end of this process, Brown will have an overarching sustainability action plan that both defines the University's scientifically-based objectives, and also maps these to operational opportunities that will help to create a more sustainable campus. The overarching action plan then will provide a framework for focused sustainability action plans for individual operational areas at Brown. The oversight of these operational sustainability action plans, and how they evolve as living documents, will be within the purview of the Office of Sustainability, while accountability for meeting the objectives of the overarching sustainability action plan will be the joint responsibility of the Office of Sustainability and the Office of the Provost. Progress toward goals will be tracked annually, and the plan will be updated every five years.

## Conclusion

In 2014, Brown celebrated its 250th anniversary. 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.