



2021–2026

**SUSTAINABILITY AND
CLIMATE ACTION PLAN**



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LETTER FROM LEADERSHIP

This Sustainability and Climate Action Plan (SCAP) is a testament to UMass Chan Medical School's commitment to public and environmental health. This plan outlines how UMass Chan Medical School (UMass Chan), a national model of excellence for public research universities, will lead by example in demonstrating how sustainable operations, procedures, and practices will support world-class education, groundbreaking research opportunities, and impactful service and engagement while embodying the Spirit of Massachusetts.

I am proud of the work that our facilities staff has carried out over the last several years, contributing to a more sustainable future. This Plan builds on our achievements and creates opportunities for the campus to be a model for sustainable operations: serving as an inspiration to our partners and community members to address climate change and work to integrate sustainability into our 'business as usual' operations.

The SCAP will support our institution's mission as we implement our strategic plan, IMPACT 2025. The operational focus of this Plan informs and invites our community to learn how our programs improve public health, contribute to environmental sustainability, and foster accountability for addressing our carbon footprint.

I am excited about the potential of this Plan. It highlights areas where we can invest in our operations to support the Commonwealth's ambitious climate action targets. This Plan strategically aligns UMass Chan with the UMass system Sustainability Policy, linking each focus area to the system-level policy goals. It also supports the state's commitment to reduce GHG emissions, water consumption, and build a more resilient infrastructure. By identifying our sustainability path, we will continue to be a leader and innovator in medical research, education, and public health.



John C. Lindstedt

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Executive Vice Chancellor,
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TERMS AND DEFINITIONS

ABBREVIATIONS

AASHE	Association for the Advancement of Sustainability in Higher Education
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
EUI	energy use intensity
EV	electric vehicle
GHG	greenhouse gas
HVAC	heating, ventilation, and air conditioning
IPM	integrated pest management
LBE	Leading by Example (Executive Order 484)
LEED	Leadership in Energy and Environmental Design
LRB	Lazare Research Building
RFP	request for proposals
STARS	AASHE's Sustainability Tracking, Assessment, and Rating System
UMASS CHAN	University of Massachusetts Chan Medical School

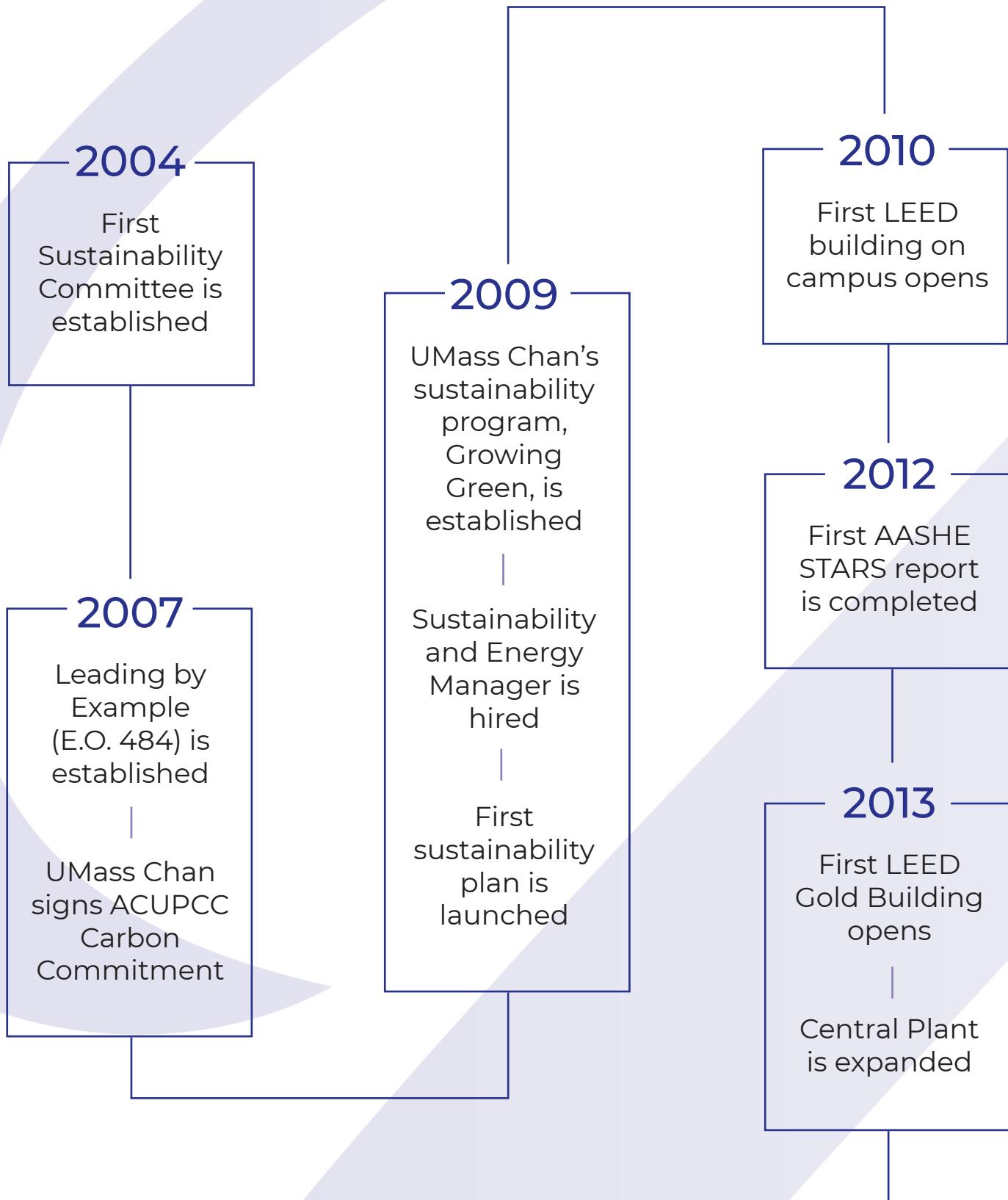


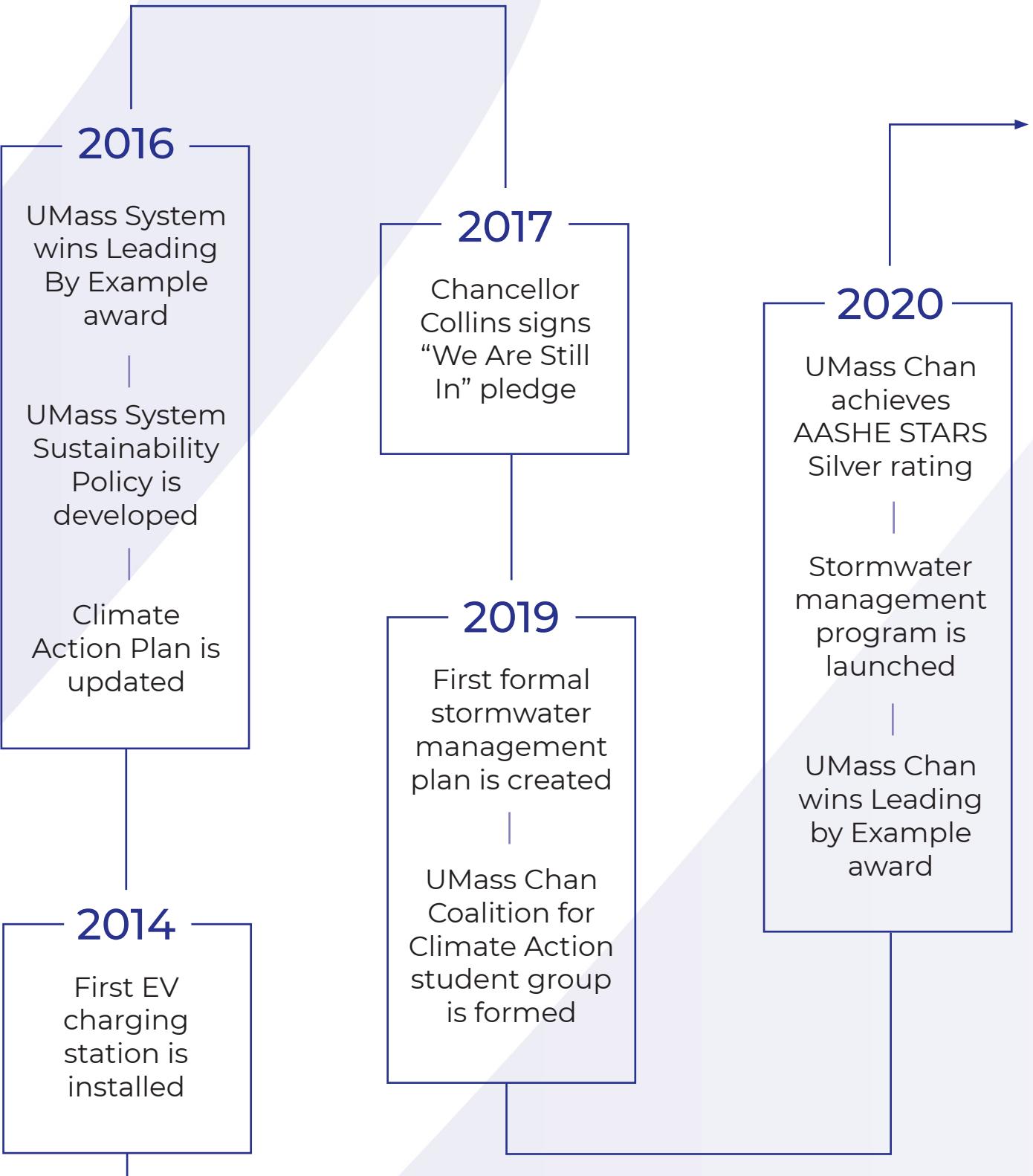
DEFINITIONS

carbon neutrality	Carbon neutrality means having a balance between emitting carbon and absorbing carbon from the atmosphere. For UMass Chan, the overall goal of carbon neutrality is to achieve a net zero greenhouse gas emissions from the main campus and affiliated structures and lands that are included for purposes of reporting the institutions GHG footprint.
net-zero carbon footprint	Net-zero carbon refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere.
central power plant	The central power plant at UMass Chan is where steam for heating, chilled water for air conditioning, and electricity are generated and then distributed to campus.
LEED certification	LEED is a third-party certification program through the U.S. Green Building Council (USGBC) that guides building and community design, construction, operations, and maintenance toward sustainability based on prerequisites and credits that a project meets to achieve a certification level (Certified, Silver, Gold, and Platinum).
institutional boundary	The main campus and appropriate affiliated structures and lands that are included for purposes of reporting. The main campus at UMass Chan is defined as buildings connected to the combined heat and power central plant including both UMass Chan owned and operated buildings, as well as owned by UMass Chan but occupied by the affiliated hospital and other partners. While UMass Chan does not have complete operational control of the Hospital, it shares the main campus and Central Plant so the GHG emissions include Hospital properties on the main campus where utilities are served by the central plant.
sustainability	UMass Chan approaches sustainability in an inclusive and pluralistic way, encompassing human health, responsibility of financial resources, and ensurance of ecological health for the future. Being sustainable is a commitment to good stewardship of fiscal resources and natural resources.
Scope 1 emissions	All emissions from onsite sources owned by UMass Chan are considered Scope 1. UMass Chan is affiliated and shares its main campus with the non-profit hospital, UMass Memorial Health Care, including the 17.5 MW combined heat and power plant which provides utilities to the main campus.
Scope 2 emissions	Indirect GHG emissions that are a consequence of activities that take place within the organizational boundaries of the institution, but that occur at sources owned or controlled by another entity. Scope 2 emission sources include purchased electricity, purchased heating, purchased cooling, and purchased steam used on campus.
Scope 3 emissions	All indirect emissions not covered in Scope 2. Some examples of Scope 3 GHG emissions are: emissions from purchased goods and services, capital goods, waste generated in operations, business travel, commuting (employee and student), end-of-life treatment of sold products, downstream leased assets, franchises, and investments.
thermal electrification	Shifting to use electricity rather than fossil fuels for heating and cooking. The goal of such a transition: all-electric buildings powered by solar, wind and other sources of zero-carbon electricity.



TIMELINE





MISSION

Advance the health and wellness of our diverse communities throughout Massachusetts and around the world by leading and innovating in education, research, health care delivery, and public service.

DEFINITION OF SUSTAINABILITY

UMass Chan defines sustainability in an inclusive and holistic way. Based on the Association for the Advancement of Sustainability in Higher Education's (AASHE) definition, sustainability includes human and ecological health, social justice, secure livelihoods, and a better world for all generations. Included in this commitment are sustainable practices that address UMass Chan's impact to environmental, social and economic issues.

VISION FOR SUSTAINABILITY AND CLIMATE ACTION

UMass Chan promotes well-being for all the people in the Commonwealth, nation, and the world through its operations, education, and research by providing health care education and research that strengthens sustainability, mitigates climate change, and preserves resources for future generations.



2021–2026 FOCUS AREAS AND GOALS



GROUNDS AND WATER MANAGEMENT

GROUND MANAGEMENT GOAL

Increase UMass Chan community access and use of the grounds as well as biodiversity on campus

WATER REDUCTION GOAL

Reduce water use at UMass Chan



TRANSPORTATION

CAMPUS FLEET GOAL

Reduce emissions from UMass Chan fleet by half

COMMUTING GOAL

Decrease commuting emissions and support low-emission commuting options



MATERIALS AND RESOURCE MANAGEMENT

WASTE MINIMIZATION GOAL

Reduce overall waste disposal by 20 percent and increase waste diversion

SUSTAINABLE PURCHASING GOAL

Implement environmentally preferable purchasing guides and standards

SUSTAINABLE FOOD AND DINING GOAL

Integrate sustainable food into campus services to support student learning and community health



BUILDINGS AND ENERGY

GREENHOUSE GAS EMISSIONS REDUCTION GOAL

Reduce Scopes 1 and 2 greenhouse gas emissions 15 percent by 2026

ENERGY USE INTENSITY REDUCTION GOAL

Reduce EUI of UMass Chan buildings 20 percent by 2026

INTRODUCTION

Human and planetary health are inextricably linked. Rising and increasingly variable global temperatures and a changing atmospheric composition affect air and water quality, sanitation levels, food production, social and economic system stability, and public health outcomes. As a public institution dedicated to academic and research advancement in public health, the University of Massachusetts Medical School (UMass Chan) maintains a commitment to environmental sustainability that supports the mission to advance the health and wellness of the diverse communities it serves.

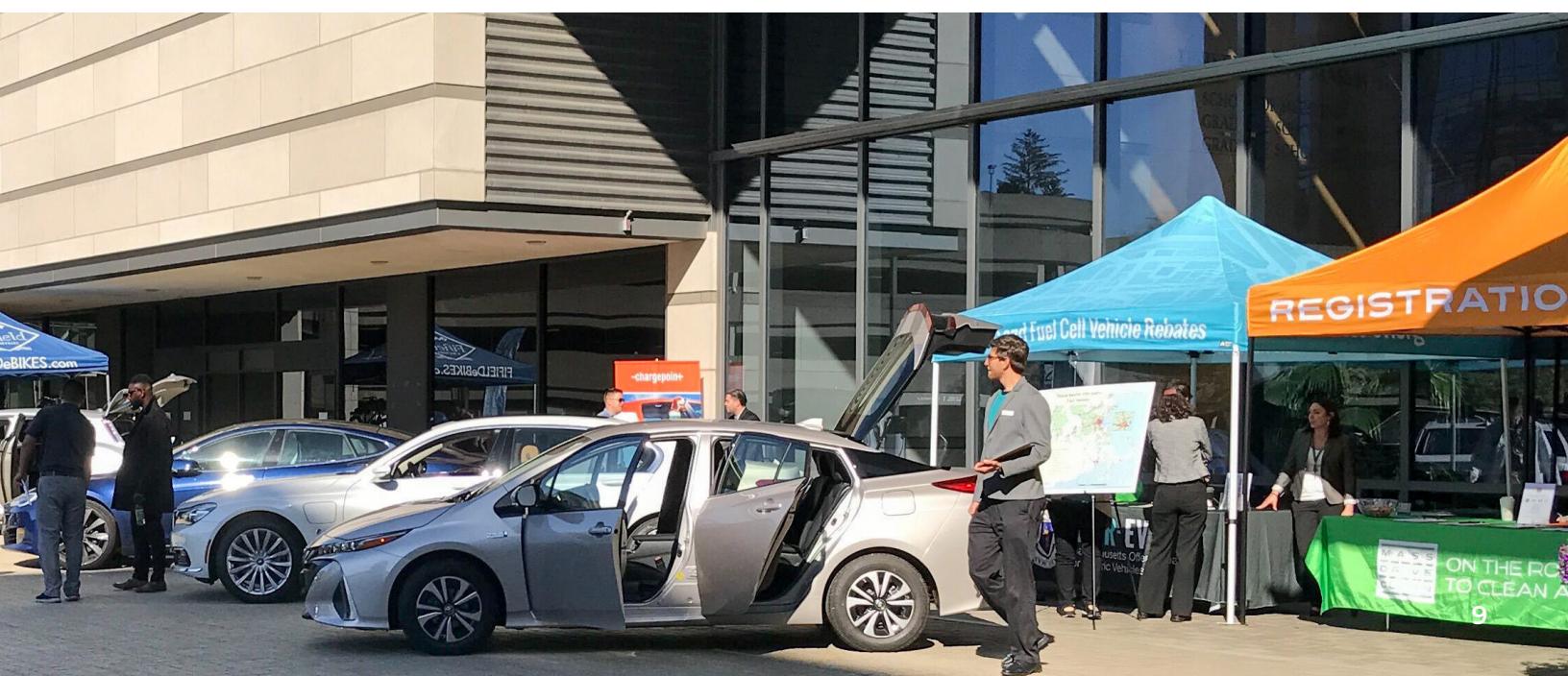
The UMass Chan Sustainability and Climate Action Plan (SCAP) aligns UMass Chan with the UMass system-wide Sustainability Policy and reaffirms UMass Chan's commitment to Massachusetts Governor's Executive Order 484: "Leading by Example—Clean Energy and Efficient Buildings." This Plan provides a five-year roadmap for a reduction in greenhouse gas emissions and an investment in sustainable operations. In addition to aligning with UMass system strategies and policies, this Plan upholds the vision of UMass Chan strategic plan, IMPACT 2025. It builds on the accomplishments of the Medical School and its clinical partners to date to further prioritize sustainability in its facilities and operations.

The sustainability program at UMass Chan promotes both human and ecological health, and includes environmental, social, and economic institutional practices. This Plan, however, is focused primarily on the operations of the institutions. UMass Chan does assess its economic and social impact through AASHE's international Sustainability, Tracking, Assessment, and Reporting tool (STARS).

The UMass Chan SCAP is the result of months of collaborative work to produce an operationally focused plan. The inclusive facilitation process began in January 2020 and moved to virtual engagement due to the COVID-19 pandemic. The stakeholders used UMass Chan's AASHE STARS Silver certification as a baseline to establish aspirational goals for sustainable operations. Community input was solicited and integrated into the process and built broad support from UMass Chan leadership.

As a signatory to the American College and University Presidents Climate Commitment, the UMass system, including the Medical School, has demonstrated leadership and realized the potential of the collective action of higher education to mitigate and adapt to the effects of climate change. The goals and strategies outlined in this Plan emphasize UMass Chan's commitment to advancing health and wellness at all levels of scale. This Plan exemplifies leadership by acting upon the intersectionality of climate change mitigation, resiliency, and human and community health.

This Plan advances existing sustainability commitments at UMass Chan by establishing five-year goals in four primary focus areas. Each focus area has specific goals and prioritizes strategies to meet specific sustainability targets. Included is an internal work plan to strengthen methods for tracking and reporting progress over time using appropriate metrics.



BACKGROUND AND BASELINE

The University of Massachusetts Medical School's commitment to sustainability and climate action is grounded in the priorities of the University of Massachusetts System Sustainability Policy, and the Massachusetts Governor's Executive Order 484, "Leading by Example—Clean Energy and Efficient Buildings" (LBE).

UMass Chan is committed to sustainability throughout the design and operations of facilities, as well as through engagement of students, staff, and faculty.

Growing Green, UMass Chan's sustainability program established in 2009, has supported the unique needs of the medical school community and has collaborated with UMass Chan's clinical partner, UMass Memorial Health Care (UMMHC). UMass Chan and UMMHC share the University campus as well as some operations and facilities, including the central plant where steam, chilled water, and electricity are generated.

ADVANCING UMASS SYSTEM COMMITMENTS

The UMass System Sustainability Policy, which was approved in 2016 by the University of Massachusetts Board of Trustees, is a guiding framework for the five campuses in the UMass system to maintain a long-term commitment to responsible stewardship of financial and environmental resources. The Policy outlines ten priorities and twelve goals with set metrics (see inset and appendix). These priorities frame the focus areas of this plan.

UMASS SYSTEM POLICY

The development process for this plan was specifically designed to integrate the UMass System Sustainability Policy Principles into the UMass Chan sustainability practices, programs, and goals:

1. Sustainability Strategic Planning
2. Clean Energy
3. Climate Resilience and Preparedness
4. Green Building Design and Sustainable Campus Operations
5. Sustainable Transportation
6. Waste Reduction and Recycling
7. Environmentally Preferable Purchasing
8. Sustainable Food Services
9. Sustainable Water Systems
10. Academic and Research Programming and Community Engagement

SUPPORTING CLIMATE ACTION IN THE COMMONWEALTH: LEADING BY EXAMPLE

UMass Chan is the third largest greenhouse gas emitter of all state agencies. Amongst the pool of state-owned agencies, authorities, and public institutions, UMass Chan contributes 11 percent of the total greenhouse gas emissions. Therefore, UMass Chan's GHG emissions reductions are important as they represent a significant impact to the Commonwealth's overall emissions and provide a unique opportunity for the institution to serve as a leader in higher education.

As a public institution in the Commonwealth of Massachusetts, UMass Chan is committed to reducing its environmental impact in accordance with LBE. LBE helps reduce the collective impact of state government operations through policy transformation, grant funding for clean energy and energy conservation projects, and the implementation of nationally recognized best practices. In 2020, the LBE presented UMass Chan with an award for ongoing leadership and contributions to the program, recognizing several years' worth of investments made on campus.

ASSESSMENT OF SUSTAINABILITY TO DATE: AASHE STARS

UMass Chan uses the Sustainability Tracking, Assessment, and Rating System (STARS) assessment tool, created by the Association for the Advancement of Sustainability in Higher Education (AASHE), to holistically measure sustainability across several disciplines, including academics, engagement, operations, and planning. The tool integrates industry-accepted indicators for sustainability performance in higher education and is essential to UMass Chan tracking progress overtime.

UMass Chan's Silver STARS certification rating in Spring 2020 highlights the institution's extensive sustainability-inclusive research, which supports the United Nations' Sustainable Development Goals (SDGs). The STARS report also underscores student involvement in sustainability efforts through the Student Government Alliance, the coordination of sustainability efforts across campus, and implementation of statewide guidelines to improve air quality measures.

The STARS reporting framework helped shape the focus areas of this plan. STARS is an important tool for UMass Chan tracking of campus sustainability both externally and internally, as STARS continuously evolves as sustainability in higher education advances. UMass Chan reports sustainability-related information annually to the state, as well as the UMass Board of Trustees, and submits an updated STARS report to AASHE every three years. Each of the nine goals in the UMass Chan SCAP are aligned with the STARS credits to coordinate progress of UMass Chan's sustainable operations. Information on campus engagement, public engagement, coordination and planning, diversity and affordability, investment and finance, and well-being is captured in the STARS report, but the scope of this plan does not include goals related to academic, research, and student engagement.

Annually, UMass Chan tracks and reports its fuel and electricity data to the LBE program and reports its scope 1 and 2 greenhouse gas emissions to the UMass Board of Trustees. UMass Chan's largest greenhouse gas impact in operations comes from its central plant. The plant provides UMass Chan's main campus and affiliated hospital with all their heating and cooling needs, as well as the majority of electricity needs. UMass Chan has made some progress tracking and addressing scope 3 emissions from its campus operations, as well as commuter impact and other indirect travel emissions, but there is much more that the campus can do to comprehensively track and reduce its indirect emissions of its supply chain and commuter and travel data.

The three main tracking and assessment platforms, LBE data to the state, sustainability data to the UMass Board of Trustees, and AASHE STARS benchmarking data, provide a comprehensive framework for tracking progress towards the goals in this plan.

PEER BENCHMARKS: HEALTHCARE AND CLIMATE ACTION PLANNING AT MEDICAL SCHOOLS

The health care sector in the United States is a significant contributor to GHG emissions and sustainability challenges. The sector produced 10 percent of the US total GHG emissions in 2013¹ thereby negatively impacting the natural environment and public health. The US healthcare industry, including research institutions, medical

¹ <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157014>, accessed March 9, 2021

centers, and hospital systems, has acknowledged and acted upon the inextricable links of climate change and public health. Many health care systems have initiated innovative and far-reaching climate mitigation efforts in their operations, outreach, and administrative practices.

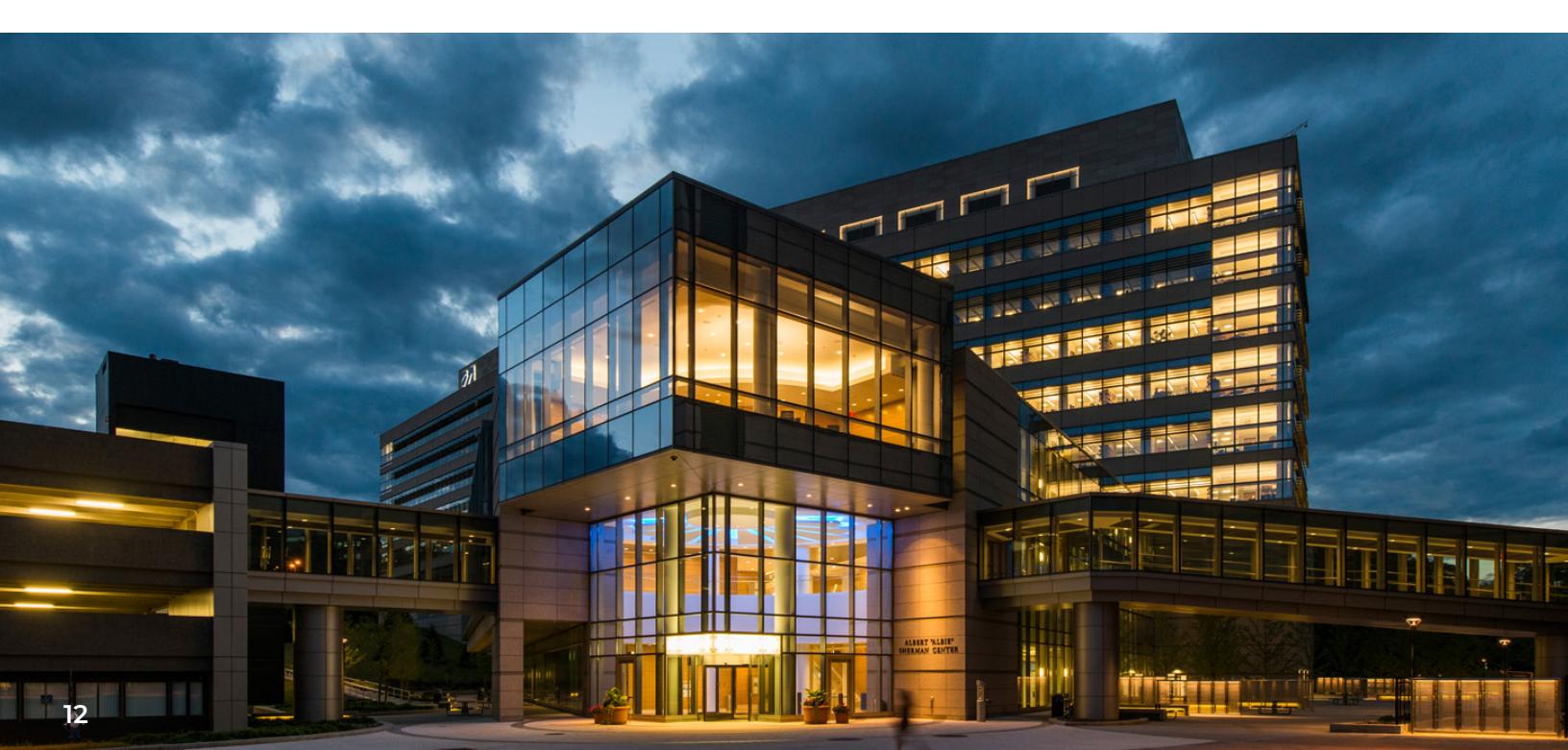
UMass Chan and its health care partner have a strong baseline of best practices within public health, health care, research, and educational institutions. There are specific organizations, coalitions, and resources in these sectors providing resources, programs, and support for more sustainable practices. One of these resources is Practice Greenhealth. It is a membership and networking organization for health care institutions that actively identify and address climate change as a public health crisis. Another organization is Health Care Without Harm, which facilitates initiatives to emphasize environmental responsibility and public health justice within the health care sector. It offers best practice resources and ranks U.S. medical centers in the areas of (1) emissions mitigation, (2) resilience practices, and (3) leadership. These best practice resources have been assessed, applied, and included in the baseline of the focus areas of this Plan.

UMass Chan is unique from other UMass system schools and most other higher education institutions in that it offers only graduate programs, has no on-campus residential students, and has a specific health research and clinical focus. As the first and only public academic health sciences center with three graduate schools and

world-class research in the state, UMass Chan has an opportunity to be a leader in sustainable operations in the Commonwealth, as well as to broaden its leadership in public health through sustainable operations.

The goals and strategies of this plan have been informed by a baseline study that gathered exemplary practices and case studies from peer institutions. UMass Chan's peers include other medical schools and four institutions within the UMass system. UMass Chan is the only medical school in the system, but the five schools UMass Medical School, UMass Amherst, UMass Lowell, UMass Dartmouth, and UMass Boston, abide by the UMass Sustainability Policy. All campus locations collaborate and report comparative data to the Board of Trustees.

Many of UMass Chan's peer medical schools, such as at Yale University, Harvard University, the University of Vermont, Brown University, and Boston University, adhere to the policies and goals outlined in their affiliated institutional sustainability policies and plans, and share key-operational services. This is not the case for UMass Chan. UMass Chan operates most of its campus facilities autonomously from the other UMass schools, has its own budgets and energy system, and only recently began sharing procurement services with the larger UMass system. This operational autonomy provides UMass Chan the opportunity to chart an independent course of success in achieving its sustainability and climate action planning goals in alignment with the UMass System Policy and state mandates.



METHODOLOGY

The goal of this planning process was to facilitate inclusive community engagement that resulted in a 5-year sustainability and climate action plan focused on operations with broad support from key-stakeholders and those responsible for implementing the strategies. The approach was to build on UMass Chan's successes and to create a plan that provides clear guidance for future emissions reductions and sustainability achievements.

UMass Chan had six process goals in mind when creating this plan:

1. Create a shared vision and goals
2. Establish clear roles and responsibilities
3. Identify mechanism for implementing and tracking
4. Prioritize emissions reduction
5. Develop broad support from stakeholders
6. Increase community awareness

UMass Chan ensured inclusive facilitation of the planning process and each meeting by using accessible and interactive meeting tools and a shared online repository for the resources and materials. The planning was led by the associate director of sustainability and campus services, Suzanne Wood. The planning process was supported by facilities leadership, and over 40 focus area group members, representing faculty, staff, and students contributed to the plan. Using data gathered from community feedback, a core group of key stakeholders assisted in prioritizing strategies set to be implemented by 2026. UMass Chan leadership provided reviews throughout each phase, building a solid foundation for the next steps of implementation.

The planning process began with a baseline and goal setting phase in December 2019. A consultant firm, GreenerU, supported the engagement and data analysis throughout the

project. GreenerU provided a greenhouse gas assessment, identifying the UMass Chan specific emissions from the central plant, and providing a baseline and recommendations for further greenhouse gas emission tracking and reduction. UMass Chan also completed its third AASHE STARS assessment and administered its first community survey to inform the plan's focus areas, goals, and strategies in the beginning of 2020.

The four focus areas of this plan were established based on the UMass Sustainability Policy and UMass Chan's current focus on sustainable operations. The focus areas of Climate and Energy, Transportation, Grounds and Water, and Materials and Resources Management encompass the key areas in which UMass Chan can integrate the UMass System Sustainability Principles and track progress using

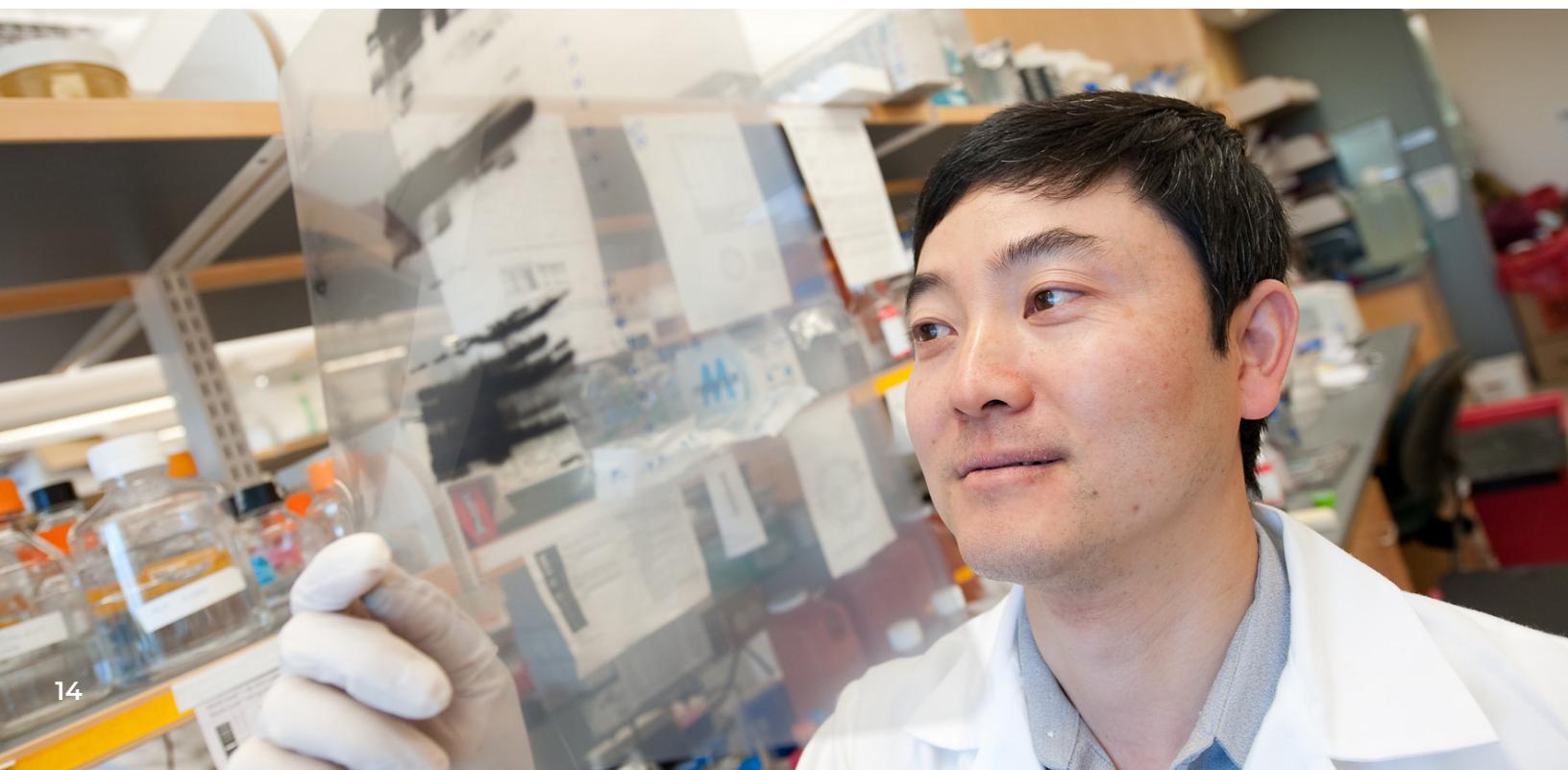
the AASHE STARS report. Focus area groups were formed with key stakeholders across multiple departments, and the core team attended facilitation training and goal setting work sessions.

In the working sessions, each focus area group assessed UMass Chan progress to date, developed goals and strategies referencing the baseline study, created a community survey, and solicited feedback from remote community engagement opportunities. The community survey, administered in Spring 2020, gathered input from close to 10 percent of UMass Chan community (more than 500 responses) to assess awareness and gauge interest in participation in the planning process. Respondents overwhelmingly agreed that it was important for UMass Chan to mitigate and adapt to climate change through its operations and programs.

The key stakeholders created a set of criteria to guide the decision-making process for the plan, identifying key criteria for the goals and strategies:

SUPPORT	Leadership support for implementation
IMPACT	Reduce GHG and resources consumption
INFLUENCE	Enable cultural change for more sustainable actions, operation, and relationships within UMass Chan
COLLABORATION	Partnering with the hospital, local organizations, and other institutions to progress sustainability and climate action
FINANCIAL VIABILITY	Recommend financially viable long-term investments to improve operations
MISSION ALIGNMENT	Support student learning and institutional research

Due to the COVID-19 pandemic in early 2020, the planning process moved fully remotely in March 2020. The last in-person event was a community idea session and the launch for the focus areas. After that, only virtual events were held both for the focus areas and community events, such as the 50-year Earth Day celebration in April 2020. Throughout the spring and summer of 2020, the focus area groups worked on the draft goals and strategies. In the fall of 2020, UMass Chan held remote community review events, providing community members with the opportunity to review a draft of the plan, ask questions, and offer feedback. These virtual events promoted community awareness of sustainability at UMass Chan and created a platform for important community thoughts to shape the plan.





FOCUS AREA GROUNDS AND WATER MANAGEMENT

The Grounds and Water Management focus area broadly includes UMass Chan's main campus and its landscape and grounds, as well as indoor and outdoor water use and management. This focus area supports University of Massachusetts Sustainability Policy principles: (4) Green Building Design and Sustainable Campus Operations, (8) Sustainable Water Systems.

GROUNDS

Sustainable grounds management focuses on the natural environment of the UMass Chan campus. This includes the walking, driving, and biking paths, landscapes and lawns, and the overall biodiversity on campus. Grounds management supports human well-being by promoting good air quality, a connection to the natural world, and safe and visually pleasing environments. The strategies aim to increase the biodiversity of vegetation and wildlife on campus, including pollinator plants and insects on campus.

BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN GROUNDS STARS CREDITS

OP-9: Landscape Management	0.00/2.00
OP-10: Biodiversity	0.00/1.00
IN-29: Pest Management Certification	0.00/0.50

PLANTING THE COMMUNITY GARDEN

UMass Chan is a partner with the Worcester Regional Environmental Council, a food justice organization which provides resources to support the UMass Chan Student Garden as well as other local community gardens. In July 2019, three second-year School of Medicine students started a community garden in four raised beds on the north side of campus as part of their Capstone project, enabling them to develop educational initiatives and provide fresh produce to the student food bank throughout their time at UMass Chan. The student-run garden creates a space for the community to participate in hands-on nutrition-focused wellness-oriented initiatives.





GROUNDS MANAGEMENT GOAL: INCREASE UMASS CHAN BIODIVERSITY COMMUNITY ACCESS AND USE OF THE GROUNDS AS WELL AS BIODIVERSITY ON CAMPUS

The green space at UMass Chan is an important part of the campus' identity. This goal builds upon UMass Chan's efforts in the Community Garden to promote the health and wellness of the community by growing fresh food, increasing enjoyment of active green spaces on campus as areas to reflect and refresh. This goal creates the opportunity to promote a greater sense of wellbeing for the UMass Chan community and assesses and supports the UMass Chan campus in becoming a certified pollinator campus with Bee City USA.

STRATEGIES AND TIMELINE

2021 2022 2023 2024 2025 2026

STRATEGY 1	Activate green spaces on campus for increased community access by the UMass Chan community	●
STRATEGY 2	Expand the community garden programming	●
STRATEGY 3	Become a certified pollinator campus	●
STRATEGY 4	Investigate developing an integrated pest management (IPM) program on campus	●
STRATEGY 5	Create a self-guided campus walking tour for the campus community	●



WATER

Conservation, recycling, and reuse of water both indoors and outdoors is key for sustainable operations. Sustainable water practices include effective rainwater, stormwater, and irrigation management, and the judicious use of water in the central plant and campus operations. The largest water consumption on the UMass Chan campus is in the central plant. Half of UMass Chan total annual water consumption is in the plant, where it is used to generate steam and chilled water to meet the thermal energy and humidification needs of the main campus. Only 5 percent of water consumed on campus is for the management of the exterior environment, such as irrigation of the landscape.

Water and energy consumption are closely linked, as energy is required to treat, deliver, and return water to and from campus facilities, and water is used at UMass Chan for producing and transporting thermal energy for the main campus. Like all institutions, UMass Chan can reduce energy use and greenhouse gas emissions associated with indoor heating and cooling, which will also reduce water consumption at the central plant.

UMass Chan tracks water consumption at the building level but does not currently track water consumption in individual labs. Exterior water management includes irrigation, rainwater, stormwater, and wastewater management, and reduces the need for effluent discharge into local surface water supplies which helps improve the health of local water ecosystems. Sustainable water practices also support, maintain, and protect healthy and finite groundwater supplies, as well as human health and biodiversity of campus vegetation.

BASELINE

UMass Chan uses AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN WATER MANAGEMENT STARS CREDITS

OP-21: Water Use	3.06/4.00
OP-22: Rainwater Management	0.00/2.00
IN-36: Stormwater Modeling	0.00/0.50

WATER EFFICIENCY AND SAVINGS ON CAMPUS

LBE establishes goals for state agencies to reduce overall water consumption through ongoing increased water efficiency measures and improved tracking for indoor and outdoor water. UMass Chan has invested in water efficiency projects in buildings, and equipment use and upgrades. For example, 16 glass-washing machines and 17 autoclaves in the Lazare Research Building were replaced with more efficient machines. The new equipment will save approximately 3.3 million gallons a year through more efficient water use and by avoiding once-through cooling with potable water.

Another example includes the Albert Sherman Center, which is designed to reduce potable water consumption by collecting and reusing non-potable water. Non-potable water is not suitable for human consumption but can be used to support mechanical equipment operation and maintenance. Some of the Sherman Center's non-potable water is piped to the central plant to be used as cooling tower make-up water.

EXPLORING WATER REUSE ON CAMPUS

In 2019, UMass Chan completed a feasibility study on the viability of district-scale water reclamation and reuse facility on campus. The proposed facility could treat up to 500,000 gallons of wastewater per day and reduce campus potable water consumption by as much as 50 percent.

The study evaluated existing water management practices and developed strategies to minimize water supply risk for critical heating, cooling, fire suppression, and other campus operations; improve the University's environmental footprint through reuse and reduced wastewater discharge; and reduce long-term water and sewer utility costs.



TABLE 1. Water use per campus user across the University of Massachusetts system

HUNDREDS OF CUBIC FEET (CCF) PER CAMPUS USER	FY16	FY17	FY18	FY19	FY20
Amherst	12.9	12.1	13.9	12.9	9.7
Boston	3.9	2.0	4.4	4.4	3.9
Dartmouth	3.3	6.0	6.4	4.7	4.7
Lowell	5.9	4.3	7.0	6.8	8.3
Medical School	36.8	36.2	33.4	38.2	36.7
University	11.4	10.7	12.6	12.3	11.0



WATER REDUCTION GOAL: REDUCE WATER USE AT UMASS CHAN

In accordance with LBE, this goal supports the Medical School's efforts to reduce both indoor and outdoor water consumption. Outdoor water consumption primarily includes irrigation and grounds maintenance. Indoor water consumption includes all water consumed in buildings point-of-use fixtures, and water used in UMass Chan's central plant.

STRATEGIES AND TIMELINE

2021 2022 2023 2024 2025 2026

STRATEGY 1	Reduce indoor and outdoor water use in accordance with Leading by Example (LBE)	●
STRATEGY 2	Use greywater for irrigation	●
STRATEGY 3	Build a district-scale water reclamation facility	●





FOCUS AREA TRANSPORTATION

Transportation management plays an important role in Massachusetts' response to climate change and public health. In 2020, the state of Massachusetts committed to increased collaboration in the northeast and New England to reduce emissions from transportation, with a shared goal of increasing sustainable transportation and commuting options. The Transportation and Climate Initiative Program² (TCI-P) is a regional initiative and intends to invest \$160 million by 2023 to improve and expand public transportation, including zero-emission buses, cars, and trucks; electric vehicle charging infrastructure; development of interstate electric vehicle charging corridors; improving high speed wireless internet in rural and low-income areas to allow for teleworking; repairing existing roads and bridges; and providing safer bike lanes and sidewalks.

In the U.S., road traffic accounts for about 40 percent³ of the pollution that forms ground-level ozone, the main component in smog. In New England, transportation is responsible for over 40 percent⁴ of greenhouse gas emissions. UMass Chan can positively impact human and ecological health and support local economies by modeling sustainable transportation systems, including increasing by greening the campus fleet and reducing employee commuting. Doing so requires collaborative solutions amongst UMass Chan and its partners in the region. Providing sustainable transportation benefits everyone, especially low-income communities. This focus area supports the University of Massachusetts Sustainability Policy principle number five: Sustainable Transportation.

CAMPUS FLEET

As of 2020, UMass Chan's campus fleet includes 69 vehicles, including one hybrid vehicle. The campus fleet includes both leased and owned vehicles that support transport of UMass Chan staff and goods. The institution has begun to electrify the campus fleet as new leases and purchases are made.

BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN CAMPUS FLEET STARS CREDITS

OP-15: Campus Fleet with Alternative Fuel 0.01/1.00

³ <https://www.mass.gov/news/massachusetts-new-england-states-and-dc-commit-to-groundbreaking-regional-program-to-reduce>, accessed March 9, 2021

⁴ <https://www.mass.gov/guides/transportation-air-quality>, accessed March 9, 2021

⁵ <https://www.mass.gov/news/massachusetts-new-england-states-and-dc-commit-to-groundbreaking-regional-program-to-reduce>, accessed March 9, 2021

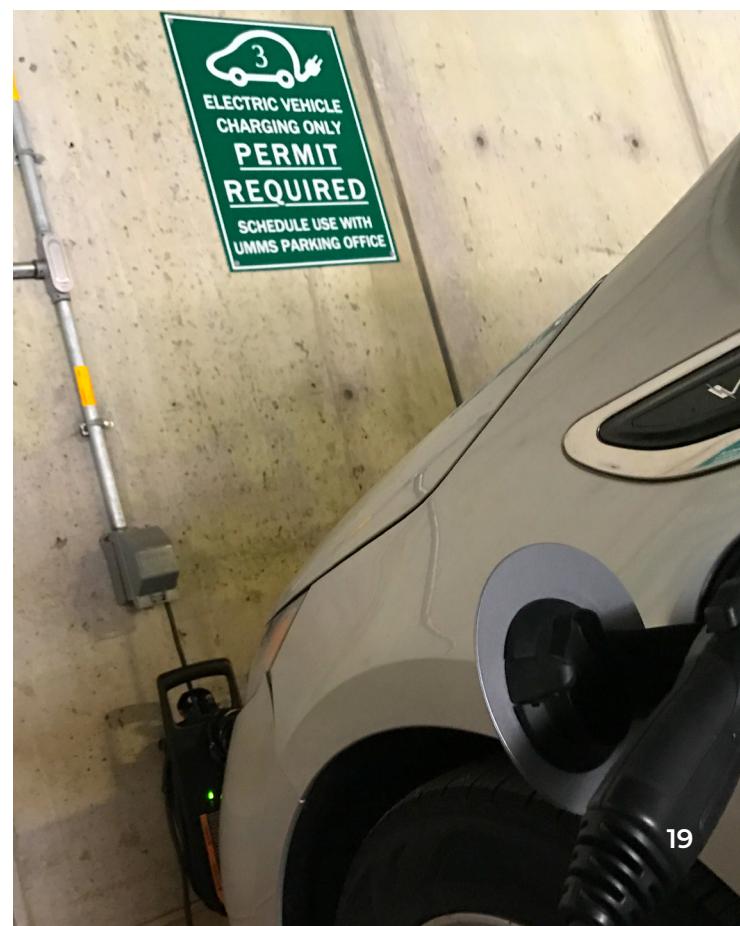


TABLE 2. Alternative energy use campus fleet vehicles across the University of Massachusetts system (percent)*

	FY16	FY17	FY18	FY19	FY20
Amherst	0.0	4.2	6.3	6.5	12.6
Boston	0.0	0.0	0.0	0.0	0.0
Dartmouth	1.1	2.2	1.4	1.4	1.4
Lowell	3.6	5.3	7.2	9.7	15.5
Medical School	0.0	0.0	0.0	0.0	0.0
University	3.4	3.6	5.3	5.7	10.7

* Excluded fleet vehicles for this metric includes off-road vehicles, heavy duty vehicles, and emergency response vehicles. UMass Chan has one electric hybrid response vehicle.



CAMPUS FLEET GOAL: REDUCE EMISSIONS FROM UMASS CHAN FLEET BY HALF

UMass Chan has the opportunity to greatly reduce the onsite Scope 1 emissions from leased and owned fleet vehicles in the next five years. Through a combination of strategies that address the types of vehicles and equipment used and the power sources and fuels, this goal encompasses improved tracking of fleet emissions and a phasing-in of more sustainable vehicles.

STRATEGIES AND TIMELINE

	2021	2022	2023	2024	2025	2026
STRATEGY 1	Increase tracking of transport fleet vehicle use and fuel consumption	●				
STRATEGY 2	Right-size vehicles for specialized and general use		●			
STRATEGY 3	Electrify fleet vehicles			●		
STRATEGY 4	Electrify grounds equipment				●	



COMMUTING

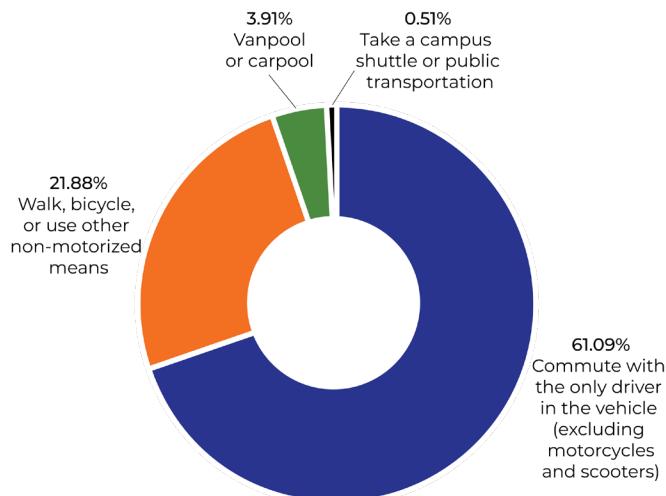
It is a priority of the institution to be able to offer commuting options that are financially, environmentally, and socially sustainable. According to UMass Chan's 2009 emissions report, scope 3 emissions from commuting are approximately 55 percent of the University's carbon footprint.⁵ The Medical School does not currently report annual greenhouse gas emissions contributed by commuting, but this is still an important area for sustainability and climate action.

In 2018, UMass Chan conducted a survey and collected commuter data for the Massachusetts Rideshare Program. The Rideshare Program is part of the Department of Environmental Protection and requires many businesses and educational facilities across the state to develop plans and set goals for reducing by 25 percent the number of times commuters drive alone to work or school. According to the results of this survey, 33 percent of students and 11 percent of staff at UMass Chan already use "more sustainable" commuting options as their primary means of transportation.

Additionally, most staff and all students require some in-person attendance to complete their responsibilities in the labs, classrooms, and medical center. In 2018, 12 percent of students and 10 percent staff reported that they worked out of the office, telecommuted, or used flextime, and more than 75 percent of student, staff, and faculty use a single-use vehicle for commuting.

⁵ UMass Chan 2009 Climate Action Plan, page 9

FIGURE 1. Student commuting habits at UMass Chan



UMass Chan and its partners strive to ensure that all faculty, staff, students, and visitors have safe, environmentally friendly, and active/human-powered commuting options to campus. However, shared roads, a peripheral location to city-center, and a hilly terrain mean that single occupancy vehicles (SOVs) remain the primary means of transport. A focus on more sustainable commuting options has been prioritized, and UMass Chan continues to work with local and regional transportation organizations to increase active and low-carbon commuting solutions.

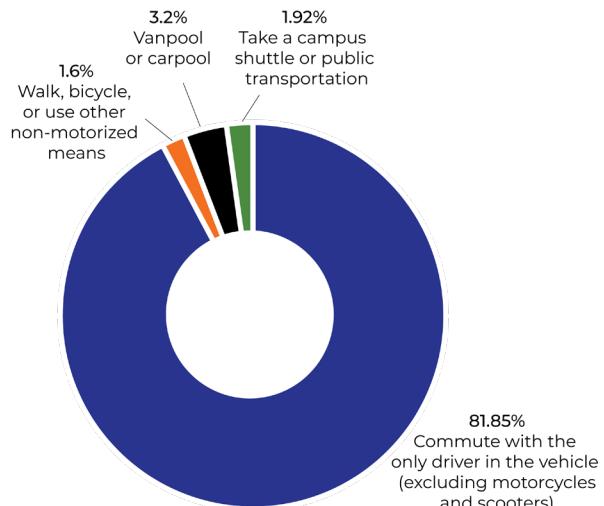
BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN COMMUTING STARS CREDITS

OP-16: Student Commute Modal Split	0.65/2.00
OP-10: Employee Commute Modal Split	0.22/2.00
OP-18: Support for Sustainable Transportation	1.80/0.50
IN-3: Bicycle Friendly University	0.00/0.50

FIGURE 2. Employee commuting habits at UMass Chan



ELECTRIC VEHICLE AND BIKING INFRASTRUCTURE

In 2019, UMass Chan installed four dual-head electric vehicle chargers in the Plantation Street garage, located adjacent to the UMass Chan campus. This project was fully funded through utility incentives, and enabled UMass Chan to have a total of nine charging stations and 7 dedicated charging outlets on the main campus.

Covered bicycle parking is located in the garages, and shower facilities and lockers are available at the fitness center. Bike racks are available outside most occupied buildings, offering convenient storage options for community members.

INCENTIVIZING SHARED TRANSPORTATION

The campus is served by the Worcester Regional Transit Authority (WRTA) with connections to all major routes and the Commuter Rail. Free bus passes are provided to employees who live in

the area and trade in their parking passes.

UMass Chan had been a partner of the MassRIDES Baystate Commute program through the Massachusetts Department of Transportation (MassDOT). While this program is no longer active, UMass Chan is providing preferential parking in the Pine Tree Lot for carpool/vanpool participants.

TELEWORKING AND REMOTE LEARNING

UMass Medical School offers four types of flexible work arrangements: flextime, compressed work week, telecommuting/alternative work site, and reduced hours/part-time. Any employee may submit a proposal for a flexible work arrangement. However, not all jobs are suitable for such an arrangement and each case must be considered by the responsible supervisor or manager. Supervisors and managers are encouraged to consider requests where they meet the needs of both UMass Chan and the individual. The COVID-19 pandemic that began in the spring of 2020 necessitated remote work and school options for the UMass Chan community, and the institution has adapted quite successfully.



COMMUTING GOAL: DECREASE COMMUTING EMISSIONS AND SUPPORT LOW-EMISSION COMMUTING OPTIONS

UMass Chan supports more sustainable options to and from campus such as walking, cycling, vanpooling or carpooling. Additional options such as taking public transportation or a campus shuttle, riding electric motorcycles or scooters, using a zero-emissions vehicle, availing of distance education and working, or a combination of these options for students and employees would also contribute to sustainable transportation.

STRATEGIES AND TIMELINE

	2021	2022	2023	2024	2025	2026
STRATEGY 1 Increase EV infrastructure and education						●
STRATEGY 2 Support telecommuting by staff, faculty, and students					●	
STRATEGY 3 Increase bicycle-friendly infrastructure					●	
STRATEGY 4 Support alternative transportation options for commuting					●	
STRATEGY 5 Implement a transportation demand management program					●	



FOCUS AREA MATERIALS AND RESOURCE MANAGEMENT

Materials and resource management is an essential part of sustainable operations, especially as it pertains to public health education and research. The materials an institution purchase, use, and dispose of has a significant impact on environmental, financial, and health-based sustainability. Sustainable purchasing practices and waste minimization efforts are complex tasks for research institutions to manage. UMass Chan has multiple streams of materials and specific regulations that must be met in classrooms, labs, and health care facilities.

All flows of materials, such as food for the dining services, chemicals for labs, office supplies, and purchased goods and equipment follow similar cycles of consumption and disposal. UMass Chan can support sustainable practices by establishing supply chain standards, creating guidelines for purchases, and creating programs for consuming, disposing, and diverting materials sustainably.

This focus area encompasses all the practices related to sustainable procurement, waste minimization, and healthy foods. It includes the impact of materials UMass Chan uses and the practices and procedures vendors and suppliers follow. These practices cover many of UMass Chan scope 3 emissions which are indirect emissions from the materials and services UMass Chan purchases. The materials and services produce GHG emissions that UMass Chan does not directly control but can influence, such as the manufacturing, transportation, and disposal of lab equipment, for example. Since UMass Chan uses these goods and services, the practices in this focus area contribute to UMass Medical School's scope 3 emissions. Currently, none of these emissions are tracked within UMass Chan's GHG report but focus area goals support the following University of Massachusetts Sustainability Policy principles: (6) Waste Reduction and Recycling, (7) Environmentally Preferable Purchasing, and (8) Sustainable Food Services.

WASTE MINIMIZATION

Waste reduction mitigates the need to extract virgin materials from the earth and reduces waste flow to incinerators and landfills that produce GHG emissions, contaminate air and water, and disproportionately negatively impact marginalized communities. Waste reduction campaigns can also engage the entire campus community in contributing to tangible sustainability goals.



BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN WASTE STARS CREDITS

OP-19: Waste Minimization and Diversion	1.05/8.00
OP-20: Construction & Demolition Waste Diversion	1.00/1.00
OP-21: Hazardous Waste Management	0.50/1.00

WASTE MINIMIZATION AND DIVERSION AT UMASS CHAN

UMass Chan implements several initiatives to promote waste diversion. UMass Chan collaborates with Partners for World Health (PWH), which is a non-profit 501(c)3 based in Portland, Maine. PWH collects medical supplies and equipment from healthcare facilities, manufacturers, other organizations, and individuals. They sort, evaluate, repackage, and prepare these supplies and equipment for distribution to individuals, communities, and healthcare facilities in need. PWH limits the impact on the natural environment by diverting materials from landfills; lowering healthcare costs by decreasing disposal fees; and by providing healthcare resources to those in need.

The results of UMass Chan waste minimization are assessed and tracked annually via the total weight of disposed materials and the diversion rate. In 2020, UMass Chan diversion rate was 28.4 percent, representing the percentage of materials diverted from incineration/landfills through recycling or reuse at the main campus. The UMass system measures waste disposal diversion annually across all campuses, and UMass Chan has a lower diversion rate compared to the other UMass campuses due to the research environment and clinical setting which forces the institution to manage waste streams differently than other campuses. UMass Chan provides recycling bins throughout campus, bi-monthly newsletters, and an annual Earth Day Celebration which promotes campus recycling, amongst other topics.

ENCOURAGING REUSE THROUGH THE SWAP SHOP

UMass Medical School has a successful materials reuse program called Surplus with a Purpose (SWAP) which operates as a "store" where faculty, staff, and students can easily donate items and adopt items from surplus. The materials are quite diverse and include everything from traditional office supplies such as printer toner cartridges and keyboards to specialized lab equipment.

TABLE 3. Diversion rate of materials in the waste stream across the University of Massachusetts system (percent)

	FY16	FY17	FY18	FY19	FY20
Amherst	57.4	57.4	58.9	56.0	54.9
Boston	63.8	62.9	51.3	63.6	51.5
Dartmouth	n/a	31.5	14.8	24.5	21.4
Lowell	42.1	40.8	48.0	50.6	64.1
Medical School	26.2	27.1	26.4	30.9	28.4
University	48.5	45.1	43.7	47.0	44.5





WASTE MINIMIZATION GOAL: REDUCE OVERALL WASTE DISPOSAL BY 20 PERCENT AND INCREASE WASTE DIVERSION

Efficient use of materials is a cross-institutional effort supported by sustainable procurement, education and behavior change programs, and improved waste stream disposal infrastructure. The development of green office and green lab programs could increase support and clarity for employees and students. Identification of key waste streams could help UMass Chan track sources and composition of waste across campus, increase recycling and composting, and decrease material destined to be incinerated.

STRATEGIES AND TIMELINE

2021 2022 2023 2024 2025 2026

STRATEGY 1	Establish green office and green lab programs	●
STRATEGY 2	Reassess key waste streams to identify additional opportunities for diversion	●
STRATEGY 3	Improve education and behavior change information and programs	●

SUSTAINABLE PURCHASING

Every purchasing decision represents an opportunity for UMass Chan to choose environmentally and socially preferable products and services, regionally sourced as much as possible, and to support vendors with strong commitments to environmental and financial sustainability.

BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN PURCHASING STARS CREDITS

OP-11: Sustainable Purchasing	1.50/3.00
OP-12: Electronics Purchasing	0.97/1.00
OP-13: Cleaning & Janitorial Purchasing	0.66/1.00
OP-14: Office Paper Purchasing	0.11/1.00
IN-13: Spend Analysis	0.00/0.50

UMASS SYSTEM PROCUREMENT PARTNERSHIP WITH UPST

The Unified Procurement Services Team (UPST) was created as a system-wide effort to deliver procurement services to all UMass campuses. The Sustainability Council and UPST team members have collaborated to improve vendor relationships with the University.

This partnership has:

- Engaged vendors to provide consistent data on meeting sustainability metrics
- Improved data access for the University
- Consulted with the UMass System Sustainability Council to build sustainability reporting standards into contracts for key products/services related
- Advocated for vendors to provide University purchasers with information on products which support environmental sustainability through their catalog systems

Over time, this initiative will allow UPST to continue to provide the UMass system with

better data to measure success in procuring more environmentally responsible supplies and resources across the campuses using the AASHE STARS report as a data needs framework.

UMass Chan is committed to providing healthy food, using its food purchases to support local and community-based economies and encouraging environmentally sound, socially just and humane farming methods. These actions help UMass Chan community in reducing environmental impacts, preserving regional farmland, improving local food security, and supporting fair and resilient

food systems.

In 2019, the Community Garden was established with a mission to educate the community on locally grown food and promote awareness of wellness and nutrition. UMass Chan has hosted a farmer's market and community supported agriculture (CSA) food pickup on campus to connect the UMass Chan community to local farmers and vendors. The medical school has also donated pre-consumer food waste to local farmers for animal feed.

TABLE 4. Plant-based foods across the University of Massachusetts system (percent)

	FY20
Amherst	41
Boston	n/a
Dartmouth	n/a
Lowell	24
Medical School	32
University	32



SUSTAINABLE PURCHASING GOAL: IMPLEMENT ENVIRONMENTALLY PREFERABLE PURCHASING GUIDES AND STANDARDS

This goal addresses the need for a clear set of guidelines on how and why to procure more sustainable products. UMass Chan will expand support for more sustainable procurement practices of laboratory chemicals, office supplies, electronics, and other goods. This goal helps UMass Chan increase transparency of sustainable supply chains across UMass Chan operations.

STRATEGIES AND TIMELINE

	2021	2022	2023	2024	2025	2026
STRATEGY 1	Integrate sustainability language into purchasing and request for proposals (RFP) documents					
STRATEGY 2	Support and promote sustainable lab chemical purchases, reuse, and disposal					
STRATEGY 3	Establish environmentally preferable office supply and electronics standards					
STRATEGY 4	Increase partnership with sustainability purchasing organizations					

SUSTAINABLE FOOD AND DINING

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BASELINE

UMass Chan used STARS credits as a baseline when creating the goals and strategies for this focus area:

UMASS CHAN FOOD AND DINING STARS CREDITS

OP-7: Food and Beverage Purchasing	0.69/6.00
OP-8: Sustainable Dining	1.13/2.00
IN-10: Sustainable Dining Certification	0.00/0.50

REUSING COOKING OIL

NexDine filters cooking oil to extend its useful life, thereby reducing the overall usage by 35 percent and saving some 6,000 gallons of oil a year. When the oil can no longer be used for cooking, it is collected by a firm that provides rendering and grease removal services across the country. The oil is transported to the company's northeast facility in Billerica, Massachusetts, where it is processed for reuse. Most of the cooking oil is recycled into yellow grease, a product used as a high energy ingredient in animal feed.

SUSTAINABLE FOOD AND DINING IN THE UMASS SYSTEM

The UMass system uses the metrics outlined in the STARS report to track sustainability aspects of food and beverages purchased for each campus. In 2020, UMass Chan began to inventory the percentage of food and dining purchases that are sustainable, ethically produced, and plant based. STARS defines sustainable and ethical food as either being evaluated by third-party verification or is produced by a local supplier whose sustainability practices are verified by the institution.

UMass Chan has developed specific sustainable dining vendor criteria, including that vendor's food purchases are tracked and reported, and that vegetarian/plant-based options are made available at every meal. The sustainable dining criteria is integrated into the campus food service contracts, and requires that the vendor sources local food, eliminates Styrofoam, partners on waste reduction goals, and achieves Green Restaurant Association certification.

In 2020, NexDine, UMass Chan current dining services vendor, received Green Restaurant Association certification for the Albert Sherman Center dining facility. This is the only Green Certified Restaurant in the Worcester area. NexDine has also partnered with the Worcester Regional Food HUB, an organization designed to enhance the regional food system by increasing local food access through partnership with local food entrepreneurs.



TABLE 5. Sustainable/ethnically produced products across the University of Massachusetts system (percent)

	FY20
Amherst	16
Boston	n/a
Dartmouth	n/a
Lowell	5
Medical School	5
University	9



SUSTAINABLE FOOD AND DINING GOAL: INTEGRATE SUSTAINABLE FOOD INTO CAMPUS SERVICES TO SUPPORT STUDENT LEARNING AND COMMUNITY HEALTH

UMass Chan supports a wide variety of on-campus procedures, programs, and events that highlight sustainable and ethical food and tracks such successes in STARS. Creating a sustainable food events guide will provide a how-to guide for community members to make choices that align with this goal. This goal encompasses partnerships with local farmers and organizations to support that ensure more locally sourced, plant-based options and reduce food waste.

STRATEGIES AND TIMELINE

	2021	2022	2023	2024	2025	2026
STRATEGY 1 Create a sustainable food events guide					●	
STRATEGY 2 Complete an AASHE STARS food inventory		●				
STRATEGY 3 Support and promote community-supported agriculture (CSA)				●		
STRATEGY 4 Collaborate with and support food recovery programs with local organizations					●	





FOCUS AREA BUILDINGS AND ENERGY

UMass Chan campus emits 11 percent of the state-owned agencies' total GHG emissions. It is essential that UMass Chan reduce its GHG emissions for the state to reach its carbon neutrality goal of 2050. This focus area supports the UMass System Sustainability Policy principles: (2) Clean Energy, (3) Climate Resilience and Planning, (4) Green Building Design and Sustainable Campus Operations.

The majority of campus GHG emissions are generated in the central plant. The plant provides all thermal needs to the main campus, and most of the electricity consumed on campus. Through a central pipe distribution system, steam and chilled water are provided to the main campus. Electricity is generated as a byproduct of thermal power generation.

UMass Chan has made significant progress in reducing GHG emissions through facilities and central plant operations and upgrades. Efficiency projects include sustainable building design, environmentally friendly maintenance procedures, and upgrades that incorporate space optimization and behavior change programs. Increasing the efficiency of the central plant and reducing the energy needs of the buildings that receive utilities from it, present numerous opportunities for GHG reductions.

In 2004, UMass Chan converted to primarily using natural gas as its primary fuel source for its central plant. In 2020, UMass Chan also began the process to switch to number 2 fuel oil as a backup fuel from number 6 fuel, which will reduce the GHG impact of backup fuels. In an effort to continue to align resiliency and sustainability, an electrical chiller will be installed in 2022 to serve new facilities currently under construction. Installing an electric chiller will increase the efficiency, flexibility, and capacity of the central plant.

The central plant emissions are considered Scope 1 GHG emissions and are approximately 91 percent of the UMass Chan's total GHG emissions. Scope 2 emissions from purchased electricity from the electrical grid represent 9 percent of UMass Chan's GHG emissions. Scope 1 emissions are high because UMass Chan produces its own heating, cooling, and electricity from the combustion of natural gas used in the central plant.

With the state of Massachusetts goal of achieving carbon neutrality for Scopes 1 and 2 emissions by 2050, UMass Chan has taken action to reduce GHG emissions by reducing the energy use intensity of its buildings and increasing the central plant efficiency. As of 2020, 33 percent of the LEED-certified square footage of state-owned buildings are facilities within the UMass system. The UMass system is also the largest public "off taker" of renewable energy in the Commonwealth, which is the process of purchasing electricity from renewable sources.

CAPITAL PROJECTS: NEW EDUCATION AND RESEARCH BUILDING (NERB)

UMass Chan received approval from the University of Massachusetts Board of Trustees to construct a new, nine-story biomedical research and education facility to support laboratory research growth and the educational enterprise. The 350,000-square-foot structure will complete the west face of the campus green and will require the removal of a portion of the First Road parking garage.

In support of the UMass system sustainability policy and this plan, the design team is targeting a LEED Gold certification with aspirations of net zero energy. The NERB sets a new model for high performing, efficient buildings on campus, including the integration of a geothermal system to reduce energy use intensity. The facility is scheduled to be occupied in the fall of 2023.

BUILDINGS AND ENERGY

BASELINE

UMass Chan used AASHE STARS credits as a baseline when creating the goals and strategies for this focus area. Baseline indicators include those related to climate mitigation, facilities, operations, and energy consumption, and climate resiliency and preparedness.

UMASS CHAN AIR AND CLIMATE STARS CREDITS

OP-1: Greenhouse Gas Emissions	4.37/10.00
OP-2: Outdoor Air Quality	1.00/1.00

UMASS CHAN BUILDING STARS CREDITS

OP-3: Building Operations & Maintenance	2.00/5.00
OP-4: Building Design and Construction	2.50/3.00
IN-9: Green Laboratories	0.00/0.50

UMASS CHAN BUILDING STARS CREDITS

OP-5: Building Energy Consumption	3.87/6.00
OP-6: Clean and Renewable Energy	0.00/4.00

GREEN BUILDING DESIGN AND SUSTAINABLE CAMPUS OPERATIONS

UMass Chan has begun to integrate green building design and decarbonization strategies into new building design and construction. The New Research Building design includes geothermal, increased efficiency, and energy recovery. These strategies are great examples of cost-effective ways the campus can begin to decarbonize in the near term.

Along with most UMass institutions, UMass Chan is beginning to explore how to reach the state's long term decarbonization goals. Several UMass institutions have conducted, or are currently conducting, a decarbonization/utilities master planning feasibility study to analyze what would be required to transition away from combusting fossil fuels to meet thermal heating and cooling needs, and when those transitions could be accommodated by. Conducting a decarbonization analysis at UMass Chan would be a significant undertaking, and would require utility master planning with coordination and collaboration with the UMass Memorial Hospital, University Campus.

Resiliency and redundancy of UMass Chan's energy system is a major requirement for the UMass Chan campus. The UMass Chan central plant provides utilities to the hospital, which provide vital services to the community. Because the hospital is reliant upon the central plant, there is a sense of urgency and accountability for UMass Chan to strike a balance of reliability while simultaneously reducing GHG emissions. UMass Chan continues to assess electrification opportunities for campus thermal needs, as one potential strategy to reduce the amount of fossil fuels combusted on campus.

EUI EMISSIONS REDUCTION AT UMASS CHAN

Energy use intensity (EUI) is a measure of a building's energy use as a function of its size or other characteristics, typically expressed as energy per square foot per year. It's calculated by dividing the total energy consumed by the building in one year (measured in kBtu or GJ) by the total gross floor area of the building.

TABLE 6. Energy use intensity (energy use per square foot) across the University of Massachusetts system (in kBtu/GSF)

	FY16	FY17	FY18	FY19	FY20
Amherst	163.90	160.9	169.9	162.3	153.2
Boston	118.0	116.7	127.0	107.9	92.4
Dartmouth	138.7	143.8	154.0	156.5	147.8
Lowell	93.8	95.4	93.2	92.9	80.6
Medical School	498.9	516.5	505.6	549.6	496.5
University	186.0	161.2	189.8	187.0	171.4

Calculating the EUI of individual buildings can provide foundational information to prioritize energy conservation measures and to identify what types of supplemental funding to seek in addition to typical operations budgets. The most significant reductions in EUI are often identified during energy audits, recommissioning of existing buildings, and equipment renewal/replacement projects. Lighting retrofits can also substantially contribute to a reduction in EUI depending on the programs in the buildings and the intensity of the fixtures.

CAMPUS SOLAR STUDY

UMass Chan completed a solar study in 2020 to evaluate the potential for on-site renewable energy production at its main campus. The study determined that on-site renewable energy production would provide marginal economic benefit. However, there may be opportunities to align renewable energy installations with LEED certification of new construction, as well as potential off campus installations.

BATTERY STORAGE FEASIBILITY STUDY

In 2019, UMass Chan received a state grant from the Department of Energy and Resources (DOER) to conduct a feasibility study to assess the potential for energy storage at the central plant, in part to increase the institution's utility resiliency. The feasibility study included a comprehensive economic analysis of the energy storage system integrated with the central plant. The study calculated the cost reduction of purchased electricity and simple payback from peak demand decrease, energy arbitrage, and other operations optimizations. UMass continues to explore options to implement battery storage on campus.

FIGURE 3. UMass Chan greenhouse gas emissions by location

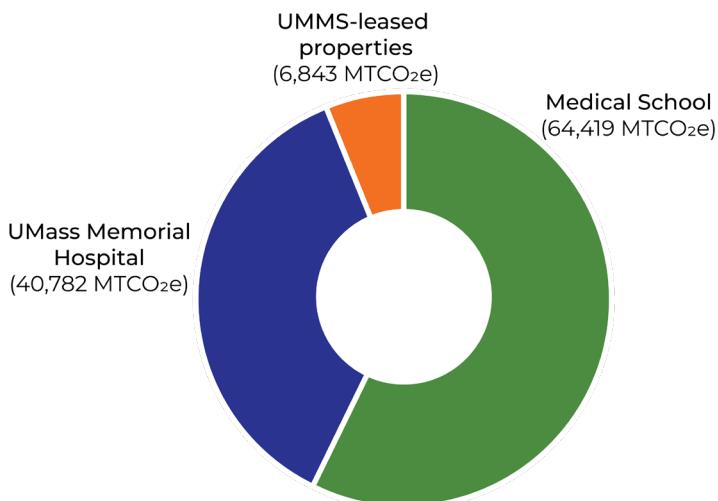
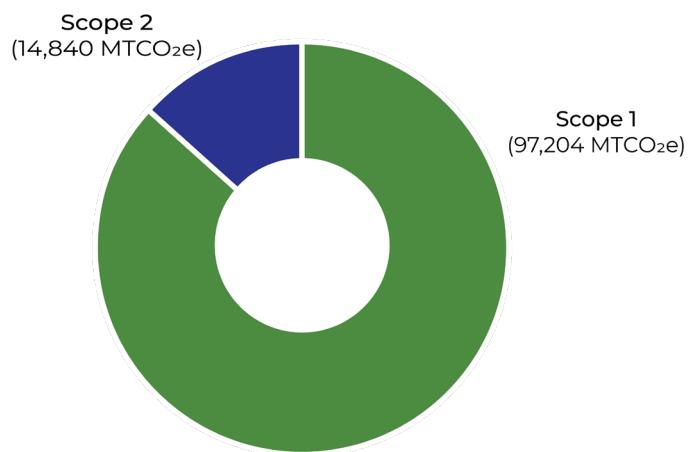


FIGURE 4. UMass Chan greenhouse gas emissions by scope (all UMass Chan associated properties)





GREENHOUSE GAS EMISSIONS REDUCTION GOAL: REDUCE SCOPES 1 AND 2 GREENHOUSE GAS EMISSIONS BY 15 PERCENT BY 2026

To reach system- and state-wide emissions reduction targets, UMass Chan will need to reduce its Scope 1 greenhouse gas emissions from on-site combustion, mainly from its central plant. UMass Chan is taking steps to reduce its GHG emissions, energy consumption, and to increase renewable energy generation and procurement, and explore non-fossil fuel-based sources of thermal and electrical energy, including on-site energy storage.

STRATEGIES AND TIMELINE

2021 2022 2023 2024 2025 2026

STRATEGY 1 Install renewable energy



STRATEGY 2 Consider GHG criteria when producing electricity on site or purchasing from the grid



STRATEGY 3 Increase electrification of campus buildings and equipment



STRATEGY 4 Increase use of heat exchanger in the central plant



STRATEGY 5 Establish a revolving fund and incentive program for projects that reduce energy and emissions





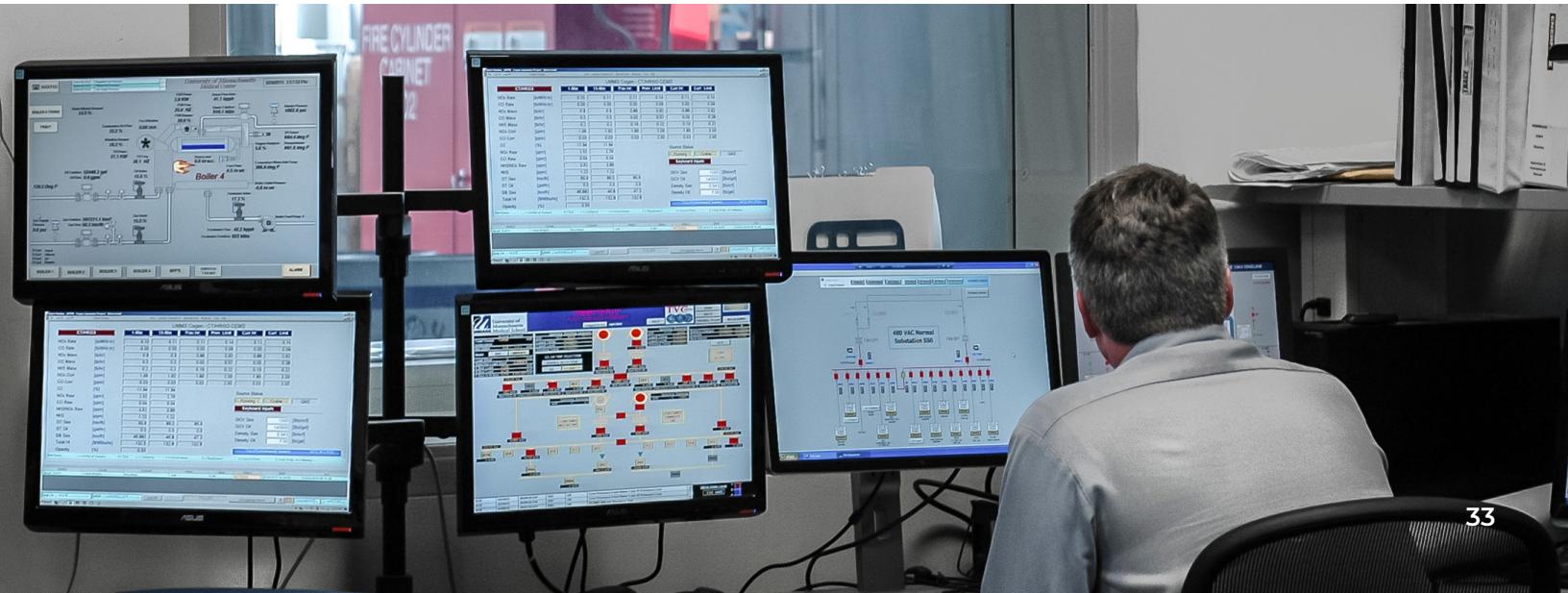
ENERGY USE INTENSITY REDUCTION GOAL: REDUCE EUI OF UMASS CHAN BUILDINGS 20 PERCENT BY 2026

UMass Chan has the opportunity to reduce the energy use of its buildings through a multi-pronged approach that combines ongoing upgrades and commissioning of building systems as well as spaces use optimization with targeted behavior change initiatives for laboratory spaces supporting sustainable practices. Expanding the Office of Sustainability to a staff of two to coordinate and manage these efforts is the first step in reaching this goal.

STRATEGIES AND TIMELINE

2021 2022 2023 2024 2025 2026

- | | | |
|-------------------|--|---|
| STRATEGY 1 | Hire an energy and sustainability engineer who reports to the associate director of sustainability and campus services | ● |
| STRATEGY 2 | Incorporate energy recovery in the Lazare Research Building | ● |
| STRATEGY 3 | Establish institutional specifications and standards for new construction and major renovations to reduce energy use intensity | ● |
| STRATEGY 4 | Upgrade all existing lights to LED fixtures and controls | ● |
| STRATEGY 5 | Establish an ongoing commissioning and recommissioning program for new construction and existing buildings | ● |
| STRATEGY 6 | Update building thermal setpoints and economizer sequences | ● |
| STRATEGY 7 | Continue implementing a building energy use metering and validation program | ● |
| STRATEGY 8 | Replace inefficient HVAC and laboratory equipment | ● |



University of Massachusetts

Sustainability Policy: Principles, Goals, and Metrics

PRINCIPLE	DESCRIPTION
	1. SUSTAINABILITY STRATEGIC PLANNING Integration of sustainability planning, practices, and strategies into the University's strategic planning processes
	2. CLEAN ENERGY Supports the development and use of clean and renewable energy sources
	3. CLIMATE RESILIENCE AND PREPAREDNESS Implementation of strategies to mitigate or reduce environmental impact
	4. GREEN BUILDING DESIGN AND SUSTAINABLE CAMPUS OPERATIONS Strategies to address emissions associated with designing, building, maintaining, and operating campus buildings and grounds
	5. SUSTAINABLE TRANSPORTATION Integrating sustainable best practices for the use and maintenance of campus fleets, student/employee commuters, and public transportation options
	6. WASTE REDUCTION AND RECYCLING Promote strategies to encourage waste reduction and re-use and acknowledge the importance of preventative measures
	7. ENVIRONMENTALLY PREFERABLE PURCHASING Implement a procurement approach to access environmentally-conscious products whenever applicable and available
	8. SUSTAINABLE FOOD SERVICES Supporting sustainable food systems through food and beverage purchases
	9. SUSTAINABLE WATER SYSTEMS Reducing campus water withdrawals can reduce pressures on local aquifers, streams, rivers, lakes, and aquatic wildlife
	10. ACADEMIC AND RESEARCH PROGRAMMING AND COMMUNITY ENGAGEMENT Ensuring Sustainability is part of Academic and Research programming and part of community engagement efforts

GOAL	METRIC
1.1 Complete a sustainability plan with a focus on energy projects at each campus, or update any existing plans, to align with the principles and goals outlined in this policy in order to adequately and efficiently understand the energy needs and potential sustainability projects on each campus.	Biennially report on the development progress of an Energy Master Plan/Sustainability Plan consistent with the Capital Plan reporting
2.1 Achieve UMass commitment to carbon neutrality by 2050 or as specified through the sustainability planning process occurring through the development of campus-specific action plans, as identified in Goal 1.1 as being necessary to achieve carbon reduction commitments and meet sustainability objectives, and UMass system's guiding principles towards this goal.	Annually publish latest available greenhouse gas (GHG) emissions inventory
2.2 Procure a defined amount of annual electricity consumption through renewable and clean energy sources as identified in Goal 1.1 as being necessary to achieve carbon reduction commitments and meet sustainability objectives.	Total GHG emissions reduced since LBE baseline (FY04)
3.1 Build climate resilience and preparedness standards into the University's capital planning process and emergency management and business continuity planning.	Published plans including measurable objective with corresponding strategies
4.1 Any new construction must meet the MA LEED Plus green building standards (LEED most current version) or other standards as identified in Goal 1.1 as being necessary to achieve carbon reduction commitments and meet sustainability objectives and continue to research and employ improved sustainable building practices.	Annual report of building construction and LEED Certifications
4.2 Reduce energy consumption and determine goals consistent with capital investments and annual programs implemented in support of energy consumption reduction, as identified in Goal 1.1 as being necessary to achieve carbon reduction commitments and meet sustainability objectives.	Total energy use intensity per square foot
5.1 Reduce vehicle fuel consumption of the University vehicle fleet through promoting the use of public transportation, reducing the number of single occupancy vehicles, and increasing the use of other alternative fuel transportation for faculty, staff, and students.	Annually report on the vehicle fleet composition and growing commuting options for faculty, staff, and students
6.1 Employ strategies around preventative measures in waste diversion to promote source reduction, re-use and recycling of used materials.	Annually report on materials recycled, reused, composted, and disposed
7.1 Establish Environmentally-Preferable Products Procurement Program (EPP) and continue to implement annual procurement goals to move toward alignment with the standards of the Environmental Purchasing Advisory Council where ever appropriate and consistent with available funding.	Annually report on purchasing of electronics, office paper, cleaning products, etc. and progress towards meeting established goals
8.1 Strive for each campus food service operation to procure sustainable food products while maintaining accessibility and affordability for all students and campus patrons.	Annually report on the percentage of dining service food products that are third-party verified and/or local and community based sustainable food products
9.1 Reduce potable water usage and determine goals consistent with capital investments and annual programs implemented in support of reducing potable water.	Annually report the potable water use per weighted campus user compared to baseline
10.1 Comprehensively integrate sustainability and climate neutrality into the core academic curriculum and research programs to create a means to enable students to use their campus as a living, learning laboratory.	Annually report on sustainability curriculum available to undergraduate students and ongoing curricular developments

UMass Sustainability Policy

Ten Principles



University of Massachusetts
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WORKING GROUP MEMBERS

TRANSPORTATION AND GROUNDS MANAGEMENT

David Adrian	Business Manager, Facilities Management
Scott Almstrom	Fleet Maintenance Mechanic
Linda Boll	Manager, Parking Services
Don Croteau	Manager, Transportation/Distribution
Brian Crowley	Assistant Maintenance Manager
Dennis Flynn	Supervisor, Receiving
Matt Gagne	Assistant Maintenance Manager
Jim Gardner	Senior Director, Maintenance Services
Vin Garino	Assistant Director, Facilities Maintenance
Chad Hammond	Grounds & Waste Lead

MATERIALS AND RESOURCE MANAGEMENT

David Adrian	Business Manager
Azraa Amroze	Medical student
Kendall Appleby	Assistant Director, Housekeeping Services, Crothall
Tony Cavello	Manager, Environmental Building Services
Colleen Driskill	Safety Officer, Environmental Health & Safety
Matt Gagne	Assistant Maintenance Manager
Vin Garino	Assistant Director, Facilities Maintenance
Steve Guerin	Director of Food & Nutrition Services, Sodexo
Mary Martin	Resource Manager, E.L. Harvey Waste Services
Shannon Merlin	Food Service Provider, NexDine
JoAnn Ranslow	Safety Officer, Environmental Health & Safety
Alan Rowe	Resident District Manager, NexDine

BUILDINGS AND ENERGY

Ed Allison	Designer/CAD Specialist
Dave Bourassa	Senior Manager, Mechanical Projects
Daren Crossman	Director, Facilities Operations MBL
Mike Culter	Interim Assistant Director, Maintenance
Brian Duffy	Senior Manager, Architectural Projects
David Fitzgerald	Lead Electrician
Josh Fleming	Manager, Building Controls
Matt Gagne	Assistant Manager, Maintenance
Emily Gentile	Medical Student
Bruce Hjort	Assistant Director, Energy Resources
David MacNeil	Senior Engineer, Mechanical Projects
Shawn McGuinness	Senior Manager, Architectural Projects
Joe Metterville	Senior Facilities Electrician
Steve Park	Maintenance Manager, Electrical
Brian Pasquale	Senior Manager, Mechanical Projects
Paul Patrick	Project Manager
Michelle Smith	Energy and Sustainability Engineer
Matt Stelmach	Associate Director, MEP Engineering
Patrick Walsh	Facilities Operations Specialist
Andrew Willbrant	Manager, Architectural Projects

Planning process led by Suzanne Wood, Associate Director of Sustainability and Campus Services, with support from GreenerU, Inc.

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