MIT Office of Sustainability

The MIT Office of Sustainability (MITOS) entered its fourth year of operation in summer 2016. The office set the foundation to create a campus sustainability model that both advances the mission of academic excellence at MIT and transforms the campus into an active demonstration of MIT's ability to address the world's greatest challenges. MIT strengthened its commitment to sustainability leadership via a number of public commitments and new programs that advance sustainable transportation, greenhouse gas mitigation, climate resiliency, innovation for sustainability, and open access to data to advance the campus as a test bed for learning and innovation.

Highlights of FY2017 include the rollout of Access MIT; the announcement of MIT's first major renewable energy power purchase agreement; the launch of a new comprehensive MITOS website; and the coordination of the World Symposium on Sustainable Development at Universities, which convened representatives from more than 33 countries at MIT. MITOS representatives continued to serve in a leadership capacity at the city, regional, and international level together with counterparts at peer institutions also striving to innovate for and implement sustainability practices on their campuses and in their organizations.

In summer 2016, MITOS onboarded two new and unique staff positions: sustainability project manager for Living Lab and project manager for sustainable design and construction. The second spot is a pipeline position shared with the Offices of Sustainability, Campus Planning, and Campus Construction. This position will work with MITOS for 15 months and then transition to the Offices of Campus Planning and Campus Construction working toward the robust implementation of sustainable design and performance standards. MITOS seeks to build upon the success of this pipeline position and host future positions from other departments as a strategy to build capacity across the Institute.

This report details the office's major accomplishments over the year in its the four focus areas:

- planning for and managing sustainable campus systems
- building the leadership and capacity of the MIT community
- transforming the campus into an urban living laboratory
- forging collaborative partnerships *on campus and throughout our communities*

Sustainable Campus Systems

In 2016–2017, MITOS continued to collaborate across operational and academic departments to engender MIT's commitment to develop and manage a sustainable campus. Notably, the Institute is on the cusp of being able to measure its impacts in more depth and at more frequent intervals. The combined force of the MIT's Plan for Action on Climate Change and the MIT Campus Sustainability Working Group Recommendations, both released in fall 2015, continued to provide guidance and chart

a course toward goal-setting, measurement and verification, and implementation of key strategies.

Sustainability Data Management

Underlying the success of the Office of Sustainability's work is the need for accessible, reliable, and replicable data streams to inform an understanding of the state of the campus today and solutions of tomorrow. MITOS put into operation a Sustainability DataHub and advanced the collection of strategic metrics that will enable the office to benchmark MIT's progress and communicate its efforts to both internal and external partners. The ultimate goal of this project is to build a significant web-based resource accessible to the MIT campus community that enhances access to sustainability data to inform decision-making and enable the campus to serve as a site for test bed projects.

Energize_MIT

MIT has launched a new website in beta form, making available a broad swath of detailed information about campus energy use and greenhouse gas emissions. This rich resource is available to the Institute's students, faculty, and staff, for education, research, and decision-making purposes.

The rollout of this central data dashboard, called Energize_MIT, is the latest in a series of steps implementing the goals and commitments set out in MIT's 2015 Plan for Action on Climate Change. The site, which offers a single web-based entry point to a centralized pool of data, is intended to improve collaboration across operational and departmental groups regarding sustainability related decision-making and measured impacts.

The site provides two kinds of information. First, a set of interactive graphic visualizations depicts information such as campus-wide and building-by-building details about use of electricity, natural gas, fuel oil, steam, and chilled water, as well as the greenhouse gas emissions associated with the energy use. Secondly, datasets can be downloaded and used to drill down into details of energy use, including some as fine-grained as energy use measurements in 15-minute increments.

Plan for Action on Climate

In an effort to advance the MIT campus as a "test bed for change" as outlined in MIT's Plan for Action on Climate Change, MITOS continued to facilitate two internal working groups: the Greenhouse Gas Working Group and the Climate Resiliency Committee. Additionally, MIT signed its first power purchase agreement in an effort to explore the role of large-scale solar and renewable energy financing strategies.

Greenhouse Gas Mitigation Plan

The Greenhouse Gas Working Group, which set out to produce a road map for MIT to achieve its 32% greenhouse gas emissions reduction goal by 2030, is already looking beyond this initial milestone. The working group, co-chaired by MITOS, developed the Institute's first campus GHG mitigation strategy and implementation plan. From Plan to Action: MIT Campus Greenhouse Gas Emissions Reduction Strategy informs strategies to scale up investments in energy efficiency, design to high-performance building

standards, renew our Central Utility Plant, and invest in on- and off-site renewable energy. Progress-to-date includes a 7% reduction in greenhouse gas emissions from the Institute's 2014 baseline through 2016. MITOS is in the process of calculating 2017 emissions.

MIT Climate Resiliency

The Climate Resiliency Committee continued to identify risks faced by MIT from climate impacts: chronic heat stress, inland flooding, and storm surge/sea level rise. Building on the work of City of Cambridge and Boston, the committee initiated a collaborative evaluation and planning process to understand how the campus should prepare for uncertain impacts. A primary area of focus continues to keep priority academic and research operations online in the event of climate-related impacts, while accelerating solutions for regional livability and long-term resilience.

Phase one of our climate vulnerability assessments in the form of a Flood Vulnerability Study is now complete. This is a partnership among MITOS, the Department of Facilities, Central Utilities, Campus Planning, the Office of Emergency Management & Business Continuity, the Office of Insurance, and researchers in the Joint Program on the Science and Policy of Global Change and the Department of Earth, Atmospheric and Planetary Sciences.

Power Purchase Agreement

MIT formed an alliance with two other Boston-based partners (Boston Medical Center and Post Office Square Redevelopment Corporation) via A Better City Initiative for the development of a 60-megawatt solar photovoltaic farm in North Carolina. This partnership led to a long-term power purchase agreement. MIT is purchasing solar energy equivalent to 40% of its current electricity use, which will neutralize the Institute's emissions by 17% from its base. This agreement not only demonstrates the value of aggregation but also provides MIT researchers with first-hand access to data from the project—called Summit Farms—that features 255,000 solar panels on 650 acres of land.

The power purchase agreement also included an educational component, and as a result, the Office of Sustainability convened the Solar Test Bed Steering Committee, a diverse group of 20 faculty, postdocs, PhD candidates, administrators, and operational staff. The committee is collaborating to determine strategies for linking Summit Farms with research and other educational activities on MIT's main campus.

Mobility: Access MIT

Eighty-four percent of the MIT community commutes to campus in ways other than driving alone in a car, such as public transportation, biking, walking, and ride-sharing. The Access MIT initiative, announced to MIT employees at the close of FY2016 and rolled out in FY2017, was designed to increase flexible and affordable transportation options. Access MIT targets MIT employees that currently drive, and further supports those that regularly commute to work via alternative modes. Program highlights include a universal subway/bus pass embedded in MIT employee IDs, daily parking prices, and

additional benefits for public transit. MITOS played a significant role in shaping the launch of the new program and will continue to act as a driving force in its expansion.

Access MIT seeks to reduce parking demand on campus by 10% over two years, which is equivalent to about 350 parking spaces. It is anticipated that 800 spaces will be lost over the next several years due to campus construction, highlighting the importance of this program as one key strategy in MIT's plan to offset this loss and provide robust access to affordable, convenient commuting options today and into the future. Meeting this goal is a high-level priority, shared by departments across the Institute, including but not limited to Campus Planning, the Office of Sustainability, and the Department of Facilities.

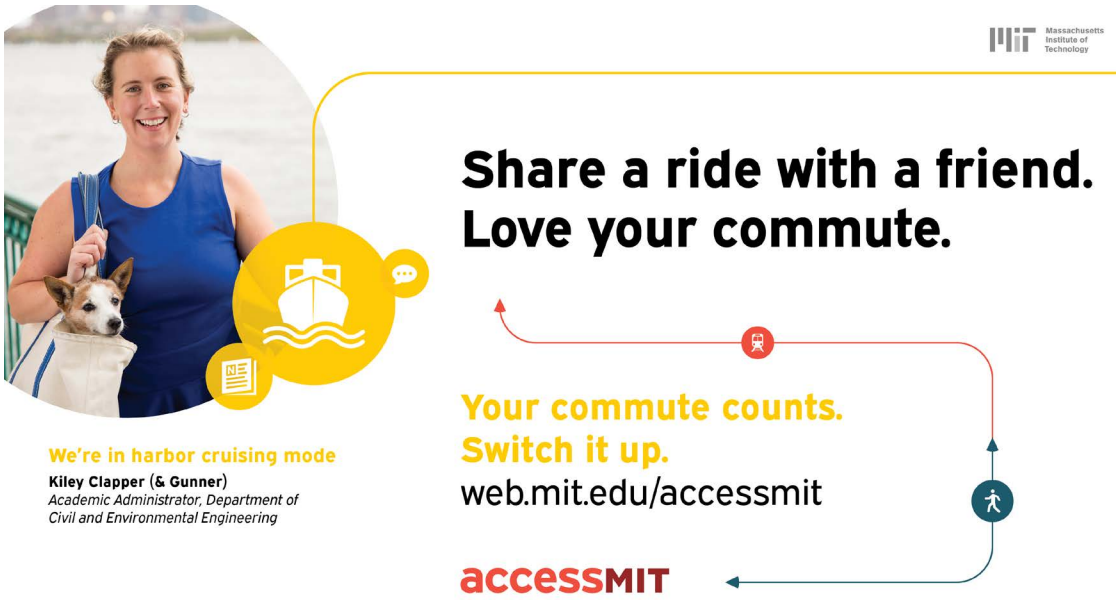

Figure 1: Image from Access MIT campaign.

Procurement: Materials Flow Analysis

The Offices of Sustainability and Procurement Operations formalized a partnership to quantify and analyze a materials flow analysis of the campus. When complete, the collaboration will enable a deeper understanding of where opportunities exist to leverage MIT's buying power, consider its sourcing, and strategically reduce its waste streams. A terms-of-use agreement for data sharing between MITOS and Procurement Operations was drafted and signed to pave the way for a new form of data exchange between internal entities at MIT. This will lead to a first-of-its-kind materials flow analysis of the goods the Institute procures, uses, and disposes of. Moreover, this analysis will also provide grounds for a doctoral dissertation in the MIT Institute for Data, Systems, and Society.

Building Leadership and Capacity

The MITOS strategy seeks to build leadership and internal capacity of the campus community to solve complex problems and meet the Institute's sustainability objectives. MITOS facilitates collaborative leadership models, such as the Campus Sustainability

Task Force, to shape a vision and plan of action for sustainability at MIT that reflects faculty, staff, and student perspectives.

Task force members were appointed by the provost and the executive vice president and treasurer. Chaired by Julie Newman, director of Sustainability, and Professor Andrea Campbell, head of the Department of Political Science, the task force completed a draft of a blueprint for campus sustainability titled, Pathway to Sustainability Leadership by MIT: Incubation, Transformation, and Mobilization. The report will be released to the MIT community for public comment in September 2017.

The Office also works to build the capacity of the individual at MIT to understand critical issues and develop skills for integrating sustainability into their day-to-day campus lives. In 2016–2017, MITOS achieved the following accomplishments in this area.

Lunch and Learn

In spring 2017, MITOS and the Department of Facilities once again presented the Sustainability at MIT Lunch & Learn series. This year's four-part series cut across programmatic areas, providing staff with deeper dives into Access MIT, greenhouse gas mitigation and reduction strategies, energy reduction, and climate resiliency. Series attendance was at capacity and effective in building alignment across campus efforts and increasing engagement on sustainability and climate action planning.

Sustainability Connect

MITOS convened more than 100 MIT staff, faculty, and students for its third annual Sustainability Connect conference on May 8, 2017. The event, which is hosted by MITOS, is designed to spark connections and ideas among the broad array of passionate people at MIT working to advance sustainability across departments and topic areas. The 2017 conference was organized around the theme, "Cultivating the Test Bed: Harvesting a

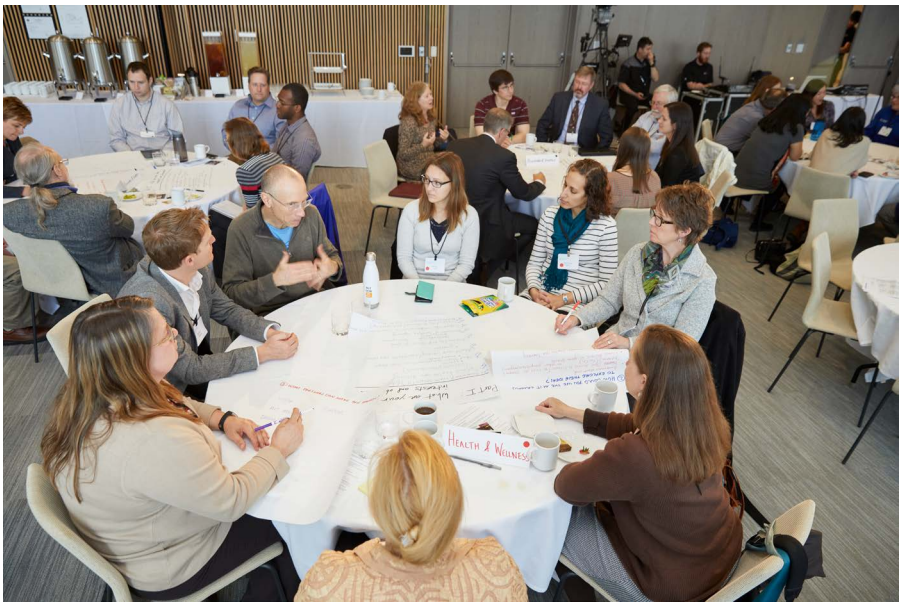

Figure 2. Participants convene at the Sustainability Connect conference held May 8, 2017.

Better Future for All." Panels and workshops throughout the day explored how to integrate innovation and social justice into future solutions, and how to create new venues for faculty, students, and staff to use the campus as a test bed platform.

For the third year in a row, MITOS led a team of departments and offices to establish a grant program in conjunction with Earth Day at MIT. The 2017 MIT Earth Day Collective funded nine projects to promote sustainable action on campus. Members of this year's collective included the Sustainability Initiative at MIT Sloan; MindHandHeart; the Recycling and Materials Management Office; MIT Medical; the Environmental Solutions Initiative; the Department of Urban Studies and Planning; the Campus Activities Complex; the Environment, Health and Safety Office; and MITOS.

Projects were selected based on their ability to promote climate action, resource efficiency, and sustainable behavior both on campus and in the community. Showcasing the creativity of the MIT community, projects ranged from an annual furniture refurbishment workshop to a waste research and innovation night, to an anti-idling solution for the MIT ambulance.

Transforming the Campus into a Living Lab

A living laboratory exemplifies learning through practice—a tenet of MIT—by opening the doors of the campus to students and faculty to explore, experiment, and develop solutions in a real-world facility. MITOS supports living lab projects that bring staff, faculty, and students together around sustainability issues ranging from traffic congestion in Kendall Square to the purchasing behavior of MIT workplaces.

MITOS served as an active internal research partner by facilitating the exchange of campus data and information among students, faculty, and staff. The Office works across MIT with administrative partners such as the Department of Facilities, Office of Campus Planning, Procurement Operations, and Parking and Transportation; academic departments and groups such as the Sloan School of Management's Sustainability Initiative, the Department of Architecture, and the MIT Transit Lab; and city collaborations such as the Kendall Square EcoDistrict. In order to facilitate each data exchange, MITOS acted as an intermediary between the data seekers and data providers, facilitated negotiations on terms of usage, and removed sensitive data elements when necessary. In 2016–2017, MITOS supported living lab experiences in the following ways.

Course Support

MITOS provided academic support for instructors in the EC.716 D-Lab: Waste in fall 2016. The Office created a menu of Lablets (prototype living lab projects) related to three specific areas of inquiry (process and systems, quality of life, and materials streams). Students conducted micro-research projects with guidance from instructors and MITOS staff. One robust micro-research study on the reusable mug program (How to Increase Use of Reusable Mugs at MIT by student Ronja Haase) at the MIT Sloan School inspired students in the Undergraduate Association Committee in Sustainability to continue collecting data and analyzing findings during spring and fall 2017 semesters.

Community Engagement

In an effort to tell the stories of living lab research, and to connect operational and academic partners, MITOS launched Laborama, an interactive "poster jam" event that featured the work of the Urban Risk Lab at MIT, the Central Utilities Plant, the Device Research Laboratory led by Professor Evelyn Wang, Information Systems & Technology, the Varanasi Research Group, the Office of Digital Learning, the Department of Chemical Engineering, the Senseable Cities Lab, the MIT Center for Energy and Environmental Policy Research, the Photovoltaics Research Laboratory led by Professor Tonio Buonassisi, and the Building Technologies group. The event featured live demonstrations of inventions and brainstorming activities for new research ideas (Lablets) and the introduction of the Adventure Card pilot program that collects information on living lab research in a baseball card-like format.

Campus as Test Bed Research

Solar Test Bed will provide a centralized physical anchor for large-scale solar research to come together. Linking the operation of the Summit Farms solar plant with academic research leverages the MIT campus as a test bed to study real-time energy data, long-term capacity markets, candidate energy storage systems, experimental solar cells, and the impacts of large-scale solar plants on neighboring communities.

The Solar Test Bed seeks to reduce time to adoption of emerging technologies, to accelerate change with balance of systems innovations, and to provide a real-world case study of how aggregated partnerships can accelerate contributions toward global climate change and generate new game-changing academic and operation knowledge.

As MITOS moves forward, it intends to develop a strategic framework for maximizing the potential of MIT to serve as a living lab and test bed for sustainability.

Campus Sustainability Incubator Fund

The Campus Sustainability Incubator Fund, launched by MITOS in spring 2017, provides seed funds to select teams of students, faculty, and researchers to explore the physical facility and social context in which they are working, living, and learning at MIT. The fund was made possible through a generous gift from Malcom B. Strandberg. The first round of funding will be awarded in summer 2017 to four project teams led by Kripa Varanasi of the Department of Mechanical Engineering, Randy Kirchain and Jeremy Gregory of the Concrete Sustainability Hub, Lisa Anderson of the Department of Chemical Engineering, and Danielle Dahan of the Center for Energy and Environmental Policy Research.

Forging Collaborative Partnerships

MITOS works strategically to build collaborative partnerships within and outside of MIT to harness the collective intelligence of communities to solve shared problems. To highlight this work, below are a number of accomplishments from 2016–2017 that demonstrate the Office's collaborative partnerships with the cities of Cambridge, Boston, and networks of peer institutions.

In Cambridge

Cambridge Compact for a Sustainable Future

Representatives from MIT continued to play leadership roles in the governance and implementation of the Cambridge Compact for a Sustainable Future by serving as board members, executive committee members, and working group chairs. FY2017 marked a turning point for the Cambridge Compact for a Sustainable Future, which now has 20 signatory members (MIT was a founding member). In June 2016, the Compact cemented unanimous member support for the adoption of a comprehensive three-year work plan that lays a path for implementing the priority actions identified by the members. MIT In FY2017 MIT hosted two workshops: Sustainable Transportation featuring Access MIT and Planning for a Climate-Resilient Campus and City. MIT will extend its participation and leadership in FY2018.

Cambridge Recycling Advisory Committee

MITOS also continued membership on the Cambridge Recycling Advisory Committee, which provides advice, assistance, and recommendations regarding the city's recycling, toxics reduction, and waste prevention programs as well as the implementation of strategies to meet the city's climate and waste plan goals, including an aggressive goal to reduce trash by 80% by 2050.

Climate Protection Action Committee

MIT served on the City of Cambridge Climate Protection Action Committee, a key avenue for ensuring continued alignment of campus climate activities with citywide initiatives. The committee comprises community members and institutional representatives from across Cambridge, and serves as the advisory body for implementation of the city's Net Zero Action Plan for eliminating greenhouse gas emissions from buildings. In May and June 2017, the committee began informing the scope of the city's Climate Action Plan, which will be developed in fall 2017.

EcoDistrict

MITOS sustained participation in Kendall Square's EcoDistrict committee, which seeks to integrate EcoDistrict principles in current and future development. EcoDistricts are guided by a community-based planning process to become places that foster local sustainability initiatives and provide opportunities for large-scale, district-wide collaborative implementation.

Low Carbon Energy Supply Advisory Committee

A MITOS representative participated on the Cambridge Low Carbon Energy Supply advisory committee. This committee grew out of the Cambridge Net Zero Action Plan, which seeks to drastically reduce greenhouse gas emissions from the city's built environment. Committee members explore how Cambridge develop an urban energy system supply transformation strategy to meet the goals set out in the Net Zero Action Plan.

In Boston

Boston Green Ribbon Commission

MIT continued to participate as a member in the City of Boston's Green Ribbon Commission that seeks to accelerate implementation of Boston's Climate Action Plan and amplify regional strategies to promote greenhouse gas mitigation, climate resiliency planning, and renewable energy adoption. Executive vice president Israel Ruiz serves as a member, and MITOS staffs MIT's engagement. In 2017, the Commission's Higher Education Working Group completed a laboratory building energy use benchmarking study that created one of the largest and most robust regional data sets on this building type in the country. The study is intended to enhance energy efficiency investments through identifying effective strategies and potential performance goals. The working group also reviewed and provided feedback on the Climate Change Preparedness and Resiliency Checklist of Boston's Climate Change Preparedness and Resiliency Policy, completed the report Institutional Renewable Energy Procurement: Guidance for Purchasing and Making Associated Environmental Impact Claims, and is in the process of developing a pilot project to test energy consumption behavior based on real-time carbon intensity information.

In the Region

Ivy Plus Sustainability Consortium

MIT continued active engagement in the Ivy Plus Sustainability Consortium and its working groups. Steve Lanou, MITOS project manager, served as chair of a working group charged with advancing alignment across our member schools for measuring and reporting sustainability progress and impacts through collective metrics definition, data collection, and reporting. These efforts are designed to provide essential performance information to Consortium school leadership, and accelerate adoption of best practices.

Northeast Campus Sustainability Consortium

MITOS staff participated in the Northeast Campus Sustainability Consortium and attended the annual meeting hosted by Dartmouth College hosted in June 2017, which brought together campus representatives from around the Northeast and Canada to share best practices. During the year, MITOS and its peer offices hosted monthly calls to explore shared challenges, such as measuring greenhouse gas emissions, diverting organic waste, and integrating social justice and diversity into sustainability programs.

In the World

International Sustainable Campus Network

MITOS director Julie Newman is a founding member of the International Sustainable Campus Network. In its eleventh year, the network provides a global forum to support leading colleges, universities, and corporate campuses in the exchange of information, ideas, and best practices for achieving sustainable campus operations and integrating sustainability in research and teaching. MIT is now represented on the advisory committee and holds a chair position for Working Group 3: Integration of research, teaching, and Facilities.

World Symposium on Sustainable Development in Universities

MITOS is actively engaged with the World Symposium on Sustainable Development in Universities. In September 2016, MITOS co-hosted the forum. The theme "Designing Tomorrow's Campus: Resiliency, Vulnerability, and Adaptation" united leading academics from around the globe to share research and practices on how to scale solutions that have the power to transform communities into more livable and sustainable places, given the urgent challenges of a changing climate. MIT served as the backdrop for three days of interactive sessions and workshops. More than a dozen MIT faculty presented their research throughout the three days.

Summary

In FY2018, MITOS will forge ahead to ensure continued success with the work that was seeded in FY2017 and look ahead to new project development. The Office will continue to seek collective engagement and action on priority areas, including:

- climate change: moving ahead with strategies for mitigation, adaptation, and resiliency;
- sustainable transportation: broadening and deepening MIT's commitment to and robust participation in Access MIT;
- data collection and analysis: launching the centralized sustainability data hub to inform and learn from our decision-making processes and institutional impacts;
- food and culture: exploring ways to connect food choices to community health, sustainable agriculture, and climate change;
- sustainable design and construction: continuing to ensure that MIT has access to the knowledge and processes needed to enable campus growth while minimizing impacts;
- stormwater and ecological land management: seeking an understanding as to how the ecological systems of MIT's urban campus perform and how the Institute can prepare for a changing climate;
- water: seeking a comprehensive understanding of our use patterns in an effort to reduce overall demand and consumption across campus and thus contributing to the affiliated risks for the watershed, and;
- campus use: leveraging the campus as a test bed for research, innovation, and teaching that leads to improved understandings of the systems at hand and deeply informs decision-making.

Julie Newman
Director