



Update on the Plan for Action on Climate Change

April 27, 2016

Office of the Vice President for Research

Introduction

In October 2015, MIT released its five-year Plan for Action on Climate Change, outlining the steps that the Institute will take to intensify its impact in advancing solutions to the urgent problem of global climate change. The goal of the plan is “to minimize emission of carbon dioxide, methane and other global warming agents into the atmosphere, and to devise pathways for adaptation to climate change, through the active involvement of the MIT community, proactively engaged with industry, government, academia, foundations, philanthropists and the public.”

This document provides a progress report on the plan's implementation so far, including updates on its oversight and leadership, communications, progress on action items, and reporting. As the progress report demonstrates, success depends on the active involvement of people from across the MIT community; fortunately, support for expanded climate action is strong and growing.

Oversight and Leadership

Vice President for Research Maria Zuber provides general oversight of the plan's implementation, which involves many offices, programs, initiatives, and labs at MIT. She is assisted in this work by Professor John Fernández, director of MIT's Environmental Solutions Initiative, who is working to maximize collaboration and communication across the MIT community, and by Professor Robert Armstrong, director of the MIT Energy Initiative, who leads clean energy research, education, and outreach efforts.

The MIT Office of Sustainability, headed by Director Julie Newman, plays the lead role in transforming MIT's campus sustainability, including implementing measures to reduce campus carbon emissions. The Office of Sustainability carries out this work in close collaboration with operational and administrative units across campus. The Campus Sustainability Task Force, co-chaired by Dr. Newman and Professor Andrea Campbell, makes recommendations and provides a forum for sharing perspectives on campus sustainability. Its work is ongoing.

In order to bring to bear the full depth and breadth of the MIT community's talent, experience, expertise, and creativity on climate action, Vice President Zuber is establishing a Climate Action Advisory Committee (CAAC) (see box on page 2). The committee's first meeting will take place in May 2016.

Overview of the Climate Action Advisory Committee

President Rafael Reif has charged Vice President for Research Maria Zuber to lead the implementation of MIT's Plan for Action on Climate Change. Vice President Zuber is establishing a Climate Action Advisory Committee (CAAC) to consult with and advise her on the implementation and ongoing assessment of the Plan for Action. She will chair the CAAC.

Charge

The role of the CAAC is to advise Vice President Zuber in order to help ensure the successful implementation of MIT's Plan for Action on Climate Change, including advising on MIT's efforts to engage with government, industry, academia, and the public to help accelerate solutions to the urgent problem of global climate change. Specifically, the CAAC will:

- Provide advice to identify, develop, and publish strategies and benchmarks for engaging government, industry, academia, and the public in accelerating solutions to global climate change. (Benchmarks will include inputs and activities, such as number of meetings held, in addition to outcomes aligned with a 2°C future¹: for example, these may include steps taken by industry to develop and implement 2°C business strategies and to support a 2°C public policy framework.)
- Provide advice and input on an annual report to be produced by the Office of the Vice President for Research to assess MIT's progress in implementing the Plan for Action and engagement partners' response to the climate challenge.
- Assist in identifying ways to engage the broader MIT community on climate action and bring the ideas and perspectives of different MIT constituencies to bear on the implementation of the Plan for Action.
- Respond to issues referred to the Committee by Vice President Zuber.

Membership

Vice President Zuber will appoint members of the CAAC and may fill vacancies as they occur. She will seek membership that is broadly representative of MIT community constituencies, including representatives of all five Schools, administrators, faculty, postdocs, staff, students, Corporation members, and alumni. Students, postdoctoral fellows/associates, and alumni will serve one-year terms, with opportunities for reappointment.

Chair

- Vice President for Research Maria Zuber
- Director or designee, MIT Office of Sustainability
- Faculty director or designee, Sloan Sustainability Initiative
- Director or designee, Center for Global Change Science
- Two undergraduate students
- Director or designee, Center for Energy and Environmental Policy Research
- Two graduate students
- Principal investigator or designee, Climate CoLab
- Two postdoctoral fellows/associates
- Director or designee, Environmental Solutions Initiative
- Two alumni
- Co-director or designee, Joint Program on the Science and Policy of Global Change
- One additional faculty member
- Director or designee, MIT Energy Initiative
- Two additional staff members
- Interested members of the MIT Corporation

Committee Staff

- Senior advisor to the vice president for research

Procedures

Vice President Zuber intends to convene the CAAC monthly during the spring and fall semesters at a time and place convenient for its members. All members will be notified in advance of meetings. The CAAC will create and appoint such subcommittees as it deems necessary to carry out specific aspects of its charge. The CAAC is an advisory body, not a rulemaking or governing body, and accordingly it is expected to make recommendations by consensus rather than by voting.

¹ 2°C future" refers to limiting the increase in global average temperature to no more than 2°C over pre-industrial levels.

Vice President Zuber has hired a new staff member, Senior Advisor Tom Kiley, whose sole focus is supporting the coordination and implementation of the plan.

A number of other campus organizations have long played vital roles in climate action and continue to do so. These include but are not limited to: the Center for Energy and Environmental Policy Research, the Center for Global Change Science, the Climate CoLab, the Joint Program on the Science and Policy of Global Change, and the Sloan Sustainability Initiative. In addition, the Graduate Student Council's Sustainability Subcommittee and the Undergraduate Association's Committee on Sustainability continue to be actively involved. The student-led group Fossil Free MIT and the alumni-led group MIT Alumni for Climate Action Leadership also work to advance climate action at MIT.

Communications

To help interested MIT community members stay apprised of the many activities related to climate action happening at the Institute, updates will be shared via climateaction.mit.edu. This site will be a place where community members can find out about upcoming climate-related events on campus, learn more about the specific roles and activities of MIT offices and initiatives involved with climate action and implementation of the plan, and find CAAC members' contact information.

A Plan for Action: Five Pillars

The Plan for Action is a five-year plan, commencing in October 2015 and running through October 2020, at which point MIT's senior officers will gauge its progress and determine anew the best way for MIT to amplify its efforts in addressing climate change. The plan includes a number of specific action items, contained in five pillars:

Pillar A: Improve our understanding of climate change and advance novel, targeted mitigation and adaptation solutions

Pillar B: Accelerate progress towards low- and zero-carbon energy technologies

Pillar C: Educate a new generation of climate, energy, and environmental innovators

Pillar D: Share what we know and learn from others around the world

Pillar E: Use our community as a test bed for change

Updates on progress within each of these five pillars are provided below. Additional updates will be reported as they become available.

Pillar A: Improve our understanding of climate change and advance novel, targeted mitigation and adaptation solutions

The Environmental Solutions Initiative (ESI) supports climate and environmental research through a multidisciplinary seed grant program. ESI's first seed grants were awarded in 2015 to projects specifically focused on climate research, implications of climate change in urban contexts, and a range of strategies for improving the sustainability of human populations and resource extraction (see box on page 4).

In the fall of 2016, ESI will announce its second call for seed grant proposals, which may inform decisions in our community on topics from building design and technologies to effective management to technology development for low-carbon waste streams.

In addition, ESI is actively engaged with key stakeholders across the Institute to help coordinate and expand the wide range of climate research happening at MIT. ESI is also actively working to expand the resources available to support this research.

Pillar B: Accelerate progress towards low- and zero-carbon energy technologies

The MIT Energy Initiative (MITEI) is making progress in establishing its eight new Low-Carbon Energy Centers (LCECs) to advance research in specific technology areas key to addressing climate change, and is assembling their faculty teams and directors. Each of the eight centers will have two faculty co-directors; so far, two co-directors have been named for four of the centers. In February, MITEI and Exelon announced Exelon's intention to join several LCECs. A leading energy provider in the US, Exelon brings to the table extensive knowledge of the energy value chain, which will help MIT researchers as they advance their work in critical areas such as energy storage, solar energy, nuclear energy, and the electric grid. MITEI has been meeting with numerous industry leaders and government officials to discuss membership in the LCECs.

MITEI's Utility of the Future study should be finalized in fall 2016. In November 2015, study co-chairs Professors Ignacio Pérez-Arriaga and Christopher Knittel held a workshop that brought together researchers and faculty from MIT and the Instituto de Investigación Tecnológica of the Universidad Pontificia Comillas (IIT-Comillas) in Madrid, along with leaders from 20 companies spanning the energy value chain. Members of the Study Advisory Committee also participated, including the chief economist of the Federal Energy Regulatory Commission and senior representatives from Ofgem (the government regulator for gas and electricity markets in Great Britain) and the European Commission.

A partnership between MITEI, IIT-Comillas, and industry members, the Utility of the Future study seeks to determine the future of the provision of electricity services. The study will analyze and model the impacts of low-cost natural gas and the growing deployment of distributed energy resources such as solar, storage, and smart grid-enabled demand response on possible evolutionary trajectories of the power system over the next 10 to 15 years. The study is examining alternative business models and transformative technologies under diverse regulatory and market contexts and within the global framework of an increasingly decarbonized power sector.

Environmental Solutions Initiative 2015 Seed Grant Awardees

(Primary investigators' department or center affiliations in parentheses)

Greenhouse Gas Emissions from Tropical Peatlands: Biogeochemical Processes and Mitigation Strategies (Civil and Environmental Engineering; Earth, Atmospheric and Planetary Sciences)

Opportunities for Mitigating CH₄ and Other Non-CO₂ Energy-Technology-Related GHG Emissions (Institute for Data, Systems, and Society; MIT Energy Initiative)

Will New Limits on Coal Use in China Reduce Toxic Air Pollutants Across Asia? (Sloan School of Management; Institute for Data, Systems, and Society; Earth, Atmospheric and Planetary Sciences)

Clearer Skies in Beijing: Collecting and Interpreting Relevant Spatio-Temporal Data for Air Quality Assessment (Civil and Environmental Engineering; Earth, Atmospheric and Planetary Sciences; Urban Studies and Planning)

Fostering Sustainable Consumption in US Cities (Urban Studies and Planning)

Improved Management of Common Pool Resources (Civil and Environmental Engineering; Economics)

Metals and Minerals for the Environment (Materials Science and Engineering; Chemical Engineering)

Digging Deep: An Integrated Approach for Assessing the Impacts of Deep-Sea Mining (Mechanical Engineering; Earth, Atmospheric and Planetary Sciences)

Developing Solutions for Human and Environmental Health Risks Created by Exponentially Increasing Exposures to Lanthanide Metals (Biological Engineering; Chemistry; Civil and Environmental Engineering)

In addition, MITEI is launching the Mobility of the Future study in spring 2016 to explore the evolution of transportation modalities and scenarios for decarbonizing the transportation sector. The study will specifically examine how interactions among such factors as engine technology options, fuel options, refueling infrastructure, consumer choice, public transit options, new transportation modalities, and government policy might shape the future landscape for mobility. It is intended to provide guidance to industry stakeholders seeking to navigate the significant changes that lie ahead.

Pillar C: Educate a new generation of climate, energy, and environmental innovators

The Environmental Solutions Initiative is committed to expanding learning experiences for MIT students on environmental topics across its Schools and degree programs. The scope of this effort will touch both undergraduate and graduate education, and will lead to co-curricular and extracurricular opportunities to maximize learning opportunities for students interested in engaging on progress toward environmental solutions.

The design of the undergraduate Environment and Sustainability Minor is underway. Four focus areas are currently envisioned: earth system and climate science, human–environment interactions, environmental governance, and engineering for sustainability. A call for proposals for new and adapted courses, whose design and creation will be generously funded by a grant from the Dirk and Charlene Kabcenell Foundation, was issued in February, and 14 proposals were received by the March 28 deadline. ESI convened a multidisciplinary group of faculty in late February to exchange curriculum ideas and discuss possible directions for teaching and co-teaching in the minor.

ESI and the Climate CoLab co-sponsored a “[Hackathon for Climate](#)” during the 2016 Independent Activities Period. The all-day event brought together more than 30 MIT faculty, staff, students, postdocs, and alumni to brainstorm ideas to help address climate change. Participants formed teams and developed project proposals that they presented to a panel of judges and the audience. Prizes were awarded for most potential impact, creativity, and best presentation.

Student interest in the environment and sustainability at MIT is strong according to a survey conducted in March by the MIT Undergraduate Association’s Sustainability Committee. The committee is also working with ESI to conduct a survey and focus groups to analyze the level of student interest in pursuing the Environment and Sustainability Minor.

Clean energy education on campus is a top priority for MITEI, which continues to facilitate initiatives such as the Energy Studies Minor, Energy Undergraduate Research Opportunities Program, Graduate Energy Fellows Program, and numerous seminars with energy leaders from within and outside MIT. MITEI is also developing an “Energy Commons,” a space for undergraduate students engaged in energy studies to gather and discuss projects. The Low-Carbon Energy Centers will also provide many opportunities for students to engage in hands-on energy research.

The Tata Center for Technology and Design is training the next generation of graduate students in the fields of energy and environment to address the complex issues facing the developing world. Nearly half of the 60 ongoing center projects directly address energy and energy-related environmental challenges, with students conducting field research and building demonstration projects in India and Africa.

The Sustainability Initiative at the MIT Sloan School of Management is growing as more MBAs and executives recognize the fundamental alignment between a healthy environment, healthy society,

healthy businesses, and a healthy economy. One-third of Sloan graduate students take three or more sustainability-focused elective classes during their time at the Institute, and Sloan offers a graduate Sustainability Certificate to master's students across the Institute. Some 100 students enrolled in the certificate program's cornerstone course sequence, known as S-Lab, in spring 2016, and approximately 40 students are expected to receive the Sustainability Certificate at Commencement in June. The Sloan Sustainability Initiative also sponsors research and outreach to policy makers and educators in climate change policy, sustainability-oriented innovation, alternative transportation, green buildings, and other areas of sustainability.

For example, the System Dynamics Group at Sloan, partnering with [Climate Interactive](#), has developed interactive simulations of the climate and energy system that are used to support national and international policy makers and negotiators. Rigorously grounded in the best available peer-reviewed science, models can be generated in an instant using ordinary laptops, making them accessible to policy makers at the local and regional levels, business leaders, civil society organizations, the media, and the public. The same models, such as the [World Climate role-play simulation of the global climate negotiations](#), are also used in education. As of the end of March 2016, more than 14,000 people around the world had participated in the role-play using the model.

Pillar D: Share what we know and learn from others around the world

Climate CoLab, a project of the MIT Center for Collective Intelligence, is a crowdsourcing platform that allows people to collaborate with one another and work with experts to create, analyze, and select detailed proposals to address climate change. In October 2015, the Climate CoLab launched a contest inviting ideas about ways that MIT alumni can help implement the Plan for Action. The contest received a strong response, and the judging panel of MIT alumni are now reviewing and selecting the most promising entries from among the 90 submitted. The winners, which will be selected by both the judges and the public, will be invited to present their proposals at MIT. The MIT Alumni Association will share the winning proposals widely so that they can be adopted and implemented by alumni around the globe.

Earlier this year the Climate CoLab launched 13 contests open to anyone in the world and focusing on a variety of topics, including decarbonizing the energy supply; influencing public attitudes and behavior to address climate change; adapting to climate change; reducing greenhouse gases from buildings, transportation, and waste management; industry; land use; fabrics and textiles; and cities. The contests are part of the Climate CoLab's larger effort to crowdsource detailed, expert-reviewed strategies for how countries and the world as a whole can address climate change.

The Plan for Action calls for short courses and seminars on climate science and policy for industry and government leaders, as well as a new web portal for providing accurate, timely information to the public on climate change. These action items have been a focus of interest for many MIT community members, and they will be early priorities for the new CAAC to discuss and make recommendations.

Pillar E: Use our community as a test bed for change

The Plan for Action called for reducing campus carbon emissions by at least 32% by 2030 from a 2014 baseline. Since the plan's publication, Vice President Zuber and Fossil Free MIT have jointly underscored that this 32% target is a floor, not a ceiling, and that the campus aspires to carbon neutrality as soon as possible.

In February, the Office of Sustainability and the Office of Utilities and Maintenance launched the Energy and Greenhouse Gas Working Group, which is tasked with analyzing opportunities and developing strategies to reach, and surpass, the 32% emissions reduction target. In the next few

months, the working group will provide a summary of initial and potential strategies. In partnership with the Climate CoLab, the Office of Sustainability launched a contest in March inviting ideas from both the MIT community and the public for how MIT can best meet—and exceed—its 32% goal.

As part of this overall target for campus greenhouse gas emissions reduction, MIT is in the process of eliminating the use of fuel oil in campus power generation. The Institute has finalized a gas supply agreement with Eversource that will allow the campus cogeneration plant to run entirely on natural gas by 2020, with the exception of emergencies and testing.

In addition, the Department of Facilities has adopted Leadership in Energy and Environmental Design (LEED) Gold version 4 as the campus design standard for all new construction and major renovations. Furthermore, a comprehensive roof assessment tool is in development that will make it possible to assess how suitable a given roof is for renewable energy installation, its potential for use as a green or blue roof (to capture rainwater for beneficial purposes), and to determine its potential for reducing the impact of the urban heat island effect.

Providing the MIT community with access to high-quality data about campus energy use and carbon emissions is critical to developing strategies to meet the 32% goal and to gauging whether those strategies are working. In January, the Office of Sustainability released MIT's first comprehensive greenhouse gas inventory. A Sustainability Data Hub, an open data platform for campus energy use, is also now in the design phase.

Finally, there has been strong interest in the call for carbon pricing on campus. Members of the faculty, along with the Office of Sustainability and the Department of Facilities, have been meeting to discuss the best approach to bring this about. Carbon pricing clearly presents an opportunity not just to advance MIT's campus carbon emissions reduction, but also to engage faculty members and students in the research and design of optimal carbon pricing strategies. Additional updates on this effort will be made in the coming months. In the meantime, the Department of Facilities is finalizing a first version of a carbon calculator for MIT capital projects.

In all efforts like this, the Office of Sustainability is working closely with faculty members to leverage campus emissions reductions activities to provide students with “living lab” opportunities for education and research.

A Strategy of Engagement

In addition to the action items contained in its five pillars, the Plan for Action makes the case for a strategy of sustained engagement with governments, industry, and other institutions to accelerate technological, policy, design, and other solutions to climate change. While this strategy of engagement is reflected clearly in the plan's action items, it must go beyond these to fully leverage MIT's convening power.

New ideas for engagement will build upon important ongoing efforts at MIT. Each year, the Joint Program on the Science and Policy of Global Change hosts the Global Change Forum, which brings together representatives of industry, government, international bodies, and research groups to discuss the evolving understanding of the science and policy aspects of the climate issue. The 2016 forum will focus on corporate strategy and climate change. Topics will include the roles of the public and private sectors in providing financing for developing countries to mitigate and adapt to climate change, what companies must do to minimize supply chain risks posed by climate change, what monitoring and evaluation methods are needed to ensure progress in the effort to decarbonize the energy system, and other critical issues.

Similarly, the Center for Energy and Environmental Policy Research (CEEPR) hosts workshops each year for small groups of industry participants, academics, and policy makers who examine the implications of recent research results and other forces that will shape the energy and environmental policy agenda in the years to come. The next workshop is planned for May. Recently CEEPR co-hosted, along with the governments of Germany and the Province of Québec, an event examining carbon markets and trading. MITEI hosts an annual spring member symposium for academics and industry and nonprofit leaders. The 2016 symposium will focus on decarbonizing the power system.

A priority for the new Climate Action Advisory Committee will be to develop ideas for engaging government, industry, and academic partners that build on existing efforts both within and outside MIT. The CAAC will assess existing multisector climate collaborations to help MIT determine how it can best bring its unique strengths and assets to bear on a multisector engagement strategy in light of the far-reaching work now underway.

The Office of the Vice President for Research, with the advice of the CAAC, will be prepared to identify, develop, and publish strategies and benchmarks for engaging government, industry, and the public. Benchmarks will include inputs and activities in addition to outcomes aligned with a 2°C future. For example, these may include steps taken by industry to develop and implement 2°C business strategies and to support a 2°C public policy framework.

Engagement activities could include, but are not limited to, direct interactions with other stakeholders; facilitated gatherings of industry and other partners, both in Cambridge and around the world; town hall-style events with the MIT community; sign-on letters; and joining existing initiatives and partnerships in order to add MIT's voice. The landscape assessment could also help inform tactical elements of the Plan for Action, such as the development of short courses for government and business leaders and the creation of a web portal to share high-quality information on the science and policy of climate change.

Finally, the Vice President for Research will convene a forum in 2016 to explore ethical dimensions of the climate issue. The forum will seek to shed light on critical questions such as the ethical responsibilities confronting all stakeholders—countries, industries, companies, shareholders, institutions, and individuals—if we are to limit the increase in average global temperatures to 2°C over pre-industrial levels, as well as on the ethical dimensions of climate change communication.

Reporting

The Office of the Vice President for Research will produce an annual report to assess MIT's progress in implementing the Plan for Action and the response of our engagement partners to the challenge of climate change. The CAAC will provide input on this report.

Questions?

Community members with questions or comments about this update may direct them to Tom Kiley, senior advisor in the Office of the Vice President for Research, at tkiley@mit.edu.