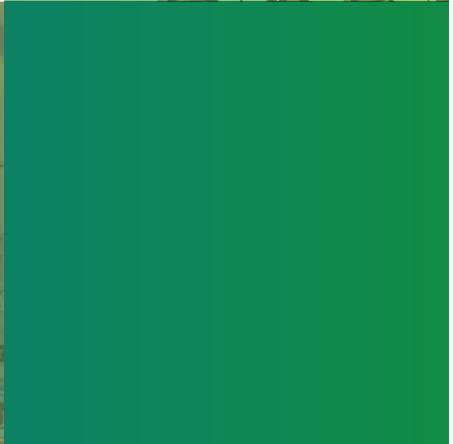




Impact Report 2021





welcome

Message from MCSC Leadership

Since its launch in January 2021, the MIT Climate & Sustainability Consortium (MCSC) has been taking important steps towards its mission of vastly accelerating the necessary global transition towards reduced greenhouse gas emissions and sustainable resource use.

The group of corporate leaders that the Consortium convenes has been conversing and collaborating – and working together with the MIT community – in exciting and meaningful ways. Through these collaborations, the Consortium identified actionable links between member companies and established key initial themes that resonated and applied across member companies’ climate and sustainability goals.

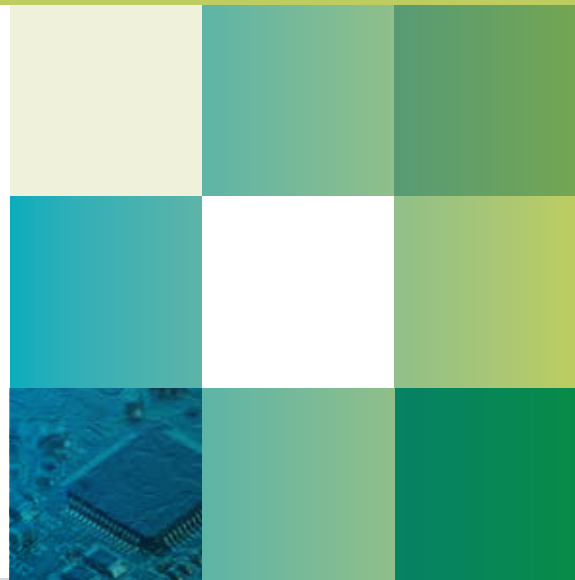
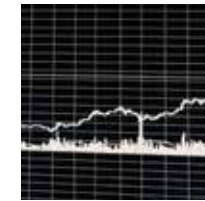
The Consortium has also engaged the MIT community. One example is MIT’s Undergraduate Research Opportunities Program (UROP). MCSC-funded UROPs explored a range of sustainability topics relevant to the students’ interests. Some of them directly involved an MCSC member company, many were led by MCSC postdoctoral Impact Fellows, and several involved MIT faculty. In addition, our recently-announced 2022 MCSC Seed Awards

will help leverage the expertise and interest of our member companies to amplify and extend the Institute’s interdisciplinary activities in climate and sustainability.

In November 2021, the first annual MCSC Symposium was held at MIT and online using a hybrid format, which was an opportunity to engage the MIT community, MCSC member companies, and other companies in the work of the Consortium. In 2022, we are eager to host workshops and events that are open to a broad range of stakeholders and enhance education opportunities.

As the Consortium grows and evolves, we are consistently impressed by the research acumen, unique ideas, diverse backgrounds, and genuine enthusiasm of the people engaging with us. We hope you read more about these exciting updates in this inaugural MCSC Annual Impact Report. Thank you for your support.

Anantha P. Chandrakasan, Chair
Jeffrey Grossman, Co-Director
Elsa Olivetti, Co-Director
Jeremy Gregory, Executive Director



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Our Work

The MIT Climate & Sustainability Consortium (MCSC) is a new kind of academia industry collaboration, working together to vastly accelerate the implementation of large-scale, real-world solutions, across sectors, to help meet global climate and sustainability challenges. It aims to lay the groundwork for a critical aspect of MIT's continued and intensified commitment to climate: helping large companies usher in, adapt to, and prosper in a decarbonized world.

MCSC Pillars

STRATEGIZE

Link stated company goals to value chains; enhance synergy and find blind spots. An example is building consensus (among Industry Advisory Board, MCSC, and MIT) around several key initial themes where there was synergy across member companies on their climate and sustainability goals. Based on these themes, the MCSC hosted five virtual workshops, which enabled strategic problem definition by member companies and the MIT community to scale climate and sustainability solutions.

IMPLEMENT

Define, design, and pilot cross-industry technology, process, and organizational change. An example is launching focused analysis efforts, each with outcomes specific to the topic and the MCSC member, that will guide the development of programs that can address the problems discussed in the aforementioned workshops.

EDUCATE

Embed sustainability practice throughout workforce and university education. An example is MCSC-funded undergraduate student research opportunities (UROPs). The MCSC funded more two dozen UROPs from across the Institute, many focused on the MCSC analysis efforts and included member companies, such as MathWorks and Dow.

We are creating new collaboration opportunities that amplify and extend MIT's current efforts, while empowering the industry to usher in, adapt to, and prosper in a decarbonized economy and world.



MIT Campus. Cambridge, MA.
Photo by: Gretchen Ertl

Member Companies

One company or sector cannot tackle the climate change crisis by itself. Making progress on a challenge this complex, vast, and urgent requires diverse science-based perspectives on climate, sustainability, and climate justice from across the global economy.

Our current cross-industry members are:



Industry Advisory Board Members

ACCENTURE

PETER LACY
Chief Responsibility Officer and Global Sustainability Services Lead

JAN-WILLEM JANNINK
Global Responsible Value Chain Lead

APPLE

SARAH CHANDLER
Senior Director of Environment and Supply Chain Innovation

ALISHA JOHNSON
Strategic Communications for Environment, Policy and Social Initiatives

BBVA

JAVIER RODRIGUEZ SOLER
Global Head of Sustainability

BIOGEN

JENNIFER WRIGHT
Head of Corporate Sustainability

JOHANNA C. JOBIN
Global Head, Corporate Reputation & Responsibility
Executive Director of the Biogen Foundation

BOEING

CHRIS RAYMOND
Chief Sustainability Officer & Vice President of Global Enterprise Sustainability

BRIAN YUTKO
Chief Engineer for Sustainability and Future Mobility

CARGILL

GREG DOWNING
Director of Sustainability

DOW

A.N. SREERAM
Senior Vice President and Chief Technology Officer

HOLCIM

MAGALI ANDERSON
Chief Sustainability and Innovation Officer

NOLLAIG FORREST
Global Head of Communications

IBM

DR. SOLOMON ASSEFA
Vice President at IBM Research

INDITEX

JAVIER LOSADA
Chief Sustainability Officer
LUIS COLOMA YEPES
Head of Infrastructure and Sustainability

MATHWORKS

DR. AKSHAY RAJHANS
Principal Research Scientist, Founding Member, Advanced Research & Technology Office

NEXPLORE – HOCHTIEF

DAVID KOCH
Chief Risk, Organization and Innovation Officer, HOCHTIEF
CEO, Nexplore

AMRO SALLAM
Chief Research Officer, Nexplore

PEPSICO

JIM ANDREW
Chief Sustainability Officer

RAND-WHITNEY CONTAINERBOARD (RWCB)

A Kraft Group Company

TONY HOBSON
Senior Vice President of Strategic Planning and Kraft Operations

ROBYN GLASER
Senior Vice President of Business Affairs

VERIZON

JAMES GOWEN
Sr. Vice President, Global Supply Chain & Chief Sustainability Officer

ABEL LEITES
Vice President, Verizon Global Supply Chain

VONTIER

KATIE ROWEN
Chief Legal & Administrative Officer

16
MEMBERS
COMPANIES

23
INDUSTRY ADVISORY
BOARD MEMBERS

50+
TECHNICAL
TEAMS
MEMBERS

MIT Campus, Cambridge, MA.
Photo by: Gretchen Ertl

People

MCSC Leadership



ANANTHA P. CHANDRAKASAN
Chair
Dean, MIT School of Engineering
Vannevar Bush Professor of Electrical Engineering
and Computer Science



ELSA OLIVETTI
Co-Director
Esther and Harold E. Edgerton Associate Professor
Associate Professor, Materials Science and Engineering
MacVicar Faculty Fellow
MIT School of Engineering



JEFFREY GROSSMAN
Co-Director
Head, Department of Materials Science and Engineering
Morton (1942) and Claire Goulder and Family Professor
in Environmental Systems
MacVicar Faculty Fellow
MIT School of Engineering



JEREMY GREGORY
Executive Director

MCSC Administrative Staff

MOLLY CHASE
Communications
Officer

EILISE CHAMBERS
Program Manager

DANUTA FORBES
Administrative
Assistant

MCSC Faculty Steering Committee

An interdisciplinary group of MIT faculty, working collaboratively with the MCSC to share their perspectives and help shape a common vision. Read more about the Faculty Steering Committee [here](#).



STEVEN BARRETT
Professor, Aeronautics and
Astronautics
MIT School of Engineering



CHAKANETSA MAVHUNGA
Associate Professor, Science,
Technology, and Society
MIT School of Humanities and
Social Sciences



ROBERTO RIGOBON
Society of Sloan Fellows Professor
Professor, Applied Economics
MIT Sloan School of Management



STEFANIE JEGELKA
Associate Professor, Electrical
Engineering & Computer Science
MIT School of Engineering



DAVID MCGEE
Associate Professor,
Earth, Atmospheric and
Planetary Sciences
MIT School of Science



MARIA YANG
Associate Dean, MIT School of Engineering
Gail E. Kendall (1978) Professor
Professor, Mechanical Engineering
MacVicar Faculty Fellow
MIT School of Engineering



JEREMIAH JOHNSON
Professor, Chemistry
MIT School of Science



DAVID PERREAULT
Joseph F. and Nancy P. Keithley
Professor in Electrical Engineering
MIT School of Engineering



SIQI ZHENG
Samuel Tak Lee Champion Professor
Professor, Urban and Real Estate
Sustainability
MIT School of Architecture and Planning



DAVID HSU
Associate Professor,
Urban and Environmental Planning
MIT School of Architecture and
Planning



DESIREE PLATA
Gilbert W. Winslow Career Development
Professor in Civil Engineering
Associate Professor, Civil and
Environmental Engineering
MIT School of Engineering



YANCHONG (KAREN) ZHENG
George Maverick Bunker Professor of
Management
Associate Professor, Operations
Management
MIT Sloan School of Management

MCSC Impact Fellowship Program

This program is a postdoctoral opportunity for individuals who want to transcend academia and industry to apply their expertise to near-term change for a more sustainable future. Impact Fellows work with MIT researchers and consortium industry members – in collaboration with external organizations and communities – to implement solutions needed for global economic transformation to address the global climate change and sustainability crisis. Read more about the MCSC Impact Fellows [here](#).



XIANGKUN (ELVIS) CAO



LAURA FRYE-LEVINE



PALOMA GONZALEZ-ROJAS



GLEN JUNOR



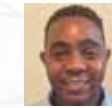
POUSHALI MAJI



SAM RAYMOND



SYDNEY SROKA



AUGUSTINE ZVINAVASHE

MCSC Student Council

The MCSC Student Council is a group of students that is partnering with MCSC leadership to help facilitate this meaningful dialogue by representing the MIT student voice, share opportunities for engagement with the MCSC with other students, and provide feedback to the MCSC as it grows and evolves.

CURRENT MEMBERS FOR THE 2021-2022 ACADEMIC YEAR



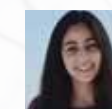
ANUSHREE CHAUDHURI
School of Humanities, Arts,
and Social Sciences/School
of Engineering



SANDHYA MAHADEVAN
Sloan School of Management



AUTUMN DEITRICK
School of Engineering



SELMA SHARAF
School of Engineering/
Sloan School of Management



KEITH HUSTED
School of Science



NATASHA STAMLER
School of Architecture
& Planning/School of
Engineering



ALAYNA JOHNSON
School of Science



EVA THEN
School of Architecture
& Planning/School of
Engineering



ANNE QINGYANG LIU
School of Engineering



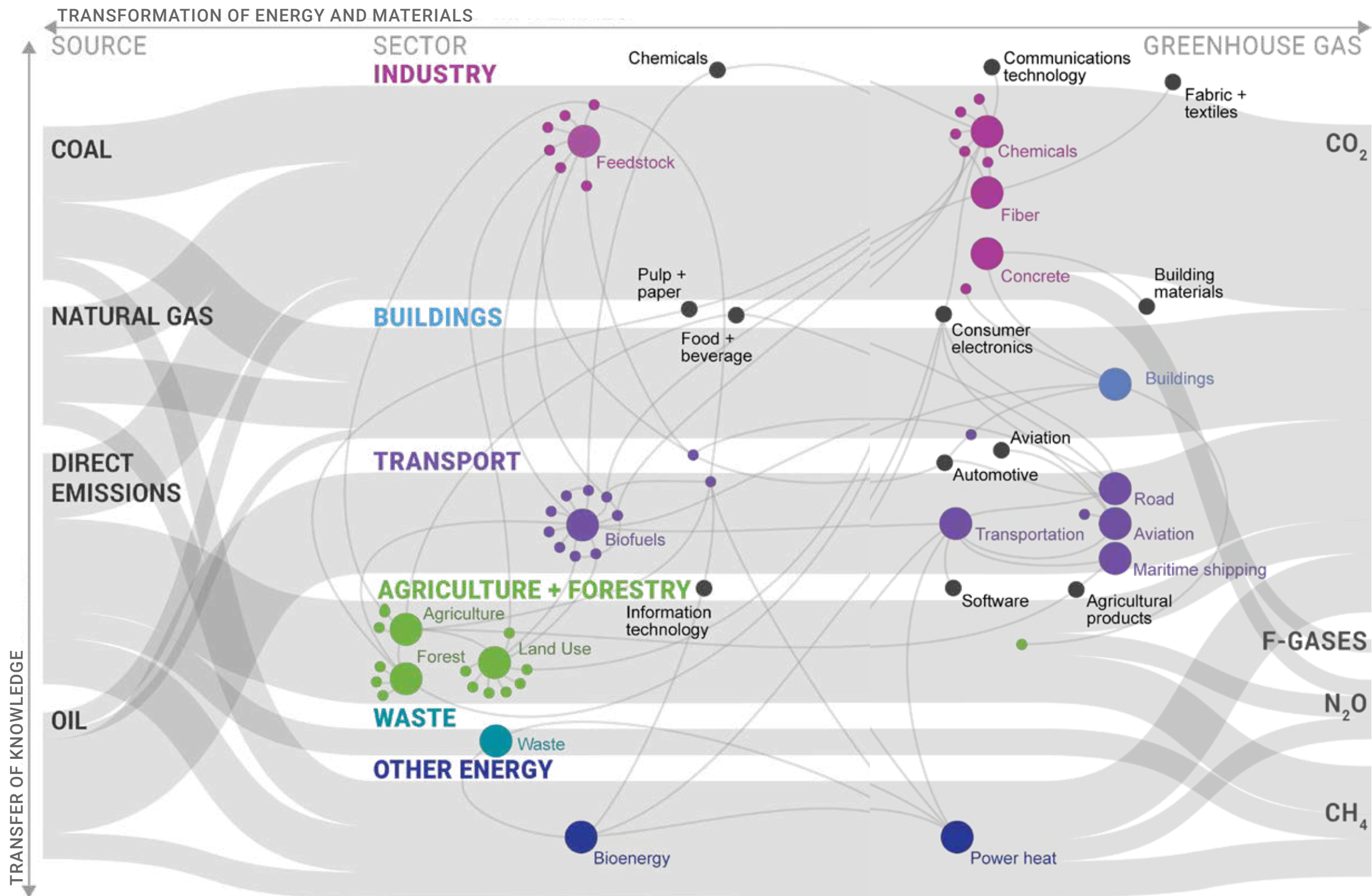
KELLY WU
School of Engineering

“It’s been a rich and interdisciplinary experience working across the research community at MIT and MCSC member companies trying to find relevant, high-impact and practical solutions to large-scale sustainability challenges.”

Poushali Maji, Impact Fellow

Synergies & Connections

TOTAL GHG EMISSIONS WORLDWIDE



The MCSC is actively working to identify and pull in MIT experts on a range of topics and research areas that help our company members reach their ambitious climate goals.

In the example of total greenhouse gas (GHG) emissions worldwide, you will see that the knowledge base at MIT is vast and spans across source, sector, and stages of the supply chain. MIT researchers are diving into every nuance and angle of the topic, and exploring the many layers of (and possible innovative solutions to) the challenge at hand—in this case, GHG emissions.

Throughout these explorations and eventual breakthroughs, industry must be central to the conversation in order for the work to generate solutions that are implementable and scalable. That's why you'll see specific industries listed by sector, represented as black dots, working with communities of MIT experts, represented as colored dots, throughout the various stages of the sustainability and climate challenge.

Company members and MIT experts come together through a meaningful and intricate web of connections, making up the larger MCSC network that will work together to develop the large-scale, real-world solutions—across sectors - that are so desperately needed to combat the climate crisis.



“It has been thrilling to see this consortium come together not only in realization of the vision that academic researchers in environmental science should be partnering with industry, but also because of the unique opportunities for synergistic, positive actions that we will strive for as a collective.”

Desirée Plata, Faculty, MIT School of Engineering



“It has been a pleasure to begin partnering with MCSC member companies to translate the latest research outcomes led by MIT researchers into economically viable, environmentally sustainable, and socially equitable solutions that will benefit many future generations.”

Yanchong (Karen) Zheng, Faculty, MIT Sloan School of Management



“The MCSC strives to craft community- and DEI-rooted projects that will have significant implications on trans-disciplinary problem-solving and mutual university-community climate partnerships.”

Chakanetsa Mavhunga, Faculty, MIT School of Humanities and Social Sciences

“The founding companies in the MCSC are leaders in their sectors and can have a huge positive impact on climate and sustainability.”

David Hsu, Faculty, MIT School of Architecture and Planning



Strategize

Workshops

Throughout its first year, the MCSC provided many opportunities for member companies to connect with the MIT community and each other, including a series of virtual workshops in June of 2021. The workshops, which enabled problem definition by member companies and the MIT community to scale climate and sustainability solutions, were focused on the following topics:

- Circularity in organic and inorganic materials
- Enhancing natural carbon sinks
- Carbon capture through engineered solutions
- Sustainable and resilient supply chains

Participants included over 35 people from member companies and 45 MIT faculty members. There were 25 company presentations and 30 MIT faculty presentations representing a diverse set of perspectives.

The topics of these workshops were established by the MCSC's Industry Advisory Board, who worked with MIT to build consensus around several key initial themes where there was synergy across member companies on their climate and sustainability goals. By focusing the strategy of the Consortium around these themes, the MCSC is identifying links between stated company goals and ways of closing gaps in achieving those goals. Our work in strategy focuses on aligning key assumptions, identifying blind spots in corporate goal setting grounded in analytical rigor, and leveraging synergy across the members. The collaborations at the workshops helped make way for the emergence of the MCSC's initial key focus areas, explored more in the coming pages.

Following the June workshops, the MCSC hosted a workshop on bio-based materials in the fall. In this session, conversations focused on ways to improve the performance and scalability of these materials for packaging applications to enable companies to lower the environmental impact of packaging while maintaining the quality of products and packaging. December's virtual Community Engagement Workshop, which delved into the social dimensions of the MCSC's work, brought together member companies with the MIT community to discuss ways in which climate and sustainability solutions can incorporate perspectives from the communities that will be impacted early in the design and implementation process.

Graphic Recording by Haley McDevitt



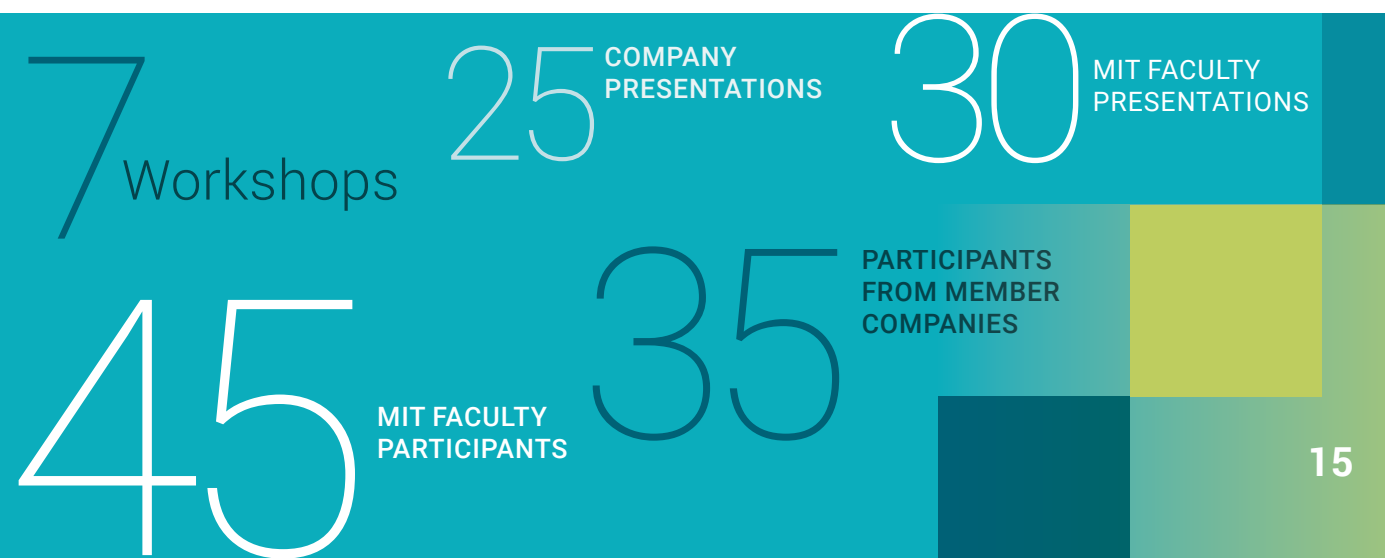
Symposium

The MCSC Symposium, held in a hybrid format in November, featured sessions on transportation, entrepreneurship, and sustainable materials and production, as well as a poster session with MCSC's cohort of Impact Fellows. The Symposium was a way to bring together the MIT community and MCSC member companies, as well as other companies who are engaging in the work of the Consortium.

The Transportation Charrette included breakout groups across different aspects of transportation, broken down by mode and then by energy input (fuels and storage). In the session, member companies worked with the MIT community to link the MCSC's roadmapping activities to assessment of critical barriers within the relevant value chains.

Representatives from MCSC member companies and individuals from the MIT community learn about the work of MCSC Impact Fellows and student researchers during the Annual Symposium's poster session.

The Entrepreneurial Opportunities in Climate and Sustainability panel focused on amplifying the potential success of climate and sustainability start-ups. The session explored new opportunities for clearer problem definition and value proposition via earlier engagement from key stakeholders, represented by the panelists themselves: Sarah Chandler, Senior Director of Environment and Supply Chain Innovation for Apple; Jim Andrew, Chief Sustainability Officer for PepsiCo; Yet-Ming Chiang, Co-Founder of A123, 24M, Form Energy, Desktop Metal, and Sublime Systems; Vladimir Bulovic, Co-Founder of QD Vision, Kateeva, and Ubiquitous Energy; Katie Rae, CEO and Managing Partner of The Engine; and Matthew Nordan, Co-Founder and Managing Director of Prime Impact Fund.



Implement

Focused Analysis Efforts

Growing from the ongoing conversations among member companies and the MIT community, the MCSC launched focused analysis efforts, each with specific outcomes that resonate with member company sustainability goals. The objective of these analysis efforts is to develop programs that can address the challenges most relevant and pressing to MCSC members. They are:

Sustainable supply chains: roadmap for tough to decarbonize transportation modes. Informing cross-sector, -mode, and -fuel links across technologies (e.g. low-carbon liquid fuels), processes (e.g. design a fuel-conversion pathway), policies (e.g. economic incentives or regulatory frameworks), and supporting infrastructure (e.g. truck charging stations), required to produce zero-carbon fuels and achieve net-zero climate forcing from tough to decarbonize challenging transportation modes.

Unlocking circularity across the value chain to improve materials recovery. Sustainable materials recovery to close gaps in maximizing resource use efficiency as well as identify strategies that provide comprehensive sustainability benefits and opportunities for future innovation. More specifically, barriers could be overcome with innovations in quality improvement of materials as well as rigorous assessment of effective policy.

Community-centered enhancement of natural carbon sinks through improved measurement, management, and implementation. Interest in deeper understanding and enhancement of natural carbon sinks to store carbon at scale within significant co-benefits, while engaging local communities. The challenges associated with preserving and enhancing natural solutions are technological, economic, and social, and thus need a multi-faceted approach.



The MCSC 2022 Seed Grants will support MIT principal investigator engagement to link the work of the Consortium to ongoing and emerging climate and sustainability efforts on campus — focused on these areas.

Cross-Cutting Themes

Data in climate and sustainability towards better data driven decisions and research. This theme revolves around the opportunity found in data to manage and develop climate and sustainability solutions. Researchers from all fields are encouraged to contribute to a collaborative data environment where data can be easily discovered and enhanced by modern data fusion and hybrid computing methods and techniques. A mixture of data pools and data warehouse architecture can enable flexibility at scale for heterogeneous datasets.

These initial analysis efforts are the primary activities of the MCSC Impact Fellows who are leading this work, alongside other Consortium researchers with a wide range of expertise in technology, policy, and science. You can read more about them online [here](#).

Value chain resilience in the context of a changing climate. Evaluating risks and adaption solutions for value chains, which are susceptible to natural hazards such as hurricanes, wildfires, and droughts. The indirect effects of these hazards can reverberate throughout the globe in the form of value chain shocks.

Lowering environmental impact and increasing performance and scalability of packaging materials. Accelerating the development of scalable sustainable packaging solutions that align with current property specifications. This could be done through catalyzing innovation opportunities in new materials discovery, packaging systems and value chain design, and evaluation of these technologies to scale.

Blueprinting process for de-risking carbon capture, utilization, and sequestration. Innovations to remove barriers towards multi-industry adoption of carbon capture, utilization, and sequestration. This includes addressing roadblocks caused by poor understanding and communication of geospatial capture, transport, and sequestration efforts; technological readiness of existing platforms; disparate regulatory and financial best practices; and the limited choice of CO2 capture technologies.

Equity-centered sustainable solution-building in climate and sustainability. This theme involves human, social, policy, and governance input into the content of technical solution-building. It includes social dimensions – equity and agent-centered design, behavior and markets, transparency and accountability, and policy and governance – as in-built components to development and implement solutions.



Educate

Undergraduate Research Through the MCSC

The MCSC has funded more than 40 undergraduate student research projects, known at MIT as UROPs – many in MCSC focus areas and many in partnership with Principal Investigators (PIs) and graduate students throughout MIT.

Through UROPs, several students worked directly with member companies, including Dow, on minimizing greenhouse gas (GHG) release, and MathWorks, on both developing green hydrogen fuel cell models and developing computational methods for modeling energy usage and physical properties of building climate control.

The wide range of project topics echoes the MCSC's interest in exploring various layers and angles to climate and sustainability challenges. Students dove into topics as broad as the social costs of climate change and carbon capture, utilization and storage (CCUS) to as specific as assessing the state of spent battery health and evaluating the economic viability of the start-ups that are creating biodegradable materials.



Louise Anderfaas worked alongside Dow to evaluate some of their products in the plastic space and strategize on minimizing greenhouse gas (GHG) release.



David Kwabi-Addo explored soil organic carbon as an MCSC-funded undergraduate student research project.

"It's been a pleasure researching with people who are passionate about creating solutions for climate change. Working with the Consortium helped me consider a greater variety of options for a profession in the future!"

David Kwabi-Addo, MIT Undergraduate Student



AN Sreeram, Senior Vice President and Chief Technology Officer at Dow, gives presentation to MIT community, including many students, in December 2021.



MIT student Claire Kim presents her MCSC-funded fall 2021 undergraduate research project, which explored carbon capture and utilization technology.



Looking Ahead & Thank You

The MCSC looks forward to hosting events that are open to a broad range of stakeholders in the coming year, as well as future opportunities for members and the MIT community to connect. The Consortium is also focused on linking its work to ongoing and emerging climate and sustainability efforts on campus through the 2022 MCSC Seed Awards, as well as on continuing to engage new companies from a diverse set of sectors.

The MCSC would like to thank the leadership and staff members of the School of Engineering Dean's Office, who have provided endless support and guidance, as well as our Faculty Steering Committee and Student Council, who have served as critical connectors to MIT's faculty and student communities.

MIT Campus, Cambridge, MA.
Photo by Gretchen Ertl

