

## First-ever Climate Grand Challenges recognizes 27 finalists

A subset of the finalists will be announced as multiyear flagship projects this spring.

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The Climate Grand Challenges competition launched in July 2020 with the goal of mobilizing the entire MIT research community around transformative projects that have the potential to make major advances in solving the big problems that stand in the way of effective global climate response.

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All-carbon buildings, climate-resilient crops, and new tools to improve the prediction of extreme weather events are just a few of the 27 bold, interdisciplinary research projects selected as finalists from a field of almost 100 proposals in the first MIT [Climate Grand Challenges](#) competition. Each of the finalist teams received \$100,000 to develop a comprehensive research and innovation plan.

A subset of the finalists will make up a portfolio of multiyear projects that will receive additional funding and other support to develop high-impact, science-based mitigation and adaptation solutions on an accelerated basis. These flagship projects, which will be

announced later this spring, will augment the work of the many MIT units already pursuing climate-related research activities.

“Climate change poses a suite of challenges of immense urgency, complexity and scale. At MIT, we are bringing our particular strengths to bear through our community — a rare concentration of ingenuity and determination, rooted in a vibrant innovation ecosystem,” President L. Rafael Reif says. “Through MIT's Climate Grand Challenges, we are engaging hundreds of our brilliant faculty and researchers in the search for solutions with enormous potential for impact.”

The Climate Grand Challenges launched in July 2020 with the goal of mobilizing the entire MIT research community around developing solutions to some of the most complex unsolved problems in emissions reduction, climate change adaptation and resilience, risk forecasting, carbon removal, and understanding the human impacts of climate change.

An event in April will showcase the flagship projects, bringing together public and private sector partners with the MIT teams to begin assembling the necessary resources for developing, implementing, and scaling these solutions rapidly.

### **A whole-of-MIT effort**

Part of a wide array of major climate programs outlined last year in [“Fast Forward: MIT's Climate Action Plan for the Decade,”](#) the Climate Grand Challenges focuses on problems where progress depends on the application of forefront knowledge in the physical, life, and social sciences and the advancement of cutting-edge technologies.

“We don’t have the luxury of time in responding to the intensifying climate crisis,” says Vice President for Research Maria Zuber, who oversees the implementation of MIT’s climate action plan. “The Climate Grand Challenges are about marshaling the wide and deep knowledge and methods of the MIT community around transformative research that can help accelerate our collective response to climate change.”

If successful, the solutions will have tangible effects, changing the way people live and work. Examples of these new approaches range from developing cost-competitive long-term energy-storage systems to using drone technologies and artificial intelligence to study the

role of the deep ocean in the climate crisis. Many projects also aim to increase the humanistic understanding of these phenomena, recognizing that technological advances alone will not address the widespread impacts of climate change, and a comparable behavioral and cultural shift is needed to stave off future threats.

“To achieve net-zero emissions later this century we must deploy the tools and technologies we already have,” says Richard Lester, associate provost for international activities. “But we’re still far from having everything needed to get there in ways that are equitable and affordable. Nor do we have the solutions in hand that will allow communities — especially the most vulnerable ones — to adapt to the disruptions that will occur even if the world does get to net-zero. Climate Grand Challenges is creating a new opportunity for the MIT research community to attack some of these hard, unsolved problems, and to engage with partners in industry, government, and the nonprofit sector to accelerate the whole cycle of activities needed to implement solutions at scale.”

### **Selecting the finalist projects**

A 24-person faculty committee convened by Lester and Zuber with members from all five of MIT’s schools and the MIT Schwarzman College of Computing led the planning and initial call for ideas. A smaller group of committee members was charged with evaluating nearly 100 letters of interest, representing 90 percent of MIT departments and involving almost 400 MIT faculty members and senior researchers as well as colleagues from other research institutions.

“Effectively confronting the climate emergency requires risk taking and sustained investment over a period of many decades,” says Anantha Chandrakasan, dean of the School of Engineering. “We have a responsibility to use our incredible resources and expertise to tackle some of the most challenging problems in climate mitigation and adaptation, and the opportunity to make major advances globally.”

Lester and Zuber charged a second faculty committee with organizing a rigorous and thorough evaluation of the plans developed by the 27 finalist teams. Drawing on an extensive review process involving international panels of prominent experts, MIT will announce a small group of flagship Grand Challenge projects in April.

Each of the 27 finalist teams is addressing one of four broad Grand Challenge problems:

### **Building equity and fairness into climate solutions**

1. Policy innovation and experimentation for effective and equitable climate solutions, led by Abhijit Banerjee, Iqbal Dhaliwal, and Claire Walsh
2. Protecting and enhancing natural carbon sinks – Natural Climate and Community Solutions (NCCS), led by John Fernandez, Daniela Rus, and Joann de Zegher
3. Reducing group-based disparities in climate adaptation, led by Evan Lieberman, Danielle Wood, and Siqi Zheng
4. Reinventing climate change adaptation – The Climate Resilience Early Warning System (CREWSnet), led by John Aldridge and Elfatih Eltahir
5. The Deep Listening Project: Communication infrastructure for collaborative adaptation, led by Eric Gordon, Yihyun Lim, and James Paradis
6. The Equitable Resilience Framework, led by Janelle Knox-Hayes

### **Decarbonizing complex industries and processes**

1. Carbon>Building, led by Mark Goulthorpe
2. Center for Electrification and Decarbonization of Industry, led by Yet-Ming Chiang and Bilge Yildiz
3. Decarbonizing and strengthening the global energy infrastructure using nuclear batteries, led by Jacopo Buongiorno
4. Emissions reduction through innovation in the textile industry, led by Yuly Fuentes-Medel and Greg Rutledge
5. Rapid decarbonization of freight mobility, led by Yossi Sheffi and Matthias Winkenbach
6. Revolutionizing agriculture with low-emissions, resilient crops, led by Christopher Voigt
7. Solar fuels as a vector for climate change mitigation, led by Yuriy Román-Leshkov and Yogesh Surendranath

8. [The MIT Low-Carbon Co-Design Institute](#), led by Audun Botterud, Dharik Mallapragada, and Robert Stoner
9. [Tough to Decarbonize Transportation](#), led by Steven Barrett and William Green

### **Removing, managing, and storing greenhouse gases**

1. [Demonstrating safe, globally distributed geological CO2 storage at scale](#), led by Bradford Hager, Howard Herzog, and Ruben Juanes
2. [Deploying versatile carbon capture technologies and storage at scale](#), led by Betar Gallant, Bradford Hager, and T. Alan Hatton
3. [Directed Evolution of Biological Carbon Fixation Working Group at MIT \(DEBC-MIT\)](#), led by Edward Boyden and Matthew Shoulders
4. [Managing sources and sinks of carbon in terrestrial and coastal ecosystems](#), led by Charles Harvey, Tami Lieberman, and Heidi Nepf
5. [Strategies to Reduce Atmospheric Methane](#), led by Desiree Plata
6. [The Advanced Carbon Mineralization Initiative](#), led by Edward Boyden, Matěj Peč, and Yogesh Surendranath

### **Using data and science to forecast climate-related risk**

1. [Bringing computation to the climate challenge](#), led by Noelle Eckley Selin and Raffaele Ferrari
2. [Ocean vital signs](#), led by Christopher Hill and Ryan Woosley
3. [Preparing for a new world of weather and climate extremes](#), led by Kerry Emanuel, Miho Mazereeuw, and Paul O’Gorman
4. [Quantifying and managing the risks of sea-level rise](#), led by Brent Minchew
5. [Stratospheric Airborne Climate Observatory System to initiate a climate risk forecasting revolution](#), led by R. John Hansman and Brent Minchew

6. The future of coasts – Changing flood risk for coastal communities in the developing world, led by Dara Entekhabi, Miho Mazereeuw, and Danielle Wood

To learn more about the MIT Climate Grand Challenges, visit [climategrandchallenges.mit.edu](https://climategrandchallenges.mit.edu).