PREFACE

The first ICEF *Artificial Intelligence for Climate Change Mitigation Roadmap* was released in December 2023. Since that time, attention to artificial intelligence (AI) has continued to grow at a rapid pace. Tens of billions of dollars have poured into AI projects, policymakers around the world have considered new AI policies, and OpenAI reports that each month more than 200 million people now use ChatGPT.

Signs of a changing climate continue to grow as well. Based on global average temperatures, July 22, 2024 was the warmest day ever recorded; 2023 was the warmest year ever recorded; and the 10 warmest years on record are the past 10 years. Yet global emissions of greenhouse gases continue to climb.

Can AI help cut emissions of greenhouse gases? This Roadmap explores that question. In this second edition of the *Artificial Intelligence for Climate Change Mitigation Roadmap*, a team of 25 co-authors builds on last year's roadmap—comprehensively updating all old chapters, adding six new chapters and offering 5–10 specific, actionable recommendations in each chapter.

Our goal is to provide a useful resource for experts and non-experts alike. In Part I of this Roadmap, we provide brief introductions to both AI and climate change. In Part II, we explore eight sectors in which AI is helping respond to climate change and could do much more. In Part III, we explore cross-cutting issues. We close with findings and recommendations.

This roadmap builds on the body of literature produced annually in connection with the ICEF conference. Previous roadmaps have addressed the following topics:

- Artificial Intelligence for Climate Change Mitigation (2023)
- Low-Carbon Ammonia (2022)
- Blue Carbon (2022)
- Carbon Mineralization (2021)
- Biomass Carbon Removal and Storage (BiCRS) (2020)
- Industrial Heat Decarbonization (2019)
- Direct Air Capture (2018)
- Carbon Dioxide Utilization (2017 and 2016)
- Energy Storage (2017)
- Zero Energy Buildings (2016)
- Solar and Storage (2015)

This roadmap is a team effort. We are grateful to the many experts who reviewed draft chapters and/or helped with research for this Roadmap in the past six months. Special thanks to Laura Cozzi, Antonia Gawel, Savannah Goodman, Mars Hanna, Nicole Iseppi, Noah Kauffman, Meg King, Cheryl Lafleur, Amy Luers, Matthew Lundgren, Priyanka Mahat, Ning Qi, Josh Parker, David Patterson, Nicolas Schunck, James Slider, Thomas Spencer, Jed Sundwall and Tess Turner. Any mistakes are of course our own. We are especially grateful for the support provided by the ICEF Secretariat, the ICEF Steering Committee (including in particular its chair, Nobuo Tanaka), the New Energy and Industrial Technology Development Organization (NEDO), experts at the Institute of Energy Economics – Japan, and our superb copy edit and design team (including in particular Dr. Kathryn Lindl, Ms. Janelle Cataldo and Ms. Jeannette Yusko).

The ICEF Innovation Roadmap Project aims to contribute to the global dialogue about solutions to the challenge of climate change. We welcome your thoughts, reactions and suggestions.

David Sandalow

Columbia University
Chair, ICEF Innovation Roadmap Project