MIGRATION AND DISPLACEMENT IN A CHANGING CLIMATE

This book provides insight into the impact of climate change on human mobility – including both migration and displacement – by synthesizing key concepts, research, methodology, policy, and emerging issues surrounding the topic. It illuminates the connections between climate change and its implications for voluntary migration, involuntary displacement, and immobility by providing examples from around the world. The chapters use the latest findings from the natural and social sciences to identify key interactions shaping current climate-related migration, displacement, and immobility; predict future changes in those patterns and methods used to model them; summarize key policy and governance instruments available to us to manage the movements of people in a changing climate; and offer directions for future research and opportunities. This book will be valuable for students, researchers, and policymakers of geography, environmental science, climate and sustainability studies, demography, sociology, public policy, and political science.

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"*Migration and Displacement in a Changing Climate* draws on evidence from the social and natural sciences, and from examples from across the globe, to provide an authoritative, balanced, and comprehensive guide that cuts through the hyperbole and points to constructive ways to respond to this powerful emerging risk to social order."

Professor Jon Barnett, University of Melbourne

"*Migration and Displacement in a Changing Climate* provides an excellent resource for those new to the topic of climate-related mobility as well as those with years of experience. The authors skilfully build a foundation through definitions and a review of research on migration drivers, and then build on these foundations with careful review of research findings in both social and natural sciences. Compelling case studies illuminate the lessons learned. Especially important and useful in today's conflict-ridden world is that the authors never lose sight of the fundamental humanity inherent within population movement, both now and in centuries past."

Professor Lori M. Hunter, University of Colorado, Boulder

"Best, Ober, and McLeman provide a unique reference of case studies on climate-affected migration in the US and elsewhere while positioning them in the context of interdisciplinary theory and policy. I finally have a resource I can use in my own class that includes all of the fundamental material on the subject in one place."

Professor Valerie Mueller, Arizona State University

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Preface

The Summary for Policymakers of the Intergovernmental Panel on Climate Change (IPCC 2023) Synthesis Report begins with this statement:

> Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals.

The report's next main statement is:

> Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people. Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected.

Among the widespread impacts on people referred to by the IPCC is a growing number of people on the move. Rarely a day goes by without news of people somewhere being forced to flee their homes in the face of a storm, flood, or wildfire, or of drought conditions causing hunger or worse in a low-income country. These and other extreme weather events occur on every inhabited continent, and in many regions their severity, frequency, and/or geographical range are increasing. On average, more than 20 million people each year worldwide are displaced by weather- and climate-related disasters, and that average is trending upward. No country is exempt; the worst affected countries include high-, medium-, and low-income countries (e.g. USA, China, and Bangladesh). Some Pacific island nations have already begun relocating coastal communities and the government of the Maldives is constructing artificial islands that will house tens of thousands of citizens in apartments built high above rising sea levels. The number of people

on the move for climate-related reasons is almost certain to continue growing for three key reasons:

- our collective unwillingness to reduce greenhouse gas emissions;
- the growing number of people living in areas exposed to climate risks; and
- the slow progress in building sustainable prosperity in low-income countries and communities.

If these three trends persist, the World Bank (Clement et al. 2021) has projected that 200 million people or more may need to move from their homes by the impacts of climate change by the 2050s – that is, within this lifetime of most readers of this book.

The good news is that this does not need to happen, and hopefully won't. The technology needed to transition away from the fossil fuel economy is now widely available and rapidly falling in price; all that is now lacking is the political will to accelerate the adoption of these new technologies. Companies and countries that make a lot of money from the fossil fuel industry are resisting this transition, but alternatives to coal and oil are not only cleaner but also cheaper and more efficient, and market realities will overcome their resistance. As many have correctly noted, we didn't switch from driving horse-drawn wagons to automobiles because we ran out of food for the horses; we switched because automobiles are a superior technology. Coal-fired power plants and gasoline-powered vehicles are entering the horse-and-buggy stage of obsolescence.

There are over eight billion people on the planet. That's a lot for the planet to support, all of them needing food, water, sanitation, shelter, employment, health care, education, and the other basic services most people living in high- and middle-income countries take for granted. The UN Department of Economic and Social Affairs projects that we will add another billion people before the human population starts to plateau, again in the 2050s, and most of those extra people will be living in low-income countries where the necessities for a happy and healthy life cannot always be taken for granted. Further, many of the areas of the world experiencing rapid population growth are locations that are highly exposed to extreme weather events and climate hazards. If we can accelerate progress toward meeting the UN Sustainable Development Goals, we can ensure that people living in countries that are poor today are less poor tomorrow and that we can meet the basic needs of everyone who is already here on the planet and all those extra people who will join us in coming decades.

If we reduce greenhouse gas emissions and build sustainable prosperity, not only can we avoid nightmarish scenarios of hundreds of millions of people having to flee their homes, we can actually lower the current average of 20 million people displaced by climate-related disasters each year. We can likely never eliminate

entirely the risk of floods or fires forcing people to move at least temporarily from their homes when they occur – these events are an inherent part of nature – but we can certainly reduce the ensuing hardship and suffering and help people recover quickly, if we so choose.

Over 10,000 studies and papers have been published on topics related to climate and migration, according to the CliMig database maintained at the University of Neuchatel. There are a dozen or more edited scholarly collections of chapters contributed by researchers working on the subject. But there are very few monograph-style books that provide one-stop, in-depth coverage of the essential information needed by students, aspiring researchers, and people working for governments, multilaterals, and nongovernmental organizations. That's what this book offers. This is not the first such book; that was *Climate and Human Migration: Past Experiences, Future Challenges*, written by one of the three authors of the present book and published by Cambridge University Press a decade ago. It continues to be widely used as a course textbook, despite the fact that a lot has changed in both the science of understanding climate-related migration and events occurring around the world. It's time for an update.

Nine of the ten hottest years recorded have occurred since that book was published in 2014. Most of the present book was written in 2023, which was the hottest year on record. That year there were devastating floods in Libya, a quarter million Canadians had to evacuate from wildfires twice the size of any previously known, the strongest and longest lasting cyclone ever recorded struck southeast Africa, and Lahaina – the former capital of Hawaii's kings and of tremendous importance to Hawaiian people still – was destroyed by a wildfire. The economic impacts of climate disasters are spiraling upward, with the human impacts being increasingly and disproportionately felt by disadvantaged and marginalized people around the world. The impacts of the COVID-19 pandemic continue to ripple through societies. Political turmoil, civil conflicts, and wars have emerged in Africa, the Middle East, and the former Soviet Union, and authoritarian parties and rulers are experiencing newfound popularity in high-income countries. Wealthy countries are building border walls and using military technologies to prevent asylum seekers from reaching their borders, and migrants are often vilified.

Despite these dark developments, there have also been many notable achievements, and progress is being made. The 2015 Paris Agreement outlines a pathway forward for countries to reduce their greenhouse gas emissions and help vulnerable countries build capacity to adapt to the impacts of a changing climate, and – notwithstanding what the skeptics say – a great many countries are working actively toward achieving its goals. In 2023, an agreement was reached to channel funds from wealthy nations with historically high greenhouse gas emissions to poorer nations, to help them recover from losses and damages suffered from the impacts

of climate change, including the displacement of people by weather-related disasters. Global "Compacts" were reached through the UN process that provide guidelines to countries on how to prepare for and manage in a humane way involuntary displacements caused by climate-related disasters. Countries in Africa and Latin America have built regional agreements to help one another deal with climate-related displacements. Powerful new computing technologies, methods, and data allow researchers to better identify how climate events affect migration and displacement and allow for increasingly more sophisticated projections and future scenarios to assist policymakers and decision-makers plan for people on the move in a rapidly changing climate. International human rights decisions are improving protections for people unable to return to areas they fled because of the impacts of climate change.

This book takes a deep dive into the connections between the earth's climate, the changes being forced upon it by human activity, and the implications these changes have for voluntary migration, involuntary displacement, and immobility (people being unable to move or not wanting to move). Using the latest findings from natural and social science, we describe the causal interactions that shape current climate-related migration, displacement, and immobility; project future changes in those patterns and how we might model them; summarize key policy and governance instruments available to us to manage the movements of people in a changing climate; and conclude with some thoughts on future research needs and opportunities.

A key departure point for this book is that migration is neither inherently good nor inherently bad. It is simply something that people have always done and will continue to do. It is not something we should fear; it is not something we should attempt to control at all costs. Migrants are people who are simply doing what they believe is best or necessary to maintain and (hopefully) improve their own well-being and the well-being of their family members and loved ones. There is nothing inherently problematic in any of this. The circumstances under which people migrate, under which migration occurs – *that* is what is important. Migration generates benefits for sending communities, receiving communities, and migrants themselves when people are able to make informed decisions, are able to move through legal channels, are able to enter the regular workforce, and enjoy the same social protections as preestablished residents of the places they move to. When people are forced from their homes without a choice, when the only options for moving are to sneak across borders at night or hire organized criminals to help them do so, when they are denied legal rights and social protections upon arrival, when the only jobs open to them are in the informal economy, and when they are separated from families, this benefits no one. And yet this is how a growing number of countries treat migrants. This must stop.

This book describes migrants and migration processes as being potential (but not necessary) outcomes of individual and household decisions of how to respond to climate risks within the context of the much wider social, cultural, economic, and political processes that shape everyday life in a given place at a given moment in time. Although we use the terms migration, displacement, and immobility throughout the book, they are not separate, distinct outcomes; decisions to migrate (or not) fall along a continuum of agency, from being purely voluntary to completely involuntary. In the face of a particular climate event, some people may move away temporarily and then return, others may leave and not return, others may not leave at all, and still others may move into the affected area from elsewhere. Some of these outcomes may be voluntary, others less so. The factors that influence migration are complex and context specific, and so are the outcomes.

The book is organized as follows. Chapter 1 starts with a brief overview of the longer history of how climate has affected human population distributions and migration, followed by a crash course on the science of climate change and the risks that emerge. It then reviews key concepts and theories that underpin how we understand adaptation to climate risks and how (and why) people move. The goal is to provide the reader with all the background concepts and terminology to begin deep dives into migration and displacement related to specific types of climate hazards, including extreme weather, cyclones (hurricanes, typhoons), and floods (Chapter 2); extreme heat, droughts, and wildfires (Chapter 3); and coastal hazards associated with rising sea levels (Chapter 4). In Chapter 5, we review techniques researchers use to model and predict climate–migration interactions, and in Chapter 6, we review policy options directly related to managing climate-related migration at global, regional, and national scales. We conclude the book with thoughts on key areas for future research (Chapter 7). We chose to end with a discussion of future directions in climate-related migration as a reminder that this field is continuously evolving. As researchers use new methodologies, collect new data, and elevate the voices of people who have previously been excluded, our understanding of the complexities of climate-related migration will improve. Some of these important future directions include consideration of the gendered dynamics of climate-related migration, inclusion of Indigenous knowledge and experience (and a related consideration of how climate-related migration interacts with cultural heritage), planning for and identifying critical thresholds in climate-related migration dynamics, and reflection on unforeseen outcomes and deep uncertainty about the future of climate–migration interactions and outcomes. We suspect this book will need to be updated 10 years from now to describe new advancements in our knowledge, and what we have yet to learn.

We conclude this preface with a short description of our approach to writing this book and our own backgrounds as researchers and scholars. This book was a collaborative effort by three authors who never all met in person at the same time. It was a product of many video calls, shared documents, virtual brainstorming sessions, and online "writing hacks" – a writing approach many scholars learned to use during pandemic lockdowns.

Kelsea Best is a professor of civil, environmental, and geodetic engineering and city and regional planning at the Ohio State University in Columbus, Ohio, United States. She has worked with interdisciplinary teams to research climate-related migration in coastal communities in Bangladesh using a wide range of methods, including machine learning, agent-based modeling, and mixed-methods approaches. Her research broadly focuses on understanding how climate change interacts with human societies and infrastructure, how people may adapt to climate change effects, and how climate adaptation measures can be designed and implemented in a just and equitable way. Her work is highly interdisciplinary and strives to connect methods, disciplines, and researchers from across geographies and fields.

Kayly Ober is a second-generation migrant based out of Washington, DC who has worked at the intersection of climate, migration, adaptation, and conflict issues for the last 15 years. She has worked in academia, advocacy, and multilateral organizations, which have analyzed and shaped the climate–migration–adaptation policy landscape. She has previously served as the Senior Program Officer for the Climate, Environment, and Conflict program at the United States Institute of Peace; Senior Advocate and Program Manager of the Climate Displacement Program at Refugees International; and a member of the Task Force on Displacement established by the Executive Committee of the Warsaw International Mechanism for Loss and Damage. She has also worked at the Asian Development Bank, the ODI Global, the Woodrow Wilson Center, and the World Bank, where she coauthored the flagship publication "Groundswell: Preparing for Internal Climate Migration." She is currently a senior advisor at the US Department of State and an adjunct professor at Georgetown University.

Robert McLeman is a professor of geography and environmental studies at Wilfrid Laurier University in Waterloo, Canada. He has been doing research on climate change and migration for two decades, using a variety of qualitative, quantitative, and geospatial methods, with a heavy emphasis on dryland and drought-prone regions, especially the North American Great Plains. He served as a coordinating lead author for the IPCC's Sixth Assessment Report, for the chapter that assessed the impacts of climate change on human health, well-being, migration, displacement, and conflict. Academia is his second career; from 1990 to 2002, he worked as a Canadian foreign service officer specializing in migration

and visa work at consulates and embassies in Belgrade, New Delhi, Hong Kong, Seattle, and Vienna.

We hope that you, the reader, find our work helpful and accessible, and that if it doesn't inspire you to pursue further research and scholarship in this field, that it at the very least helps you see climate and migration (and the future of it) in a different light.

Companion materials including resources for instructors teaching this book are available at www.MigrationInChangingClimate.com.

The views and opinions expressed in this book are those of the authors and not necessarily the views and opinions of the United States Government.

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Robert McLeman would like to thank the many scholars and students who have collaborated with him on climate-migration research over the years – far

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