MIDWEST CLIMATE SUMMIT

MCC Research Agenda
At the Educators' Community of Practice

Abigail Aderonmu-Omunu
International Center for Energy, Environment, and Sustainability
Washington University in St. Louis

Tuesday, March 14, 2023

#MidwestClimateCollaborative

What we'll talk about

- Background
- Why Research Agenda
- Knowledge Synthesis
- Research Agenda
- Climate Research in Education

Midwest Region

https://www.touropia.com/midwest-states-map/

MIDWEST CLIMATE COLLABORATIVE

MCC Projects

Connecting, amplifying, filling gaps, and building capacity

Midwest Climate Research Agenda

Bridging the gap between research & practice

Climate Ambassadors

Connecting the scientific community to decision-makers and building capacity for greater engagement

Educator Community of Practice

Connecting, sharing resources, and preparing future leaders

Climate Asset Map

Leveraging successes and sharing resources

Student Sustainability Conference

Bringing together undergraduate students across campuses to discuss and develop climate action

Tracking Climate Commitments

Supporting ambitious, science-informed mitigation and adaptation targets

MIDWEST CLIMATE COLLABORATIVE

Midwest Climate Collaborative: Research Agenda

Midwest-wide Climate Research Agenda

A multi-stage process of literature and data review, key stakeholder interviews and surveys, and community engagement that will identify and define immediate and long-term climate priorities for the Midwest. The Agenda aims to synthesize what is already known about climate impacts and solutions in the Midwest; to develop strategies that can inform and accelerate climate mitigation and

Acknowledging Georgia Climate Project

Environmental Management (2018) 62:190–209
https://doi.org/10.1007/s00267-018-1051-4

PROFILE

Climate research priorities for policy-makers, practitioners, and scientists in Georgia, USA

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Abstract
Climate change has far-reaching effects on human and ecological systems, requiring collaboration across sectors and disciplines to determine effective responses. To inform regional responses to climate change, decision-makers need credible and relevant information representing a wide swath of knowledge and perspectives. The southeastern U. S. State of Georgia is a valuable focal area for study because it contains multiple ecological zones that vary greatly in land use and economic activities, and it is vulnerable to diverse climate change impacts. We identified 40 important research questions that, if answered, could lay the groundwork for effective, science-based climate action in Georgia. Top research priorities were identified through a broad solicitation of candidate research questions (180 were received). A group of experts across sectors and disciplines gathered for a workshop to categorize, prioritize, and filter the candidate questions, identify missing topics, and rewrite questions. Participants then collectively chose the 40 most important questions. This cross-sectoral effort ensured the inclusion of a diversity of topics and questions (e.g., coastal hazards, agricultural production, ecosystem functioning, urban infrastructure, and human health) likely to be important to Georgia policy-makers, practitioners, and scientists. Several cross-cutting themes emerged, including the need for long-term data collection and consideration of at-risk Georgia citizens and communities. Workshop participants defined effective responses as those that take economic cost, environmental impacts, and social justice into consideration. Our research highlights the importance of collaborators across disciplines and sectors, and discussing challenges and opportunities that will require transdisciplinary solutions.

Keywords Adaptation · Climate change · Horizon scanning · Mitigation · Research priorities

Why a Research Agenda?

- Prioritize research needs
- Align research with needs of different stakeholders outside academia
- Targeted research have potential to inform policy

MIDWEST CLIMATE COLLABORATIVE

Increase in Research Agenda Projects

Contents lists available at ScienceDirect

Climate Services

journal homepage: www.elsevier.com/locate/cliser

Identifying research priorities to advance climate services

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ABSTRACT

Climate services involve the timely production, translation, and delivery of useful climate data, information, and knowledge for societal decision-making. They rely on a range of expertise and are underpinned by research in climate and related sciences, sectoral applications (e.g., agriculture, water, health, energy, disasters), and a number of social science fields, including political science, sociology, anthropology, and economics. Feedback and engagement between these research communities and the communities involved in developing and/or using climate services is thus critical, ensuring that climate services are built on the best available science and providing researchers with guidance regarding priority challenges in the development of climate services that should warrant their attention.

This paper reports the results of an international survey to gauge community perspective on research priorities for climate services, highlighting several areas in which respondents agree on the need for future work. The survey results indicate an overarching interest in research that can better connect climate information to users, particularly around the communication of climate information, the mapping of climate information needs, and the evaluation and prioritization of capacity building efforts. They also reveal significant interest in climate research to advance the skill of forecasts at subseasonal-to-seasonal scales – considered more broadly useful to decision makers than information at the end-of-century timescale – and to identify the drivers of extreme events. To support climate-related research, survey respondents underscore the need to continually develop and maintain the observational network.

In analyzing these results, the paper offers guidance to researchers and to other members of the climate services community that may find these priorities useful in directing their own work to address the challenges posed by climate variability and change.

Drakvik *et al. Environmental Health* (2022) 21:37
https://doi.org/10.1186/s12940-022-00848-w

Environmental Health

COMMENTARY Open Access

Priorities for research on environment, climate and health, a European perspective

Elina Drakvik[1,2], Manolis Kogevinas[3,4,5,6*], Åke Bergman[1], Anais Devouge[7], Robert Barouki[7] and on behalf of the HERA (Health and Environment Research Agenda) Consortium

Abstract

Climate change, urbanisation, chemical pollution and disruption of ecosystems, including biodiversity loss, affect our health and wellbeing. Research is crucial to be able to respond to the current and future challenges that are often complex and interconnected by nature. The HERA Agenda, summarised in this commentary, identifies six thematic research goals in the environment, climate and health fields. These include research to 1) reduce the effects of climate change and biodiversity loss on health and environment, 2) promote healthy lives in cities and communities, 3) eliminate harmful chemical exposures, 4) improve health impact assessment and implementation research, 5) develop infrastructures, technologies and human resources and 6) promote research on transformational change towards sustainability. Numerous specific recommendations for research topics, i.e., specific research goals, are presented under each major research goal. Several methods were used to define the priorities, including web-based surveys targeting researchers and stakeholder groups as well as a series of online and face-to-face workshops, involving hundreds of researchers and other stakeholders. The results call for an unprecedented effort to support a better understanding of the causes, interlinkages and impacts of environmental stressors on health and the environment. This will require breakdown of silos within policies, research, actors as well as in our institutional arrangements in order to enable more holistic approaches and solutions to emerge. The HERA project has developed a unique and exciting opportunity in Europe to consensuate priorities in research and strengthen research that has direct societal impact.

Keywords: Research agenda, Climate, Chemicals, Cities, Impact assessment, Infrastructures, Transformational change

Background

Climate change, urbanisation, chemical pollution and disruption of ecosystems, including biodiversity loss, impact our health and quality of life. Research is instrumental to be able to respond to the current and future environmental and health challenges that are so complex and interlinked by nature. The European Commission (EC), in line with policies of the European Union and the United Nations Sustainable Development Goals [1], launched a call for proposals to define priorities for research on environment, climate and health [2]. The Health and Environment Research Agenda (HERA) project, emerging from that call, was developed by a European consortium, and recently submitted its final report entitled "EU research agenda for the environment, climate & health, 2021–2030" [3], summarised in this commentary. The HERA Agenda highlights several key areas where further research is crucial for the next decade. This article provides a topical contribution to discussion of environmental health priorities and provides opportunities to reflect on future directions of research in this field, especially in the European context.

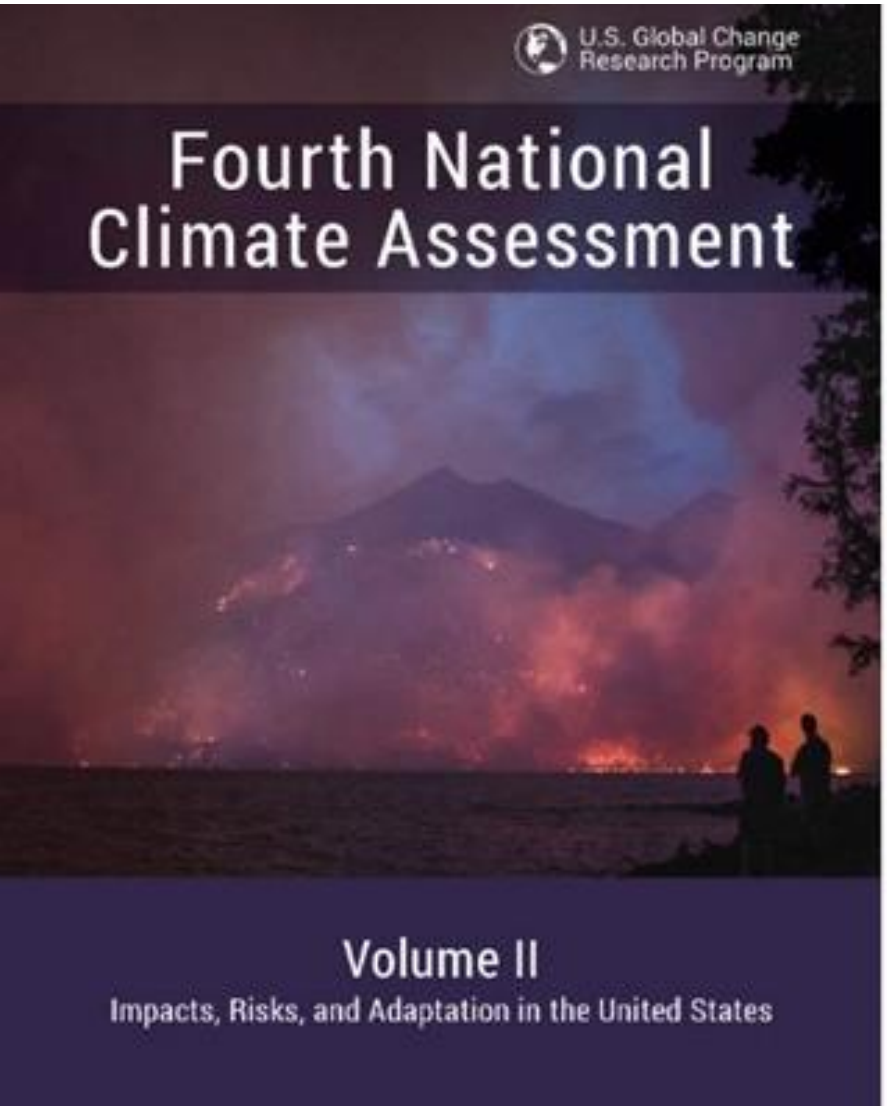
MIDWEST CLIMATE COLLABORATIVE

Midwest Climate Collaborative: Research Agenda

MCC Research Agenda: Objectives

- Develop a climate research agenda focused on strategies that can inform climate mitigation and adaptation in the Midwest in the next 10 years.
- Identify immediate and long-term climate research questions (~ 40-50 key questions)

Midwest Region: National Climate Assessment Report



Different or Complimentary

Climate Change Impacts in the United States

CHAPTER 18
MIDWEST

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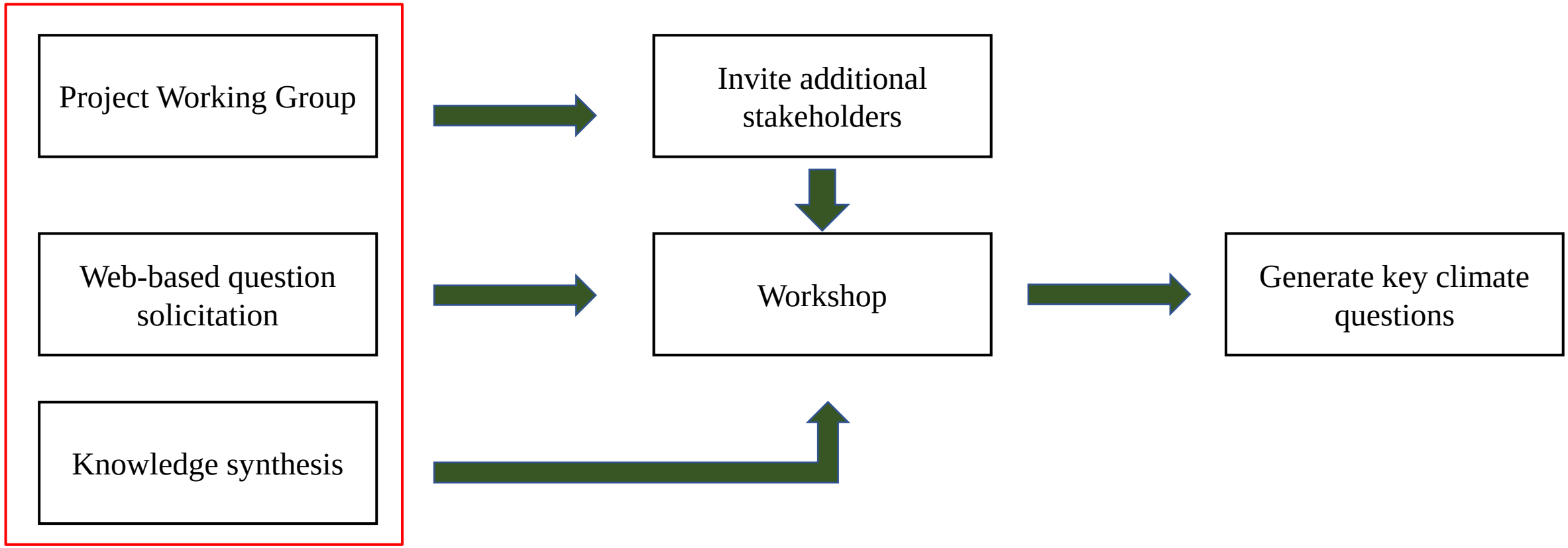
Recommended Citation for Chapter

Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson, 2014: Ch. 18: Midwest. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 418-440. doi:10.7930/J01J012N.

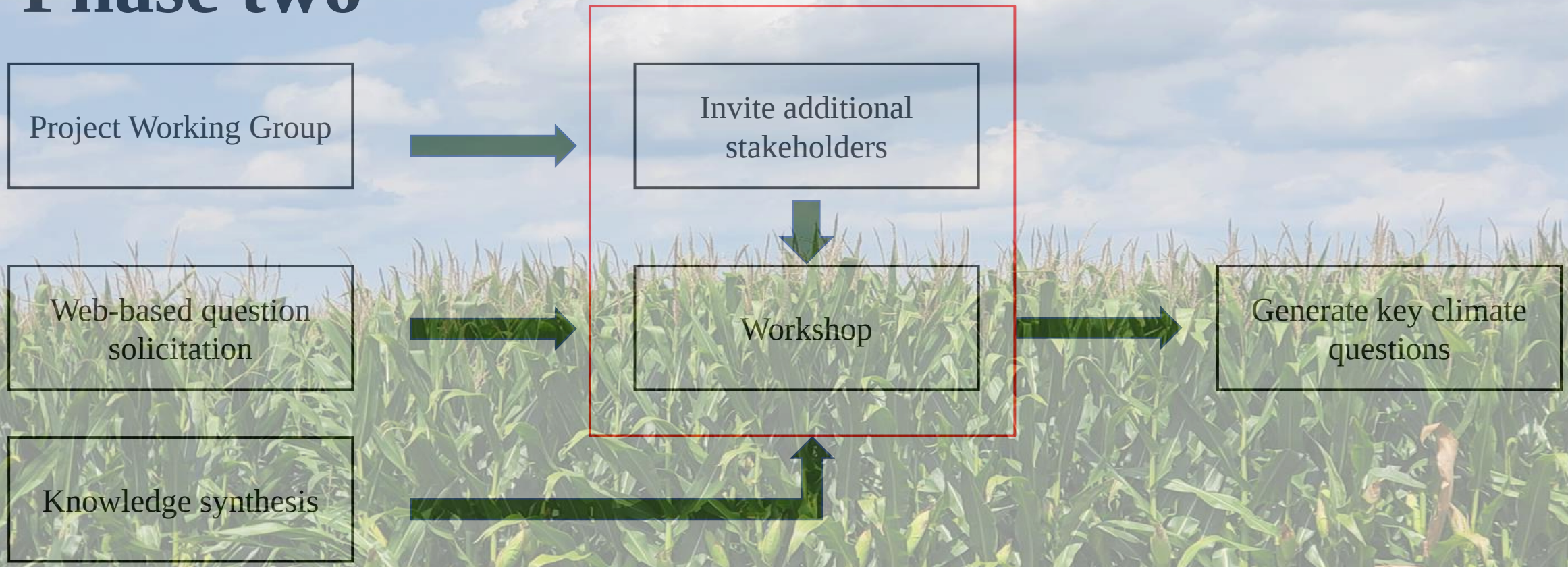
On the Web: http://nca2014.globalchange.gov/report/regions/midwest

INFORMATION DRAWN FROM THIS CHAPTER IS INCLUDED IN THE HIGHLIGHTS REPORT AND IS IDENTIFIED BY THIS ICON

Collaborative research process: **Phase one**



Collaborative research process: **Phase two**



Project Working Group:

- Circulate question solicitation portal
- Synthesize/filter web feedback
- Identify workshop participants
- Participate in workshop
- Synthesize & decide final research questions (~40 questions)
- Contribute to writing paper

Knowledge Synthesis

Databases

Medline, Scopus, Web of Science

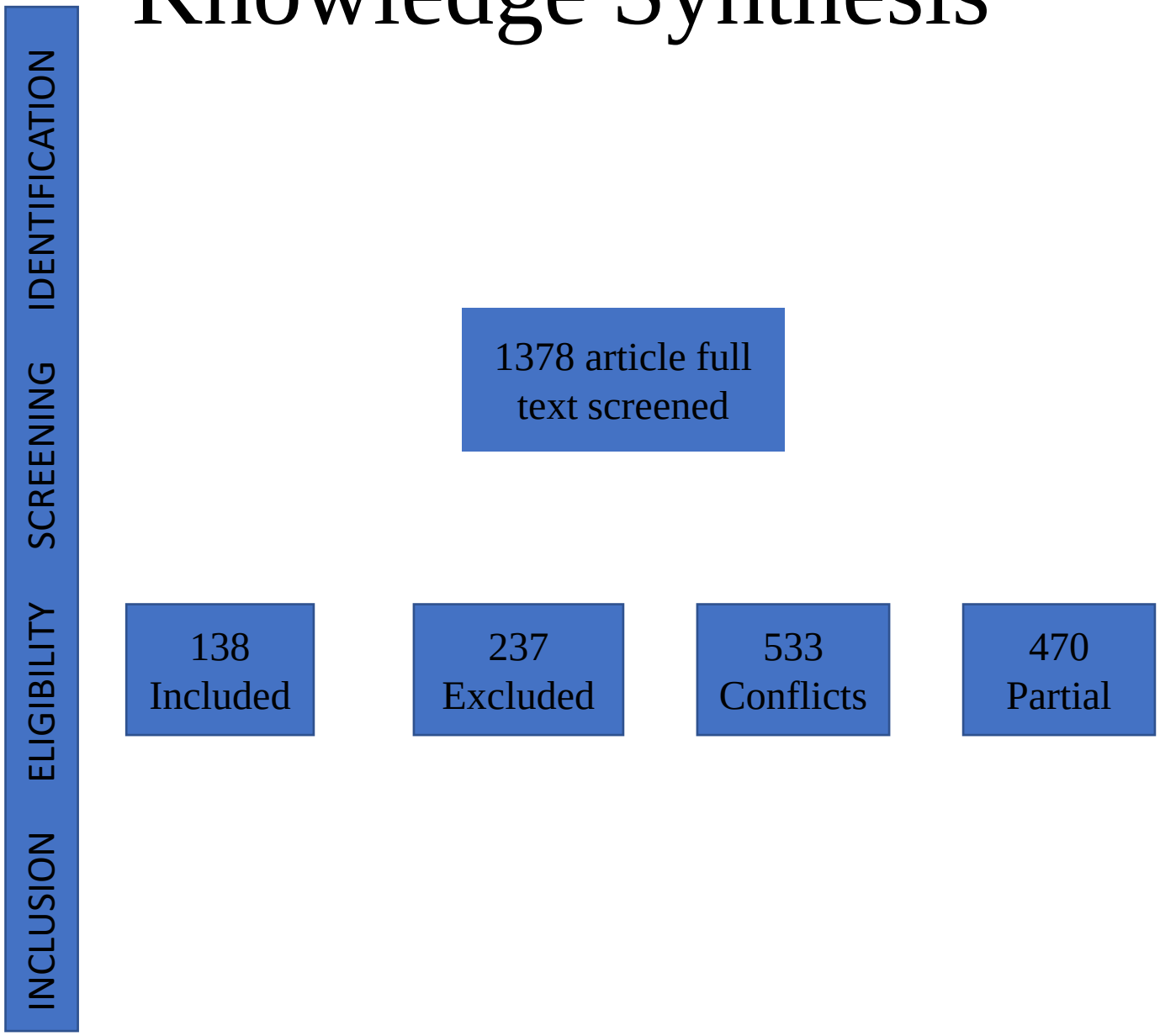
Search String

climate AND (change OR adaptation OR mitigation OR vulnerability OR resilience OR drought OR temperature OR rainfall OR flood) AND (Midwest OR Missouri OR “South Dakota” OR Wisconsin OR “North Dakota” OR Kansas OR Nebraska OR Illinois OR Iowa OR Minnesota OR Indiana OR Ohio OR Michigan)

Selection Criteria

Criteria	Decision
Predefined keywords exist as part of title, keyword, abstract or body of paper	Include
Study includes any words synonymous to predefined keywords	Include
Study is published in peer review journal	Include
Study is published in English	Include
Geographic scope of study includes any of the twelve states in the Midwest	Include
If study includes a combination of Midwest states and other US regions	Include
Study covers any of the following categories: Agriculture, biodiversity, infrastructure, ecosystem, transportation, human health, and community	Include
Study does not cover any of the following categories: Agriculture, biodiversity, infrastructure, ecosystem, transportation, human health, and community	Exclude
Study duplicated in search	Exclude
Study published before 2018	Exclude
Article is a systematic review	Exclude

Knowledge Synthesis



MEDLINE Complete

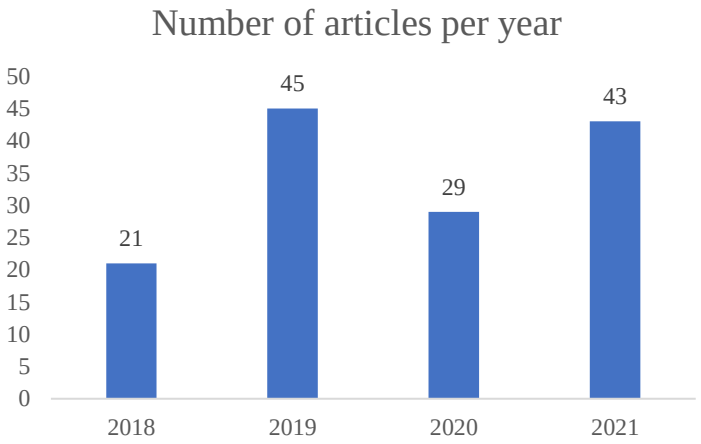
EBSCO Health

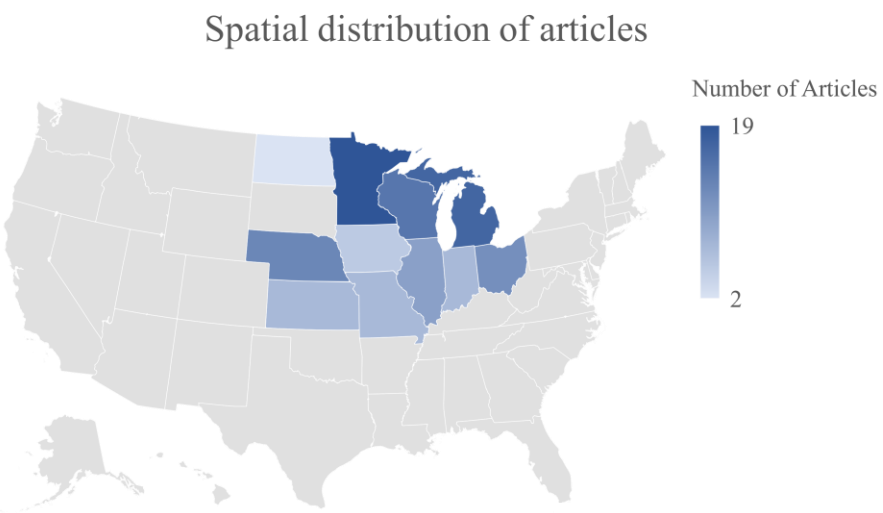
ELSEVIER Scopus

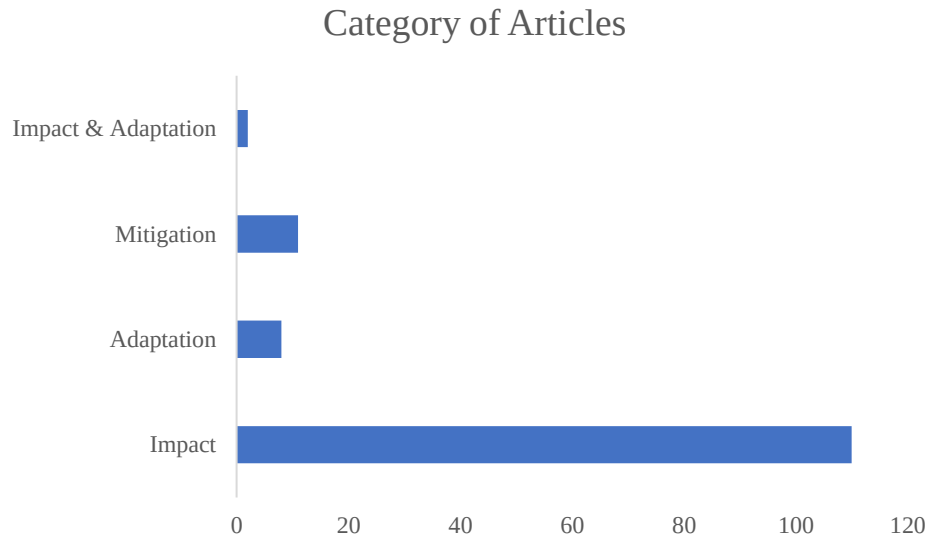
Clarivate Analytics

WEB OF SCIENCE™

Knowledge Synthesis







Some of the research topics include…

Knowledge Synthesis

Forest

- Trees
- Boreal tree species
- Bark Beetle
- Soil respiration
- Minnesota pine ecosystem
- Pine forests
- Forests

Transportation & Infrastructure

- Flood attenuation
- Energy
- Energy demand and supply
- Oil and gas wells
- Electric utility
- Electrical grid
- Heavy precipitation

Human Health

- Pre term births (PTB)
- Community-Based participatory research
- Epistaxis
- Asthma
- Chronic bronchitis risk in women
- Indiana communities
- Public health impacts
- Dysphoria
- Heat vulnerability
- Heat-related illness
- Patients & Physicians
- Human vulnerability
- Human health
- Heat vulnerability

Agriculture

- Nitrous oxide and leaching
- Hydrology and nutrient loss
- Pest management
- Atrazine & estrone
- Groundwater
- Nitrogen loads
- Phosphorus load
- Cover crops
- Switchgrass
- Crop loss
- Poultry
- Corn yield
- Maple Syrup
- Wheat production
- Vavilov Barley
- Ammonia
- Soil
- Water use,irrigation
- Soil carbon sequestration
- Viticulture
- Irrigation
- Maize
- Crop yields
- Soil carbon sequestration
- Soil temperature
- Atrazine
- Dairy production
- Wheat
- Lentil
- Nitrogen non-point source pollution

Biodiversity & Ecosystems

- Forested Riparian Buffers
- Nutrient loads in a Great Lakes watershed
- Forest Tent Caterpillar(FTC)
- Kirtland's Warbler
- Insectivorous tree swallow
- Watersheds
- Salamanders
- Drosophila species
- Soil fungal communities
- Turtles (Cheldra serpentina)
- Cooper's hawks (Accipiter cooperii)
- Wetland
- Common snapping turtle
- Freshwater fish
- Forested riparian buffers
- Ectomycorrhizal fungal community in temperate & boreal host species
- Native Prairie Soil Microbiome
- Ticks
- Emerald ash borer (Invasive beetle)
- Walleye
- Lake Erie
- Tree Swallow
- Northern bobwhite
- Emerald Ash Borer
- Prairie grass
- Boreal peatland plant
- Phytoplankton
- Boreal peatland
- Butterlflies
- Snail
- Non-native insect (larch casebearer)
- Sphagnum
- Watershed
- Open top chambers in taller plant communities
- Ticks
- Lake ice phenology
- Watershed
- Peat
- Epichloe and non-epichloids
- Butterfly
- Water resources
- Juglans spp. (Walnuts)
- Betula papyrifera (Paper Birch)

Web-based question solicitation

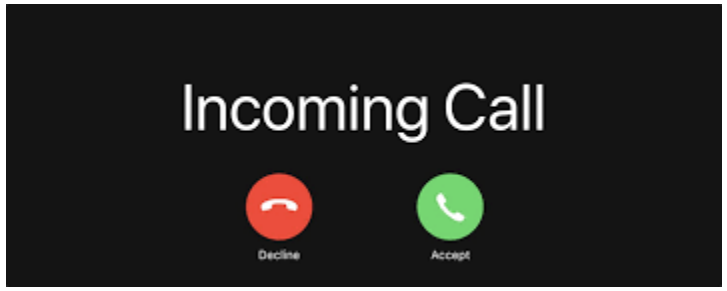
- What research question, if answered, would substantially advance our understanding of climate impacts and solutions across diverse sectors and populations in the US Midwest?

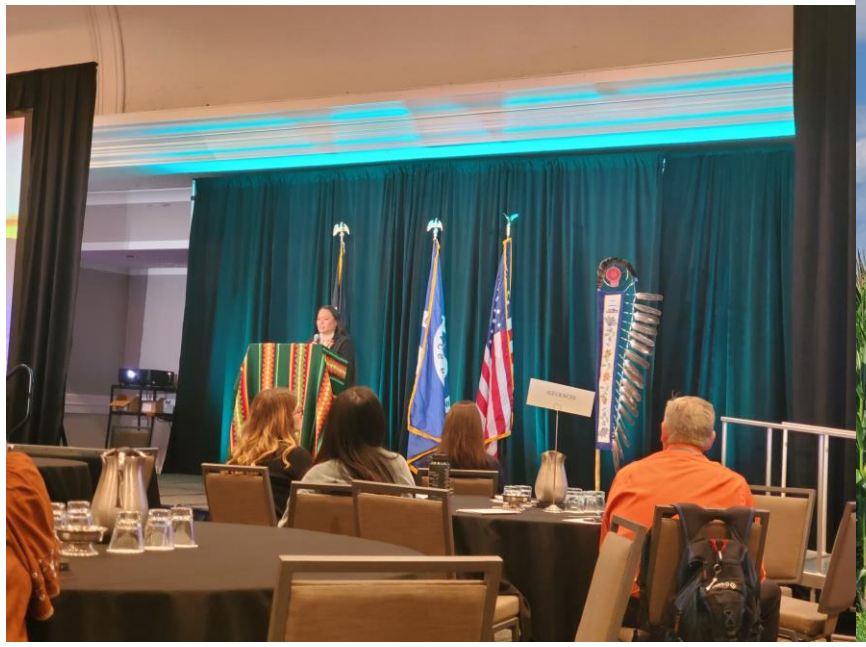
- What question, if answered, will help you do the climate action work you need to do?

Working Group

- **Arleigh Truesdale**, Northwestern University
- **Christopher Weatherly**, Washington University in St. Louis
- **Isabel Azpiroz**, Northwestern University
- **Jabbar Wesley**, Spire Energy
- **Karen Petersen**, The Nature Conservancy
- **Luz Rooney**, Climate Reality
- **Mike McMahon**, Northwestern University
- **Mikhaila Calice**, UW-Madison
- **Pati Vitt**, Lake County Forest Preserves
- **Paula Scholl**, Sargent & Lundy (Rtd)
- **Abigail Aderonmu-Omunu**, Washington University in St. Louis

Connecting for collaboration





Where did questions come from?

- Indiana
- Iowa
- Kansas
- Minnesota
- North Dakota
- Ohio
- South Dakota
- Virginia
- Washington State

- Education
- Local Government
- Non-Profit
- Private Sector
- State/Regional Government

- Advocacy
- Agriculture
- Built Environment
- Business Development
- Community
- Conservation
- Elected Official
- Energy
- Financial Services
- Healthcare
- Higher Ed
- K-12
- Transportation

Research Agenda in Numbers

Seven Topic Areas

Midwest Climate Research Agenda: A Project of the Midwest Climate Collaborative

The Midwest Climate Research Agenda aims to identify key climate research questions for the region (our definition of Midwest includes the following states: North Dakota, South Dakota, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, Wisconsin). We are asking practitioners, researchers and stakeholders to submit questions that address climate issues in your sector and/or geographic location. As you develop questions, think about:

***What research question, if answered, would substantially advance our understanding of climate impacts and solutions across diverse sectors and populations in the US Midwest?

***What question, if answered, will help you do the climate action work you need to do?

We are seeking questions that address a range of climate-related issues covering natural, applied, and social sciences. Our definition of "climate research" in this project is broad.

We are seeking questions that address a range of climate-related issues covering natural, applied, and social sciences. Our definition of "climate research" in this project is broad.

We encourage questions that meet the following criteria:

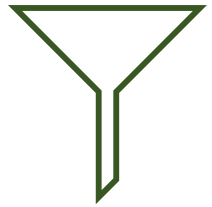
1) Relevant to climate change in the Midwest
2) Answerable through a realistic research design
3) Not answerable by simple 'yes', 'no', or 'it depends'
(Rudd et al., 2018; Sutherland et al., 2011)

In the following sections, you will have the opportunity to list multiple questions.You may list as many as twenty. Questions received will be reviewed by a cross-sectoral, multidisciplinary team to create a research agenda of 40-50 questions for the Midwest.

Please visit the MCC website for additional information and updates about the Midwest Climate Research Agenda : https://midwestclimatecollaborative.wustl.edu/projects/midwest-wide-climate-research-agenda/

Over 200 questions

11 Working Group Members



1 Virtual Workshop over 2 days

Climate Change & Education

International Journal of
Environmental Research and Public Health

MDPI

Article

Association of Summer Heat Waves and the Probability of Preterm Birth in Minnesota: An Exploration of the Intersection of Race and Education

M. Luke Smith [1,2,*] and Rachel R. Hardeman [1,3,4]

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check for updates

Abstract: Preterm birth (PTB) is common and has negative impacts on infant health. While some maternal risk factors have been identified, including age under 20 or over 40, substance abuse, low BMI, and racism, less is known about the impact of environmental exposures like high heat. We combined 154,157 records of live births occurring in Minnesota between 2009 and 2015 with hourly weather records collected from the Minneapolis–St. Paul airport. We tested if maternal heat wave exposure (a seven-day period with a mean daily high temp of 37 °C) immediately prior to birth leads to a higher risk of preterm birth. Additional covariates included maternal age, race/ethnicity, educational status, and residence in the seven-county Minneapolis–St. Paul metro area. Pregnant women exposed to a seven-day heat wave of 37 °C or higher experienced a higher relative risk of PTB compared to women who did not experience a heat wave (1.14 risk ratio (RR), 1.0–1.3 95% confidence interval (CI)). The result is robust to controls for a woman's age, race/ethnicity, educational attainment, place of residence, and year of the birth. Children born to Black women with college degrees who are exposed to heat waves experience a higher relative risk of PTB compared to White women with college degrees in a heat wave (2.97 RR, 1.5–6.1 95% CI). Summer heat waves are associated with higher risk of PTB in late-term pregnancies in Minnesota.

Keywords: maternal and child health; health equity; social determinants of health; climate change; heat waves; preterm birth; racism

Published in final edited form as:
Int J Public Health Res. 2019 August 28; 9(2): 1127–1134.

Climate change and health beliefs, knowledge, and educational needs among disaster providers

Sue Anne Bell, PhD, FNP-BC[1], Megan Czerwinski, PhD(c)[1], Jennifer Horowitz, MA[1], Theodore J. Iwashyna, MD, PhD[1], Mona Sarfaty, MD[2]

[1]University of Michigan

[2]George Mason University

Abstract

Introduction: Climate change has been called the greatest public health threat of our time. Increasing morbidity and mortality is expected to continue as climate-associated disasters become more prevalent. Disaster health professionals are on the front lines of addressing these health sequalae, making the need to assess their knowledge of climate change and health and their perceived need for a policy response critically important.

Objective: The purpose of this study is to examine the knowledge, opinions, and educational needs of disaster health providers surrounding climate change and health.

Methods: A web-based questionnaire assessing disaster health professionals' attitudes and knowledge on the health effects of climate change and associated policy recommendations was

Education & Curriculum

ARTICLE

Biochemistry and Molecular Biology Education | WILEY

Introducing climate change into the biochemistry and molecular biology curriculum

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Abstract

Our climate is changing due to anthropogenic emissions of greenhouse gases from the production and use of fossil fuels. Present atmospheric levels of CO_2 were last seen 3 million years ago, when planetary temperature sustained high Arctic camels. As scientists and educators, we should feel a professional responsibility to discuss major scientific issues like climate change, and its profound consequences for humanity, with students who look up to us for knowledge and leadership, and who will be most affected in the future. We offer simple to complex backgrounds and examples to enable and encourage biochemistry educators to routinely incorporate this most important topic into their classrooms.

KEYWORDS

Climate Change Education & Workforce Development

Climate Change and the Practice of Medicine: Essentials for Resident Education

Philipsborn, Rebecca Pass MD, MPA; Sheffield, Perry MD, MPH; White, Andrew MD; Osta, Amanda MD; Anderson, Marsha S. MD; Bernstein, Aaron MD, MPH

Abstract

Despite calls for including content on climate change and its effect on health in curricula across the spectrum of medical education, no widely used resource exists to guide residency training programs in this effort. This lack of resources poses challenges for training program leaders seeking to incorporate evidence-based climate and health content into their curricula. Climate change increases risks of heat-related illness, infections, asthma, mental health disorders, poor perinatal outcomes, adverse experiences from trauma and displacement, and other harms. More numerous and increasingly dangerous natural disasters caused by climate change impair delivery of care by disrupting supply chains and compromising power supplies. Graduating trainees face a knowledge gap in understanding, managing, and mitigating these many-faceted consequences of climate change, which—expected to intensify in coming decades—will influence both the health of their patients and the health care they deliver. In this article, the authors propose a framework of climate change and health educational content for residents, including how climate change (1) harms health, (2) necessitates adaptation in clinical practice, and (3) undermines health care delivery. The authors propose not only learning objectives linked to the Accreditation Council for Graduate Medical Education core competencies for resident education but also learning formats and assessment strategies in each content area. They also present opportunities for implementation of climate and health education in residency training programs. Including this content in residency education will better prepare doctors to deliver anticipatory guidance to at-risk patients, manage those experiencing climate-related

TEACHING AND LEARNING IN MEDICINE
2022, VOL. 34, NO. 3, 329–340
https://doi.org/10.1080/10401334.2021.1913417

Routledge
Taylor & Francis Group

OBSERVATIONS

An Examination of the Intersection of Climate Change, the Physician Specialty Workforce, and Graduate Medical Education in the U.S.

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ABSTRACT

Issue: As U.S. healthcare systems plan for future physician workforce needs, the systemic impacts of climate change, a worldwide environmental and health crisis, have not been factored in. The current focus on increasing the number of trained physicians and optimizing efficiencies in healthcare delivery may be insufficient. Graduate medical education (GME) priorities and training should be considered in order to prepare a climate-educated physician workforce. *Evidence:* We used a holistic lens to explore the available literature regarding the intersection of future physician workforce needs, GME program priorities, and resident education within the larger context of climate change. Our interinstitutional, transdisciplinary team brought perspectives from their own fields, including climate science, climate and health research, and medical education to provide recommendations for building a climate-educated physician workforce. *Implications:* Acknowledging and preparing for the effects of climate change on the physician workforce will require identification of workforce gaps, changes to GME program priorities, and education of trainees on the health and societal impacts of climate change. Alignment of GME training with workforce considerations and climate action and adaptation initiatives will be critical in ensuring the U.S. has a climate-educated physician workforce capable of addressing health and healthcare system challenges. This article offers a number of recommendations for physician workforce priorities, resident education, and system-level changes to better prepare for the health and health system impacts of climate change.

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