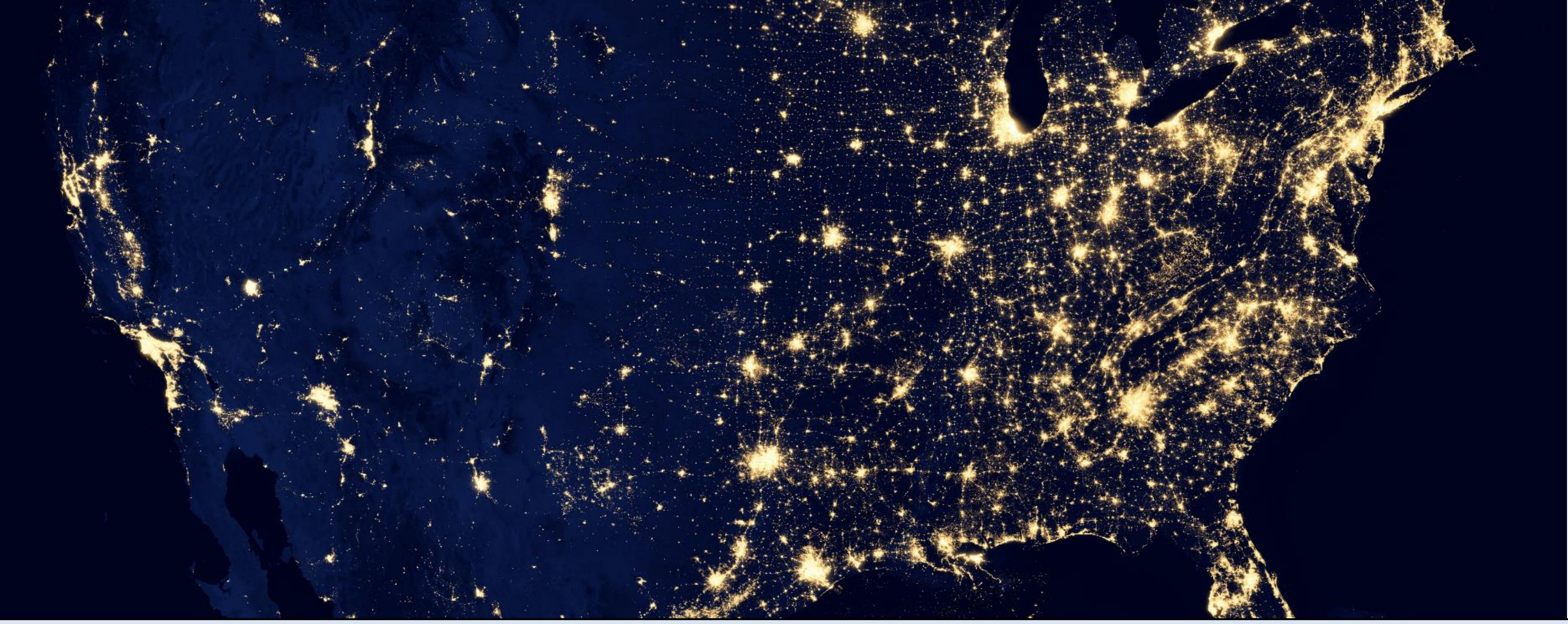
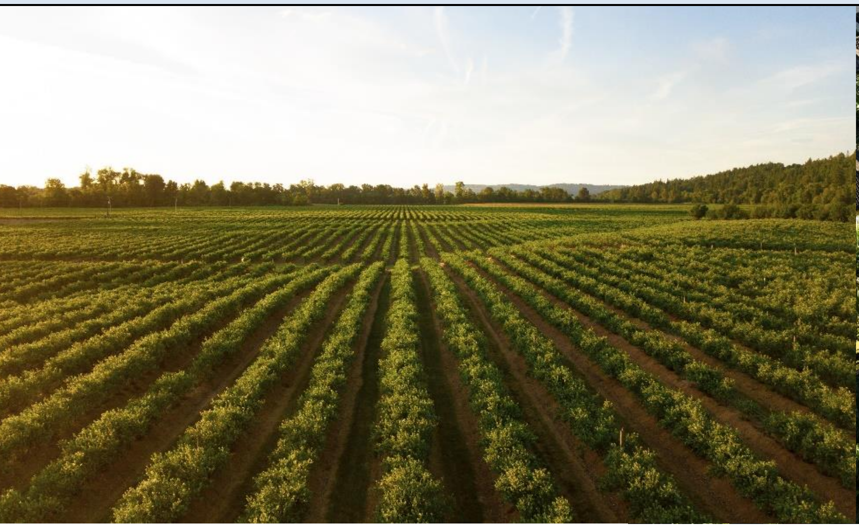
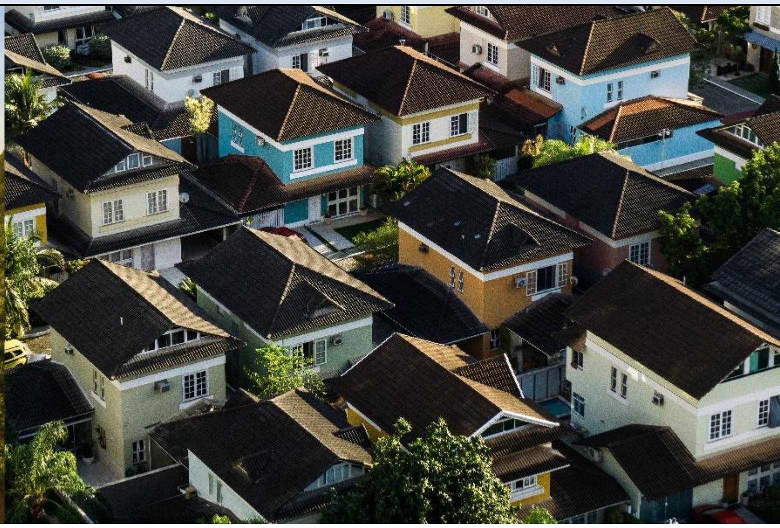


Global Environmental Change and Workforce Need





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Global Environmental Change and Workforce Need

Emma Tipton

Policy Program Study

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Table of Contents

Executive Summary

Global environmental change is increasingly at the forefront of national and international concern. As society seeks to understand and address the challenges related to global environmental change, the weather, water, and climate (WWC) enterprise will be an essential partner. This endeavor will influence the application of science, including the "translation" of science for various audiences and situations. Consequently, it will almost certainly require an expansion in the skills, personnel, knowledge, and training of the workforce. However, as the scope of global environmental change is broad and encompasses many sectors of society, the emerging needs within the workforce are accordingly complex and diverse.

This American Meteorological Society (AMS) Policy Program study is the third of a series of workshop-based studies to help provide the foundational understanding that the WWC enterprise needs to meet future workforce challenges in Earth system observations and science. We first focus on the developing "climate workforce" as a key component of society's response to global environmental change. While climate change is only one aspect of global environmental change, the application of climate knowledge is increasingly relevant throughout a large portion of the workforce in a variety of ways. As such, the term "climate workforce" is used broadly here to refer to numerous job positions that lie along a spectrum of familiarity with climate science.

Through conversations with professionals representing two fields that are likely to have an increasing need for climate observations, science, and translators—agriculture and urban planning—we identify seven key findings on the ways in which global environmental change is driving the workforce and how the enterprise as a whole might respond to these developments in order to most effectively advance WWC observations and science and benefit society.

Findings:

- While climate change is only one aspect of global environmental change, the application of climate knowledge is increasingly relevant throughout a large portion of the workforce in a variety of ways and so represents a key component of society's response to global environmental change.
- The climate workforce encompasses a wide range of roles and responsibilities; however, those involving a component of translating science for various audiences are likely the fastest-growing set of positions and would benefit the most from additional support from the broader WWC enterprise.
- Climate translation has the greatest impact when it is a multilateral and iterative process focusing on relevant impacts and solutions for a particular stakeholder group rather than explaining the science behind a certain projection. Serious consideration of environmental justice and meaningful community engagement is a necessity when obtaining, disseminating, and otherwise translating climate information.
- Organizations and individuals within the climate workforce will need to balance expertise in a few fields with strategic collaborations to fill gaps and maximize impact.

- There is a strong need to integrate datasets and methodologies, including those from a wide range of social sciences. Data management skills will therefore be essential, as will incentives to support interdisciplinary and transdisciplinary work.
- As the workforce expands, it is as crucial to establish mechanisms to support retention and resilience within the workforce as it is to promote specific skill sets.
- There are opportunities for training and collaboration within the workforce, such as a climate certification program, that may help ensure standards for climate knowledge and enhance the value of WWC observations and science.

Following the outcomes of the workshop discussions, we present a definition of the climate workforce that reflects how different groups may utilize or relate to climate knowledge. Positions may be termed as "knowledge-forward," "knowledge-extending," "knowledge-drawing," or "knowledge-embedded." However, these groupings should not be taken as concrete or hierarchical and may perhaps best be seen as a shorthand for the ways in which positions with different levels of climate knowledge all contribute to the larger and ever-evolving ecosystem of the workforce.

Continuing to examine and refine the roles of and interactions among the academic, public, and private sectors is crucial for identifying emerging workforce needs and options for addressing them across all sectors of the enterprise. Through its studies and related activities, AMS will continue to build and enhance frameworks for workforce success based on three foundational components: 1) expanding interest in weather, water, and climate issues broadly throughout the public, 2) empowering broader contributions from professions within and outside of the enterprise, and 3) helping to ensure that people have the skills needed to make the contributions they can and wish to make.

1. Introduction

1.1 Background

Global environmental change is increasingly at the forefront of national and international issues and discussion. As society seeks to understand and address the challenges related to global environmental change, the weather, water, and climate (WWC) enterprise will be an essential partner. This endeavor will influence the application of science, including the “translation” of science for various audiences and situations. Consequently, it will almost certainly require an expansion in the skills, personnel, knowledge, and training of the workforce. However, as the scope of global environmental change is broad and encompasses many sectors of society, the emerging needs within the workforce are accordingly complex and diverse.

This American Meteorological Society (AMS) Policy Program study is the third of a series of workshop-based studies to help provide the foundational understanding that the enterprise needs to meet future workforce challenges in Earth system observations and science. The previous two studies (see Higgins and Miller 2020; Tipton et al. 2021) identified opportunities and needs for advancement based on technological and societal drivers. Here, we explore the various ways in which global environmental change is driving the workforce, as well as how the enterprise as a whole might respond to these developments in order to most effectively advance WWC observations and science and benefit society. Climate and climate change is used as a lens for this exploration. While climate change is only one aspect of global environmental change, the application of climate knowledge is increasingly relevant throughout a large portion of the workforce in a variety of ways and so represents a key component of society’s response to global environmental change.

This study synthesizes input from across the WWC enterprise along with additional analysis. To gather community expertise, a series of one-on-one and small group conversations with professionals from the public, private, and academic sectors were conducted throughout early 2022. Additionally, two virtual workshop discussions were held in May 2022. These workshops centered on two specific sectors—agriculture and urban planning—likely to have an increased need for climate observations, science, and translators in the future.

1.2 The climate workforce

As part of preliminary scoping efforts for the study, the Policy Program team developed a working definition of the “climate workforce” that considers four groups along a spectrum of familiarity with climate science (Figure 1). While there may be some overlap, jobs within each group generally necessitate different degrees of climate science knowledge.

Under this definition, Group 1 consists of positions with a primary focus on climate science (e.g., climate scientists in academic or research & development positions). Group 4, on the other end of the spectrum, consists of positions requiring minimal knowledge of climate science (e.g., installers of rooftop solar panels). This study focuses on the two intermediary groups: Group 2 (termed “climate + x”) and Group 3 (“x + climate”), where “x” is a field outside of climate, such as finance, transportation, or health. While their training or expertise may or may not be in climate, those employed within each of these two groups must navigate climate information in some form, often with a translation component of needing to make this information usable or valuable to various stakeholders. These definitions were presented to the two workshop groups in order to prompt discussion. Iterating on the preliminary definitions following the workshop discussions produced a revised set of definitions, shown in Section 3.1.

What is the climate workforce?

Group 1: Climate scientists or similar roles with a large research focus. They likely hold a masters or doctoral degree and are often employed in academia, national labs, or in R&D for the private sector.

Group 2: "Climate + x." Positions that require significant climate knowledge and the translation of that knowledge for another group. One example might be "climate risk analytics" positions in the private sector.

Group 3: "x + Climate." Employees with primary expertise in a field outside of climate but who are also significant users of climate information. This group would likely benefit from climate science training or improved communication with the WWC community. Examples may include local government sustainability officers or planners, civil or environmental engineers, or public health officials.

Group 4: Green or climate jobs that require minimal knowledge of climate science. One example might be an installer for rooftop solar panels.

Figure 1: Preliminary definitions of the climate workforce

1.3 Focus areas

Agriculture and urban planning were chosen as focus areas for this study, representing fields that are likely to have an increasing need for climate observations, science, and translators (i.e., the "x" in the "climate + x" or "x + climate" groupings). For example, the agricultural sector uses Earth system observations and science to determine what crops to plant, which varieties to use, when to plant and harvest, and when to apply fertilizers, pesticides, and water (Higgins 2021). A changing climate might influence crop suitability, soil conditions, the spread of pests, the timing of growing seasons, and the frequency and severity of weather events, as well as working conditions for outdoor workers. Meanwhile, as the number of people living in urban areas continues to rise, the planning community aims to understand and address concerns that affect the lives and livelihoods of urban populations, such as stormwater management, heat islands, infrastructure, and public health. Agriculture and urban planning each encompass a wide variety of communities, risks, resources, and capacities; together, they provide a valuable snapshot of the range of issues posed or accelerated by global environmental change as well as the ways in which the climate workforce might intersect with or help address these issues.

2. Global Environmental Change and Workforce Needs

2.1 Characteristics of the current climate workforce

Discussions with those working within climate and climate-adjacent spaces reveal a highly active sector with numerous potential opportunities for the current and future workforce. While not all may identify specifically as “climate translators,” the application of climate knowledge is increasingly a part of many professionals’ portfolios. Notably, many of these professionals report a high level of fluidity within their positions, their roles necessitating communicating at times with research scientists, officials in specific sectors (e.g., transportation or supply chain management), government agencies, and the public. Others see more distance between themselves and WWC science; for example, they may not personally interact with any climate scientists. However, by working with colleagues who are familiar with the current literature [e.g., Intergovernmental Panel on Climate Change (IPCC) reports], they in turn are able to convey pertinent knowledge to stakeholder groups. It is also common for those in such positions to reach out to consultants, advisory committees, or other external contractors for specific climate knowledge as needed.

While increasing awareness of—and funding for—climate and environmental issues has resulted in many new climate-related positions across a range of fields and industries, discussion participants also expressed concerns regarding ongoing attrition of the existing workforce. This attrition may be due to a number of factors such as aging, burnout, stressors from the COVID-19 pandemic, or other retention issues (e.g., harassment); nonetheless, it has contributed to a loss of institutional knowledge and relationships as well as a lack of diverse perspectives within the workforce. As the climate workforce expands, enabling workplace retention, resilience, and capacity-building is crucial to ensuring that WWC is an attractive field in which to work and collaborate—this in turn will help ensure that society can fully benefit from advances in climate observations and science.

2.2 Skills, competencies, and workforce development

Discussion participants emphasized that the manner in which climate science is packaged and interpreted is crucial to its use. As such, translation efforts by the climate workforce have the potential to be highly effective by focusing on relevant impacts and solutions for a particular stakeholder group rather than explaining the exact science behind a certain projection. An agroecologist, for example, might work with farmers in a region to determine how smoke from an ongoing wildfire could impact crop yields while a planner might seek to visually depict hazard mitigation scenarios so that local stakeholders can see various manifestations of policy.

Although backgrounds and roles may vary, certain skills and competencies have been commonly cited as particularly significant for success in translation activities and within the climate workforce more broadly. Consequently, training and development opportunities within the workforce will likely need to expand or shift in order to support these skills.

2.2.1 Data management

The ability to manage data (e.g., finding, quality checking, presenting, storing, and otherwise working with a variety of data) will almost certainly be essential for the future climate workforce. Sources of WWC data are increasingly abundant and diverse, aided by rapid advances in technology. Navigating the resulting morass of data to derive meaningful information is therefore critical to ensuring that information reaches the organizations and communities that need it.

The necessity of data management and other technological skills within the geosciences has been discussed in previous Policy Program studies (e.g., Tipton et al. 2021). A common refrain throughout these discussions is that geoscience academic programs have on the whole been slow to incorporate data science training into their curricula. Potential solutions include collaboration with the private sector to develop modules for hands-on learning[1] as well as expanding support for short courses and massive open online courses (MOOCs) on key topics. However, the climate workforce is also likely to draw on data skills from outside of the geosciences. Data scientists, for instance, are increasingly entering into the climate space, bringing new techniques and expertise such as developing digital twins of the Earth system or enhancing artificial intelligence and machine learning (AI/ML) capabilities. Dedicated efforts will likely be necessary to facilitate collaboration and effective problem-solving between these data scientists and geoscience domain scientists.

2.2.2 Interdisciplinarity

A key component of expanding capability with data and meeting climate translation needs most effectively is the integration of datasets and methodologies outside the conventional realm of the geosciences. The climate workforce seems well-positioned to accomplish this: the breadth of the workforce is considerable and many with backgrounds in disciplines not strictly associated with WWC science are increasingly encountering and learning climate information and applying it to problems within their field. However, it has been noted that there is generally a great deal of siloing among the various disciplines that contribute to work involving climate and in particular, a division between the social sciences and the geosciences that must be bridged.

At present, social science is often applied to the geosciences primarily through the lens of economics (e.g., evaluating the costs or benefits of various actions). While economics research is one component of determining the impacts of global environmental change and potential responses, social science is in reality a grouping of many different fields with their own important roles to play. For instance, disciplines such as geography, history, and journalism provide vital context for climate and other crucial challenges and are necessary to help effectively communicate these issues to a range of audiences.

As such, it is increasingly critical to join geophysical and biophysical data with a variety of social science data (including, but not limited to, economics) in order to build a robust understanding

[1] See, for example, the work of the AMS Mind the Gap ad hoc committee

of past, present, or future scenarios. This in turn will require support at all levels for interdisciplinary (i.e., blending disciplines) and transdisciplinary (i.e., developing new methodologies that are informed but not constrained by existing disciplines) teams and projects, including funding opportunities for convergence research and developing incentives to reward collaboration. The federal government may help to lead by example; for instance, by promoting cooperation between agencies. One example of a federal-led project coupling physical and social datasets is an effort between the NOAA Pacific Northwest Regional Integrated Sciences and Assessments (RISA)[2] team and USDA to examine crop insurance along with yield loss and climate impacts.

As the climate workforce increasingly spans multiple disciplines, data may serve as a common currency to enable communication across fields. However, in addition to emphasizing the importance of data management skills, this will almost certainly necessitate a level of standardization that does not exist at present. Additional work will be needed in order to establish methodologies for integrating a variety of disciplines in order to address issues related to global environmental change.

2.2.3 Environmental justice and community engagement

The impacts of global environment change often reveal the disparities in power dynamics among groups and exacerbate inequity. As such, serious consideration of environmental justice is a necessity for the workforce when obtaining, disseminating, and otherwise translating climate information. Effecting true progress will require a range of skills from the workforce as well as support from the broader WWC community.

Translation is ideally a multilateral and iterative process, with the knowledge of stakeholders transmitted to scientists just as the knowledge of scientists is transmitted to stakeholders. For example, farmers are the best source of how the impacts of climate change are manifesting on their lands; this type of specialized knowledge needs to be translated to science and policy in order to devise and implement solutions effectively. However, pathways of scientific and government engagement with communities have a history of being largely one-sided or extractive. Even when requirements for community engagement exist, they may be treated as merely a box to be checked, with a lack of capacity—or sometimes a lack of interest—preventing more significant effort. This in turn leads to an erosion of trust and increases the challenge of bridging the gap between climate observations and science and their application.

It is clear that members of the future climate workforce will need to be prepared to engage with communities and ensure that past inequities are not carried forward. There is no single set of criteria for what meaningful community engagement looks like; indeed, what is or is not meaningful is highly dependent on community-specific needs and values. However, the path to meaningful engagement almost certainly begins with coproduction, co-learning, shared leadership, and valuing the priorities and expertise of communities. Moreover, engagement must be a continuous process rather than a single instance. Valuing community engagement,

[2] Known as Climate Adaptation Partnerships (CAP) as of October 2022.

equity, and justice as an essential framework for climate work is part of a skillset centered in systems thinking and systems modeling—a skillset increasingly in demand within WWC (Tipton et al 2021).

There is also a need to think critically about data, including how and where data are measured. The increasing use of open data [e.g., the NASA Transform to Open Science (TOPS) initiative] may serve as a way to increase transparency and encourage perspectives across diverse disciplines and communities. However, it is key for the WWC community to remember the sovereignty of Indigenous knowledge, which has historically been discounted within the Western scientific community. A push toward open data may leave historically marginalized communities at risk of having their knowledge, resources, or data unethically acquired or distributed. As such, it is necessary for the WWC community to co-develop a framework for making data open but also proprietary when needed.

2.3 Training/education mechanisms and professional development strategies

Adequately preparing both students and professionals to effectively apply climate knowledge within their fields will almost certainly require a retooling of education and training mechanisms. Much of the work done by the climate workforce does not require a doctoral degree in climate science, as there is not a high need for original research questions or new toolkits; rather, science needs to be understood, packaged, and communicated across diverse audiences. This creates a need to employ interdisciplinary methodologies and systems thinking, as well as to be familiar with data management and principles of community engagement and environmental justice. Adaptability will certainly be an essential skill as well. However, it is also not realistic to expect climate translators to know everything or to wear too many hats. Organizations and individuals within the climate workforce will need to balance expertise in a few fields with collaborations to fill gaps and maximize impact while not reinventing the proverbial wheel.

New interdisciplinary modules and courses are increasingly emerging across academic programs; however, there is a tough balance between over-burdening students and making their training worthwhile. Exposing students to fieldwork that continues over multiple semesters or years may be one effective method to develop understanding of complex and systemic issues beyond the classroom and to build relationships with local communities or other users of climate information. The inclusion of topics such as redlining may provide context for accounting for the legacies of historical inequities within climate work while resources such as the Environmental Protection Agency's Environmental Justice Screening and Mapping Tool[3] may help users gain familiarity with combining environmental and socioeconomic datasets. Moreover, in an age of misinformation, it is crucial for students and those translating climate science for other groups to be able to identify false conclusions about climate change that appear in the media or come from politicians or the lay public.

[3] See https://www.epa.gov/ejscreen.

It is also important for learning and professional development to continue during early career stages and beyond. Short courses have been cited as a potentially powerful tool for lifelong learning, allowing participants to refresh skills or pick up new ones. Additional opportunities for formal recognition of skills relating to climate science or translation may include a climate certification program offered by AMS or another professional scientific society. Such a program, developed in collaboration with those from across the spectrum of the climate workforce, would allow individuals and organizations, particularly those that work with consultants or other contractors, to operate with confidence that their employees or colleagues possess accurate understanding of climate science. Additionally, development and regular updates to the training would provide AMS and its members an effective opportunity to engage with and learn from other communities.

3. Conclusions

3.1 Revisiting the structure of the climate workforce

This study initially framed the "climate workforce" as a set of four groups along a spectrum of familiarity with climate knowledge. The four groups resonated with professionals representing two fields that are likely to have an increasing need for climate observations, science, and translators. It was emphasized that climate is increasingly a part of many professionals' portfolios, regardless of sector or level of specific climate knowledge.

A revised definition of the climate workforce (Figure 2) renames each group to better reflect the ways that climate knowledge may relate to their work. Positions with a primary focus on advancing climate science through research are termed "knowledge-forward" positions; positions that inherently stem from or are otherwise tied to these advances in knowledge but require minimal knowledge of climate science to execute are termed "knowledge-embedded". The two intermediary groups, formerly "climate + x" and "x + climate", are here termed "knowledge-extending" positions and "knowledge-drawing" positions, respectively. Those in knowledge-extending positions may utilize their existing climate knowledge to encompass the needs of other fields while those in knowledge-drawing positions may pull from reputable sources of climate knowledge to supplement their expertise in a different area.

However, it must be noted that these groupings should not be taken as concrete or hierarchical, as there is a great deal of fluidity and interfacing between groups. Moreover, workshop participants noted that the critical role of the social sciences may not necessarily be captured in any arrangement of groups. The framing may perhaps be seen as a shorthand for the ways in which positions with different levels of climate knowledge all contribute to the larger and ever-evolving ecosystem of the workforce.

What is the climate workforce?

Knowledge-forward positions: Positions with a focus on the advancement of climate science, generally research-based, and often requiring an advanced degree.

Knowledge-extending positions: Positions that require significant climate knowledge and the translation of climate knowledge to meet the needs of other disciplines or groups.

Knowledge-drawing positions: Positions primarily in a field outside of climate but also rely significantly on climate information to inform aspects of the role.

Knowledge-embedded positions: Positions that are inherently linked to climate or climate-related issues but themselves require minimal knowledge of climate science.

Figure 2: Revised definitions of the climate workforce

3.2 Key takeaways and areas of further study

The weather, water, and climate community will be essential in navigating the various physical and societal transformations that global environmental change will bring. What we refer to in this study as the "climate workforce" extends beyond the bounds of the traditional demarcation of WWC workforce, with many lessons to be learned regarding skills that will almost certainly be broadly applicable in addressing the wide array of needs stemming from global environmental change. Through examining various aspects of the climate workforce, we identify seven key findings on the intersection of global environmental change and workforce need.

Findings:

- While climate change is only one aspect of global environmental change, the application of climate knowledge is increasingly relevant throughout a large portion of the workforce in a variety of ways and so represents a key component of society's response to global environmental change.
- The climate workforce encompasses a wide range of roles and responsibilities; however, those involving a component of translating science for various audiences are likely the fastest-growing set of positions and would benefit the most from additional support from the broader WWC enterprise.
- Climate translation has the greatest impact when it is a multilateral and iterative process focusing on relevant impacts and solutions for a particular stakeholder group rather than explaining the science behind a certain projection. Serious consideration of environmental justice and meaningful community engagement is a necessity when obtaining, disseminating, and otherwise translating climate information.
- Organizations and individuals within the climate workforce will need to balance expertise in a few fields with strategic collaborations to fill gaps and maximize impact.
- There is a strong need to integrate datasets and methodologies, including those from a wide range of social sciences. Data management skills will therefore be essential, as will incentives to support interdisciplinary and transdisciplinary work.
- As the workforce expands, it is as crucial to establish mechanisms to support retention and resilience within the workforce as it is to promote specific skill sets.
- There are opportunities for training and collaboration within the workforce, such as a climate certification program, that may help ensure standards for climate knowledge and enhance the value of WWC observations and science.

As the workforce expands and develops, its ability to advance and effectively make use of WWC observations and science is only partially dependent upon the skillsets of its members. Although outside the scope of this study, it is also important to consider what supporting infrastructure is needed to help the workforce, and the broader society, address the challenges of global environmental change. This includes both physical and cyberinfrastructure, from satellites and other sensing instruments to exascale and cloud computing needs. An additional element for consideration is the emerging question of open science and how it might change the landscapes of data collection and dissemination as it enters into federal research requirements.

Continuing to examine and refine the roles of and interactions among the academic, public, and private sectors is crucial for identifying emerging workforce needs and options for addressing them across all sectors of the enterprise. Through its studies and related activities, AMS will continue to build and enhance frameworks for workforce success based on three foundational components: 1) expanding interest in weather, water, and climate issues broadly throughout the public, 2) empowering broader contributions from professions within and outside of the enterprise, and 3) helping to ensure that people have the skills needed to make the contributions they can and wish to make.

References

Higgins, P. A. T., 2021: Societal benefits in weather, water, and climate: Understanding, communication, and enhancement. American Meteorological Society Policy Program, 39 pp., https://www.ametsoc.org/ams/assets/File/policy/Societal_Benefits_in_WWC_final.pdf.

Miller, A. and P. A. T. Higgins, 2020: New minds for new science: The forecast for work in the weather, water, and climate enterprise. American Meteorological Society Policy Program, 32 pp., https://www.ametsoc.org/ams/assets/File/AMS%20Workforce%20Study%202020.pdf

Tipton, E., L. White, and A. Miller, 2021: Who will make sense of all the data? Assessing the impacts of technology on the weather, water, and climate workforce. American Meteorological Society Policy Program, 33 pp., https://www.ametsoc.org/ams/assets/File/policy/Technology_Impacts_on_Workforce2021.pdf.

Appendix

List of professionals who contributed to the study, in alphabetical order. The organizations listed represent primary employers at the time of the interview/presentation.

Michele Barbato, UC Davis
Philip Berke, University of North Carolina
Christian Braneon, NASA
Amy Clement, University of Miami
Brad Coleman, the Climate Corporation
Nick Deffley, City of Savannah
Maude Dinan, USDA Climate Hub Southwest
Kris Ebi, University of Washington
Erin Garnaas-Holmes, DC DOEE
Stephen Goyer, DC Office of Planning
Jenn Hatch, DC DOEE
Jeanne Merrill, California Climate and Agriculture Network
Aaron Piña, NASA
Dawn Smith, City of Calgary
Gavin Smith, North Carolina State University
Kelly Smith, National Drought Mitigation Center
Paul Stoy, University of Wisconsin-Madison
Missy Stults, City of Ann Arbor
Mingfang Ting, Columbia University
Rebekah Webber, California Certified Organic Farmers
Stacy Wright, Atkins Global
Ariela Zycherman, NOAA

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