

Higher education institutions can accelerate societal climate action

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Institutions of higher education (IHEs) have great collective capacity to address major societal challenges. This was apparent during the COVID-19 pandemic, as academic institutions in the United States and across the globe quickly mobilized to protect their students and staff, help develop and administer vaccines and diagnostic tests, and provide trusted information to caregivers, the public and government decision-makers. The strains that Earth's rapidly changing climate places on the economy, the environment, and society call for an even greater exercise of this capacity (Leal Filho et al. 2023, Lippel et al. 2024).

Such calls are not new. In 2006, the American College and University Presidents' Climate Commitment (ACUPCC) encouraged IHEs to "model ways to minimize global warming emissions" and "provid[e] the knowledge and the educated graduates to achieve climate neutrality." Nearly 20 years later, many IHEs are broadly engaged in deepening climate knowledge and preparing students to develop and implement climate solutions. Academic researchers are developing innovative low-carbon technologies and improved methods to build climate resilience. Many of the 284 signatories to the ACUPCC are decarbonizing their campuses and participating in the dramatic, market-driven transformation of global energy systems. IHEs across the nation are working with partners in the public, private, and social sectors to disseminate climate knowledge and solutions.

But the escalating scale and pace of the climate challenge, with extreme heat, floods, droughts, and fires battering campuses and communities, call for a more robust and better coordinated response.

Time to act at scale

The magnitude and urgency of climate change are immense. Neither the public sector nor the private sector alone can deliver solutions for all climate-impacted communities. As educators,

innovators, and bridge-builders, IHEs can help orchestrate a cross-sectoral effort to address the challenge. The time has come for IHEs to make the climate challenge a central priority and to step forward as leaders in climate action. A broader, better coordinated effort to leverage IHEs' capacities could accelerate climate action across society.

IHEs have the capacity to educate millions of green infrastructure workers, adaptation and resilience planners, and climate information communicators. Their research, engagement, and innovation capabilities are well-tuned for developing climate solutions, analyzing their social impacts and building acceptance for innovative technologies. Their records in public service and deep community relationships qualify them as trusted sources of climate information. With renewed institutional commitment, improved resources, and committed partners, IHEs can accelerate climate action locally and nationally.

Current constraints on the open discussion of climate change in some parts of the United States do not reduce the urgency of climate action or limit the catalytic potential of IHEs. IHEs are locally rooted institutions, skilled in engaging with their own communities to build effective partnerships. Using shared language and recognizing common values such as safety and prosperity, they can help municipalities and states assess the impacts of climate change, protect against the manifest risks of increased extreme weather events, and participate in the clean energy transition.

Three roles for higher education in addressing climate change

US land-grant universities pioneered the link of community needs to academic knowledge and research (Kopp 2021). Born during the 1860s with a focus on agriculture and industrial development, the land-grant model matured with the late nineteenth

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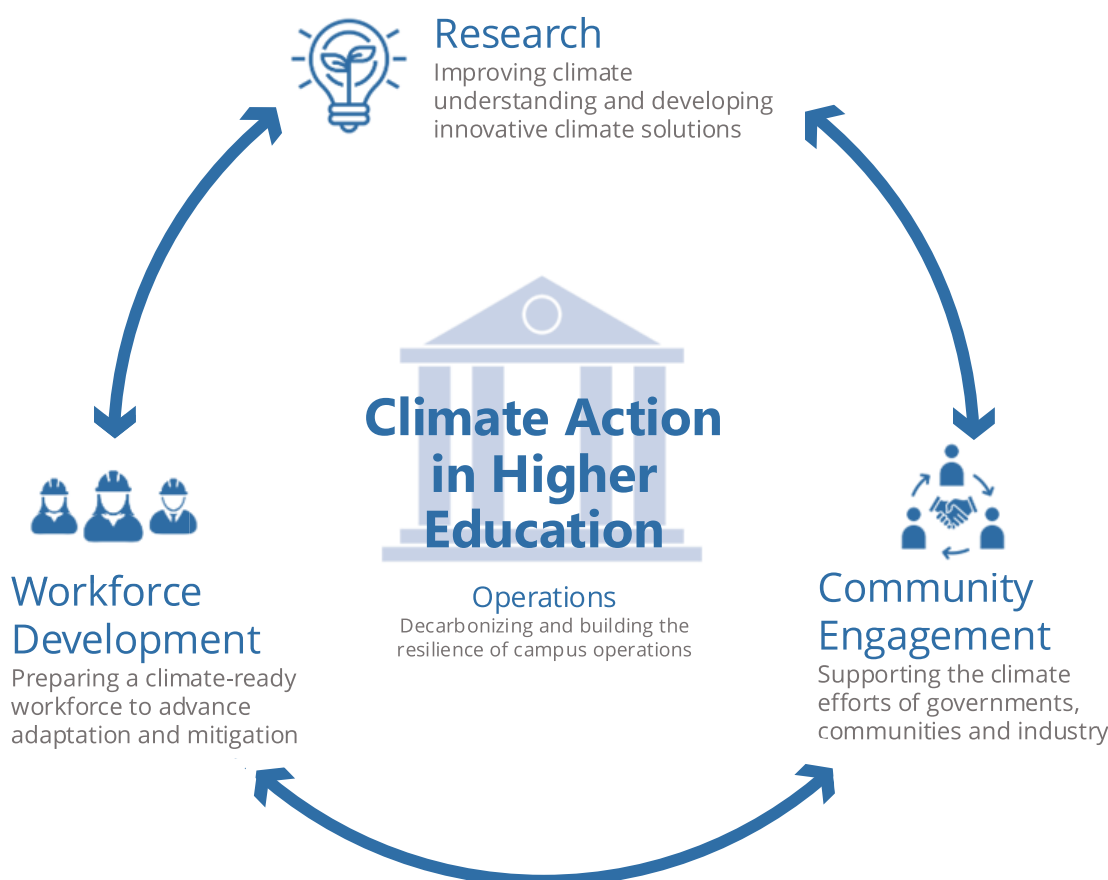


Figure 1. Higher education's roles in addressing the climate challenge.

century addition of the agricultural experiment stations and the early twentieth century addition of the Agricultural Cooperative Extension Service. The resulting tripod of accessible education, use-inspired research, and community engagement is reflected in three key roles IHEs play in advancing societal climate action (figure 1).

First, IHEs ready the climate adaptation and mitigation workforce while preparing all graduates for the realities of a shifting climate

Across educational levels, a variety of ongoing efforts are addressing the great need for climate-ready workers.

Two-year IHEs are building associate degree and certified training programs around resilient and climate-friendly technologies. Their innovative programs for electricians; heating, ventilation, and air conditioning technicians; building inspectors; and auto mechanics can prepare much of the workforce needed to replace retiring workers as the public sector invests in infrastructure modernization. (table 1a; Kane 2024, Wicks-Lim and Pollin 2024).

At the baccalaureate and advanced degree level, IHEs are revising their curricula to match the skills of graduating engineers and scientists with the needs of the green workforce. They are educating boundary-spanning workers who can bridge science, technology, and policy. And they are providing their graduates with practical tools for working in interdisciplinary teams, communicating with government officials and private interest holders, and

engaging with community members (table 1b; Ferraro et al. 2020, Rozance et al. 2020).

IHEs also have innovative offerings outside of degree tracks such as AmeriCorps programs employing college graduates in resilience work, fellowships placing scientists and engineers in state climate policy roles, and microcredential options for climate-relevant upskilling (table 1c).

But the scale of the climate challenge demands more. Emerging efforts to integrate climate concepts across higher education curricula demonstrate how IHEs can support climate literacy across disciplines and career paths. In every sector, workers must understand how their decisions can mitigate climate change and increase preparedness and resilience. (table 1d).

Second, university-led research improves climate understanding and develops climate solutions

Climate solutions should be built on a deep understanding of the Earth system and the complex feedback mechanisms coupling its physical, chemical, biological, and social components. New technologies and strategies for adaptation, resilience, and mitigation must emerge from accurate measurements and models of how and where the climate is changing and be validated through prototyping and testing, just as medical advances emerge from detailed studies of the human body and are validated through laboratory and then clinical trials. As leaders in Earth systems research and the invention of clean technologies, universities are following this paradigm to stimulate the development,

Table 1. Illustrative examples of innovative IHE programs that accelerate societal climate action.

Activity	Institution	Program
a) Two-year college workforce development	Atlantic Cape Community College Olive-Harvey College Santa Fe Community College	Wind Training Center Rivian Technical Trades Program Energy Smart Academy
b) Boundary-spanning graduate training	Columbia University Rutgers University-New Brunswick University of Washington	Columbia Climate School Coastal Climate Risk and Resilience (C2R2) Graduate Certificate Northwest Climate Adaptation Science Center Research Fellowship Program
c) Nondegree programs	Rutgers University-New Brunswick University of California, Berkeley	Eagleton Science and Politics Fellowship—Climate Action Track Grizzly Corps
d) Undergraduate curricular requirements	University of California, San Diego	Jane Teranes Climate Change Education Requirement
e) Climate services and community science	Northern Arizona University Rutgers University-New Brunswick Texas Southern University and five other HBCUs University of Colorado University of Connecticut University of Minnesota University of Washington	Institute for Tribal Environmental Professionals New Jersey Climate Change Resource Center HBCU-CBO Gulf Coast Equity Consortium Western Water Assessment Connecticut Institute for Resilience and Climate Adaptation Climate Adaptation Partnership Climate Impacts Group
f) Private-sector engagement	Massachusetts Institute of Technology University of Chicago	MIT Climate and Sustainability Consortium Energy Transition Network

demonstration, and deployment of scalable and economically viable climate solutions.

Third, IHEs are publicly engaged anchor institutions

Public and private IHEs serve their communities and society at large through teaching and research. They are hubs in their local or regional economies, working with local government, civic organizations, and industry. They educate regional students, co-produce innovations responding to public needs, and support science-based community decision-making.

Large land-grant and public universities host many important climate services programs (table 1e), with university-based climate knowledge brokers, analogous to agents in the Cooperative Extension System, playing essential roles in developing and delivering services, coproducing research, and integrating community engagement into institutional climate action. Beyond the land-grant institutions, many other IHEs also use strong local ties to engage with their communities on adaptation and mitigation. For example, the HBCU-CBO Gulf Coast Equity Consortium links historically Black colleges and universities with community-based organizations to engage residents in participatory research that advances disaster preparedness, climate resilience planning, and related topics. Tribal colleges and universities are underresourced but uniquely positioned to support the climate resilience efforts of tribal nations and inform the use of Indigenous knowledge in climate action (Fillmore et al. 2018).

The private sector is an essential part of American communities, and IHEs' private sector interactions contribute to the development and deployment of decarbonization and resilience solutions across virtually all sectors of the US economy. Like

community engagement, private sector engagement can help identify challenges, coproduce solutions, translate research into real-world impact, and develop both the current and future workforce (table 1f).

Across all three roles, IHE campuses can serve as microcosms for testing climate action

Campuses resemble small to mid-size municipalities. IHEs manage buildings, energy infrastructure, and transportation systems, as well as procurement and waste operations. But unlike cities and towns, IHEs have centralized ownership and management structures that simplify decarbonization and resilience efforts. But they still face significant challenges. To date, every IHE claiming carbon neutrality relies on off-campus carbon offsets and renewable energy credits to balance direct emissions from campus operations (Barron et al. 2021). Modernizing campus infrastructure and operations to completely eliminate greenhouse gas emissions will likely require cross-sector partnering to leverage public and private resources.

By linking their education programs, research labs, and engagement activities to campus decarbonization and adaptation efforts, IHEs can serve as living laboratories for climate action, supporting experiential learning, helping innovations move beyond laboratory scale, and demonstrating climate solutions to the surrounding community (Verhoef and Bossert 2019, De Chalendar et al. 2024).

Realizing higher education's full potential

We propose several strategies for more fully activating the higher education sector as national leaders in responding to climate change.

Support engaged scholarship on a platform of effective, respectful, and sustained community relationships

Community- and publicly engaged scholarship, which is critical to leveraging IHE expertise to advance decarbonization and adaptation, must be built on a platform of effective, respectful, long-term working relationships. Sustaining such relationships requires rewarding faculty and staff who embed engagement in their research, teaching, and service. Otherwise laudable efforts to promote community-engaged scholarship have often been limited by the lack of appropriate career support. Faculty tenure and promotion policies need to accommodate the time needed to build relationships, and well-defined career pathways must be available for non-tenure-track faculty and other staff members participating in this work (Lubchenco 1998, Keeler and Locke 2022).

In the land-grant model, community relationships curated by dedicated cooperative extension staff are part of core university infrastructure. In contrast, climate extension staff are typically in precarious soft-money positions. Although programs like the National Oceanic and Atmospheric Administration's Climate Adaptation Partnership and the US Geological Survey's Climate Adaptation Science Centers have helped position IHEs as go-to sources of information for addressing climate risks (e.g., table 1), their funding is not stable. IHEs and their funding partners should work to improve retention of climate extension staff and increase opportunities for students and early-career researchers to contribute to community-engaged research.

Deepen and expand cross-sectoral partnerships

IHEs should work creatively with partners in the public, private and social sectors to achieve common climate objectives. As IHE's climate-aware students graduate, they can become ambassadors to companies and communities. Public agencies could appoint IHE climate liaisons to coordinate opportunities for mitigation and disaster preparedness. Municipal and industry partners could expand the living lab model, speeding commercialization and adoption of climate technology while supporting the local economy.

IHEs and their extension staff can help ensure that cross-sectoral partnerships authentically meet the needs of all parties by following transparent principles and employing tactics like centering community partners as investigators, avoiding competition for funding with community partners, making research outputs readily accessible, and tackling bureaucratic barriers (Kopp 2021, Baptista et al. 2024, Lippel et al. 2024).

Build a robust IHE climate action network

Effective climate action requires greater integration within IHEs, across IHEs, and with external partners. An integrated approach within an institution can make more effective use of intellectual and financial resources while providing richer learning experiences for students. Synergies can be found among campus sustainability, climate workforce development, climate research, and climate services programs.

Existing IHE networking organizations play important roles in each of these areas. But none takes the comprehensive whole-system approach—including policy engagement—needed to meet the climate challenge.

IHEs can strengthen internal and external connections to speed their dissemination of effective climate actions. They can share high-impact practices with institutions facing similar challenges.

They can develop collective messages for engagement with policymakers in government and industry. They can use their external connections to raise awareness of climate solutions in municipalities, industries, and businesses.

Time to act is now

IHEs are ready, willing, and able to implement the strategies proposed above. In partnership with local communities and private sectors partners, IHEs can collectively build the future-ready workforce, conduct community-engaged scholarship, and serve as test beds for local, regional, national, and global climate solutions.

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