



# Rising to the Challenge, Together

## A Review and Critical Assessment of the State of the US Climate Adaptation Field

A REPORT PREPARED FOR  
THE KRESGE FOUNDATION

December 2017

BY  
Susanne C. Moser  
Joyce Coffee  
Aleka Seville

## Contents

<b>Abbreviations</b> .....	<b>3</b>
<b>Acknowledgements</b> .....	<b>4</b>
<b>Executive Summary</b> .....	<b>6</b>
The Challenge .....	7
The Response .....	7
The Report .....	8
The Vision—And How We Can Achieve It .....	9
Conclusion: We Can and Must Rise to the Challenge—Together .....	13
<b>1. Introduction</b> .....	<b>14</b>
1.1 The Climate Challenge Before Us .....	15
1.2 Overview and Approach of This Study .....	17
1.3 Key Audiences, Intent, and Overview of the Report .....	20
<b>2. The Role and Power of a Professional Field</b> .....	<b>22</b>
2.1 Defining a Field .....	23
2.2 The 4Ps of a Field .....	23
2.3 The Relationship Between Movements and Fields .....	25
2.4 The Power of a Mature Field .....	26
<b>3. US Resilience Building and Climate Adaptation in the First Two Decades of the 21st Century: Key Findings</b> .....	<b>29</b>
3.1 Perceived State of the Adaptation Field .....	30
3.2 Field Component: Purpose .....	31
3.3 Field Component: People .....	35
3.4 Field Component: Practice .....	38
3.5 Field Component: Pillars .....	45
<b>4. Meeting the Needs of the Adaptation Field: From Road Blocks to Road Markers</b> .....	<b>48</b>
4.1 A Unifying Vision .....	50
4.2 Purpose .....	51
4.3 Pillars .....	53
4.4 Practice .....	56
4.5 People .....	62
<b>5. Rising to the Challenge, Together: A Critical Assessment, Recommendations, and Call to Action</b> .....	<b>65</b>
5.1 Critical Assessment .....	66
5.2 Approach to Prioritization .....	72
5.3 Toward a Mature Adaptation Field: Recommendations .....	73
5.4 Measuring Progress Toward a Mature Field .....	80
5.5 Clarion Call to Action .....	80
<b>Endnotes</b> .....	<b>83</b>

## Abbreviations

<b>4Ps</b>	The four components of a field: purpose, people, practice and pillars
<b>100RC</b>	One Hundred Resilient Cities
<b>AB</b>	Assembly Bill (California)
<b>ACCO</b>	Association of Climate Change Officers
<b>ASAP</b>	American Society of Adaptation Professionals
<b>C40</b>	Network of (initially) 40 mega-cities committed to addressing climate change through mitigation and adaptation
<b>CRO</b>	Chief Resilience Officer
<b>CSCs</b>	Climate Science Centers (US Geological Survey/Department of Interior Program)
<b>DOE</b>	Department of Energy
<b>DOI</b>	Department of the Interior
<b>EPA</b>	Environmental Protection Agency
<b>FEMA</b>	Federal Emergency Management Agency
<b>G20</b>	Group of Twenty (an international forum for the governments and central bank governors from 20 major economies)
<b>HUD</b>	Department of Housing and Urban Development
<b>ICLEI</b>	International Council for Local Environmental Initiatives (typically used with its tagline, Local Governments for Sustainability)
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>ISO</b>	International Standards Organization
<b>LCCs</b>	Landscape Conservation Cooperatives (Department of Interior Initiative)
<b>NAACP</b>	National Association for the Advancement of Colored People
<b>NAF</b>	National Adaptation Forum
<b>NCA</b>	National Climate Assessment
<b>NIST</b>	National Institute of Science and Technology
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>RISA</b>	Regional Integrated Sciences and Assessment (NOAA Program)
<b>SB</b>	Senate Bill (California)
<b>SDGs</b>	Sustainable Development Goals
<b>UCS</b>	Union of Concerned Scientists
<b>US</b>	United States (of America)
<b>USDA</b>	US Department of Agriculture
<b>USDN</b>	Urban Sustainability Directors Network

## Acknowledgements

It has been a privilege to work on this study. The three of us had the honor—and challenge—of generating, absorbing, and integrating a huge amount of information about The Kresge Foundation’s investment in climate adaptation and resilience building as well as the state of the US climate adaptation field. Over time, we started thinking of what we were doing as a matter of “touching the elephant”—after the old Indian story of the blind men palpably exploring different parts of a strange animal, and everyone getting a different impression of what it might be. A considerable amount of discussion and adjudication was required to put together trunk, tail, tummy, and tusks into a sensible whole. We feel humbled and fortunate to have had the opportunity to learn so much more about this vibrant area of work, one we thought we already knew well.

That we have discovered an “elephant” at all is largely due to the help we received along the way. It began in the most basic way, with the financial support from The Kresge Foundation that enabled this study. But what was far more instrumental and enriching was the intellectual support of Lois DeBacker and Dr. Chera Reid at the Foundation, along with the rest of the Environment Program’s staff: Dr. Jalonnie White-Newsome, Jessica E. Boehland, Shamar Bibbins and Jill Johnson. Most importantly, Lois’s and Chera’s attention to detail and thoughtful engagement every step of the way, coupled with their deep respect for our independent thinking and interpretations, have enabled, supported, and strengthened this project, and we are deeply grateful.

At the heart of the study are the 87 interviewees and survey participants, who gave most generously of their time to answer our many questions—frankly, carefully, and elegantly. They helped us learn so much about the work Kresge has funded over the past seven years, and also enabled us to place it in the larger context of resilience-building efforts underway elsewhere. This study—and even more the real-world change to which each of the interviewees is contributing—would simply not exist without these dedicated, passionate individuals. Many of them, along with dozens of individuals not previously involved in the study, joined us at the National Adaptation Forum 2017 to discuss preliminary findings and explore bold ways forward. We thank them—each and all—for their thoughtfulness, creativity, and commitment to “rising to the challenge.”

Another big thank you goes to our research assistants—Alejandra Calzada Vázquez Vela at Four Twenty Seven and Dr. Carol Berzonsky with Susanne Moser Research and Consulting—for their detailed and extensive review and coding of the grantee materials, as well as to Sara O’Connell at Four Twenty Seven for her help with the survey deployment. Various staff at IntegReview were exceedingly helpful in moving our study protocol efficiently and successfully through the Institutional Review Board process to ensure that we followed proper human-subjects research guidelines. Our deep appreciation also goes to Dr. Anne Waple, Laurie Mazur, and Sharis Simonian for help in editing this report. That the final product and related deliverables look as compelling as they do is due to the creative design and sharp

eye of Jamie Carson and Kevin Fitzgerald at Carson+Co Global. Hugh McDiarmid Jr., The Kresge Foundation's Communications Officer, and Alejandro L. Herrera, the Foundation's graphic designer, also helped at critical moments to present this study in effective ways.

We are furthermore grateful for the input, critical reflection, and synthetic feedback that we received from the six individuals who comprised the Advisory Group of this study. The Kresge Foundation wisely thought it important to have a diverse set of eyes provide input at key times in the design, meaning-making, and concluding stages of this project. The contributions during a half-day meeting at The Kresge Foundation and during the final review stages of the report were particularly helpful. Dr. Melissa Finucane (RAND and East-West Center), Garrett Fitzgerald (Urban Sustainability Directors Network), Beth Gibbons (American Society of Adaptation Professionals and Institute for Sustainable Communities), Taj James (Movement Strategy Center), Mariella Puerto (Barr Foundation), and Brian Swett (Arup) provided just that diversity of perspective and experience to help us grow confident that the elephant that we found is not, in fact, a giraffe.

With all these individuals' support—and after our own deep grappling with the data and their meaning and implications—we have little doubt that what we have been touching is indeed a real, and big, and wondrous animal. But in as heterogenous a field as climate adaptation across a country as large and varied as the United States, and involving such a diversity of communities,

people, politics, and climate risks, we could not touch all parts of the elephant, and thus are certain that there are gaps and perspectives not reflected here. In part, this is due to the particular focus and intent of our study; in part, it reflects inevitable time and research constraints; and, in part, it mirrors the particular positions, privileges, and backgrounds we brought to this investigation. So maybe this elephant has more legs to stand on than we discovered; maybe it is more bushy-tailed than we concluded.

These limits of our vision notwithstanding, we know for sure that we have been changed as a result of the study and what we learned through it and from each other. Our commitment and hope to advance equitable resilience building in American cities and beyond has only grown. And so, we wish that the results presented here do the same for our readers. We hope that they adequately mirror the state of adaptation in our country, that our critical assessment provokes spirited conversation and, ultimately, that our findings and recommendations unleash our collective determination to dig in even deeper and begin, or continue, the difficult but great work of transformation needed to successfully meet the challenges that await us. Let's join together.

**Joyce Coffee**

President  
Climate Resilience Consulting

**Susanne C. Moser**

President  
Susanne Moser Research and Consulting

**Aleka Seville**

Director of Community Adaptation  
Four Twenty Seven, Inc.

# Executive Summary

## The Challenge

Midway through the second decade of the 21st century, American society—and the world—face stark environmental, economic, security, health, and political challenges. Climate change is widely acknowledged as a crucial—maybe even existential—threat to humans, other species, and the natural systems on which all life depends. And the climate crisis is accompanied by other urgent imperatives: the need to preserve a habitable planet while ensuring equal opportunity for all. Yet today, there is a vast gap between the scope of these challenges and our nation’s efforts to address them.

The challenges of climate adaptation and resilience building are now an everyday reality for decision makers across the country. As climate impacts accelerate and population grows in vulnerable areas, disasters are more frequent and devastating. Supercharged storms (like Hurricanes Sandy, Harvey, Irma, and Maria), catastrophic wildfires, and deadly heatwaves affect growing numbers of Americans—in rural areas, small towns, and large cities. Over the past five years, Americans experienced at least 10 major disasters per year, each generating more than \$1 billion in damages—double the average number of such events

**It is time to accelerate and scale up adaptation while blazing transformative paths to an equitable, resilient future.**

from 1980–2016.<sup>1</sup> In the US and around the world, it is the least fortunate who bear the greatest social, economic, health, and environmental costs from such disasters.

And worse is yet to come. Today’s disasters and disruptions reflect relatively modest climatic changes. The warming and impacts experienced so far have mostly stayed below the thresholds of tolerance for human and natural systems. But current emissions trends point to warming of at least 9°F (5°C) above pre-industrial levels by 2100,<sup>2</sup> a scenario that “must be avoided,”<sup>3</sup> according to the World Bank. The impacts of such warming would dwarf anything Americans, and the world, have yet experienced.

From the challenges associated with emerging impacts, and from those still to come, the message is clear: now is the time to fast-track climate mitigation efforts to preserve a livable future. And, given the scale of change already set in motion, it is time to accelerate and scale up adaptation while blazing transformative paths to an equitable, resilient future. These trends and necessities frame and shape our study, analysis, and recommendations.

## The Response

Americans are, in fact, beginning to adapt to climate change. This report—which draws on extensive interviews, surveys, and a literature review—takes measure of the nascent field of climate adaptation in the US. We found that the adaptation field is emerging, but it is not yet equal to the task before it; nor is the field evolving quickly or deliberately enough to manage worsening climate threats.

Spurred by headline-grabbing disasters and more insidious climate impacts, communities across the US are experimenting with adaptation. They are aided by an ever-growing base of knowledge and a plethora of tools. New actors are getting involved—including utility managers and the private sector—and an infusion of funds from government and philanthropy is proving essential for the field’s growth. Cities are emerging as leaders in adaptation, and they are forging vital networks for learning and collaboration.

Still, the field remains limited in scope and effectiveness. Driven largely by crises, the adaptation field does not have a unifying vision of a better future; it remains mostly reactive, rather than proactive. A sense of urgency is lacking, and too many adaptation efforts are stalled at the planning stage. The prevailing emphasis on urban adaptation leaves small towns and rural areas behind, and neglects important interdependencies between cities and surrounding areas. And while there is growing awareness of the disproportionate impact of climate change on the most vulnerable—and the need for equitable solutions—few adaptation actors understand how to incorporate equity into their work.

At this pivotal moment for the field’s development, leadership is key. The federal government played an important role during President Obama’s second term, jump-starting adaptation efforts with funding, research, and agency directives. But the Trump Administration and Congress are working to extinguish those efforts—

creating a leadership vacuum that cities, states, and others are scrambling to fill.

Across our nation—in urban high-rises and on rural back roads; in corporate boardrooms and regional planning commissions; in statehouses and the halls of Congress—there is a gap between the size of the climate challenge and efforts to address it. The Union of Concerned Scientists has termed this the “resilience gap.”<sup>4</sup> We believe that gap can only be closed through significantly scaled-up climate mitigation and adaptation efforts, enacted with a concerted effort to build social cohesion and equity.

There is a gap between the size of the climate challenge and efforts to address it.

The stakes are high. Without a much-strengthened adaptation field, the resilience gap will widen. Accelerating climate risks will disrupt attempts to expand economic opportunity and shore up critical infrastructure; they will destabilize our communities, harm human health, and undercut efforts to maintain crucial life-support systems such as clean water, clean air, and healthy ecosystems. Conversely, a strong adaptation field can head off the worst projected impacts of climate change, while ensuring that risks are not disproportionate and that benefits are equitably shared. Building this field—and quickly—must be an urgent priority.

## The Report

What would a strong, mature adaptation field look like, and what would it take to build it? To help answer that question, The Kresge Foundation—one of the leading philanthropies supporting climate adaptation in the US—commissioned an assessment of the state of the field in 2016. The assessment, shaped at critical points by a six-member Advisory Group, included:

- An extensive review of academic and non-academic literature to contextualize current US adaptation efforts;
- Interviews with 87 individuals representing the public, private, and NGO/civic sectors and academia, covering a wide range of adaptation-related expertise and perspectives;
- An online survey targeted at the same project participants;
- A detailed analysis of Kresge grantee portfolios; and
- Feedback from 88 invited individuals (study participants and others) during a half-day workshop at the National Adaptation Forum 2017 in St. Paul, Minnesota.

This report, which is informed by that assessment, captures the current state of the US adaptation field, identifies needs and opportunities, and makes specific recommendations to move adaptation and resilience building forward.

**Audiences.** This report speaks to those who are helping to build the adaptation field, and to those who work to prepare for and respond to growing climate risks in a complex and fast-moving world. Thus, our primary audiences are:

- Field builders and supporters working to advance adaptation;
- Field actors and implementers seeking to make American communities safer and more resilient; and
- Other partners, currently outside the field, who are needed to close the resilience gap.

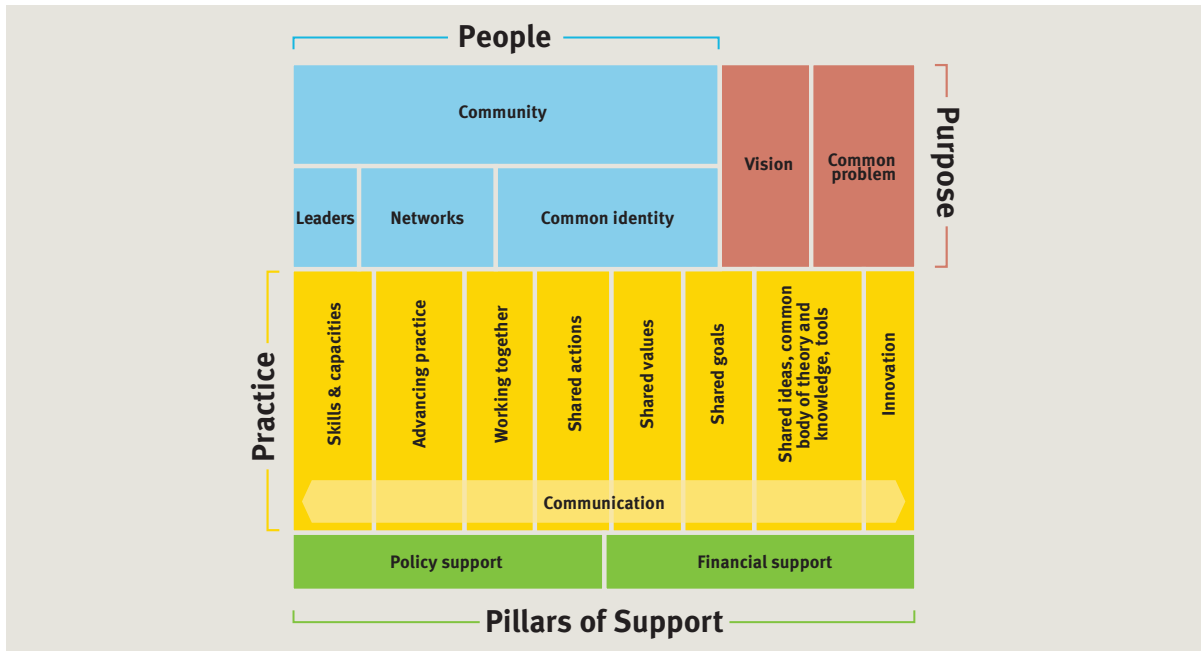
**Framework.** To communicate our findings, we have developed a simplified model of a professional field. We call this framework “the 4Ps,” as the many elements of a field cluster around four interlinked foundational components: Purpose, People, Practice and Pillars.

- The **Purpose** is the goal a field is focused on or organized around. The field’s purpose is centered on the clear delineation of a common problem, and linked to a vision of a world in which that problem is fully addressed.
- The **People** are the field actors—the individuals, organizations, and networks who lead the field and carry out its work, and the common identity that unites them.
- The **Practice** consists of actions taken and the knowledge, tools, and skills used to fulfill the field’s purpose.
- The **Pillars** are the funding and policy that support the development of a field and enable realization of the field’s purpose.



## The Vision—And How We Can Achieve It

Here, we lay out a vision for each of the 4Ps in a mature adaptation field, and compare that vision to the field as it stands today. We assess the field's critical needs and offer recommendations—for the field as a whole and for specific actors.



The 4Ps of a Field: A field is made up of four basic components—purpose, people, practice, and pillars.

### PURPOSE

#### Vision

A well-developed adaptation field creates the nationwide capacity to effectively and equitably close the resilience gap for all. It understands its mission as preventing, minimizing, and alleviating climate change threats to human well-being and to the natural and built systems on which humans depend. It also works to create new opportunities by addressing the causes and consequences of climate change in ways that solve related social, environmental, and economic problems.

The US adaptation field has not yet found its common purpose.

#### Current status

The US adaptation field has not yet found its common purpose. It is not evenly galvanized around a common purpose, nor oriented around a shared vision. For some, the goal is to alleviate emerging climate change consequences, while for others, resilience building must address root causes of insecurity. The common problem

of climate change, of course, is shared and increasingly recognized as a major challenge (from local to global levels). The emergence of climate change impacts is rapidly raising awareness of the need for adaptation, even if this recognition is not yet universal. However, due in part to the relatively limited and widely varying impacts to date, climate change is not seen as a priority everywhere. And Americans still differ significantly—in a highly polarized and politicized environment—in their acceptance of the human causation of climate change. The result is a lack of urgency around addressing climate change through mitigation and adaptation.

#### Key needs

- A greater sense of urgency to vastly step up action on both mitigation and adaptation.
- A unifying values framework to guide adaptation.
- Clear regional, sectoral, national, and cross-cutting priorities to drive focus.

### Recommendations

To foster a common purpose, adaptation field actors must:

- Communicate the urgency of climate change more forcefully, widely, and effectively in ways that are tailored to different audiences and foster confidence that people can implement effective solutions;
- Insist on the need to address climate challenges through both mitigation and adaptation, in ways that enhance equity and social cohesion;
- Convene stakeholders, at all levels, in order to craft a common understanding of the problem and a vision of a desirable future;
- Identify problems that intersect with climate challenges, and use climate-adaptive solutions that help close the resilience gap.

## PEOPLE

### Vision

The mature adaptation field is a powerful, widely recognized, confident, respected, and deeply integrated area of work accomplished by people who share a common identity. Individuals, communities, organizations, busi-

**The field does not yet have a widely recognized core of leaders to help articulate a shared vision and common values around which others might mobilize.**

nesses, and government agencies have taken full ownership of the complementary strategies of climate mitigation and adaptation, implemented in ways that build social cohesion and equity.

With ready access to a wide range of relevant expertise, interconnected field actors share goals and collaborate. Individuals and institutions within the field have adopted a culture and practice of adaptive thinking and acting in a world of constant and potentially disruptive change. Extensive networks actively and deliberately share knowledge and resources. Social capital, inclusivity, and a collaborative spirit supports actors' informal and formal work together.

### Current status

A growing number of actors are now involved in adaptation and resilience building, and some are already well

connected, beginning to form a sense of community and shared identity. Early on, dominant actors included academics, government staff, and environmental NGOs; more recently, they have been joined by city and other local officials and grassroots advocates who now play an important role in moving adaptation forward. Utilities and private-sector actors are also entering the adaptation field in growing numbers. There are important overlaps between the field and the climate justice movement, with movement leaders shaping alternative visions of a climate- and community-resilient future. Still, while the overall number of people involved with resilience building is growing, smaller cities and rural areas are at risk of being left behind, and the field does not yet have a widely recognized core of leaders to help articulate a shared vision and common values around which others might mobilize.

### Key needs

- Greater engagement by previously uninvolved actors, such as the private sector, youth, and those who do not see themselves as adaptation practitioners.
- Leaders at all levels who can champion adaptation in their sectors.
- Effective utilization of existing networks.

### Recommendations

To broaden the circle of people engaged in resilience building, adaptation field actors must:

- Engage the private sector, youth, and underrepresented actors, including those in small towns and rural areas;
- Bring people together around common problems to define a shared vision and adaptation action agenda, including agreed-upon measures of progress and success;
- Reach out to research institutions, agencies, and professional societies to identify entry points into climate change and adaptation.

## PRACTICE

### Vision

The mature adaptation field has available exemplary models and best practices of how to adapt effectively and equitably. These practices are widely known and backed up with robust evidence. Rigorous profes-

sional standards as well as certification and training in core concepts, technical issues, and ethical challenges are established and applied. Ongoing tracking of progress and feedback mechanisms support rapid learning, cross-fertilization, and the maturation of the field's practice, driving toward transformation. The field uses 21st-century communication tools to broadcast the urgency of climate action. Co-creative science–practice partnerships are the norm, allowing for ongoing exchange between knowledge generation and application. The field also facilitates networking and collaboration at scale. Field actors everywhere are skilled in approaching adaptation challenges through integrative, holistic, and out-of-the-box thinking, while embracing uncertainty. They help communities envision desirable futures and empower them through awareness raising and coalition building.

### **Current status**

Important progress has been made in adaptation practice over the past several years. The knowledge base for adaptation is improving, and peer-learning networks have emerged as effective ways of spreading practices and insights. Human-capacity building has helped advance climate and adaptation literacy. Most practitioners recognize the need to assess impacts and vul-

**The field requires much more professionalization and deepening to be effective.**

nerabilities and seek to mainstream adaptive approaches into existing processes and structures. Many also recognize the need to collaborate across silos and disciplinary boundaries, and to move from planning to implementation.

Still, the field requires much more professionalization and deepening to be effective. Best practice is not yet established and there are considerable barriers to action, including competition for scarce funds. There is little understanding of and capacity on social equity and the need for transformational change. Some call for more systemic changes. Yet, without a unifying vision, much-enhanced capacity, and sustained investment in communication, the field does not effectively share its work and successes internally or with external audiences.

### **Key needs**

- More and better tools to persuade decision makers, funders, and the public of the need to adapt.
- Greater sophistication and professionalization of practice.
- Greater capacity on social equity and transformative change.

### **Recommendations**

To rapidly advance the breadth and quality of practice, adaptation field actors must:

- Develop analyses and communication tools that:
  - Make the economic case for adaptation;
  - Assess and disclose climate risk;
  - Measure progress toward resilience; and
  - Tell positive stories of success—especially in vulnerable communities.
- Build capacity for adaptation and transformative change by:
  - Professionalizing practice through certification and training;
  - Breaking down silos and other divisions to address resilience challenges holistically;
  - Developing leadership, understanding, and metrics on equity; and
  - Embracing the need for and investing in transformative change.

## **PILLARS**

### **Vision**

Philanthropic and government funders and private investors are fully committed to funding field building and resilience building until the resilience gap is closed. Funding is not only available after disasters, but is sustained and coordinated for proactive, preventive measures. Funders help to grow resources commensurate with the threat, build funding coalitions, and support the development of new financial instruments and systems to support transformative interventions. The economic case for adaptation is well established. Policymakers at all levels fully embrace the need for mitigation and adaptation, enacting strong resilience legislation, removing legal and institutional barriers, and requiring the implementation of stringent mitigation and adaptation practice with attention to social cohesion and equity. Policies that support the adoption of best practices and climate-adaptive standards for buildings, infrastructure, and other systems are applied, evaluated, and regularly updated.

### **Current status**

Funding and policy to support the field are inadequate, inconsistent, uncoordinated, and not solidly anchored

or institutionalized. Where funding is available, it is predominantly project- or crisis-driven and—with the retreat of the federal government—increasingly scarce. Thus funding, which was already one of the most critical barriers to adaptation, is now utterly inadequate to meet growing needs for proactive adaptation and disaster response as climate change impacts accelerate. Adap-

**Funding and policy to support the field are inadequate, inconsistent, uncoordinated, and not solidly anchored or institutionalized.**

tation policy at the federal level—after several years of leadership and executive-branch progress—is currently being dismantled or undermined. This places greater pressure on state and local leadership, which is growing, albeit unevenly,

across the US. The conversation about standard setting and other high-impact leverage points is only beginning, while the demand for shifts in policy goals and direction at all levels of government is rapidly growing.

#### **Key needs**

- Creative, sustained, and coordinated financing and funding mechanisms.
- Effective adaptation-related policy at every level of government.

- More strategic interventions to help diverse sets of adaptation professionals meet critical needs and achieve higher impact.

#### **Recommendations**

To strengthen the supportive pillars of funding and policy, adaptation field actors must:

- Create new funding mechanisms, such as regional funding collaboratives;
- Encourage greater coordination and collaboration among existing funders in the field;
- Develop and implement interventions that can scale up adaptation efforts, including:
  - Policy levers;
  - Regional support and leveraging of local efforts;
  - Collaboration with professional societies; and
  - Establishment of stringent standards affecting all climate-sensitive structures and activities.

## **What You Can do to Advance Adaptation in the US**

All readers of this report have a role to play in adapting to climate change—whether or not you identify as an adaptation professional. Below is a sample of priority actions for various actors within and outside the field; more detail on how to find your role and make a contribution can be found in Chapter 5.

- The most important thing **thought leaders** can do to advance the field is to press the urgency of climate change. They must insist on the need to address climate challenges through both mitigation and adaptation in ways that enhance equity and social cohesion. Thought leaders can push the field to think bigger, bolder, and deeper about challenges and solutions.
- The most important thing **field builders and supporters** can do is to expand and stabilize the funding support for the field and to use every leverage point, including policy, to move adaptation forward rapidly, effectively, and equitably. The task is one of acceleration, scaling up, and ensuring deeper practice.
- The most important thing **field actors and implementers** can do is to make resilience building real on the ground—to implement mitigation and adaptation in equitable and just ways so that American communities are safer for all. This includes deepening practice on equity and transformative solutions, learning from peers and those outside the field, sharing lessons learned, and breaking down silos and other divisions to address resilience challenges holistically.
- The most important thing **supporters and actors currently outside the field** can do is to assess their sector's sensitivities to climate change and disruptions, educate themselves about adaptation, and forge alliances with relevant actors in the adaptation field.

## Conclusion: We Can and Must Rise to the Challenge—Together

---

As climate disruptions increase, decision makers will face a host of unprecedented problems. These will likely include massive migrations of people within and outside the US, as well as threats to vital systems like food, water, and energy.<sup>5</sup> To rise to the challenge, the adaptation field must rapidly grow in size, scope, and sophistication.

That process has begun. The nascent field of climate adaptation represents an important achievement. The changes made to date mark the beginning of a profound cultural shift for modern society, as we move out of the

**To rise to the challenge, the adaptation field must rapidly grow in size, scope, and sophistication.**

relatively stable climate in which our species has thrived.<sup>6</sup> The new era we are entering will be vastly more uncertain, faster-paced, and more complex than anything we have experienced; it will pose daunting social, political, economic, technological, and ecological challenges. The people and institutions that comprise the adaptation field have begun to recognize those challenges and shape a response. But the challenge becomes clearer with every disaster.

There is much that needs to be done, and we each have a unique role to play. Wherever we sit, we must become relentless questioners of the status quo. We must ask the climate question: Are the enduring structures we build able to withstand—and mitigate—climate change? And we must ask the equity question: Are climate risks and opportunities shared equitably? We must learn and measure progress together, as the pace and complexity of the problem—unfolding in unique ways across a vast nation—is too large to address, track, or assess alone. Together, we can rise to the challenge.

The vibrancy of the field we witnessed in the course of this study gives us much hope. The adaptation field's collective energy to address climate change stems from love of place and people, passion for our work, determination, and commitment to make a difference. It is fed by a desire to serve, and the lure of opportunities to be creative and solve difficult problems. It is sustained by the friendships that unite us, and sometimes even by the anger and frustration with the status quo that could just as easily divide us. The efforts needed to navigate the transformational changes ahead require nothing less. We urge you to join us.



# CHAPTER 1

# Introduction

## 1.1 The Climate Challenge Before Us

**The climate is changing, and society is at rapidly growing risk.** Midway through the second decade of the 21<sup>st</sup> century, American society—and the world—face stark environmental, economic, security, health, and political challenges. To address those challenges in ways that reduce risks and create opportunities that benefit humanity is a tall order indeed. Here in the US, repeated weather-related disasters and accelerating climate change impacts are affecting growing numbers of Americans, particularly in cities. In fact, the challenges of climate adaptation and resilience building have become an everyday reality for decision makers across the country.

Human-caused climate change is a scientifically firmly established and well-documented reality. While widely acknowledged as a crucial, maybe even existential, threat to humans, other species, and Earth's life-support system on which we all depend, a vocal minority of the US population—including powerful elites in the Trump Administration and Congress—continue to deny this scientific consensus.<sup>7</sup> And even when people agree that climate change is a problem, a profound lack of urgency to take action prevails, reflecting both a lack of understanding of Earth's dynamics and the climate momentum already set in motion, as well as the more immediately pressing concerns of day-to-day life.

These disconnects notwithstanding, climate change has been declared a significant risk to climate-sensitive sectors and investments, economic activity, the fiscal soundness of the federal budget, and human welfare. Contributions to this understanding include: the ever-more dire global scientific assessments of the Intergovernmental Panel on Climate Change (IPCC) and its Congressionally mandated, national equivalent, the National Climate Assessment;<sup>8</sup> the documentation of humanity now exceeding four out of nine planetary boundaries;<sup>9</sup> and data-driven judgments by economists,<sup>10</sup> the insurance community,<sup>11</sup> the World Bank,<sup>12</sup> the Risky Business collaborative,<sup>13</sup> and the non-partisan US Government Accountability Office.<sup>14</sup>

In the international arena, 195 nations—including the US—signed the historic Paris Climate Accord in December 2015, agreeing to limit warming to less than 3.6°F (2°C) above pre-industrial levels by the end of the 21<sup>st</sup> century, and preferably to less than 2.7°F (1.5°C).<sup>15</sup>

Achieving such a global political agreement as documented in the Paris Accord was an impressive and necessary start, but the most important work—putting it into action and going beyond the initial goal—is yet to be done. Even if countries adhere to their commitments under the Accord, emissions will still warm the planet by approximately 5°F (3°C) above pre-industrial levels unless more-ambitious reductions are made.<sup>16</sup> To that end, the Paris Accord creates a policy mechanism for successively more-ambitious emissions reductions and adaptation targets.<sup>17</sup>

However, in June 2017, the Trump Administration withdrew the US from the Paris Accord, attracting widespread criticism from the global policy, scientific, business, and advocacy communities. While the withdrawal may prove temporary, many bemoan the loss of US leadership and credibility in international affairs and in the global market for clean energy. And any lag in commitment to stringent climate action makes it ever more challenging to reach the ultimate goal of the Accord (limiting warming to 2°C).<sup>18</sup>

**The challenges of climate adaptation and resilience building have become an everyday reality for decision makers across the country**

Meanwhile, atmospheric CO<sub>2</sub> concentrations are now above 400 parts per million—a level not seen in at least three million years<sup>19</sup>—and still rising.<sup>20</sup> This means that concentrations are still following a “business-as-usual” pathway—in other words, largely unchecked. If this trajectory continues, global average warming could be as much as 9°F (5°C) above pre-industrial levels by 2100,<sup>21</sup> a scenario that “must be avoided,” according to the World Bank.<sup>22</sup> However, there are signs that the rate of CO<sub>2</sub> emissions growth is slowing, and the voluntary cuts called for in the Paris Accord should yield pathways that are lower than the business-as-usual scenario. How much lower depends largely on the scale and speed of emissions reductions.

The challenges that must be overcome to avoid these higher warming scenarios, however, are tremendous. In the lead-up to the IPCC's 2018 Special Report on 1.5°C warming, a growing number of studies are being published that detail just how challenging it is to still limit warming to levels most consider tolerable and manageable in terms of impacts and adaptation challenges.<sup>23</sup>

Regardless of how emissions unfold in the future, climate change is already affecting Americans—in rural areas, small towns, and large cities. And climate impacts are accelerating: global surface temperatures are warming

at increasing rates,<sup>24</sup> and the number of warm extremes now far exceeds the number of cold extremes.<sup>25</sup> The world's oceans are absorbing heat and carbon dioxide, becoming warmer and more acidic as a result, and undermining the ability of coral reefs and other shelled organisms to reproduce and survive. This poses a major threat to global marine biodiversity and seafood supplies.<sup>26</sup>

**Climate change is already affecting Americans and climate impacts are accelerating.**

Since the early 1990s, the global sea level has risen at double the rate of the previous 100 years (or more).<sup>27</sup> Even more disconcerting, recent projections point to ever greater sea-level rise by 2100, with some recent studies suggesting that as much as 8 feet of average global sea-level rise by 2100 can no longer be excluded.<sup>28</sup>

Evidence of climate-driven changes is emerging across the US in the form of extreme events and other progressively more severe impacts. For example:

- “Nuisance flooding” that impacts infrastructure and disrupts daily life is accelerating in many coastal cities (Figure 1).
- Intense storms—such as Sandy, Katrina, Harvey, Irma, and Maria—were worsened by warmer oceans and higher sea level.
- Prolonged droughts and unusual seasonal patterns have disrupted biological processes and agricultural production in the Midwest and California.
- Thousands of Americans regularly suffer the effects of extreme heat and extended allergy seasons.
- Increasingly, there are more subtle and insidious mental health impacts from disasters, as well as growing uncertainty, displacement, and climate-driven losses from Hawai’i to Alaska and Louisiana to Maine.<sup>29</sup>



Figure 1: Nuisance flooding—here in Atlantic City, New Jersey—is one of many climate change impacts already disrupting daily life. Flooding affects growing numbers of coastal cities as sea-level rise accelerates. Source: Press of Atlantic City

**Many types of climate-related disasters are on the rise, and adaptation will only become more difficult.**

Because of population growth and development in vulnerable places, the world, including the US, is now regularly—and increasingly frequently—witnessing multi-billion-dollar climate-related disasters. Over the past five years, Americans experienced at least 10 major disasters per year, each generating more than \$1 billion in damages—double the average number of such events from 1980-2016.<sup>30</sup> The actual cost of disasters is considerably larger, as these figures capture only the insured value of lost property, but not the long-lasting ripple effects on businesses and communities.<sup>31</sup> In the US and around the world, it is the least fortunate who bear the greatest social, economic, health, and environmental costs from disasters.<sup>32</sup>

And worse is yet to come. Today’s disasters and disruptions, while devastating, reflect relatively modest climatic changes. The warming we have experienced so far has mostly stayed below the thresholds of human tolerance and infrastructure design, and it has arrived at a pace that government decisions could keep up with. But current emissions and accelerated warming trends point to far worse consequences to come. It is challenging to grasp that—at least in the foreseeable future—we will not experience such a stable climate again.

**It is the least fortunate who bear the greatest social, economic, health, and environmental costs from disasters.**

Instead, in coming years, our adaptation efforts will contend with a rapidly warming climate and an ever-smaller window of time to prepare for impacts that may well exceed the capacity of our systems. Many of those impacts will happen more frequently and with greater intensity. And, as the climate continues to change, it is more likely that we will see “surprises” or unexpected and rapid shifts.<sup>33</sup> For example, with Arctic sea ice declining more rapidly than projected,<sup>34</sup> the loss of sunlight-reflecting ice is rapidly warming polar oceans and catalyzing the release of methane from Arctic soil. This additional release of greenhouse gases may further accelerate global warming and is likely to have unpredictable and potentially far-reaching consequences for lower-latitude regions.<sup>35</sup>

It is difficult to predict the full impacts of a changing climate. A recent review of climate change impacts on biodiversity and ecosystems, for example, concluded that it is largely unknown at this time whether distressed, disrupted, and disconnected ecosystems are capable of delivering the quantity and quality of ecosystem goods and services on which a growing and largely urbanized human population is making increasing demands.<sup>36</sup>



Moreover, complexity of interacting stresses will make planning and management more challenging. One recent study, for example, illustrated this complexity in an exploration of how the globally adopted Sustainable Development Goals (SDGs) can be achieved simultaneously. While meeting all targets is highly dependent on meeting overarching climate goals, some specific sustainability goals can be met with policies and practices that synergistically enhance each other, while others can only be met via profound trade-offs,<sup>37</sup> pointing to resource, economic, and social limits the world has yet to confront.<sup>38</sup>

**Now is the time to fast-track climate mitigation efforts and to accelerate and scale up adaptation while blazing transformative paths to an equitable, resilient future.**

From the challenges associated with emerging impacts, and from those still to come, the message is clear: Now is the time to fast-track climate mitigation efforts to preserve a livable future (Figure 2). Given the scale of climate change already set in motion—which, for some systems, such as large ice sheets and the oceans, is practically irreversible on human timescales—it is time to accelerate and scale up adaptation while blazing transformative paths to an equitable, resilient future.<sup>39</sup> These trends and necessities frame and shape our study, analysis, and recommendations.



Figure 2: Wind power is one of the most rapidly growing renewable energy sources in the US, and an essential part of accelerated climate mitigation efforts. Land-based wind power also provides crucial income sources to those whose land is used for windmills. Source: National Renewable Energy Laboratory

## 1.2 Overview and Approach of This Study

In the fall of 2016, The Kresge Foundation—one of the leading foundations supporting climate adaptation and resilience building in the US—commissioned a review of its climate adaptation portfolio and an assessment of the state of the field of adaptation. From the start, The Kresge Foundation conceived of this study not as a proprietary analysis for its exclusive use, but as a resource that would draw on, and give back to, the larger adaptation and resilience community. The study we undertook, and report on here, aims to:

- Develop an up-to-date understanding of the state of the adaptation field in the US;
- Glean lessons from a subset of Kresge grantees over the past seven years;
- Identify emerging opportunities to move adaptation and resilience building forward;
- Share insights with, and thus galvanize, the existing and emerging adaptation/resilience community; and
- Inform The Kresge Foundation's forward-looking strategy.

To accomplish these goals, this assessment includes significant new, independent data gathering and analysis. It is also informed by, and builds on, several important recent efforts:

- The Third National Climate Assessment (NCA3), which included an assessment of US adaptation activities through 2013,<sup>40</sup> as well as multiple other national, sectoral, and regional reviews.<sup>41</sup>
- A series of reports commissioned or supported by Kresge since NCA3:
  - A set of case studies of community-based adaptation;<sup>42</sup>
  - A review of local adaptation needs versus adaptation resources and services;<sup>43</sup>
  - A scan of and strategy paper for urban resilience-building efforts<sup>44</sup> ;
  - An assessment of efforts needed to build resilience for low-income communities and communities of color;<sup>45</sup>
  - An assessment of the extent to which professional societies are taking on adaptation;<sup>46</sup> and
  - An assessment of the state of the green infrastructure workforce.<sup>47</sup>

- An international “resilience field-building survey” undertaken by The Rockefeller Foundation in 2014, which largely focused on online research and knowledge-sharing platforms supporting the field.<sup>48</sup>
- The federal government’s 2016 review of investments in community resilience.<sup>49</sup>
- Research on lessons from regional US climate collaboratives.<sup>50</sup>

(See Box 1 for definitions of core concepts.)

Using these resources, combined with new research, this study offers a framework through which the US adaptation field might view itself. It also provides an up-to-date, overall assessment of the field’s development and possible future directions.

Our research effort got underway in December 2016, just after Americans elected a new Republican Administration and Republican majorities in the US Senate and House of Representatives. That political sea change makes this state-of-the-field assessment both more critical and more challenging. The bulk of the data collection and analysis took place against a backdrop of

This study offers a framework through which the adaptation field might view itself and provides an up-to-date assessment of the field’s development and possible future directions.

increasing uncertainty in the US adaptation community, and amid rising concern about the loss of momentum on climate in the US and globally. That concern was reinforced by the appointment of key cabinet members who do not support science or climate policy—

sparking science and climate protest marches in the spring of 2017.

Many communities were, and still are, attempting to strengthen efforts to protect lives and improve livelihoods in the face of accelerating climate pressures. However, with the new Administration’s immediate intent to drastically change health care, environmental, social, security, and economic policies, there was increasing concern that these efforts would be undermined, under-supported, or otherwise weakened.

In that context, this report endeavors to provide greater insight into the progress made in recent years and illuminate areas in which, in light of resource and other constraints, the field can advance and enable US communities to meet the climate challenge.

**Study methods.** The study synthesized here involved two closely related, but distinct, tasks: to review a sub-

sample of The Kresge Foundation’s climate adaptation portfolio, and to place that work in the context of the activities and trends in the larger adaptation field. To accomplish this, we used multiple methods to collect diverse data with the aim of creating a robust picture of the state of the adaptation field (Figure 3). Throughout, we worked closely with Kresge staff to ensure the research would adequately respond to the questions the Foundation sought to answer. Moreover, an advisory group provided input into the research design and interpretation of findings, and offered feedback on a draft of this report.

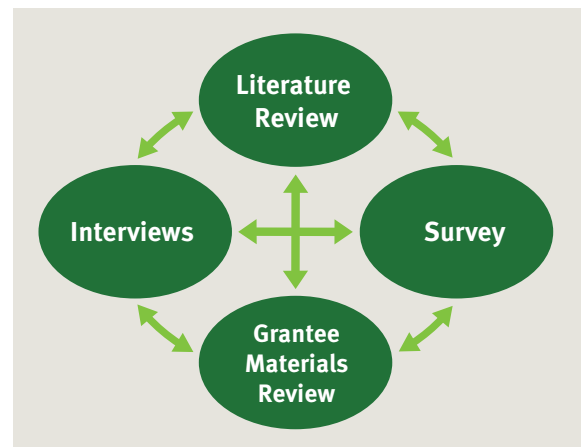


Figure 3: A multi-method approach was used to create a robust understanding of the state of the adaptation field in the US.

First, we undertook an extensive review of both academic and non-academic literature—including numerous reports produced by Kresge grantees—to contextualize current US adaptation efforts. That literature review informed and complemented the information collected through other research methods.

The next step entailed 78 semi-structured interviews with 87 interviewees. They included selected Kresge grantees (46 individuals at 40 grantee institutions), other thought leaders (30), the project’s advisory group (6) and Kresge staff (5). The interviewees included representatives of the public, private, and NGO/civic sectors and academia, with individuals covering a wide range of adaptation-related expertise and perspectives. Just over 60% of the interviewees were women, and just below 40% were men. The interviews lasted 82 minutes, on average (ranging from 36 to 128 minutes), and covered 20–25 questions each and numerous follow-up probes.

The interviews were complemented with an online survey (39 multiple-choice, rating, and open-ended questions), developed in parallel with the interview questions and targeted at the same project participants (except Kresge staff).

## Box 1: A Note on Core Concepts: Kresge's and Our Use of Key Terms

The Kresge Foundation, largely following international and scientific convention, understands **adaptation** to mean efforts undertaken to prepare for and manage anticipated or experienced impacts of global climate change and related extremes. This includes both planning and implementation of place-based adaptation efforts as well as field-building initiatives. Support for such efforts has been a distinct focus of Kresge's Environment Program since 2009.

In 2014, Kresge formally refocused its climate change grantmaking strategy toward the broader concept of **resilience**. Kresge uses the term differently than most disciplinary definitions. For Kresge, building resilience in the face of climate change requires:

- Reducing the causes of human-driven climate change (mitigation);
- Preparing for and managing the impacts of climate change (adaptation); and
- Doing both by applying a social equity lens, with attention to procedural, distributional, structural, and transgenerational aspects of equity.<sup>51</sup>

**Equity** means ensuring that people—regardless of race, gender, class, or any other trait—have access to the rights, legal protections, assets, and resources they need to create healthy, productive, and meaningful lives for themselves. Ensuring equity in this way will vastly improve the adaptive capacity of those often most vulnerable to the impacts of climate change. This is distinguished from **equality**, which aims to treat everyone the same and ensure equal rights, regardless of their current status. In short, for The Kresge Foundation, building resilience means addressing climate change and building **social cohesion** (the willingness of members of society to cooperate with each other to work toward the well-being of all members, to fight exclusion and marginalization, create a sense of belonging, promote trust, and offer opportunities for upward mobility)<sup>52</sup> at the same time, so as to fundamentally address underlying vulnerabilities and legacies of injustice. Throughout the report, we thus pay particular attention to **climate justice**, a term that relates the causes, effects, and responsibility for climate change solutions to environmental and social justice and thus brings the ethical and political dimensions of climate change to the fore.<sup>53</sup>

Building on a conceptualization advanced by the Union of Concerned Scientists (UCS), in this report we also repeatedly speak of closing the **resilience gap** (Figure 4). This gap describes “the degree to which a community or nation [or sector] is unprepared for damaging climate effects—and therefore the degree to which people will suffer from climate-related events.”<sup>54</sup> Closing the resilience gap, according to UCS and consistent with Kresge's understanding of resilience-building, can only be achieved through significantly scaled up mitigation and adaptation efforts, enacted with a concerted effort to build social cohesion and equity.

For the purposes of this study, we use climate adaptation and resilience interchangeably unless we specifically describe or distinguish particular meanings that emerged from our research.<sup>55</sup> Since most grantees included in the sub-sample of the Kresge portfolio reviewed for this study focus primarily on climate adaptation (with occasional co-benefits for mitigation) and their focus on equity varies, our primary focus is on climate change adaptation as defined by Kresge and the scientific community. To the extent that these adaptation or resilience-building efforts aim to redress fundamental injustices evident in social and human–environment relations, economic systems, legal structures and processes, and the underlying worldviews and mindsets that created them, we consider them **transformative**.<sup>56</sup> Efforts undertaken exclusively to address current climate vulnerabilities or other social and environmental challenges without regard to a rapidly changing climate were not part of the portfolio or literature reviewed.<sup>57</sup>

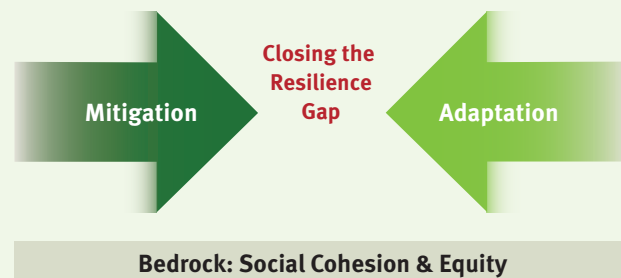


Figure 4: The adaptation field must close the resilience gap through significantly accelerated mitigation and adaptation efforts while building social cohesion and equity. Source: Adapted from the Union of Concerned Scientists (2016)

The study also included a detailed analysis of grantee portfolios, each containing one or more project reports over the granting period. We analyzed 42 funding recipients (38 of them unique). Of those grantees, 17 were classified by Kresge as undertaking “place-based innovations” (39 reports), and 25 grantees were classified as engaged in associated or cross-cutting “field-building initiatives” (71 reports). Grants included in this study were selected by Kresge as representative of the program’s climate adaptation portfolio.

Since a strategic reorientation in 2014, Kresge’s climate-resilience grantmaking is primarily focused on urban areas, to align with the Foundation’s purpose of creating opportunity for low-income people in American cities. Earlier investments focused on cities as well as rural areas and natural ecosystem adaptation. The portfolio review includes a sub-sample of the earlier and more recent grants in each of these areas.

Finally, feedback on preliminary findings and input on potential ways to advance US adaptation were elicited from 88 invited individuals (study participants and others) during a half-day, facilitated workshop at the National Adaptation Forum 2017 in St. Paul, Minnesota.

The list of study participants can be found in Appendix A, and a detailed description of the research approach and methods in Appendix B, along with interview protocols and the survey instrument. Detailed syntheses of the interview findings are available upon request from the research team. The insights from the literature review are woven throughout the report.<sup>58</sup> The study’s advisory group and Foundation leads are listed in Appendix D.

### 1.3 Key Audiences, Intent, and Overview of the Report

A wide variety of communities across the US are now engaged in efforts to adapt to climate change—albeit still too few. Cities have been leading in the US in this respect.<sup>59</sup> While this is an exciting new challenge for some, it remains a difficult struggle for others. Some have self-organized and are well connected to peer-learning networks, while others face climate change practically on their own. Resources and capacities are unevenly distributed among the entities engaging in adaptation, and the specific challenges of adaptation vary across geographies, sectors, and levels of governance. Such differences in the stage of adaptation, different conditions from which to launch adaptation, and widely differing adaptation challenges create a diverse set of audiences for this report.

**Audiences.** This report speaks to those who are helping to build the adaptation field, and to those who work to prepare for and respond to growing climate risks in a complex and fast-moving world. Thus, our primary audiences are (also summarized in Figure 5):

- Thought leaders providing guidance to the adaptation field;
- Field builders and supporters working to advance adaptation;
- Field actors and implementers seeking to make American communities safer and more resilient; and
- Other partners, currently outside the field, who are needed to close the resilience gap.

Thought leaders can be found in government, business, environmental or community groups, philanthropy, academia, in the leadership of movements, or in consultancies. These leaders are willing to think bigger, bolder, and outside the box; they often initiate change processes that deviate from historical patterns of “what we’ve always done.” In so doing, they are able to innovate, break down divisions and barriers, do the unprecedented and unexpected, and take on the task of rapidly advancing our collective resilience-building efforts.

**Intent.** Our research findings describe what these individuals and groups have accomplished to date and where we have fallen short as a field. Our intent was to listen carefully to the varied experiences and views of study participants, place them into the context of the broader adaptation and resilience literature, and critically assess the emergent field of adaptation. We wanted to understand what drives the adaptation community forward, what holds it back, what is happening already, what is only emerging, and what is not (yet) happening but should. Ultimately, we seek to move forward collectively and build the nationwide capacity to close the resilience gap by rapidly and radically limiting the extent of climate change, minimizing the impacts, and doing so in ways that account for and remedy social inequities.

While appreciating the enormous hard work already being done, and fully acknowledging that it has taken valiant and exhausting efforts just to get where we are, we did not create a feel-good report that lets us rest on our laurels. The accelerating pace, all-encompassing scope, and global scale of climate change converging with other societal and environmental challenges—juxtaposed with the sheer difficulty of challenging and changing thinking, politics, and institutions to close the resilience gap—leave the field rather worried about the state of adaptation efforts in the US at this time. Some

Purpose	People		Pillars		Practice	
	Location	Role	Policy Support	Financial Support		
Partners needed to close the Resilience Gap	Current field insiders	Field Builders & Supporters	Policymakers at higher levels	Government funders	Program managers and staff	
				Philanthropic funders		
				Private investors		
		Field Actors & Implementors	Local elected officials, civic leaders, organizational leaders, business leaders	Private entities (e.g. utilities)	Finance and procurement officers, financial staff and experts	Practitioners in public and private sector (planners, resource managers, engineers, etc.)
						Adaptation service providers (NGO, gov, academic, consultancies)
						Network conveners
	Community-based orgs / grassroots advocates					
	Current field outsiders	Potential Field Actors & Implementors	Other potential leaders	Additional potential funders	Academics and other researchers	
					Communicators	
					Adaptation-specific professional societies	
Other professional societies						
				Media		
				Other practitioners		
				Other		

Thought Leaders

Figure 5: The key audiences for our report – thought leaders, field builders, field actors, and external partners – are required to close the resilience gap.

fields of practice have the luxury of evolving at their own pace; in the field of climate adaptation, failure or slow adoption could mean death and destruction. Incremental progress in adaptation simply does not match the rapidly accelerating pace of climate change.

Thus, this report is designed to inform our intended audiences in a way that can advance the field as a whole—and quickly. This is not a “how-to-adapt” report. Instead, it aims to help a diverse and rapidly emerging field understand where we are, how we got here, and where we can and should go next.

**Overview.** The report takes the reader from a vision of a mature adaptation field, to findings about its current state and gaps, and finally to recommendations for moving forward toward this vision.

- Chapter 2 introduces the central concept of our study—the notion of a “field of practice”—and provides a conceptual framework that guides the entire report and a vision of a mature adaptation field.
- Chapter 3—the first of the “findings” chapters—offers an assessment of the state of the field through the eyes of our study participants, providing an integrative description of the state of the US adaptation field, based on our research.

- Chapter 4—the second of the “findings” chapters—synthesizes what we heard from our study participants about the needs of the field, reflecting critical roadblocks to its advancement at this time.
- Chapter 5 provides a critical assessment of the state of the field and offers a series of audience-tailored recommendations. They are guided by a context-sensitive approach to prioritizing the implementation of these recommendations so that all readers can find a way to contribute to building a mature adaptation field that is capable of closing the resilience gap over the next decade.

We hope that many will read this report, and be inspired to work with commitment and enthusiasm to make America safer, healthier, economically more secure, and more just as we head into an increasingly challenging climate future. Because the challenge is big and significant progress is possible, even in difficult times, we conclude our study with a clarion call to action.

## CHAPTER 2

# The Role and Power of a Professional Field

A critical assessment of the US adaptation field requires a lens through which to examine it. We begin our assessment by defining the characteristics of a field in Section 2.1. We then lay out an easy-to-remember framework through which to look at a field in Section 2.2, relate professional fields to social movements in Section 2.3, and articulate why it matters to have a well-developed field in Section 2.4. We use these insights to create a vision of a mature adaptation field in Section 2.5. We offer this vision as a beacon to work toward, but also as an ideal against which to assess the field's current state. The gap between the current state and our vision of a mature field drives the recommendations we put forward at the end of this report.

## 2.1 Defining a Field

The specific meaning of a “field” was not widely known or shared among study participants. For some in our study, the term “field” referred narrowly to a professional field of practice; for others—used more loosely—it was shorthand for community; and for still others, it was interpreted as the “state of the art.”

For the purposes of this report, we combine several existing definitions, each highlighting a different field component. Together, these definitions allow us to comprehensively describe and assess the current state of the adaptation field, and help it become more mature and effective. Thus, we define a field as “a community of organizations and individuals working together to solve a common set of problems, develop a common body of theory and knowledge, or advance and apply common practices,”<sup>60</sup> whose practitioners are “engaged in shared goals, values, and actions over time, [...] who bring different skills and capacities to these shared actions.”<sup>61</sup> A field also requires mechanisms to produce and share knowledge, foster literacy in key concepts and approaches, develop and set professional skills and standards, create and maintain networks of actors to share ideas and spread best practices, and generate adequate support through funding mechanisms and policy.<sup>62</sup>

Yet, while such a comprehensive definition is appropriate to capture the many dimensions of the adaptation field, it is challenging to hold in mind. We have thus developed a simplified framework of field components that is directly derived from this definition, but that is more intuitive and manageable. We call this framework “the 4Ps of a field.”

## 2.2 The 4Ps of a Field

The many elements of a field cluster around four interlinked, foundational components: **Purpose**, **People**, **Practice** and **Pillars** (Figure 6).

The **Purpose** is the widely valued goal a field is focused on or organized around. The field's purpose is centered on the clear delineation of a common problem, and linked to a vision of a world in which that problem is addressed once and for all or—in the case of climate change—is being addressed in an ongoing manner.

Often, fields emerge around an initial problem framing that evolves over time, partly because of changed problem understanding, partly because actors aim to make the problem (and associated vision) as compelling to different audiences as possible. Sometimes, problem and purpose framings change because initial problem areas have been resolved but new, related problems emerge. As such, the Purpose component is a source of renewal and innovation for a field and provides opportunities for actors to test ideas and practices.

The **People** are the field actors—the individuals, organizations, and networks—that come together to address a particular problem and, in so doing, create a field of practice. Over the course of a field's evolution, the community of organizations and individuals grows and changes, and it

often overlaps with other fields. This field component includes visible leaders and many others who carry out the work of the field.

Networks among field actors emerge as a crucial element as they help people share knowledge, ideas, and resources within the field, and pull in new ideas and resources from outside the network. They serve important peer-learning and collaborative functions.

In a mature field, a common identity unites otherwise unconnected actors around an overlapping set of problems, ideas, and practices. This common identity can help people find grounds for collaboration and adds to the strength of the social capital within the field.

The **Practice** consists of actions taken and the knowledge, tools, and skills used to fulfill the field's purpose. In a mature field, a shared set of practices is guided by ideas that are rooted in a common set of theories, concepts, and approaches (a shared knowledge base) that are continually bolstered and refined by ongoing

The many elements of a field cluster around four interlinked, foundational components: Purpose, People, Practice and Pillars

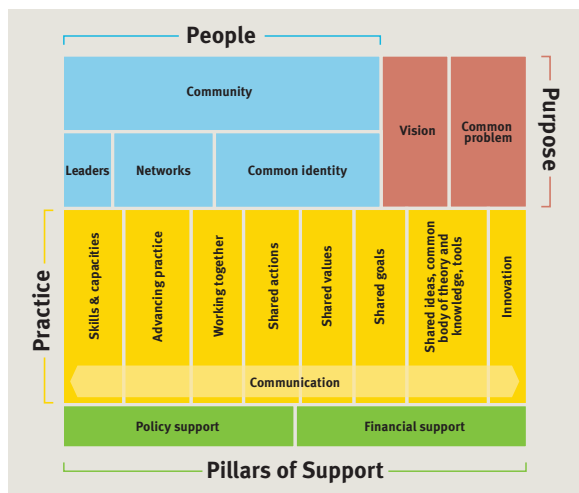


Figure 6: The 4Ps of a field

research and learning. Put differently, a shared practice translates concepts into action and builds a body of trained, experienced people who can implement action effectively. Thus, a crucial aspect of a shared practice is continual skill building and deepening, advancing literacy in core aspects of the field, and fostering ways to integrate such applied knowledge across the field and other fields through highly skilled practitioners.

Innovation in knowledge and practice is integral to the practice component of a field, as specific problems and contexts change, and new needs emerge, all requiring novel solutions. Innovation also helps a field expand by creating new opportunities for application or refinement of practices.

Importantly, a field is networked not only for information sharing and peer learning, but also for collaboration. Routine collaboration is a sign of an advanced field, particularly if it occurs not only within sectors, disciplines, or government silos, but also across them. Such collaboration is enabled by shared goals, values, and action agendas. Collaboration is also crucial to garner the support of policymakers and the public. Individual actions, implemented haphazardly, are typically insufficient to make a real difference on the common problem. Instead, widespread implementation of action, coordinated through a common action agenda and aimed at shared goals, can be achieved through joint strategic planning and aligned complementary actions.

The more a field coalesces, the more powerful is its force in garnering policy and funding support.

Communication provides a foundation for all of a field's practices (although the current field-building literature does not spell this out explicitly). Here, we deliberately bring attention to communication as a cross-cutting practice, as the "glue" across all practices. It is an often called-for, but frequently neglected, area of work that enables a field to flourish and adaptation practice to spread and become normalized in everyday life—to simply become "what we do." As such, communication constitutes an essential practice that cuts across all others, holds the field together, and shares efforts, developments, needs, and successes within the field and to external audiences.

The *Pillars* support the development of a field through funding and policy, enabling the realization of the field's goals. Coordinated, complementary, and sustained funding and financing from various sources is essential. It enables the field to build problem understanding (for example, through investment in research), to support networking among field actors and efforts in community- and identity-building, and crucially, to build up the practice basis of a field.

Policy support, in the form of widely adopted policies, can bolster and legitimize a field. Policy can also scale up, and thus leverage, people and practice to make widespread and faster progress. Policy (and associated funding allocations) can provide incentives, establish standards of best practice and set expectations; it can also help overcome barriers that hold back widespread implementation of the shared action agenda.

**Links among the 4Ps.** As these brief descriptions make clear, there are many connections among the subcomponents of the 4Ps, as well as links between Purpose, People, Practice, and Pillars. For instance, people's identity is shaped by shared values, goals, and actions. Collaboration is made easier through a common vision and shared practice, and results in coordinated actions. Community leaders and networks often define a common identity. And, as argued above, communication as a cross-cutting practice supports and enables all other parts of a field. The more a field coalesces, the more powerful is its force in garnering policy and funding support, and yet foundational support from these pillars is required to help the field emerge as a recognizable entity at all.



## 2.3 The Relationship Between Movements and Fields

Movements and fields are different but overlapping. Social movements arise out of profound grievances within a society.<sup>63</sup> Defined by some as collective-action efforts aimed at social change from the bottom up,<sup>64</sup> they typically involve “organizational structures and strategies that may empower oppressed populations to mount effective challenges and resist the more powerful and advantaged elites.”<sup>65</sup>

How do movements affect a professional field? Importantly, movements raise awareness of problems

**Movements raise awareness of problems otherwise invisible or ignored by the larger society, and they offer alternative visions of the future.**

otherwise invisible or ignored by the larger society, and they offer alternative visions of the future. Thus, they may very well define the *Purpose* around which a field coalesces. With their demands, they set an

ambition for the future, driving the field toward certain goals and actions.

Generally, movements do not seek to define or shape professional *Practice*, but to change societal conditions and the values, policies, economic models, and

funding priorities that underlie them. In so doing, they also change professional practices. For example, movement members may launch a campaign to protest unjust or discriminatory behavior and enact fair and equitable practices, which changes the norms within a field over time. By envisioning and promoting alternative values, or by engaging directly with those practicing a particular profession, they can help normalize the knowledge, actions, and behaviors that support the movement’s goals in everyday practices.

Movement members may also work within a certain profession, and, in turn, members of a professional field may choose to actively participate in movements (a *People* link between movement and field). Professionals of certain fields may also silently approve (or disapprove) of a movement’s claims and aims, and—depending on their alignment—enact the values promoted by the movement.

Finally, field builders and supporters may align themselves with movements and actively support movement building and the link between movements and fields, or they may respond to a movement’s demands through policy changes (reflecting the *Pillars* component of field building). Thus, there are important overlaps and mutual influences between movements and fields, but the two should not be conflated in means or ends.<sup>66</sup>

### Box 2: The Influence of the Climate Justice and Just Transition Movements on the US Adaptation Field

A movement has been growing—in the US and internationally<sup>67</sup>—that presses not only for climate action, but for *climate justice*. It calls on society to:

- Avoid placing an uneven burden on those least responsible for contributing to the causes of climate change, and
- Support and protect those who are most vulnerable to climate impacts.

After considerable work to align perspectives and demands, the climate justice movement has found crucial allies in the *just transition* movement, which emerged from the longstanding struggle for environmental justice and equitable treatment of workers needing to transition out of toxic or “dirty” work environments. Together they campaign for clean, secure, and healthy livelihoods; equitable access to clean energy; and resilient communities (Figure 7).<sup>68</sup>

The climate justice movement unites coalition partners around intersecting demands for a livable environment as well as economic and social justice—including gender equality, racial justice, civil rights, and environmental justice.

The movement demands deep, abiding, transformative change that addresses the root causes of climate change and social injustice. It challenges the legacies of resource *extractivism*—the idea that Earth and certain groups of people can be exploited for economic gain, regardless of environmental consequences or

social injustice.<sup>69</sup> Climate justice holds that addressing these root causes is essential to enabling communities to survive and thrive in the long term. The movement also asks the field to grapple with the potential for **maladaptation**—adaptation efforts that actually result in worsened climate change and increased climate vulnerabilities for people or the environment—such as promoting air conditioning to protect against heat, the use of which results in increased electricity consumption and thus increased carbon emissions.<sup>70</sup>

The climate justice movement demands that policymakers and professionals (re)consider how they approach adaptation. For all to thrive in a climate-changed world, the movement argues, it is necessary to act in the interest of those previously neglected. Like other movements, the climate justice movement pushes for changes in thinking among those who are privileged to change the prospects for those disadvantaged by the current system. The movement has begun to influence the adaptation field: some in the field now apply a social justice lens to their resilience-building work, while others do not yet recognize that they can choose to act differently. As the movement grows in power, many expect it to further strengthen its influence on the field’s leadership and approaches.



**Figure 7: The People’s Climate March in 2014 united climate justice and just transition movement members with others advocating for a clean, green, and just future for all.**  
Source: People’s Climate March

## 2.4 The Power of a Mature Field

If the field of climate adaptation did not exist, or if the nascent field did not grow to maturity, would it matter to our collective ability to manage the risks from climate change? Based on the evidence we have gathered, reviewed, and assessed, we believe the answer is a resounding **yes!** A mature adaptation field matters profoundly to our collective ability to survive and thrive in a changing climate.

**There is power in a mature field.** Once a field is well established, people know where to turn for expertise and services. A field can distinguish good practices from bad, or at least offer reliable institutions to resolve questions and disputes. Those same institutions advance shared goals reflecting widely held values. And a mature field has a cadre of highly skilled people at the ready to address complex issues. These professionals have the institutional support, networks, and funding that enable them to take necessary actions.

They stand on a foundation of well-established experience and knowledge, are adequately trained, and connect with others facing similar challenges to learn, share lessons and approaches, and advance the field’s purpose. A mature field normalizes particular practices, establishing them as “business-as-usual.” It has the political and public support to introduce appropriate or new solutions and promote best practices as standards to which practitioners must adhere. As a result, a mature field solves problems effectively, efficiently, and in an integrated manner,<sup>71</sup> reducing societal burdens and creating new opportunities.

The need for a mature adaptation field is especially pronounced because climate adaptation is still considered a new and alternative practice, as opposed to an integral part of everyday work. That must change: making decisions or doing business without considering climate change is inadequate at best; at worst, it is wasteful and provides a false sense of security. As climate change unfolds, adaptive thinking, capacity, and knowledge

must permeate society, changing how decision makers at every level and in every sector do their work. A mature adaptation field would be able to help those outside of it to make better-informed decisions. Moreover, as the

federal government decreases its support and information resources for climate change action—even as climate risks multiply—the need for a mature adaptation field grows more acute (Box 3).

### Box 3: What a Mature Adaptation Field Would Look Like

**Purpose.** The ultimate goal of a well-developed adaptation field is to create the nationwide capacity to effectively and equitably close the resilience gap. The field is singularly focused on working toward a world in which that gap is closed for all. It understands its mission as preventing, minimizing, and alleviating climate change threats to human well-being and to the natural and built systems on which humans depend. It also works to create new opportunities by addressing the causes and consequences of climate change in ways that solve related social, environmental, and economic problems.

**People.** The mature adaptation field is a powerful, widely recognized, confident, respected, and integrated area of work accomplished by people who share a common identity (Figure 8). Individuals, communities, organizations, businesses, and government agencies within the field have taken full ownership of the complementary strategy of climate mitigation and adaptation, implemented in ways that build social cohesion and equity, to achieve the transformational changes required to keep communities safe and thriving. With ready access to a wide range of relevant expertise, deeply interconnected field actors share goals and collaborate. Individuals and institutions within the field have adopted a culture and practice of adaptive thinking and acting in a world of constant and potentially disruptive change. Extensive networks actively and deliberately share knowledge and resources. Social capital, inclusivity, and a collaborative spirit—within and between networks—support actors’ informal and formal work together.

**Practice.** The field uses 21<sup>st</sup>-century communications platforms and tools to convey the urgency of climate action to media, the public, policymakers, and other professionals, and to identify and widely share adaptation stories and lessons learned. Field actors are also skilled in the oldest, most engaging form of communication—dialogue—to advance mutual understanding and, where possible, consensus around the challenges of transformative change. Effective, co-creative science–practice partnerships are the norm, allowing for ongoing exchange between knowledge generation and application. Both scientists and practitioners work closely to distill (and periodically update) core principles and tenets of adaptation knowledge and approaches. They produce, test, and assess an ongoing stream of innovations in a professional culture that always thinks “ten years ahead,” staying focused on long-term transformative goals. Exemplary models and best practices of how to adapt effectively and equitably are available, widely known, and backed up with robust evidence.

Rigorous professional standards and certification are established on the basis of consistent guiding principles that skilled professionals apply to diverse, unique, and complex contexts. Widely accessible professional trainings enable newcomers to the field to rapidly gain proficiency in core concepts, technical and social issues, and the ethical principles that guide the field’s work. Key competencies needed to build resilience are ubiquitous and drive toward transformation. Ongoing tracking of progress and well-established feedback mechanisms support rapid learning, cross-fertilization, and the maturation of the field’s practice. They also enable rapid response to current and emerging threats and critical needs. The field routinely



**Figure 8: A mature adaptation field is a powerful, widely recognized, confident, respected, and deeply integrated area of work accomplished by people who share a common identity.** Source: WE ACT for Environmental Justice

facilitates social networking, trust building, and collaboration at scale. Field actors everywhere are skilled in approaching adaptation challenges through systems, integrative, holistic, and out-of-the-box thinking while embracing deep uncertainty and risk-taking. They help communities envision desirable futures, and empower them through awareness raising, education, community-driven actions, coalition building, and changed processes and structures.

**Pillars.** Philanthropic and government funders and private investors are fully committed to funding field building and resilience building until the resilience gap is closed. Funding is not only available after disasters, but is sustained, coordinated, and available for proactive, preventive measures. Funders help to grow resources commensurate with the threat, build funding coalitions and inspire new financial instruments and systems to support transformative interventions. The economic case for adaptation is well established.

Policymakers at federal, regional, state, and local levels fully embrace the need for mitigation and adaptation, enacting strong resilience legislation and removing legal and institutional barriers to adaptation. Policy interventions are coordinated with funding instruments and approaches, supporting and requiring the implementation of stringent mitigation efforts and complementary adaptation practice with concerted attention to social cohesion and equity. Policies that support the adoption of best practices and climate-sensitive standards for buildings, infrastructure, and other systems are applied, evaluated, and regularly updated to move communities toward greater resilience in the face of climate disruptions.

As we will show in the next chapter, this vision of a mature field is not yet realized. Continued efforts in field building are required to support rapid, efficient, effective, and widespread progress on resilience in the US.

## CHAPTER 3

# US Resilience Building and Climate Adaptation in the First Two Decades of the 21st Century: Key Findings

With a frame for the adaptation field, we now turn to the key findings from the research. First, we investigate what study participants believed to be the state of the field and their perspectives on it. Then we consider how study participants described the field’s purpose, the people advancing the field, dominant practices of the field, and pillars of support for the field that help it stabilize and grow.

### 3.1 Perceived State of the Adaptation Field

**On the existence of a field.** Study participants differed on whether there is—or should be—an adaptation field. The research revealed a broad spectrum of opinions (Figure 9), which we synthesize into three distinct groups:

- **Most believed the US adaptation field exists, either in nascent or maturing form.** Signs of maturation include a growth of interest in adaptation; a set of professionals with adaptation expertise in academia, NGOs, cities, and consulting firms; the existence of philanthropic support; and a shared knowledge base. A few saw the potential for the field to “bust silos” by overcoming disciplinary and managerial divisions and by fostering collaboration among diverse actors. But most saw the field as still limited in scope. A significant number among this majority cautioned that the field suffers from a lack of social equity emphasis. “There is definitely not a field of practice with respect to social community adaptation,” meaning a community of practitioners who focus on securing and improving the lives of people. Others noted that actors in the field are “stuck” and have not expanded enough to include a broader set of expertise and voices (Box 4).
- **A minority believed there should not or could not be a distinct adaptation field.** Some observed that adaptation issues are too deeply embedded in other sectors or areas of work to merit a separate field. Instead, they said, all professionals should be aware of climate change impacts and address

them as a key feature in their work. In this way, adaptation expertise and practice would grow, but not within a distinct field. Climate adaptation would become “an adjective to whatever subject matter expertise people have” or a “sub-field” of established disciplines and professions involved in building resilience (public works, private corporations, communications, etc.). At most, adaptation professionals would resemble general practitioners in medicine, with wide but non-specialized knowledge; they would refer clients to specialists when needed.

- **A small minority believed there is no field at all yet, but there should be.** Those participants pointed to the lack of common definitions, goals, language, well-established bodies of knowledge, professionalization, adequate funding, and supportive policy environments—all critical practices and pillars required to establish a field.

While many study participants had never considered looking to other fields for inspiration, some noted that more-established fields can offer lessons and best practices in field development. For example:

- *Greenhouse gas mitigation*, and related to it, *renewables and energy conservation*, particularly for engagement of both government and the private sector and for clear measures of progress;
- *Emergency management and disaster response* for its federal legislative framework, mandated local action, and measurable impact, including continuity planning and the involvement of the insurance sector;
- *Public health*, for catalyzing cultural shifts, translating science into practice, institutionalization, and consistent impact assessments; and
- *Urban planning*, for its diffusion of tools, knowledge of infrastructure and public works, and the creation of professional societies, such as the American Planning Association.

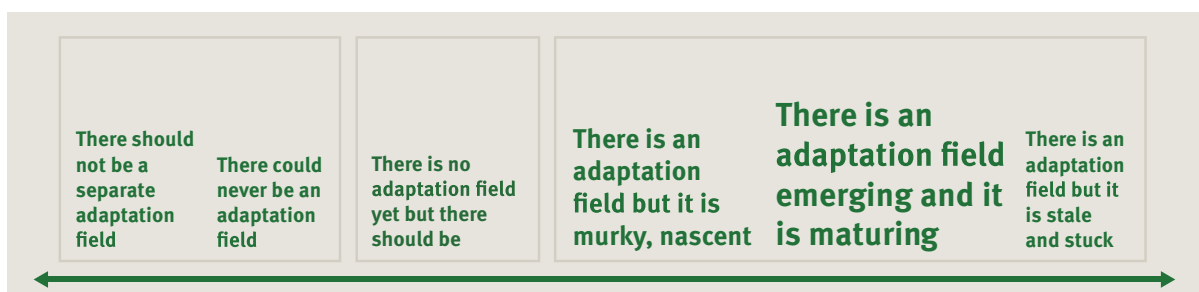


Figure 9: Study participants voiced a spectrum of opinions on the existence and current status of the US adaptation field. The size of the font indicates the proportion of interviewees expressing a certain opinion.

### Box 4: Assessing the Status of Key Aspects of the US Adaptation Field

Survey participants were asked to rate the degree to which they felt selected aspects of the US adaptation field are developed at this time (Figure 10). Their responses suggest that the funding and policy environment is least developed (equivalent to the *Pillars* component in our 4P framework). Their assessment is nearly as pessimistic about the status of standards of practice (*Practice*). Opinions were more diverse regarding the shared knowledge base (*Practice*) and the question of whether there is a network of leaders (*People*). Strikingly, when asked in a separate question who respondents looked to as leaders of the field, among the 72 responses, only two people and five organizations (government agencies, NGOs, and foundations) were mentioned more than twice. In other words, while the US adaptation field may have a network of leaders, it is widely dispersed; expertise and thought leadership is not concentrated in particular places or organizations; and no one truly stands out as a field-wide leader. No question was asked about the *Purpose* component of the 4P framework.

### Perceived Status of Various Aspects of the Current US Adaptation Field

(n=53)

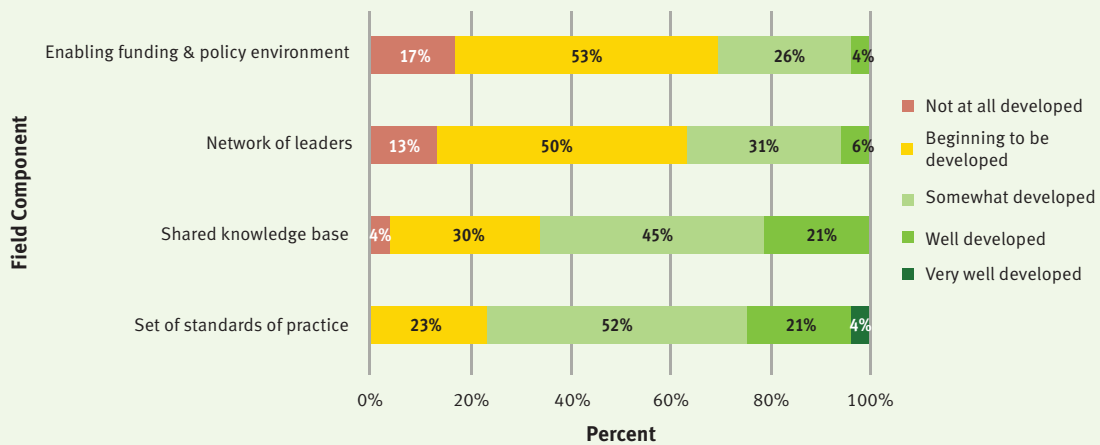


Figure 10: Survey respondents were asked to rate the status of selected sub-components of the adaptation field.

### 3.2 Field Component: Purpose

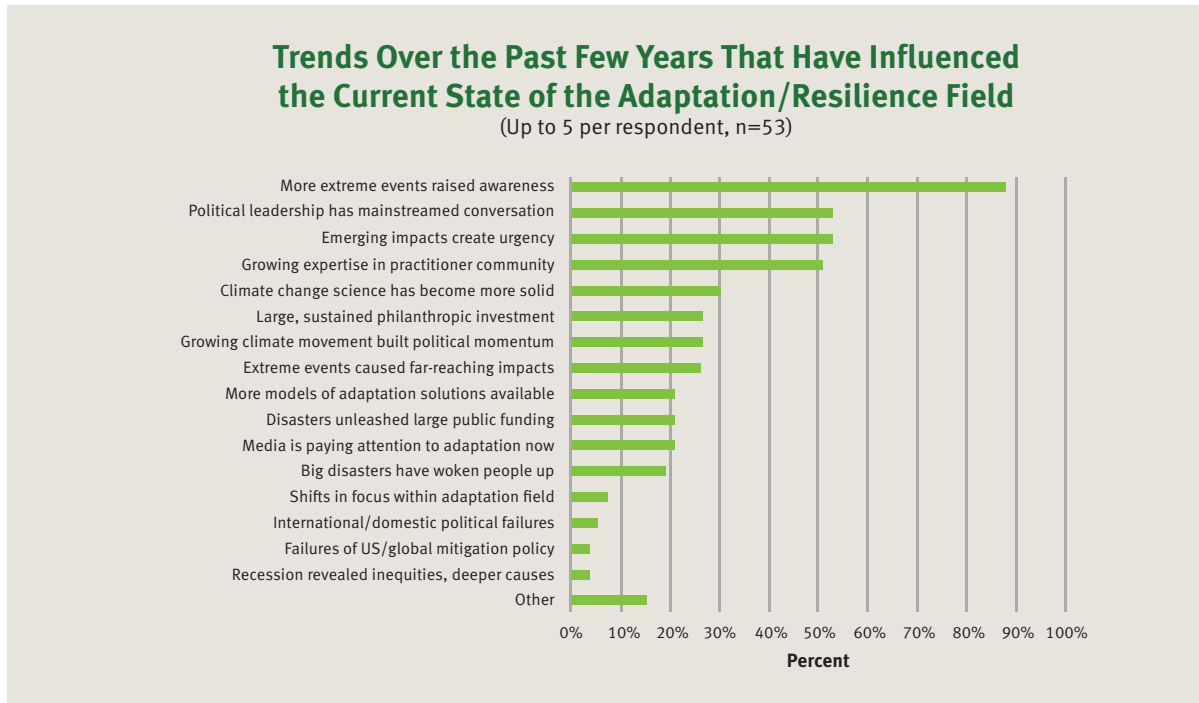
#### Climate impacts are a key driver of the adaptation field.

The field of adaptation has been driven, in large part, by increasingly pressing problems arising from climate change itself, providing purpose to disparate actors. Extreme events and accelerating climate impacts across the country are creating a sense of urgency and spurring action (Figure 11). Other factors, such as funding and political leadership, have also been driving adaptation, but these are often related to emerging crises.

**Climate change “symptoms” demand attention.** One interviewee—reflecting the responses of many—observed, “climate change is happening now, not 100 years from now.” Communities are facing more extreme

climate events (named storms, floods, major wildfire outbreaks, and so on) as well as insidious impacts (droughts, sea-level rise, changes in growing seasons). In many parts of the US, these events are openly acknowledged as consistent with human-caused climate change; in other regions, it is still politically unwise to make this link.

Over the past few years, these climate impacts have raised awareness and galvanized action in several ways. In affected communities, people have become increasingly aware of the immediacy of the risks and “cannot go back to the old ways of doing things.” As a result, local practitioners typically “respond in pragmatic ways, regardless of political leanings.” In politically conservative areas, however, they tend to stay



**Figure 11: Perceived trends that have influenced the current state of the US adaptation field.**

focused on the immediate problems and avoid talking about the underlying driver of human-caused climate change. Extreme events also drive adaptation considerations in sectors that do not identify as part of the adaptation field, such as utilities, planning, and health services.

This has been true in directly and indirectly impacted places, where extreme events had significant cascading impacts on people, economies, and the natural and built environment. This increased the perceived need and actual demand for adaptation actions even among those who did not previously think about preparing for climate change impacts.

“Signature storms,” such as Hurricanes Katrina and Sandy, provided learning moments far beyond the directly affected communities. After those storms, leaders asked, “Are we prepared if that were to happen here?” This far-reaching impact was aided, in part, by sustained media attention. In fact, some called Hurricane Sandy a “big watershed resilience moment,” that focused public attention on climate vulnerabilities and the need for adaptation in the US.<sup>72</sup> Events outside the nation’s borders have also had an impact on the US adaptation field. The 2011 floods in Thailand—which caused \$43 billion in economic damages worldwide, including major disruptions and losses to US businesses<sup>73</sup>—served as a driver of increased private-sector attention to climate extremes, leading businesses to

examine their own vulnerabilities and interconnections, including in supply chains (Figure 12).

Chronic climate stresses—such as recent extended droughts in Texas and California, which resulted in severe agricultural losses—also spurred action on adaptation. This category of field drivers includes growing challenges from nuisance flooding in low-lying coastal areas and emerging relocation pressures on island communities (Louisiana, Alaska, the Chesapeake Bay, and US-affiliated Pacific Islands). The degree to which chronic stresses drove public opinion, planning pro-



**Figure 12: One of the largest wildfires in California history, the 2013 Rim Fire threatened power and water supplies for the City of San Francisco 150 miles to the west, illustrating how communities must prepare not only for local climate disruptions but also those that originate far from their boundaries** Source: Clint Gould, U.S. Forest Service



cesses, and government action depended, in part, on who was affected and on their level of political clout.

These high-visibility climate impacts made it easier to communicate the need for resilience-building efforts to the public. During and immediately after a climate event, there is a window of opportunity and often less skepticism about climate change. Such events can also spark conversations about climate change mitigation (Box 5). However, openness to hearing about climate change is still not uniform across the US. In more conservative areas, linking disasters to human-caused climate change is considered taboo in a time of great distress.<sup>74</sup>

**Crisis-driven adaptation has its limits.** Climate impacts have created urgency around adaptation. But the distributed nature of these events, the reactive mode of the field, and the politicized debate over climate change have prevented the emergence of a unifying vision. And in places where extremes have not yet perceptibly increased in frequency, intensity, or scale, adaptation action remains absent or is emerging more slowly. In those places, the need for action is simply not as compelling yet. Thus, participants thought, waiting for the symptoms of climate change to emerge is late, at best, and irresponsible, at worst.

Moreover, the adaptation community has not yet defined a clear sense of its own purpose, or a vision of a desirable future. But some see a transformative role

for the field. When asked about the purpose of adaptation, survey respondents overwhelmingly agreed it offers “a chance to improve things over the current state of affairs,” with far fewer saying it is about “keeping or sustaining what we have in the face of change,” much less “finding a dignified way out of a worsening situation.” Improving things, rather than just responding to crises, would require proactive adaptation planning and agreement on a more desirable future state.

However, the current adaptation field is far from that. Put differently, the adaptation field today is driven by problems, not purpose.

**Resilience requires attention to root causes.** For some respondents, climate change represented the “tip of the iceberg,” linked at the root with far deeper socioeconomic and environmental challenges. They felt it was short-sighted to only deal with the symptoms. They urged the field to address the “triple threat” of “urbanization, globalization, and climate change.” Others located the root causes in “capitalism, neoliberalism, and white supremacy,” and saw the central purpose of the adaptation field as addressing those deep societal challenges.

The convergence of economic and climate crises has illuminated deeper threats to community resilience. One interviewee observed that “the disparity between

The adaptation field today is driven by problems, not purpose.

### Box 5: The Climate Conversation is Changing

In the past, some considered climate adaptation an admission of failure to reduce greenhouse gas emissions; many refused to champion adaptation because they feared it would undermine support for mitigation.<sup>75</sup> But in the face of escalating shocks and stresses, the stigma attached to climate adaptation seems to be decreasing for many study participants. Nearly 80% of survey respondents saw agreement on the need for adaptation and some viewed adaptation as “a gateway drug” to mitigation; one-third of survey respondents strongly agreed that “adaptation is often a way to get people interested in mitigation.” Indeed, for many, it was crucial to pair adaptation with stronger efforts to reduce emissions. As one interviewee remarked, “If we are not going to focus on mitigation, then we are going to get pretty far behind on adaptation.”

Many study participants said the field is turning toward “a comprehensive resilience conversation,” which embraces adaptation, mitigation, and social cohesion. “We’re thinking about the issues more systematically now,” said one. “Resilience demands that.”

Yet for others, the prevailing thinking about adaptation and resilience is still not going deep enough. Many noted that there has been little real progress to date in integrating adaptation and mitigation, much less social cohesion. And several emphasized the need for much deeper thinking, dialogue, and action on equity, as explored below.

the 1% and the 99% [is] growing wider,” deepening the vulnerability of the marginalized while further concentrating economic and political power in the hands of the few.<sup>76</sup> This has reinvigorated calls to address deep economic and racial inequities—as in the Occupy and Black Lives Matter movements. The 2016 presidential election further drew attention to rural-urban, class and racial divides, and underlying political polarization and injustice. Interviewees argued that if those long-standing patterns of inequity are left unattended in adaptation (and otherwise), socio-economic vulnerability and the disparate consequences of climate change will only grow.

That differential vulnerability was painfully evident during storms like Sandy and Katrina, which revealed “a range of long-standing vulnerabilities and problems that had existed in communities” long before the hurricanes. Other examples mentioned included the loss of jobs for farm workers during the height of the drought in California’s Central Valley, and the inability of Alaskan villages to obtain federal funds for relocating their villages from threatened coastal areas.<sup>77</sup>

**There is new awareness of equity concerns, but little agreement or action.** While interviewees noted that a growing number of actors understand the importance of equity in climate adaptation, few saw these issues addressed comprehensively in practice. A majority of survey respondents did not believe that “social equity/climate justice is getting adequate attention.” Study participants echoed findings in the literature that indicate that when social and economic equity are at the core of adaptation, low-income and minority populations benefit, breaking historic patterns of discrimination.<sup>78</sup> However, we found a pronounced gap between the literature and practice: differential social vulnerabilities have been recognized by academic researchers at least since the 1970s, but this well-established work is rarely acted upon in adaptation plans and policies.<sup>79</sup>

Study participants gave several reasons why the adaptation field has failed to address—or only shallowly engaged with—social equity, such as:

- Inadequate, lackluster or complete lack of involvement of grassroots communities in formal adaptation processes;
- Frustration over whose voice and expertise counts;
- Persistent distrust between “big green” environmental groups and environmental justice groups, marked by challenging collaboration and a highly uneven distribution of assets;

- Half-hearted consideration of social vulnerability studies (and a general lack of awareness of academic work on equity); and
- Uncertainties about how best to integrate climate and social justice work without diminishing the importance of either issue.

Some noted a difficult conundrum many face when dealing with climate change and social equity problems: should they focus on immediate symptoms or address underlying causes? Clearly, the immediate needs from climate disruptions could be a matter of life and death and cannot be postponed. Yet, many communities face life-or-death challenges even on sunny-weather days. The persistent postponing of solutions to these ongoing challenges and the systemic nature of exclusion from decision-making processes are at the heart of the fight for civil and human rights. The climate justice and just transition movements address precisely these linked needs and rights. Still, study participants were nowhere near agreement on how much of this fundamental work should be undertaken by the adaptation field.

In fact, many interviewees said they are struggling with the best way forward on equity in adaptation. While there is a growing awareness of rising inequality due to climate change, even among mainstream adaptation professionals, interviewees consistently cautioned that the issue was not yet mastered. “Everybody is supposed to know how to do this [meaningfully bringing equity into the adaptation conversation].” But many are at best getting a “first exposure to equity questions.” Encouragingly, interviewees noted, the next generation of leaders (millennial and younger) appear to embrace equity as “business-as-usual.”

Many interviewees said they are struggling with the best way forward on equity in adaptation.

Reducing, and eventually eliminating, social inequity requires persistence and important shifts in focus, cultural understanding, and values. Some believed a first step toward prioritizing equity issues would be to focus on social inclusion in adaptation processes. This has happened in some cities with progressive leadership. In those cities, people grappled with the deep, structural interrelatedness of climate change and injustice and moved to a focus on *community* resilience, improving health, air quality, job opportunities, and housing rather than exclusively on *climate* resilience, which focuses only on climate-driven stresses and shocks (Figure 13).



**Figure 13: Children are especially vulnerable to certain climate impacts, such as heat and air pollution. Poverty and other environmental health issues can converge with the climate crisis to affect the most vulnerable, and some in the adaptation field demand more systemic solutions.** Source: Jim Gathany, CDC Public Health Image Library ID# 5708

Some organizations are working to advance thinking and practice in this area. Notably, members of the Urban Sustainability Directors Network (USDN) are teaching each other how to include equity in adaptation. The Kresge Foundation has played an important role by funding capacity-building efforts at the non-profit, grassroots, and community levels. While interviewees cautioned that there are always some who are insincere or opportunistic and “slap equity on climate change proposals,” (and climate change on equity-focused proposals) to get funding, many applauded the Foundation’s linkage of adaptation and equity. That linkage has encouraged environmental justice groups to deepen their engagement and leadership in the climate resilience space. Others appreciated Kresge’s capacity-building efforts, which increased cultural competence and sensitivity to equity issues in historically predominantly white environmental organizations.

### 3.3 Field Component: People

**New actors and networks are entering the adaptation field.** Early on, academics, government agencies, and NGOs led the charge on adaptation; now, they are joined by city networks, community groups, utilities, and the private sector. This shift has fundamentally altered the adaptation field in the last five or ten years. Many who have entered the adaptation space are forging networks of communities and learning together. This “self-organizing” is taking place among cities that are leading resilience building in the US,<sup>80</sup> and at other scales—households, businesses, regions, states, sectors, nations, and beyond. In and of itself, self-organizing to face a challenge together is a sign of resil-

ience<sup>81</sup> and indicates that a field of practice is coalescing. At the same time, an increase in participation is evident in the growth of networking among field actors and the emergence of a common identity, although few have emerged as field-wide leaders. Important new actors include:

**City networks.** Adaptation-related networks are growing the field and inspiring a sense of community. Notably, city practitioners, who have a number of networks available to support their learning and capacity building, are collaborating and learning rapidly from each other. One described them as “following the principles of ‘rip and skip,’ whereby cities rip off ideas from one another, skip lengthy idea evolution in their own cities based on others’ success,” and get more quickly to implementation. Or, as another put it, cities are “stealing readily from one another.”

Adaptation-related networks are growing the field and inspiring a sense of community.

The adaptation field now includes several city networks, which overlap but also have clear differences in frameworks and approaches. ICLEI-Local Governments for Sustainability was one of the earliest, beginning with planning templates and benchmarks on mitigation, and later embracing adaptation. For members of USDN, “preparedness, adaptation, and resilience [has been] the number-one interest...for the last three to four years” (Figure 14). The network of (originally) 40 megacities (C40) addresses both mitigation and adaptation, offering insights and resources particularly to large cities across the globe. And the Rockefeller Foundation pioneered 100 Resilient Cities initiative (100RC) is creating a cohort of cities exploring a broader conception of resilience in practice. Cities participating in 100RC share knowledge, tools, and external partners, such as consultancies. Regionally based networks of local communities appear to be less well resourced, but benefit from shared experience with geographic conditions and climate challenges.

**Community groups.** As cities now often take the lead on adaptation and the climate justice movement grows in strength, grassroots groups are initiating their own efforts and demanding a seat at the table in formal adaptation processes. The Kresge Foundation was credited for its support of networks in this area. “Kresge has played a big role,” several noted, in building the adaptation field for cities and enabling community groups at the neighborhood level to inform and help shape urban adaptation practice. These community groups are sometimes linked to networks for peer learning and



**Figure 14: The Urban Sustainability Directors Network has grown into a close-knit network of city leaders, all working to address sustainability challenges. Adaptation and equitable resilience building have been among members' concerns for years.** Source: USDN

mobilization through the climate or environmental justice movements, but generally do not participate in city networks such as USDN, C40, or 100RC.

**Utilities.** Other professional fields increasingly recognize the need for adaptation and are forging networks for that purpose. Leading among them are water utility professionals, whom study participants identified as crucial to adaptation action. Many noted a growing engagement from this sector, even if its practitioners are not necessarily identifying as adaptation professionals. Many considered the water sector “a learning platform for adaptation” (Figure 15), as it has to grapple with key challenges essential to the uninterrupted functioning of a critical resource.



**Figure 15: Managing climate change in the water sector was seen by many as a “learning platform” for adaptation. Utilities must provide essential services while addressing climate-related changes in rainfall, sea level, groundwater levels, water quality, and ecosystems—and confronting various obstacles to change.** Source: NOAA

For example, utilities are affected by multiple climate change impacts at once, including: droughts, wildfires, invasive species, flooding, sewer overflows, various impacts on energy production, diminished groundwater supplies, salt-water intrusion and subsidence. Utilities must not only provide essential services to

their customers; they must also ensure environmental protection and the sustained provision of ecosystem services, which in turn benefit society (through affordable food prices, for example). Addressing these interacting changes effectively is extremely difficult. While utilities are expected to design, build, and maintain expensive and long-lived infrastructure, many find it challenging to retain a highly skilled workforce and provide high-quality training for existing and new staff; deal with internal resistance to new ways of thinking, planning, and decision making; contend with a highly regulated but also customer-sensitive decision environment; and overcome significant institutional barriers and political obstacles affecting water management.

Electric utilities were mentioned much less frequently, most often in terms of the nexus between power and water. However, renewable energy plays an important role in building resilience. For example, it can mitigate greenhouse gas emissions while increasing the public’s interest in climate action. And, given its increasing financial viability, installing renewables in communities is seen as an important strategy to help build resilience while creating jobs—especially in lower-income neighborhoods.

**Private sector.** The private sector is considered key by many to successful adaptation in the long run. And, over the last several years, critical groups of private-sector actors have entered the adaptation space. The first group consists of businesses, which are managing their climate-related risks on site or throughout supply chains to ensure continuity. Businesses are preparing their operations for climate disruptions, and also exploiting opportunities by entering new markets (Figure 16).

**The private sector is considered key by many to successful adaptation in the long run.**



**Figure 16: Even on sunny days, downtown Miami floods regularly, affecting businesses and residents. Such impacts are bringing the private sector to the adaptation table, and creating opportunities in resilience building.** Source: Wikimedia Commons

Climate-sensitive sectors are considering adaptive steps to reduce risk, particularly where there are significant dependencies on energy and water for production or manufacture, but also in recreation and tourism, building and development, and the interconnected sectors of insurance and finance that can help advance more systemic adaptation.

Consulting firms also play a growing role in adaptation. These include global engineering, planning, construction, and management firms as well as boutique, specialist consultants. Respondents saw significant growth in these firms “taking on adaptation as a service and product,” with some pointing to the emergence of corporate resilience and adaptation titles, especially after Hurricane Sandy. While most saw a need for a community of consultants providing adaptation services, some non-profit study participants registered concern that these for-profit consultants are infringing on their own work, especially consultants “going it alone” without input from communities. That concern is met in equal measure from the other side: some consultants do not appreciate that government- or philanthropy-supported non-profits are able to provide adaptation services for free.

Investors—the last group of private-sector actors mentioned—are showing early signs of interest in adaptation, both from the perspective of examining portfolio risks and identifying investment opportunities.

#### **Adaptation actors are not working together effectively.**

There is a fundamental tension between the need to grow the number and diversity of actors in adaptation on one hand, and establishing useful networks and a sense of community on the other. Over the past several years, the field has seen significant growth in actors,

some of whom are well-networked and are already developing a common identity, but also many others who are not yet linked to each other or across networks.

Resilience requires greater connections across sectors, disciplines, and management divisions. Such formal networking does not currently exist, but is crucial to better account for the interconnectivity and interdependencies of systems. The need for such regular interactions is illustrated by the cascade of impacts following major storms. For example, after Hurricane Sandy, electrical failures caused disruptions of hospital power supplies, food losses due to lack of refrigeration, and fuel pump shut-downs. These events showed, as one interviewee put it, “how much we all need to work together.” A common purpose (Section 3.2) and resulting common identity and shared action agenda would help spur collaboration, but actors are still more likely to work within their own silos and focus on local needs and benefits rather than on systemic adaptation.

Interviewees also observed a need for more collaboration between the public and private sectors. Many non-private-sector interviewees expressed a strong desire to work with the private sector, given the potential opportunities to align goals and leverage new capital, resources, and capacity. Due to the lack of collaboration to date, however, public- and civic-sector representatives have little understanding of the roles the private sector could take on. There is an equal lack of understanding within the private sector of the adaptation work already led by local governments, non-profits, and grassroots organizations. Thus, study participants called for much deeper engagement of the private sector overall, and deeper engagement of private-sector entities with others working on adaptation.

**A clearly visible, widely recognized set of leaders has yet to emerge.**

#### **Leadership is distributed and not solidly established.**

Today, leadership of the adaptation field reflects the dispersed and heterogeneous nature of climate change itself. A clearly visible, widely recognized set of leaders has yet to emerge. This is problematic given the current lack of political leadership at the federal level.

Virtually all interviewees expressed concern over diminishing leadership by the Trump Administration. This is a break from the important role played by the federal government in recent years. When asked about the drivers of the field over the past few years, the second Obama Administration was hailed as profoundly influential. In fact, survey respondents counted that leadership as the second-most influential factor on the development

of the adaptation field (Figure 11). Federal leadership helped to:

- Mainstream the conversation about climate adaptation, at least in politically progressive and moderate circles;
- Create critical federal resources (data and toolkits, information resources, research portals);
- Advance policies helpful to adaptation (flood protection standards, green infrastructure);
- Give visibility to local, state, and tribal leaders working with the federal level on resilience; and
- Provide dedicated funding through a number of federal agencies (including NOAA, EPA, HUD, FEMA, DOE, and various agencies within DOI).

State and regional leadership also played an important role in the field. Several state governors and legislatures have emerged as leaders—notably in California, Florida, New York, and Massachusetts. We will discuss their important policy work in Section 3.5.

As discussed in Box 4, the leadership of individuals and organizations is far less clear. Very few, if any, individuals or organizations are seen as field-wide leaders, although such leadership does exist or is emerging within sectors and networks. This is also true within the climate movement, and more specifically, the climate justice movement. The climate justice movement offers important leadership by articulating a guiding vision, values, and practice (Box 7).

### 3.4 Field Component: Practice

Adaptation practice has advanced in recent years: a common knowledge base is growing; there has been important investment in skill and capacity building; a plethora of tools support adaptation planning. Scientists and practitioners are working together more effectively, and communities are experimenting with various innovations. But overall, adaptation remains in planning mode and has barely begun to move into implementation.

**The knowledge base on adaptation is improving.** All respondents noted important advances in the common knowledge base that supports climate adaptation planning. Over the last few years, physical climate science has advanced understanding of climate extremes and the ability—at least in some cases—to attribute and forecast them. Concurrently, the social sciences, including economics, are contributing to a better understanding of human vulnerabilities to climate change impacts, adaptive capacities, and the inter-related barriers and limits to adaptation. However, far less data and scientifically credible information is available on adaptation *benefits*.

Overall, adaptation remains in planning mode and has barely begun to move into implementation.

Overall, the knowledge base has strengthened to the point where advances in climate science have been a driver of

#### Box 6: The Critical Need to Make Smaller Cities and Rural Areas Part of the Action

As adaptation practice accelerates in larger metropolitan areas, smaller cities and rural areas are being left behind. When rural and urban adaptation actors compete for resources, rural areas often lose out. Smaller cities or townships in rural areas lack the capacity to take full advantage of the benefits of existing networks.<sup>82</sup> As federal support, data, and tools for adaptation are taken away, these less populous areas rely on networks of larger cities to brainstorm ideas and identify solutions. But the mechanisms to share these insights and adapt potential solutions to different circumstances are not yet in place. Smaller cities and local jurisdictions (townships, villages, and rural counties) are thus generally less likely to be engaged in adaptation planning or implementation, given the general scarcity of resources, staffing, and time.

But while urban and rural areas have distinct challenges, there are crucial limits to successful adaptation if each pursues adaptation separately. An exclusive focus on either urban or rural areas would—in the words of one respondent—constitute a “dangerously incomplete strategy.” It would disregard interdependencies between city dwellers and their rural counterparts, miss critical political dependencies, and ultimately limit the ability to ensure safety and secure livelihoods for both urban and rural dwellers. Moreover, given that equity issues also pervade rural areas (equitable allocation of resources and political power, rural poverty, limited job opportunities and health care, lack of critical infrastructure), a “city-only adaptation strategy will miss opportunities for expanding climate justice.”

## Box 7: Climate Justice and Adaptation: Current Status and Opportunities for Deeper Integration

In the US and around the world, a diverse and growing coalition of national, regional, and grassroots organizations are forging a movement for climate justice. That movement increasingly overlaps with the nascent adaptation field.

Despite these connections, some respondents noted that integration of movement and field is not as good as it could be across the four dimensions: Purpose, People, Practice, and Pillars. One argued that a “big shift in the organizing model” is needed to change societal values and practices. And much can be learned from the movement on how to integrate social equity and justice concerns into adaptation. For example, the adaptation field does not yet (but could):

- Make deliberate efforts to build relationships and trust between mainstream and grassroots resilience-building groups;
- Help capture and share lessons from the movement across the adaptation field;
- Provide technical assistance to groups otherwise unable to use available information and resources;
- Share resources with less advantaged groups in meaningful ways;
- Give marginalized people voice and a seat at the table;
- Focus on the roots of the climate crisis; and
- Conduct a sharper analysis of what drives differential vulnerabilities, resource exploitation, and racial and socio-economic disparities.

Some believed that, until the climate justice movement and the adaptation field commit to working together, communities will not be able to address the converging climate, economic, health, and justice crises.

While interviewees differed on whether and how the climate justice movement should influence the further evolution of the adaptation field, there are signs of mutual growth, enabled by major field donors like The Kresge Foundation, which supports actors who straddle the movement and the field. Through its own broad definition of resilience, Kresge urges those focused on climate vulnerabilities to embrace economic and social issues, and those focused on social justice issues to address climate change. Kresge asks both to embrace adaptation and mitigation as complementary and necessary strategies needed to close the resilience gap.

the field, and lack of scientific certainty is among the least important barriers to adaptation. Still, many observed that disagreement over the importance of climate change remains a big hurdle to adaptation.

Both Kresge grantees and other thought leaders acknowledged that the “blessing and the curse of adaptation is that it is intrinsically local.” Consequently, some—particularly practitioners working in local contexts—place a high priority on the need for downscaled data (including, for instance, visualizations that show changes to a building-dense coastline as sea level rises) and project-specific quantification of risks, costs, co-benefits, and negative side effects of adaptation. Many noted that the growing availability of these data (though with varying levels of robustness) has helped advance adaptation, but a good

percentage said the lack of locally specific information is still frequently a problem.

Communication research has made great advances, enabling public engagement around climate change in general and adaptation more specifically.<sup>83</sup> However, there is still limited communication about and media attention to adaptation; participants considered communication better within the field than outside it or to the public.

**Investment in capacity building has strengthened the field.** For many study participants, growing investment in human capital was one of the most important signs of field development and maturation. It also constitutes a critical ingredient—alongside technical, financial, social, political, institutional, and natural capital—in the overall adaptive capacity of a community.

Philanthropic support for capacity building, such as trainings, peer-learning opportunities, adaptation-focused professional societies, and general operating support that allows organizations to engage with adaptation has also been valuable. Similar (albeit less) support comes from academics as well as government agencies and other organizations. For example, professional associations outside the field, including those focused on public health, risk management, water management and planning, are increasingly seeking to identify what their members need to know about adaptation and offer relevant professional development courses.<sup>84</sup>

Peer-learning opportunities have played a significant role in skill and community building and the professionalization of the field. Particularly valuable have been convenings, societies, and dedicated events where practitioners can network, build relationships and trust, learn from each other, and collaborate.

**Tools supporting adaptation are increasingly available, but remain difficult to select and use.** As climate-related knowledge has grown, so have the number and variety of tools available to support adaptation planning and implementation. Almost 60% of grantees and nearly 45% of other thought leaders somewhat agreed that “we now have the basic tools we need to assess climate risks,” and about 40% of both groups agreed that “we now have the necessary tools to evaluate adaptation response options.” These numbers are important indicators of field progress.

In addition to tools to assess climate risk, other technical tools are available—for example, to help make the economic case for adaptation. Also available, but less well known, are tools to support equitable stakeholder engagement processes, such as power analysis or mapping<sup>85</sup> and frame analysis.<sup>86</sup>

While the proliferation of tools was hailed by some, others were critical or skeptical about the helpfulness of these new resources. “Early on, we were building the information pieces; now we’re drowning in a sea of information, portals, projections, and tools.” As a result, it is “unclear to people what’s relevant, what matters to decisions, which to use for decision making, which to apply on the ground.”

In order to integrate adaptation into day-to-day activities in many different contexts, tools must be flexible and accessible to both new and experienced users. But about half of survey respondents thought the lack of sufficient staff resources to assess relevant information was a major hurdle to advance adaptation. Where tools

are available, interviewees noted, there is no guarantee that they can or will be used. Moreover, the field has not yet established systems for maintaining, evaluating, updating, and improving these tools over time. Study participants expected the demand for user-friendly tools to continue to grow rapidly where there are mandates to take climate change into account in long-term planning and decision making, but it is not clear whether that demand can readily be met.

**Science and practice are increasingly working together, yet more collaboration is needed.** Today, there are growing efforts to bring together disparate disciplines, sectors, and actors across the field. For example, a number of interviewees pointed appreciatively to bridge-building between academia and practitioners, which has grown in sophistication and prevalence. Science–practice collaboration can be time-consuming and challenging, as it often requires different processes from those used when working in separate silos. In many instances (though not exclusively), such efforts are supported by federal programs, such as NOAA’s Regional Integrated Science and Assessment (RISA) centers, the DOI’s Climate Science Centers (CSCs) and Landscape Conservation Cooperatives (LCCs),<sup>87</sup> the USDA’s Climate Hubs, and longstanding Sea Grant/Land Grant extension services. These entities serve as links at the boundary of science and practice, connecting scientists to a wide range of practitioners.

The Third National Climate Assessment (NCA3), released in 2014, evolved in important ways from prior assessments to place a major emphasis on such transdisciplinary collaboration, regional outreach, and public engagement to build a dispersed network of climate assessment capacities. And, in the second term of the Obama Administration, the White House convened adaptation-related roundtables and task forces of experts from varied fields to foster such networking and coalitions.

In relatively rare cases, practitioners actively seek scientific input for their adaptation efforts; more often, researchers reach out to decision makers and policymakers, practitioners, and adaptation service providers to better understand what scientific information they need, to make their knowledge more practically relevant and accessible, and to be more directly engaged in adaptation planning processes. Still, many interviewees wished scientists would get out of the academy more often, engage with other forms of knowledge and expertise, and appreciate and work with community-generated data. Thus, much work remains to be done, as incentives to reach across the science–practice divide are lacking from both sides.



For many interviewees, increased collaboration was seen as a necessity, given the systematic nature of climate change and adaptation. Others saw working together as particularly critical during challenging political times—to guard against policies that undermine adaptation progress, for example, or to shore up fledgling coalitions. For still others, collaboration simply helps ensure the most efficient use of time and resources.

**The field is experimenting widely, but not yet discerning best practices.** All fields need innovation to remain fresh and to rapidly respond to novel challenges. The early years of adaptation in the US were all about innovation; simply adjusting to a changing climate required new thinking and a break with traditional practices. (A less generous read might be that much of adaptation to date has been more about stepping up hazard mitigation

**It is now time to distill lessons learned from these experiments and establish a set of best practices.**

practice, and as such not entirely innovative.) But many study participants saw a rise in experimentation. As one put it, leading cities are trying new things, in “lots of place-based experiments, to see what sticks.” Study participants appreciated this as a necessary

phase of the field, but some argued that it is now time to distill lessons learned from these experiments and establish a set of best practices. Both research and practice were seen as sources of innovation. In fact, some interviewees believed that practice is all too often overlooked as a source of innovative solutions, particularly around effective stakeholder engagement and meaningful efforts to address the concerns of low-income communities.

Creative post-disaster resilience-building efforts, such as HUD’s Rebuild By Design competition after Hurricane Sandy, were seen as another source of innovation (Figure 17). The Rockefeller Foundation’s support for capacity building ahead of the competition was noted as an innovative way to improve the quality of proposals. That support also had positive spin-off benefits, even when competing communities or states did not succeed in obtaining funding. A Resilient By Design competition has since been launched in the San Francisco Bay Area.<sup>88</sup> Other community-rebuilding or solution-finding efforts across the country were called out for their inspiration and innovation.<sup>89</sup> This experimentation and innovation was enabled by open-minded political support and significant government funds—a field pillar made available through the Sandy Recovery Improvement Act and related disaster-relief appropriations<sup>90</sup>—as well as additional philanthropic support.



**Figure 17: An entry in the Rebuild by Design competition, which invited innovative adaptation solutions.** Source: Rebuild By Design/OMA Team

Nature-based solutions represent another active area of innovation—though in some senses, nature is the oldest protection under the sun. Still, for modern-day communities, it is considered innovative to introduce nature-based solutions to issues such as flood and shoreline protection, water and air quality, or the conservation of soil and biodiversity. A range of efforts are underway to assess the lifetime costs and benefits of so-called green infrastructure, especially when compared to traditional grey (human-built) infrastructure. Climate change-driven water concerns (drought, flooding, water pollution, water retention) may increase the need for and acceptance of nature-based practice, as city dwellers learn to “look upstream...to gain awareness of where their water comes from as supplies dwindle” and see forests as a means to accomplish local or national emission reduction goals. Some interviewees hoped that, within five years, mandates to install green infrastructure would be well established, along with a national certification and training program in green infrastructure.<sup>91</sup>

These examples notwithstanding, even the most optimistic study participants did not see innovation as a deliberate, institutionalized practice—even in the cities leading on adaptation. Institutional and resource constraints and competing demands leave little room for making innovation a habit. And mechanisms to spread innovations—such as competitions—are scarce, resulting in limited reach.

**Practice is advancing, but barriers stymie progress from planning to action.** Adaptation planning has advanced, in large part due to the experience of climate extremes and other impacts. “It’s unthinkable that you would have a city climate plan without adaptation now. It used to be that was the norm,” said an interviewee.

## Box 8: Lessons Learned from Practice: Strategic Interventions for Effective Adaptation

Our research uncovered powerful approaches that have spurred real change on the ground. **Following these steps, in the sequence offered below, has proven effective in moving comprehensive planning efforts to implementation.** Importantly, these steps combine technical services with effective engagement and a sharp analysis of political power, authority, and potential conflicts.

### *Preparatory Work*

- “Power-map” who is doing what; identify agency roles and levers of power.
- Map grassroots concerns to identify priority climate impacts and locally preferred responses.
- Assess the policy and funding landscape.
- Identify existing practices that contribute to resilience.
- Identify local champions.

### *Technical Assistance and Advisory Services*

- Offer advisory services that provide unbiased opinions and deep immersion in implementation tactics.
- Provide ready access to examples of best practices.
- Conduct original research and provide technical assistance and/or partner with universities; harvest academic work; develop key data, and bring it to cities and communities.
- Work with stakeholders to identify and/or offer a range of potential solutions.
- Work with stakeholders to identify targets and measures of adaptation success (relating to core dimensions of the resilience gap, including adaptation, equity, and mitigation); identify ways they can be tracked in the course of ongoing work; and create external accountability structures.
- Perform cross-cutting research—for example, on social cohesion, climate-driven displacement/migration, infrastructure investments, etc.

### *Strategic Partnerships*

- Use a partnership model with a memorandum of understanding that all partners agree to at the start of the project, which pays attention to mitigation, adaptation, and climate justice.
- Ensure key stakeholders are at the table and become aware of all perspectives.
- Build relationships between communities, local governments, and the private sector to create a vision of the future.
- Build capacity through trainings, toolkits, and supporting resources (including peer networks) to sustain ongoing learning.
- Facilitate collaborative funding applications with multiple entities, including meaningful engagement of low-income communities and communities of color.
- Offer a leadership academy for agency staff, taught by community groups, on how best to partner with community members.
- Recognize and engage key community service providers (for example, community development organizations) to help them adjust the services they provide to residents; and connect them with other partners for bigger impact.

### *Enabling Implementation*

- On the back end of projects, incentivize follow-through and enforcement.
- Assist with development of funding mechanisms, such as voter-approved financing.
- Build projects on the ground with the community.
- To avoid displacement or “climate gentrification,” work closely with community leaders and local governments to acquire land and development rights through community land trusts and/or collaborative purchase mechanisms.

### Significant limits in funding, staff capacity, the lack of legal mandates, and regulatory or other governance barriers prevent many from moving from planning to action

One sign of advanced practice is that some cities are already on the second generation of their adaptation planning processes. But, generally, interviewees noted that—absent a major influx of post-disaster funding—most cities and other jurisdictions are not implementing their adaptation plans. Significant limits in funding, staff capacity, the lack of legal mandates, and regulatory or other governance barriers prevent many from moving from planning to action—a finding widely supported by the literature.<sup>92</sup>

**Adaptation is increasingly mainstreamed into existing institutions.** The first generation of climate practice—dating back to the late 1980s—involved impact assessments, climate mitigation plans, and later, stand-alone adaptation plans.<sup>93</sup> Today, approaches to adaptation are far more diverse and the isolated adaptation plan is less common. Instead, from federal agencies to city and county governments, adaptation is increasingly “mainstreamed” into existing plans and procedures, such as general/comprehensive plans, hazard mitigation plans,

capital improvement plans, or sector-specific planning documents.<sup>94</sup> With this evolution, there is more emphasis on risk-management approaches, and on building adaptation capacity and greater flexibility into existing management procedures (Figure 18).<sup>95</sup>

Mainstreaming means that climate change is integrated into routine planning processes and decision making.<sup>96</sup> It is seen as a way to ensure that government agencies, community organizations, and others can take new action to advance resilience while using the resources, processes, and capacities currently available to them. Though not all respondents interpreted the term in the same way, mainstreaming appeared to be the preferred approach for most.<sup>97</sup> It was seen as a way to help overcome barriers to adaptation, bypass the need to create new regulations or policies, limit costs, prevent new silos from being created (or overcome existing silos), and build adaptive capacity (Box 9).<sup>98</sup>

Although it has not been achieved widely, mainstreaming has emerged as the preferred approach in the US adaptation community today. In fact, many interviewees see mainstreaming as the only viable path forward. As one put it, “We need to integrate an adaptation focus with broader goals that communities want to achieve...

### Box 9: Barrier and Capacity Needs Addressed Through Mainstreaming

- **Financial constraints:** Adaptation work can be advanced within existing budgets without having to secure additional, separate, or new funding sources.
- **Political hurdles:** Climate change considerations can be integrated into projects and programs already underway to protect them from short election cycles and political opposition.
- **Inadequate planning processes:** Existing plans, processes, and solution options can be informed and improved by consideration of future climate impacts.
- **Limited authority:** Where dedicated climate, sustainability, or resilience staff do not have the authority to influence other processes (such as hazard mitigation plans, public health vulnerability assessments, capital planning), mainstreaming balances responsibility among multiple agencies and departments with authority to act.
- **Capacity deficiencies:** Where there are no dedicated staff for climate change and resilience (especially in small and medium-sized cities and towns), mainstreaming is the only viable, near-term approach.
- **Lack of motivation:** In the face of multiple competing priorities, finding overlaps and co-benefits between adaptation and other goals can elevate the urgency to act.
- **Lack of consistency:** Mandates from higher government levels can help ensure that lower-level entities address climate change, and do so consistently across jurisdictional boundaries.
- **Language barriers:** If climate change is politically or conceptually problematic, using the vernacular of existing processes can help open doors and engage broader audiences.
- **Separate/siloed approaches:** Mainstreaming can initiate better coordination of previously disconnected efforts, build broader support, uncover budget overlaps and complementarities, and achieve additional benefits.

If you can figure that out, you have figured out resilience.” Such integration would lead to more holistic approaches and correct the shortcomings of siloed planning and management. If they succeed, as one put it, then “every mayor and governor is eventually going to wake up worrying about climate change.... Resilience can’t be a niche thing. It must be a sea change, integrated into government everywhere.”

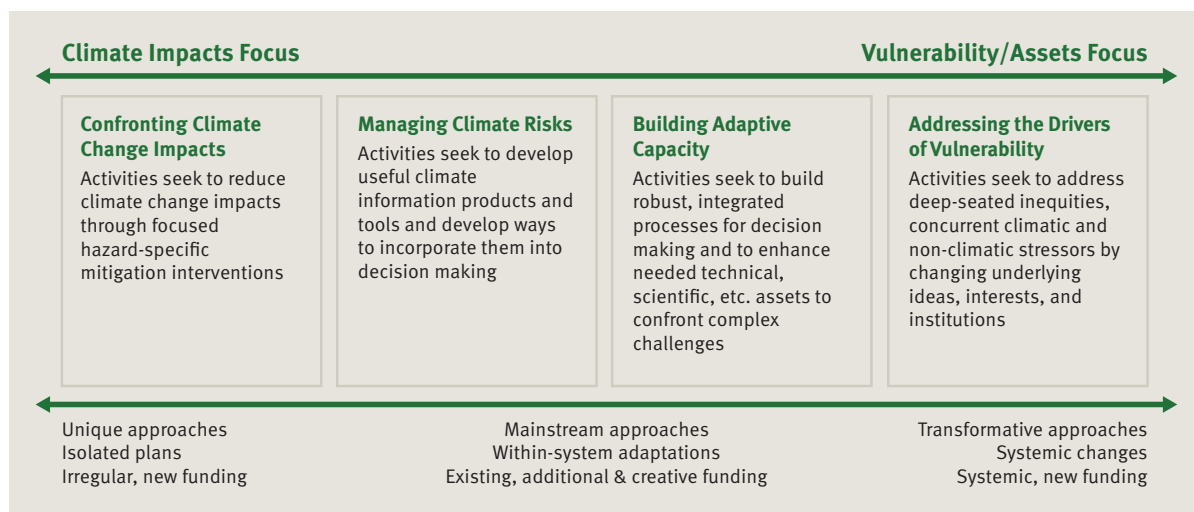
**Resilience can’t be a niche thing. It must be a sea change, integrated into government everywhere.**

Yet, some interviewees and the literature do not embrace mainstreaming uncritically. “Mainstreaming adaptation,” one observes, “inherits the weaknesses and strengths of the underlying plans and planning agencies.”<sup>99</sup> Concerns among some interviewees about mainstreaming focused on a number of limitations:

- Greater awareness of climate risks in the disaster preparedness community could lead to addressing adaptation through hazard mitigation and emergency planning, which some considered too reactive.
- While mainstreaming of resilience and equity into planning and sustainability over the past several years has led to increasing recognition that these things are “everyone’s job,” this recognition has not been followed by funding or action.
- There is a mismatch between governance jurisdictions and the geographic extent of climate change impacts, with jurisdictional boundaries and processes inherently limiting the scope of action.

- Some of the models and approaches used to assess risks and response options use outdated data and produce results that give perverse incentives (such as by using cost-benefit analyses for one-off infrastructure projects that split up costs and incentives), overly discount the future, and select inadequate design life horizons for decision making.
- Traditional, mainstream “top-down” approaches do not give adequate room for potential “bottom-up” innovations.
- Other shortcomings of traditional governance—narrow, siloed mindsets, institutions that perpetuate existing inequities, non-transparent decision making—will not spark transformative solutions to converging climate, social, and economic crises that will lead to a better future. “What got us here,” said one interviewee, “will not get us there.”

**More systemic changes are needed to close the resilience gap.** Mainstreaming does not guarantee that adaptation moves from planning to successful implementation; nor does it necessarily result in improved processes or outcomes that address long-standing inequities and deep drivers of vulnerability. For some, therefore, mainstreaming is only a step toward more comprehensive, systemic change. Consistent, conscious effort is needed to surface the necessary questions and build the commitment and political will needed to reach larger goals. Figure 18 shows the spectrum of adaptation approaches observed in the US (and elsewhere), indicating the spectrum ranging from isolated plans to mainstreaming to more transformative approaches.



**Figure 18: The spectrum of adaptation approaches.** Adaptation approaches can range from stand-alone planning efforts enabled by post-disaster funding to mainstream approaches that address climate risks largely within existing structures, processes, and funding mechanisms to transformational approaches that aim to address the deep drivers of vulnerability through systemic changes. Source: Inspired by Klein (2008), drawing on McGray, Hammil and Bradley (2007, p.35)<sup>100</sup>

### 3.5 Field Component: Pillars

The adaptation field is built on two foundational pillars: *policy* and related government programs that support, encourage, or demand new thinking, adaptive planning, experimentation, and implementation; and *funding support* that directly enables field building or implementation of adaptation actions. Today, the two pillars are neither robust nor effectively integrated.

#### Policy Support

**International and federal policies have influenced the field.** Policy—either directly or indirectly, positively or negatively—has shaped the US adaptation landscape over the past two decades. At the international scale, the failed Copenhagen climate negotiations in 2009

**Policy has shaped the US adaptation landscape over the past two decades.**

inadvertently elevated the necessity for adaptation. Later, the successful Paris Accord included an explicit (albeit vague) adaptation goal, and was seen as pivotal to advancing global recognition of the

need for adaptation. In addition, some interviewees mentioned the SDGs and policy drivers informing the financial sector, such as the G20's push for financial disclosure (Task Force on Financial Risk from Climate Change) and changes in French law (Article 173) that are also expected to fortify the policy pillar of the field.<sup>101</sup>

In the US, the failure of the federal Waxman-Markey Bill (the American Clean Energy and Security Act of 2009), which focused on mitigating greenhouse gas emissions, underlined the need to prepare for climate change impacts not avoided. (Some interviewees also said this failure taught them important lessons about attempting policy changes without the environmental justice community fully on board.)

During the Obama Administration's second term, federal support for climate adaptation and mitigation rose significantly. Some said that support had profound effects; others said those efforts were "way too slow." In the absence of bipartisan Congressional support, the Administration frequently used easily reversible executive orders to promulgate climate change action, a vulnerability made visible by the policy shifts of the Trump Administration.<sup>102</sup> But many agreed that the Obama Administration's embrace of the scientific consensus on climate change was "very important" in advancing adaptation policy. Key positive efforts mentioned included:

- The federal Sandy Recovery Improvement Act and related Hurricane Sandy Rebuilding Task Force

unleashed significant federal funding, science-informed decision making, and interdepartmental collaboration.

- The NCA3, released in 2014, was praised for its downscaled climate projections, high-resolution spatial climate data, effective delivery, and regional engagement strategies.
- The State, Local, and Tribal Leaders Task Force—described by more than one respondent as "incredible"—produced recommendations that were adopted by the Administration and then rolled out as part of a suite of federal climate change actions.
- Several federal data and tool portals made adaptation-relevant information widely available to state, local, and tribal decision makers.
- President Obama's leadership during his second term, and particularly his efforts in response to Superstorm Sandy, helped "mainstream the resilience conversation."
- Efforts by multiple agencies (including EPA, NOAA, DOI, and the US Army Corps of Engineers) to study, embrace, and then promote green infrastructure and nature-based solutions have raised awareness and enabled some states and cities to design and implement these solutions.

Study participants were more divided on the Obama Administration's impact on social equity. Some acknowledged that the Administration recognized the differential needs of communities and injustices in who benefitted from resilience-building efforts. But many interviewees believed that much more should have been done. "[O]ne of the disconcerting trends in these [federal] policies: poor people and communities of color have been left out of the conversation."

**There are new threats to adaptation policy under Trump.** The Trump Administration is widely regarded as a key challenge to adaptation. Many worried about the long-term impact of active climate deniers assuming agency leadership positions; the retraction of Obama-era executive orders; and the removal of climate data, tools, and analyses from federal websites. On the other hand, several considered that the Department of Defense—an important federal actor in climate adaptation in the Obama Administration—will remain a critical player in furthering climate risk reduction in the Trump Administration. While a few held some optimism around the promised investment in infrastructure, others feared that such infrastructure would not be designed for resilience.<sup>103</sup> Most expected the field would be faced with significant cuts in funding and a lack of active governance and political support for climate action. These changes would leave a major gap for adaptation leaders

elsewhere to fill. At the same time, some thought the Trump Administration’s neglect of climate change might be a major motivator for the movement and for the field at the state and local level.

Overall, the constructive federal role over the past several years supported the field, but adaptation is not yet solidly anchored in the policy landscape. As a result, the US adaptation field does not currently benefit from widely adopted adaptation-related policies.

**Adaptation mandates are emerging in some states.**

Partly driven by emerging impacts, partly by progressive state leadership, several state governors and legislatures are leading on adaptation, study participants noted. In California, two successive governorships and legislative leadership delivered strong climate policy, including a bill mandating that local communities include climate change considerations in general plan updates and local hazard mitigation plans.<sup>104</sup> Another recent bill initiated a process to update the state’s engineering standards to better account for changing climate risks.<sup>105</sup> Moreover, state agencies are providing technical assistance, coordination support, and competitive grant programs for local and regional adaptation efforts.<sup>106</sup> But leadership on adaptation is not only coming from the top down. With support from various foundations, grassroots groups have succeeded in bringing concentrated attention to social equity in state policymaking. This, in turn, affects the bills introduced,

how state agencies write calls for grant proposals and update adaptation plans, and how state agencies integrate social equity into their work (Box 10).

The Florida legislature, despite climate skepticism, adopted changes to its coastal law creating Adaptation Action Areas to prioritize the receipt of climate risk mitigation funds—an idea that grew out of the work of the Southeast Florida Regional Climate Compact.<sup>107</sup> New York and Massachusetts were noted for “state shifts that opened a policy space” for adaptation. These initiatives were seen as changing the conditions for local adaptation, and allowing for regional approaches. A number of other states have also adopted adaptation plans, though many gaps remain—particularly in the Midwest, the Great Plains, and in southern states.<sup>108</sup>

Standards promulgated by governments or institutions are a key element of policy, but they are generally still lacking in the adaptation context (the recent bill in California notwithstanding). Some respondents thought the field should be careful not to duplicate efforts where existing professional standards, such as in engineering or law, could be used or adapted for adaptation field practice. Some standards are also adopted internationally (for example, by the International Standards Organization [ISO]) and efforts are underway there to adopt adaptation-focused standards, which could become influential in the US.

## Box 10: Changing Policy and Practice from the Bottom Up: Advancing Social Equity

There is growing recognition of the importance of social equity in adaptation, but that recognition is not often followed by funding for equity-focused action. Nor does it guarantee the institutionalization of equity into local- or state-level policy and planning processes. Part of the problem is that many government officials and staff lack understanding of how issues of equity play out in their work and how they might better address them.

The Community Resilience Initiative, led by Rooted in Resilience—a grassroots organization in Oakland, California—offers one way to address this challenge. Rooted in Resilience developed an “equity check list” and then trained local and state agencies in how to apply it in grantmaking, stakeholder engagement, and adaptation planning. The initiative gained widespread recognition among local and state agencies, including the Governor’s office and the legislature, resulting in legislative and state planning guidance changes. Follow-on support from a regional foundation<sup>109</sup> enabled a number of environmental justice activists to participate in the update of the state’s “Safeguarding California” adaptation strategy.<sup>110</sup>

Over time, the persistent advocacy of environmental justice groups in California has won significant legislative victories. For example, funding generated through California’s Assembly Bill (AB) 32 requires that environmental justice must be considered in supported projects. More recently, Senate Bill (SB) 1000 requires an environmental justice element in local general plans.<sup>111</sup>

## Funding Support

**Funding from philanthropy and government has been crucial for field growth.** The literature on field building (much of it funded by philanthropy) is unanimous in its assertion that funding is crucial for a field’s emergence and maturation. The recent infusion of financial resources from philanthropic and governmental sources was noted repeatedly as an important influence on the emergence of the adaptation field. Much of that infusion came from federal sources (including hazard mitigation and post-disaster rebuilding funds from FEMA, competitive grant programs within NOAA and EPA, and HUD Community Development Block Grants). But respondents said funding from foundations (such as Kresge, Rockefeller, MacArthur, Surdna, JPB, Doris Duke, and others) was also extremely influential. They particularly appreciated philanthropies’ interventions to create more public support for resilience work and to complement and enable field-building and adaptation policy development.

Philanthropic funding promulgated influence, exposed recipients to thought leadership, generated new ideas, and provided the “fuel to bring them to fruition.” Especially, as The Rockefeller and The Kresge Foundations “lean[ed] into the urban scale” (with Kresge described as the “bottom-up” and “equity-focused” foundation, and Rockefeller as bigger, “top-down” and more “formulaic”), their influence has become important in many cities across the nation. Both foundations were credited with branding and mainstreaming adaptation and resilience issues, and Rockefeller was noted for framing resilience in terms broader than climate change.

**Foundations are not collaborating effectively.** While there was widespread gratitude and appreciation for philanthropic leadership and support of the adaptation field, several interviewees noted the persistent lack of collaboration among foundations. Interviewees recognized that each organization has different missions and strategies. But at a time of diminishing federal resources, they saw little room for missed opportunities, misalignment of funding streams, or counterproductive philanthropic investment. Several interviewees pointed specifically to diminishing funding for adaptation in rural areas, a trend seen—even among some urban-focused interviewees—as detrimental to the field overall. Efforts to bring philanthropy together to explore complementarities and create common funding pools were deemed positive and necessary.

Funding is crucial for a field’s emergence and maturation.

Some noted that, in recent years, federal leaders interacted more with foundation leaders (and vice versa) but feared this is not likely to continue under the Trump Administration. With federal assets for adaptation at risk, many interviewees called on philanthropy to fill current and future gaps in funding. Others thought that private finance—in the form of public-private partnerships and in debt and equity investments—should be tapped more effectively to fill the federal gap and help the field evolve.

## CHAPTER 4

# Meeting the Needs of the Adaptation Field: From Road Blocks to Road Markers



The findings presented so far have helped us understand the history and status of the field. Throughout the interviews, study participants also described barriers and needs they felt had to be addressed in order to move the field forward and to move from adaptation planning to action. The needs described in this chapter, if unmet,

will stand as major roadblocks to progress for the adaptation field. These needs are also immediate entry points to advance the field and—if fulfilled—will serve as useful indicators of progress. They are organized below by the 4Ps of the field, prioritized by the frequency with which we heard them from study participants.

## Box 11: Key Field Needs Identified by Study Participants

### *Central to all components of the field*

- A unifying vision is needed to provide clear direction and to unite the field.

### *Purpose*

- The field needs a greater sense of urgency to vastly step up action on both mitigation and adaptation.
- There is a lack of clear regional (as well as national and cross-cutting) priorities to drive focus.

### *Pillars*

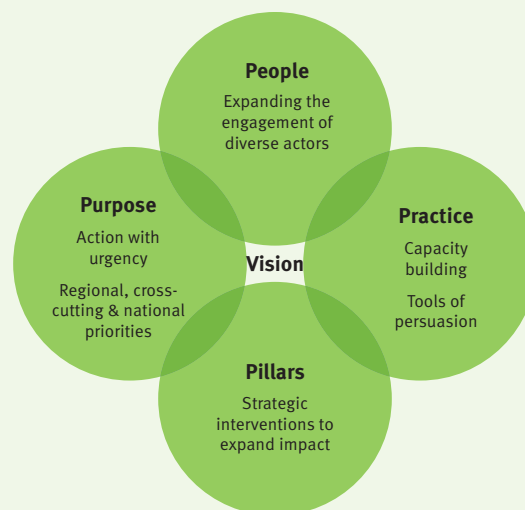
- Specific strategic interventions are required to help diverse sets of adaptation professionals meet critical needs and achieve higher impact. These include: policy levers; regional scaling of local efforts; collaboration with professional societies; establishment of standards; and creative, sustained, and coordinated financing and funding mechanisms.

### *Practice*

- A gap exists in the range of tools and resources available to persuade decision makers, funders, and the public to adapt. Tools are needed to make the economic case for adaptation, disclose climate risk, measure progress, and tell positive stories of success.
- The field must build capacity for deeper thinking, committed action for equity, greater sophistication and professionalization of practice, and transformative change.

### *People*

- The field must engage previously uninvolved actors, including the private sector (funders, insurers, investors), professionals who do not see themselves as adaptation practitioners, and young people (Figure 19).



**Figure 19: Critical needs identified by study participants.**  
A unifying vision is central to all 4Ps.

## 4.1 A Unifying Vision

### The adaptation field lacks an all-encompassing vision.

Many study participants lamented that without a unifying vision of what the field is trying to achieve, virtually “everything goes,” at least within the limits of existing law, funding, and governance. The result may be uncoordinated action, exclusively human-centered adaptation at the expense of environmental systems (or the reverse), and inequitable adaptation that protects the wealthy while deepening the vulnerability of the poor. Several interviewees were concerned about the dangers of maladaptation;<sup>112</sup> others feared that without a larger vision to orient the field, adaptation will never achieve the same momentum as mitigation.

The lack of a unifying vision providing strategic direction was seen as especially problematic for communities that are “underfunded, understaffed with no redundancies, and [that depend on only] one or two prime employers.” In such communities, “leaders are in reactive mode, overwhelmed by other priorities, constrained by short terms, and unable to cultivate and show the leadership necessary to scale their work.” As one observed, “We’re so caught up. We are scrambling for rapid response. We have so little time to think.” With extremely limited capacity to implement the day-to-day work, let alone tackle bigger goals, many grassroots and community groups wished for leadership and a network or cohort of likeminded groups to create and implement a bigger vision.

**The federal leadership vacuum could spur visioning in communities.** Some thought the current political situation (including the elimination of significant federal

funding for resilience work) could “inspire a deeper vision and more impact,” as communities will need to be more self-reliant in the face of converging socio-economic and climate crises. Rather than bringing adaptation to a standstill, they felt the current situation could motivate actors to come together to craft this vision. But one noted, “this needs to happen this year,” given the urgency of the problems. “We cannot wait for someone else to do this; we need to take this in-house. The people making the bigger decisions are not going to do so in our interest, so communities will re-envision their future based on this external realization, their lived experience, and their own sense of purpose.”

**The field needs a values framework to guide adaptation.** What might such a meaningful and coherent vision look like for a diverse, decentralized field with widely differing concerns and deep political divisions? Many called for a “values framework” to guide the adaptation field, though there was no consensus on exactly which values should guide adaptation (Box 12).

Most agreed that shared values are a key element of a robust field of practice (see Chapter 2). Importantly, as one suggested, the field must shift from an emphasis on the problem and instead focus on envisioning a positive future. “Flip from ‘risk’ to the ‘future we want’ for our communities and regions.” They urged that any such vision should be accompanied by a complementary set of metrics for progress and success.

The field must shift from an emphasis on the problem and instead focus on envisioning a positive future.

### Box 12: Elements of a Values Framework for the Adaptation Field

Values to guide the development of a unifying vision for the adaptation field and to give it direction could include:

- Greater commitment to the common good;
- Greater openness, on all sides, to different ways of thinking;
- Deep examination of human-to-human and human-to-nature relations;
- Prioritization of human-centered and nature-based approaches over technology-driven adaptation;
- Commitment to social justice and fairness;
- Focus on economic vitality;
- Meaningful community engagement; and
- Community resilience.

**One framework, many visions.** Study participants argued that there may not be a singular vision for the field, given that “all adaptation is local,” and that visioning is most powerful when specific to regions or sectors. In urban areas, for example, one suggested replacing the car-oriented urban-suburban paradigm of the 1950s with a new vision centered on human well-being. Such locally specific visions would need to account for tangible manifestations of climate change, offer locally practicable and desirable solutions, and advance diverse needs and goals.

In short, while a unifying vision for the field was valued and desired, there was less clarity about the framing of that vision. It might, for example, embrace a diverse set of context-sensitive visions, brought together by a coherent set of values, while contributing to a larger set of goals.

## 4.2 Purpose

**Many communities are not yet aware of the need to adapt.** Despite the extraordinary scale of the climate change problem, there is not a corresponding sense of urgency in addressing the problem in the country at large. Meeting the scope of the global climate challenge requires vastly more robust mitigation and adaptation action than has occurred to date (Figure 20).



**Figure 20: A massive effort to scale up clean, renewable energy to mitigate greenhouse gas emissions is the ultimate adaptation method: it will make it possible for communities to avoid the worst impacts, and enable them to adapt to those that cannot be avoided.** Source: US Department of Energy

**No component of the current field matches the scale and scope of the problem.** Study participants felt that field-building efforts must be effectively scaled and accelerated across all sectors and geographies. Yet, simply doing more of the same in more places would not produce the needed systemic breakthroughs, policy support, and funding. “One-off activities in commu-

nities and companies are not enough” and the emergence of alternative economic and community models is moving too slowly. Interviewees warned that while adaptation planning is happening, “there are more places and sectors that are not aware of the need to adapt than are aware, and the number adapting is even a smaller percentage.”

And even where adaptation is underway, some felt that practitioners lack a big-picture understanding of the potential for tipping points and irreversible changes. As one put it, “We are still stuck in the variability paradigm of history, [where after a disturbance we are] going back to the former state, versus the new reality of the dynamic future we are facing.” Consequently, some feared the responses being put into place may not suffice to stem the tide of widespread environmental destruction and disruption.

Some criticized the framing of adaptation as a planning process, or even just as a “process” rather than an “outcome”—as one put it, as “an infinite road map with no destination.” Others agreed that shifting the focus to outcomes would help define a purpose and articulate why adaptation is so important, while spurring innovation.

**Priorities for adaptation investment are values-driven and difficult to reconcile.** With rapidly emerging impacts and reduced funding, it is important to determine which vulnerabilities to focus on first or most. When we asked participants about sectoral and regional priorities for investment, their answers reflected a variety of values, experiences, passions, and concerns (Box 13). Clearly, such value-laden choices are not easily reconciled, but must be engaged.

A strong majority of survey participants called for greater investment in the water sector, urban systems/infrastructure and coastal zones (Figure 21). Human health is also near the top of the list; respondents mentioned impacts including the growth in tropical diseases such as zika, malaria, and dengue in new geographies; increased heat-induced asthma and pollen-induced allergies; and mental health impacts from climate stresses and shocks. It is notable that attention to cross-cutting issues that connect different sectors, as well as indigenous peoples, lands and resources, and rural areas fell into the middle of the prioritized list. Many respondents acknowledge that their stakeholders place a greater emphasis on solving health problems than solving climate problems. Accordingly, there is an opportunity to follow both practitioner direction and recommendations from the literature by emphasizing health-related adaptation messages and action.<sup>113</sup>

### Box 13: What is "Greatest Vulnerability"

Decisions about the focus of efforts to reduce vulnerabilities are deeply value-laden, if not always conscious. The underlying differing values can fuel passionate debates and must be engaged if a common vision and shared action agenda is to be found.

For some study participants, "greatest vulnerability" aligned with potential for economic disruption and loss; they believed adaptation efforts should prioritize highly urbanized, economically vital coastal regions. Others pointed to economic sectors that may not generate the greatest contribution to GDP, but are critical for overall security. In this case, agriculture and the nation's food supply would emerge as a high priority.

Yet others interpreted "greatest vulnerability" as the biggest potential for loss of unique ecosystems, species, and ecosystem services on which a region, the country, or even the world relies. Such an interpretation might prioritize adaptation in natural areas under intense development or climate pressures.

Yet another interpretation of vulnerability rested on existing and historical legacies of social injustice, calling for greater focus on low-income and marginalized communities, in both urban and rural areas.

### US Sectors Perceived to Have the Greatest Need for Investment in Adaptation/Resilience

(Top three, n=53)

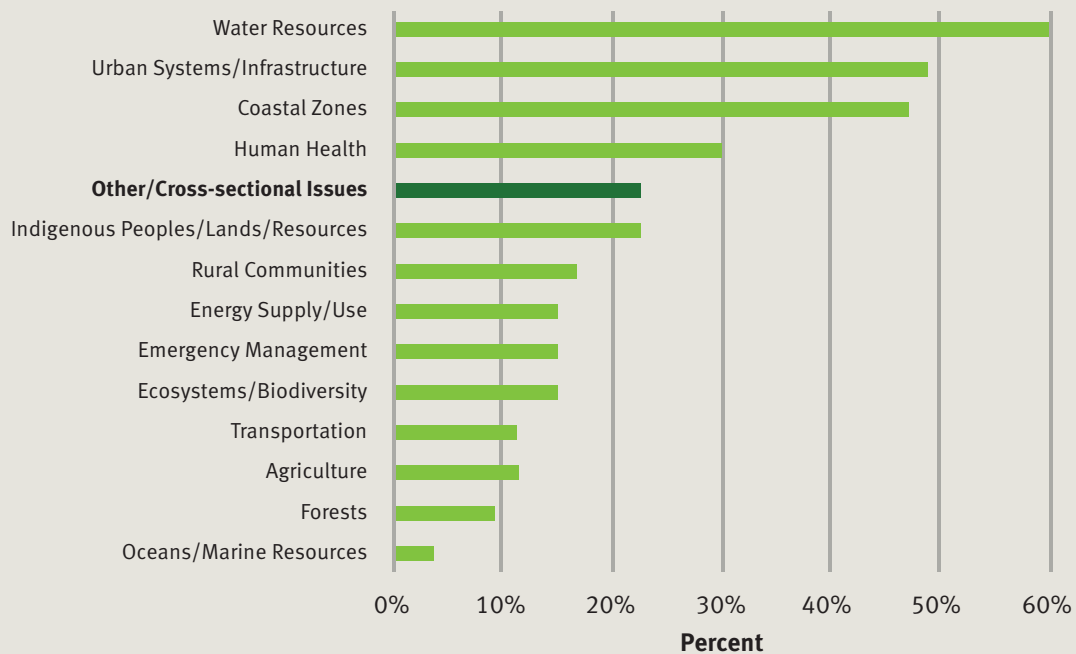


Figure 21: Study participants see the water sector, urban areas, coastal zones, and human health as the highest priorities for future adaptation investment.

An even wider spread emerged among regional priorities (not shown). Nearly half of all respondents identified the Southeast as the region needing the greatest investment in adaptation. Only the national level as the area of greatest need for further adaptation investment came even close (with 42% of responses). All other regions received less than 25% each, although here too, the cross-cutting regional issues fell into the top third of priorities.

### 4.3 Pillars

Study participants emphatically and frequently called for strategic interventions to achieve higher impact and to put the adaptation field on a stronger footing. These include financing and funding mechanisms; policy levers such as regional scaling of local efforts; and work with professional societies and standard-setting organizations.

#### Financing and Funding

Not surprisingly, nearly all respondents pointed to the need for more creative, sustained, and coordinated funding and financing for adaptation work. While many grantees use the terms “funding” and “financing” interchangeably, we find the distinction made by experts in the field helpful and intuitive (Box 14).<sup>114</sup>

Changes to financing and funding for adaptation could include:

**Collaborative regional funding models to help fill federal gaps.** Given diminished federal leadership and support for climate action, study participants believed funding and financing needs should receive greater priority from other funders now. Many feared that

state and local funding sources will be even more constrained; and communities, sectors, and adaptation service providers will need to find alternative funding sources for previously federally funded projects. Some participants suggested that regional funding collaboratives—sometimes encompassing cities and the rural areas from which they source critical resources—might help. For example, cities could pay rural areas for their stewardship of natural resources.

**Funding support for proactive adaptation.** Others suggested that adaptation funding must shift in focus from reactive disaster response and recovery to proactive adaptation and resilience building. Funding for preventive efforts would incentivize communities to take crucial steps before disaster strikes. This approach has been shown to prevent significant losses, and it is more cost-effective than post-disaster funding.<sup>115</sup>

An important preventive step would be to remove the perverse incentives created by federal flood insurance policies, which allow “the cost of one person’s desire to live in a coastal area [to be] passed on to other people.”

Some respondents cited FEMA’s disaster deductible as a good start; it requires those receiving disaster assistance to bear a certain amount of the cost themselves. The key, they believed, is to make clear who actually “owns the risk [so that communities] understand it and have more incentive to mitigate.”

Funding must shift in focus from reactive disaster response and recovery to proactive adaptation and resilience building.

Others emphasized that funders must “avoid stranded investment and the dangers of making [any] investments that are not adapted to future conditions.” Indeed, they

### BOX 14: Funding and Financing Adaptation

**Funding** is money received for a specific purpose that does not have to be paid back. Examples include local revenue and grants from foundations or government. Challenges with funding include the lack of dedicated adaptation programs, the siloed and piecemeal nature of funding sources, competitive allocation, requirements of matches from other sources, and declining availability.

**Financing** is money received for projects or programs that must be paid back. Loans, bonds, and other forms of public or private financing are examples. Challenges include mechanisms that are often technically difficult to implement. In addition, not all adaptation work can be financed, and sources to repay loans must be found.

Source: Adapted from Grannis (2017)



**Figure 22: After Superstorm Sandy, the city of Hoboken, New Jersey worked with financial experts to develop a multi-purpose solution that includes green infrastructure, open space, parking capacity, and sub-surface stormwater protection.** Source: Re:Focus website and Re:Invest: A Roadmap for Resilience, used with permission

stressed, all traditional capital expenditures should include adaptive goals. One pointed particularly to the need to improve city procurement processes and ensure that “chief financial officers and chief capital officers grow to be adaptation experts.”

**Creative financing.** Interviewees also thought that innovative, non-traditional finance mechanisms are badly needed (Figure 22). “Establishing new financial instruments has high transaction costs, but we need them for adaptation. This is a big hurdle to getting to larger-scale implementation of adaptation in the next ten years.” To overcome that hurdle, interviewees thought it important to “get adaptation experts in conversations with people who control money—retirement funds, (re)insurance, bond investors, and credit rating agencies.”

Private-sector financiers are another potential source of resources. As one interviewee observed, “there is so much money out there. Impact investing is growing. How do we

**Philanthropists should engage in more strategic collaboration to scale efforts and complement available funding and finance pools.**

turn this into something real [for adaptation] to create the communities we want?” But, they wished that communities would recognize that private-sector investors are only

interested if there is a return on their investment. Some projects will not generate revenue (“a seawall is not a toll road”), and thus require other means to generate the necessary funds. And to get projects privately funded, “[investors] need someone to hand-hold communities through the project development process, including for project pre-development” to identify previously unforeseen revenue streams or collateral benefits. One participant recommended that, in addition to general obligation bonds, innovative finance mechanisms like resilience bonds<sup>116</sup> or

other insurance-linked securities might finance otherwise “non-bankable” projects.

## Foundation Collaboration and Growth

**Philanthropic funding has been an important pillar of support to date, and that support can be leveraged to greater effect.** The leading suggestion was that philanthropists should engage in more strategic collaboration to scale efforts and complement available funding and finance pools.

**Networks and long-term capacity building require support.** Some foundations, particularly Kresge, were appreciated for providing “soft money for ongoing support, including for networks.” This has been essential to complement funding for “shovel-ready” projects that do not cover staff time, engagement, planning, or capacity building. Interviewees said that many foundations do not like to give money when there are no ribbon-cutting outcomes at the end. Others thought foundations are risk-averse and tend to go with the familiar, rather than with the most qualified or innovative. And “foundations go through cycles and trends; they come and go; topics are on and off, while issues for communities do not go away.” The enduring problem of climate change merits equally enduring foundation support.

**Like their grantees, funders must collaborate.** Many pointed to independence and isolation among foundations even when they work in similar, overlapping, or closely related issue areas such as resilience, climate action, and social equity. For example, “The Rockefeller Foundation and The Kresge Foundation barely seem to acknowledge one another.” After years of foundations prodding collaborative grantee work, an interviewee said, “We’re collaborating. Now they [the funders] need to step up” and collaborate among themselves.

Many felt the philanthropic community needs to “think bigger” and “act as though they know we are in this for the long haul,” for instance, by coming together to fund large efforts collaboratively, considering more re-granting through local foundations, spurring government funding and finance initiatives aimed at adaptation, and inspiring social investments. This would be particularly helpful for smaller communities and organizations with limited ability to access funds; it may be crucial now that federal funding is being cut back.

One suggested a “national urban sustainability consortium,” that could utilize a collective impact model<sup>117</sup> and position NGOs to better serve cities collaboratively. In such a consortium, each would focus on what they do best to achieve common goals, and competition for resources would be decreased. Some believed such joint efforts would require reassessment of individual foundations’ funding criteria, as “not everything within the big efforts will meet every funding criterion” of each contributing foundation.

**More funding is needed to grow the field.** Finally, some urged that foundation supporters of adaptation needed to reverse the trend of “shrinking, not growing,” noting, for example, the John D. and Catherine T. MacArthur Foundation’s withdrawal of support for adaptation in the US. Many wished that related fields—such as public health, social equity, smart growth, poverty alleviation, and community development—would explicitly embrace adaptation to extend the available pools of support.

At the same time, many believed foundations should not abandon funding for urban areas, but extend it—maybe



**Figure 23: Urban areas—such as Hartford, Connecticut or Boston, Massachusetts—are dependent on and connected to rural areas, such as Massachusetts’ Pioneer Valley. Integrated approaches—for example, agricultural adaptation to ensure food supplies that also addresses flooding along the Connecticut River—would benefit both cities and rural areas.** Source: Photo by Ben Frantz Dale, 2003, available via Wikimedia under Creative Commons 3.0 license

through pooled funds—to small and medium-sized cities and towns that have not benefitted from foundation support and are not part of city networks. This would recognize the resource flows between cities and rural areas, and enable holistic solutions (Figure 23). Foundations could thereby help the field develop “a Marshall Plan for resilience investment, a New Deal societal contract.”

## Scaling up via Policy Levers

**As federal policy lags, state and regional efforts must step up.** To address climate change without strong leadership from the current US Administration or Congress, most interviewees thought state-level and regional (multi-locality and multi-state) work must now step in to provide the necessary policy pillars of support. They felt that it is especially important to work more effectively with state government officials, partly to help scale up efforts, and partly to form alliances that can shield local efforts against inappropriate federal interference. Still, the field should make use of any federal levers that still exist. For example, regional branches of federal agencies are often very supportive of local- and state-level action and can be useful partners there. In addition, study participants emphasized the continued need to protect important federal assets, such as research programs, data, tools, and information portals.

Some cautioned against an overly optimistic shift in focus to lower levels of government: many states and local communities lack the financial capacity or political inclination to step into adaptation leadership. But state and regional efforts are currently seen as the most realistic hope to enable and scale up local adaptation. Existing regional efforts, however, need to be strengthened to have more “teeth” (Box 15).

## Standard-Setting Efforts

**Carefully chosen standards are needed to help improve practices.** Another suggested way to strengthen the field’s pillars is to leverage regulatory changes and standards. But some cautioned that leverage points must be carefully chosen and designed to move practices in a positive direction rather than backward.<sup>119</sup> In this context, some identified the need for exemplary codes or a library of sample ordinances to make it easier for cities to change their codes.

Carefully chosen standards are needed to help improve practice.

Professional societies and national and international standard-setting organizations (such as the National Institute of Science and Technology [NIST] and the ISO were

## Box 15: The Promise and Pitfalls of Regional Collaboratives

Multiple local governments (cities and counties) have joined together in regional collaboratives to advance adaptation. Collaboratives are underway in Southeast Florida, Metro Boston, the San Francisco Bay Area, Los Angeles, San Diego, Puget Sound, and the Twin Cities—and also in less-urbanized areas such as the Sierra Nevada region, New England, and the Intermountain West.

These collaboratives differ widely in their approaches, actors, foci, activities, governance structures, and effectiveness. To date, they serve mostly as hubs for learning and capacity building as well as for information generation and sharing. They also offer safe spaces for cross-sector engagement and the creation of common goals. However, their impact on local and regional policy has been very limited in most instances, given the strong preference for home rule—the desire to maintain local policymaking authority, rather than yield it to higher levels of government.

The San Francisco Bay Area is, in some ways, an exception (Figure 24).



**Figure 24: Environmental and business organizations, elected officials, and community leaders from the nine counties surrounding San Francisco Bay came together in 2016 to support ballot measure AA. The measure enables communities to collect a small annual parcel tax to restore the Bay's wetlands, providing protection from sea-level rise and offering environmental and recreational benefits.** Source: NOAA Office of Response and Restoration

Cross-state regional collaborations also show some evidence of success. Examples include promising efforts to manage ocean acidification on the West Coast (including British Columbia); to preserve water quality and contain invasive species in the Great Lakes region (including US states and Canadian provinces); and to increase coastal resilience in and among states bordering the Gulf of Mexico.

Governance experts suggest these multi-jurisdictional collaborations will exert their greatest strength only when their collaborative structures are imbued with sufficient authority and funding to enact regional solutions.<sup>118</sup>

considered potential partners for advancing high-quality solutions and for “broaden[ing] the tent” by engaging actors whose work is relevant to building climate resilience. Though these partners are not necessarily focused on adaptation, some of their work is intrinsically helpful in adaptive decision making, such as selecting building materials or determining how infrastructure is built to withstand stressors such as heat, wind, or waterflows.

### 4.4 Practice

A large number of interviewees identified several critical needs to advance the state of practice. Some could be described as “tools of persuasion”—more effective ways to persuade elected officials, funders, investors, and the

public to do more to build resilience and remove barriers to adaptation. Many of these tools rely on specific knowledge (for example, in economics, risk disclosure, and measures of adaptation progress and success); others address the need for positive, inspiring stories.

A second set of needs coalesces around stepped-up capacity building, professionalizing the field, and fostering greater sophistication in adaptation. Finally, the field needs to go deeper, by incorporating equity into minds, hearts, and practice, and embracing the need for transformative change.

### Tools of Persuasion

**Making the economic case.** The first needed “tool of persuasion” is better analysis that would allow prac-



tioners to make the economic case for adaptation, linking climate events to corporate, public, community-wide, and personal costs. From national to local and project scales, most interviewees argued the field must better understand and communicate “what’s at stake, cost-wise, in terms of [for instance] flooding and real estate values,” which would “bring a lot more awareness” and willingness to invest in adaptation. We should be able to say, “Because adaptation efforts were undertaken, it’s less bad than last time or than it could have been,” “demonstrat[ing] the impact of climate on budgets for lawmakers and market operators.” The field should develop cost curves that show the relative expense of particular adaptation interventions—similar to those used for mitigation.<sup>120</sup> Others called for specific tools, such as:

**The field must better understand and communicate what’s at stake, cost-wise.**

- Cost-benefit analyses that allow for a comparison of projects;
- Analyses that integrate project lifetime costs of traditional (grey) vs. green infrastructure;
- Valuation of ecosystem services and values;
- Assessments of the cost of inaction or, in some cases, the cost associated with not overcoming certain adaptation barriers; and
- Quantification of non-monetized social/community benefits.

Such tools could help the field move from a “laundry list” of what might help to a clear set of priorities, backed-up by solid evidence. That said, study participants seemed to have limited awareness of existing studies that show significant savings in damages and recovery costs from investment in hazard mitigation. The third NCA, for example, noted “[a] robust finding [is] that the cost of inaction is 4 to 10 times greater than the cost associated with preventive hazard mitigation.”<sup>121</sup> Despite this well-established evidence, communities are often hesitant to mandate resilience-building measures and unaware of tools available to incentivize such actions.<sup>122</sup> To help make the economic argument, interviewees suggested, the field must draw on the best current thinking among economists to raise risk awareness and increase risk ownership.<sup>123</sup>

**Climate risk assessments and disclosure.** As one interviewee observed, “Everyone underestimates what they are exposed to and assumes they will be made whole by someone else.” Consistent risk assessment and disclosure could drive the resilience of economic sectors and the field in general. Respondents noted that if cor-

porations share a protocol for assessing and disclosing climate-risks material to their businesses, it could boost the resilience of specific sectors, alert investors to potential losses, and build a powerful constituency for government action. Some see risk disclosure as particularly powerful: “What will drive the field to the next level is insurance, bonding, engineering, and legal liability requirements” that embed climate risks in investment decisions.<sup>124</sup> Together with changes in how risks and benefits are calculated (for example, lowering the discount rate to place greater value on the future; improving benefit-cost analysis; and including valuation of currently non-monetized benefits, such as ecosystem services or social/cultural benefits), climate risk assessment and disclosure could lower the hurdle of high upfront costs and increase the value of resilience investments over short and longer timescales.

**Measures for adaptation progress and success.** Interviewees expressed frustration that there is not one clear adaptation target—akin to the 1.5 or 2°C warming limit intended to drive greenhouse gas mitigation.<sup>125</sup> A target is an important tool of communication, persuasion, and governance; without one, some feared the field would remain fragmented and ineffectual in the political and financial worlds. Some believed the lack of metrics of success is “potentially fatal” to progress.<sup>126</sup> The lack of systematic monitoring and evaluation is also a problem: respondents were not clear about how to select adequate indicators and metrics, and many bemoaned

**What will drive the field to the next level is insurance, bonding, engineering, and legal liability requirements that embed climate risks in investment decisions.**

the lack of resources for ongoing monitoring; one said the field has taken an “artisanal approach” to adaptation tracking and assessment to date. How to establish and track measures of adaptation success and progress is “consistently the top topic cities want to learn about.” And while measures of vulnerability in the public domain are improving, those have not yet translated into adaptation targets or standards. Some believed that NIST has a role to play; and in fact, it has already taken up the baton.<sup>127</sup> In short, while they welcomed the emerging debate over metrics and standards, interviewees were impatient for speedier progress.

**Stories of success.** In addition to indicators and metrics, the field needs stories of success. This was reiterated many times: “We need a narrative that helps us sell adaptation,” said one. “We need to demonstrate



**Figure 25: In Buffalo, New York, previously unemployed workers were trained to retrofit homes and community buildings with energy efficiency and solar power. Personal pride, professional skills, lowered energy bills, and a beautified, safer neighborhood are the result. The field needs to capture and share success stories like this one.** Source: PUSH Buffalo

that this is a quality-of-life issue, not a political issue,” said another (Figure 25).

The need for a compelling narrative about adaptation echoed the frustration that, despite much local experimentation on adaptation in recent years, there are still only limited lessons learned. “We need case studies on how to integrate mitigation and adaptation, how to talk about adaptation, how to integrate science information. This will increase learning between cities—including for small and medium-sized cities—accountability, and peer pressure to advance adaptation.” Others saw a need to go beyond or get more out of existing clearing-houses of case studies, which are too hard to navigate and systematically evaluate.

Important examples of progress—especially in the most vulnerable communities—rarely get written up or shared. Representatives of the environmental justice community, in particular, pointed to the challenge of telling their stories when they barely have enough resources to do their work. In other words, “the very thing we’re wanting to see more of, we don’t have a way of learning about” because the best efforts to build equity and social cohesion are not resourced sufficiently to capture stories for the field’s adoption. And because the most visible, widely distributed success stories revolve around urban communities, rural adaptation efforts and audiences are even more isolated and forgotten. “We are doing great work; we just don’t have the ability to get the message out.”

Some noted the need for success stories on crossing political and cultural differences. They felt the field needs to better understand current political shifts and figure out how to connect with people “who are not like

us.” Others noted the importance of getting inspiring stories into the mainstream media to show the intersection between health, small business, economic growth, and climate change. “We need investment in communication and advocacy for smart policies at the local level.”

## Advancing Capacity for Moving to Action

Interviewees greatly appreciated recent (mostly philanthropic) investments in capacity building through education, trainings, project-based and network-based peer learning. But there is an urgent need to expand the circle of those benefiting from capacity-building efforts.

Interviewees felt it was important to learn which tactics and approaches are most effective, to move investments in planning and capacity building to real results, and to bring those results to scale. All too often, excellent studies and thoughtful plans end up “on the shelf.” As one noted, “There are very few examples of where adaptation plans have been implemented, either on their own or incorporated into other things.” So, “we need to turn plans and policies into a reality.” In the next five years, as one put it clearly, we need to “cross the frontier of implementation.” Areas of greatest need include:

We need to turn plans and policies into a reality.

**Professionalization of practice.** Interviewees saw a need to intensify efforts in professionalization to ensure that adaptation actions are of high quality. They named several priority areas for increasing the sophistication of practice:

- Deeper understanding of climate change science, the interconnected nature of natural and social systems, and the depth of the challenges around increasing social cohesion and social equity;
- Strategic thinking in resilience-building interventions;
- A better understanding (and ability to apply principles) of effective climate change communication with diverse audiences; and
- Understanding of the need for transformative change. (See below.)

Interviewees appreciated movement toward professionalization, as indicated by the emergence of new professional titles such as Chief Resilience Officer (CRO), a job title that—while not always implying work on climate resilience—did not exist just a few years ago. While acknowledging that “practical experiments are deepen-

ing, work in professional networks is accelerating” and “the climate question” is more often asked in existing professional work, a large number of interviewees said professionalization is nowhere near where it should be at this time. “I see the field chasing itself, in reaction mode,” said one; others lamented that in the last five years, government and philanthropic funders have not come together to strategically invest in the field.

**Certification and training.** Efforts to move toward formal certification are underway, with the American Society of Adaptation Professionals (ASAP) in planning mode and the Association of Climate Change Officers (ACCO) offering trainings. But respondents said this work must be undertaken with greater intentionality over the next five years to create more certainty regarding professionals’ level of understanding and skill. Moreover, professional groups need more resources to link trainings directly to projects on the ground.

To further the professionalization of the field, several interviewees called for formal educational standards, connecting the professional pipeline from high school to higher education and career development. Integrating education with practical experience would also help overcome long-standing challenges in connecting research with practice. Some felt preparation for adaptation would need to be “an emphasis in other professions,” since most professionals in the field are from other professions. Over time, there might also be specialized training for adaptation professionals. It remained unclear to many interviewees what such training would entail. “Since we don’t, as a field, know what our leading practices are, universities have no guidance [for professionalizing the field].... We don’t have that conversation. Those are the systemic questions we need to be asking.”

## Deeper Thinking and Committed Action for Equity

**In practice.** Many interviewees saw a need for the field to embrace social equity as a multi-dimensional concept. Several called for examples of what equitable adaptation actually looks like in practice and where equitable outcomes have been achieved.

Despite acknowledgement of equity on paper, interviewees thought the mainstream adaptation community had not deeply considered or committed to equity as a leading practice; and, “without this [commitment], equity is too easy to ignore—it’s already ignored in our current systems.” They felt the field must first create the space to have conversations about equity, with expert facilitation to help overcome distrust. Some noted that

“the environmental community doesn’t have a civil rights background” and “in the white community, there is still a lack of willingness to acknowledge past exclusion and racism.”

Equity issues are becoming particularly pressing in high-risk coastal regions and other climate hotspots, where residents must decide whether to adapt in place or migrate to less insecure regions. Which communities and neighborhoods can afford to stay and attract the resources and political support to do so? If they cannot stay, do they have the resources and socio-economic mobility to move away? Extreme events like Hurricanes Katrina and Sandy, as well as the gradual but incessant impacts of coastal erosion in places like Alaska and Louisiana, provide empirical evidence of these pressing social equity dimensions of climate change adaptation.<sup>128</sup> Interviewees argued this is an issue to be addressed today, not ten years from now. Addressing the issue now “increases our strength, since social equity is tied to mobility.”<sup>129</sup> Research confirms this: “[T]he wealthy are more mobile in the face of climate-induced hardship, and more effective at limiting the mobility of others,” further marginalizing the poor.<sup>130</sup>

**In research.** Some suggest that environmental equity needs its own “think tanks” to be sure the issue is addressed without having “to depend on external experts.” As one stated, “Folks who work on equity and environmental justice do not have their own research.” As a result, the equity dimensions of climate change are not systemically examined and addressed.

**In training.** While experienced adaptation professionals consider equity essential to successful adaptation, most still struggle with “equity literacy” and find it difficult to operationalize. Some interviewees worried that attempting to solve social equity through adaptation was burdening two ill-defined and inadequately measured systemic challenges, threatening the success of both—perhaps especially when attempted beyond the project scale. Many flagged the need for quality equity training as a way to raise awareness and cultural competency, “especially among those who have never given it a second thought,” keeping in mind that an appreciation of the many dimensions of equity can take years to develop. A suggestion was for funders to require high-quality, equity-focused preparation as a condition of allocating funds.

While experienced adaptation professionals consider equity essential to successful adaptation, most still struggle with “equity literacy” and find it difficult to operationalize

**In funding.** Others felt that the development of equitable processes could be supported by concrete funding requirements, such as an “equity screen” and criteria similar to those used by the World Bank when addressing impacts within the poorest populations.<sup>131</sup> But interviewees acknowledged that “it’s a very different thing to have a set of criteria for equity integration as opposed to doing it.” Moreover, there is not just one type of equity; it manifests in many contexts and ways; for example, between rural and urban areas; as income, racial, or gender inequality; in the context of geographic redlining; in human health; in the likelihood of displacement and migration; across generations; and between humans and other species. Interviewees felt that the depth of dialogue required to grapple with these complex inequities is simply not taking place on a widespread level, but it must.

**In leadership.** Study participants felt strongly that the field also needs to cultivate leadership on equity. The field should “continue to invest in change agents!” said one interviewee; another called for a deeper bench to avoid tapping the same equity leaders again and again. They suggested the field should foster specialized partnerships (with equity-savvy consultants, NGOs, and academics, for example) to advance and spread deeper understanding. And while many agreed that equity concerns are receiving more attention than in past years, there are still huge gaps to fill to ensure that “resilience is not a luxury good.”

## Capacity for Transformative Change

Meeting the needs described in this chapter would go a long way toward advancing the field. But for a handful of interviewees, even successfully addressing these needs was not enough. Given the growing scale and pace of climate change, and the lack of serious attention to social equity in all its dimensions, they called for transformative thinking and action aimed at the deeper causes of climate, environmental, and social problems. “We have to get to the root of the problem, or else it’s just insufficient half measures (Figure 26).”

When society avoids addressing root causes, some said, it perpetuates narratives that limit what is possible with resilience building. As one noted, “We have forgotten how to live in abundance within limits, and instead live with a constant sense of scarcity and fear without limits.” Others pointed to deeply anchored narratives about human domination over nature, about separation and difference, and other ways of reinforcing division rather than unity. Yet others pointed to inertia and its underlying drivers: institutional processes and structures; interest politics; power distribution; access to resources; and mindsets.<sup>132</sup>



**Figure 26:** Some study participants called for transformative change in the structures, beliefs, and values at the root of current climate and socio-economic crises. Source: Heather Craig, Survival Media Agency

**An agenda for transformative change.** Respondents offered outcomes that would reflect transformative change, echoing the goals of the climate justice movement.<sup>133</sup> These include:

- A move from an extractive economy to a regenerative economy;
- Poverty eradication;
- Elimination of racism;
- A functional grassroots democracy;
- A complete conversion to renewable energy;
- Decentralized, distributed water and energy systems; and
- Clusters of self-sufficient or gridless communities (Figure 27).

In comparison to the more modest adaptation goals commonly discussed, these respondents aimed much deeper. “Adaptation is about a lot more than tweaking; it is about a real systems change.”



**Figure 27:** Gridless communities, generating their own energy locally, are both a catalyst for and an envisioned outcome of transformative change. Source: BlackRockSolar

Interviewees spoke of the need to build capacity to transition to a different future, and for different processes required to achieve it. Some said a profound shift in values is needed, although there is no consensus<sup>134</sup> on whether that shift will precede—or follow—the creation of very different systems. Some argued that “values are the DNA and operating system of society” from which all other actions flow. Thus, interviewees suggested, “the movement needs to find its moral center,” its core values, to catalyze a shift in how we treat one another and the environment.

**Adaptation is about a lot more than tweaking; it is about a real systems change.**

Others felt strongly that communicating about values is not enough; that instead, “we need to lead with solution sets” and model transformative change for others. They said it is necessary to both “create the will and show the way to get it done.” As one put it, “The answer is not ‘I have a plan,’ but it is ‘I have the capacities [to act].” Thus, they felt there is a need to invest in these capacities, not as an alternative to the other critical needs listed in this chapter but as integrated extensions or modifications of them. Accordingly, investment in capacities should further the transformative change needed (Box 16).

An important gap, interviewees said, is in recognizing the profound lack of current capacity for deep, transformative work. First and foremost, they observed, is the lack of time, resources, and space to think bigger. Because there is so little capacity to do urgently needed work, they noted how most people revert to doing things “the way we have always done them.” But interviewees also recognized that time and capacity are not always the limiting factors. Some pointed to active avoidance of the need for transformative change in sectors and segments of society that would rather perpetuate the status quo. They asserted that transformative change is profoundly about power and privilege, and about changing power relationships (Box 17).<sup>135</sup>

Interviewees told of numerous instances where race and class (and to a lesser extent, age) affected the ability of actors to participate in adaptation-related planning or implementation processes, or where actions taken were either overtly ignored or did not address equity implications.<sup>136</sup> Interviewees emphasized that in the alternative, empowered, and more equitable processes they helped create, “we engage as whole human beings, not defined just by positions or expertise.” In these processes, considerable time is spent in mutual education and awareness raising about the root causes of inequi-

## Box 16: Transformative Capacities: An Incomplete List

To successfully navigate the difficult terrain of transformational change, needed capacities include:

- Facilitating knowledge co-creation and utilization;
- Ability to collaborate at scale;
- Systems thinking, holistic thinking;
- Visioning;
- Embracing deep uncertainty;
- Power-mapping and power-building through community-based actions and coalitions;
- Building trust, legitimacy, and social capital;
- Recognizing and accepting the limits of previously used approaches;
- Recognizing the limits of, and being able to constructively dismantle or destabilize, existing systems;
- Developing (or enabling) creativity and social innovations;
- Preparing communities/systems for deep change;
- Creating, recognizing, and seizing windows of opportunity;
- Identifying goals and targets, and tracking progress along a transformative pathway;
- Framing a new narrative, championing it, and inspiring others with it;
- Facilitating difficult, emotion- and value-laden dialogues;
- Building psychological skills to deal with loss, profound change, and renewal.<sup>137</sup>

## Box 17: Power and Privilege in Climate Adaptation

**Privilege**—commonly defined as a special right, advantage, or immunity granted or available to particular groups—can play into adaptation in countless ways. For example:

- Wealthier populations can afford to live in neighborhoods with lush tree canopies, helping to shade against extreme summer heat—a privilege not held by poorer populations, in whose neighborhoods far less has been invested to maintain tree cover. Privilege is when we do not have to think about that.
- Air- and water-polluting industries, refineries, power plants are found predominantly in communities of color. Resulting health impacts, such as asthma, disproportionately affect them. Privilege is when we can pretend our children’s health is a birthright.
- Many women—in science, business, politics, or community work—still find their voices, ideas, or achievements given less attention than those of men. Privilege is when we are heard every time we speak.

**Power**—defined here as the capacity to influence or direct a course of action or others—is needed to make adaptation-related decisions. When people are not in formal positions of power to make certain decisions (such as a mayor, legislator, business owner, or head of household), they must empower themselves, alone or together, to gain influence over decisions. For example:

- Having the time and ability to attend a public meeting gives access to decision-making processes.
- Having the resources to effectively communicate one’s story gives voice.
- Having the ability to convene leaders garners respect and enables more powerful ideas and coalitions to emerge.

ties and how existing structures and decision-making processes perpetuate inequality.<sup>138</sup>

Finally, they argued, changing power relationships in community-driven resilience planning requires rethinking and broadening the definitions of expertise to include those who do not necessarily hold advanced degrees and thus are not in privileged positions to determine “whose knowledge counts,” but who may hold in-depth local knowledge of community needs, assets/strengths, and vulnerabilities. (Figure 28).

### 4.5 People

While study participants appreciated the influx of new actors into the adaptation field over the past several years, many called for leadership development and engagement of previously under-represented actors.

**Leadership is needed.** Participants urged the adaptation community to address the lack of clear field leadership. A critical way forward, some suggested, is to “power-map critical influencers inside and outside the field [to identify] points of power that can be supported

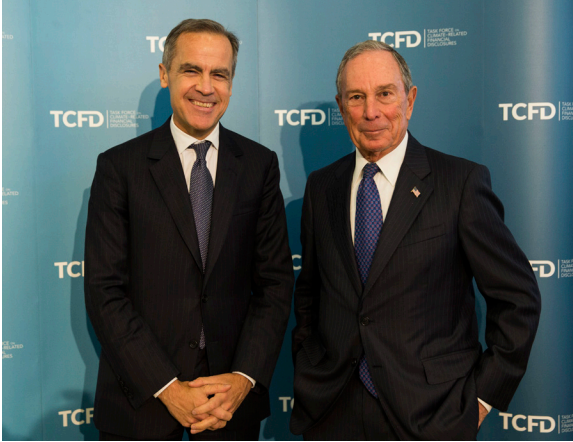


**Figure 28:** Some scientists realize they are not the only “experts” when it comes to building resilience to climate disruptions. Here, Irving Nasafotie (Hopi Office of Range Management) and Daniel Ferguson (University of Arizona) discuss range conditions in the Summer of 2013 on the Hopi Tribe’s land in Northern Arizona. Source: Michael Crimmins, used with permission

and amplified and that will talk about climate for a long time.”

**Broaden the tent.** Participants highlighted the need to engage several groups of currently under-represented actors, including:

**The private sector.** Many study participants believed the field needs broader participation from the private



**Figure 29: Business leaders are answering the adaptation field's call for greater engagement of the private sector. Mark Carney, Governor of the Bank of England and Chairman of the G20's Financial Stability Board (left) and former NYC Mayor Michael Bloomberg (right) joined the task force on climate-related financial disclosures to develop voluntary, consistent risk disclosure protocols that companies can use with their stakeholders.** Source: Task Force on Climate-related Financial Disclosures.

sector, including businesses mitigating climate risks within their own operations and supply chains; investors in community resilience efforts; and consultants with expertise in adaptation (Figure 29). Engaging the private sector—either directly or through business associations such as the (San Francisco) Bay Area Council, ACCO, or Chambers of Commerce—was considered a lever for greater capacity building and field growth. The “field would have more gravitas and impact if the private sector were involved,” said one interviewee. “This would help to mainstream adaptation and create scale.”

Deeper engagement of the private sector, however, would require changes in the way stakeholders interact. For example, when forging public-private partnerships, government staff and consultants would need to ensure that diverse community voices are at the table from the start. Conversely, where resilience-building efforts are driven by grassroots organizations, those efforts would have to link up with governments and private-sector actors to ensure integration and gain leverage.

**Workers in related fields.** Interviewees said the workforce lacks understanding and capacity on adaptation, and “this is likely to remain a problem, especially around the intersections of social progress and climate adaptation.” They thought it was critical to educate and engage workers in the building sector, real estate, public works, health care, transportation, energy, capital planning, and in state governments.

**People in rural areas.** As resources shift toward urban areas, interviewees saw a need to engage smaller cities and rural areas, particularly where they can form productive partnerships with cities. And, given the recent emergence of populist sentiments in blue-collar areas across rural America, they thought it particularly important to ensure that the needs of rural workers and communities are addressed meaningfully. This is especially true around issues such as education, health care, good employment options, and social and communication networks. Without engagement of these communities, a truly shared vision and hope for a better future cannot be created. Political polarization could worsen, ultimately challenging the ability to govern effectively (Box 6).<sup>139</sup>

**Youth.** Several interviewees insisted that strategic engagement of young people is critical to the success of adaptation, in part because youth are “better positioned to think outside the box and be creative,” and “they understand [that] inequity is right in front of every community.” A few interviewees attributed the creative potential of youth to their unique experience with the last decade’s social, economic, and environmental crises, noting that young people are actually better positioned to “deal with uncertainty” because they have lived it. Moreover, the climate justice and just transition movements offer opportunities to introduce young people to a new wave of meaningful careers. Some thought working with cultural icons who embrace climate action could energize youth. Thus, engaging and empowering youth was seen as a huge need and missed opportunity.

In this context, interviewees suggested cultivating an “adaptation farm team” that cultivates talented young people so that they can scale their reach and build cross-sector relationships. Specific suggestions included empowering youth to work with celebrities to message change. Youth could also be engaged through AmeriCorps programs—especially in rural areas—and through schools and religious communities (Figure 30).

**Existing networks should be better utilized.** To increase reach and impact, study participants thought the adaptation field must achieve more with existing networks—particularly in the urban context—by connecting various

There is a need for better linkages among networks.

urban-focused organizations and collectives. Interviewees pointed to the need for better linkages among networks already focused on urban adaptation (C40, 100RC, ICLEI, and USDN) and among those networks and organizations with a broader set of goals and connections to elected officials (National League of Cities, US Conference of Mayors, and National Association of Counties).



**Figure 30: The CivicSpark San Joaquin Valley Regional Team in California is volunteering to plant trees. Fellows in the program work with local communities to learn on the job about resilience building and lend a hand to capacity-limited municipalities.** Source: CivicSpark San Joaquin Valley



## CHAPTER 5

# Rising to the Challenge, Together; A Critical Assessment, Recommendations, and Call to Action

In this final chapter, we draw conclusions about the state of the field compared to the vision of a mature field we offered in Chapter 2. This critical assessment points to an inescapable conclusion: the US field of climate adaptation is emerging, but it is not yet equal to the task before it; nor is it evolving quickly or deliberately enough to manage worsening climate threats.



**Figure 31: Participants at an event during the National Adaptation Forum 2017 in St. Paul, Minnesota, discuss barriers and opportunities to move the adaptation field forward.** Source: Joyce Coffee, used with permission

The recommendations we offer in this chapter are based on this assessment. We offer an approach to prioritization, then ask our readers to identify their place in the field-building picture, and to use their leverage to help close the resilience gap within the next 10 years (Figure 31).

## 5.1 Critical Assessment

Table 1 provides a highly condensed synthesis of the previous four chapters. It recalls the 4P framework that has guided this field assessment and provides a line-of-sight comparison of:

- The vision of a mature adaptation field;
- The field that we found through our empirical research;
- The climate-driven and societal demands increasingly placed on the field; and
- Our assessment of the current state of the field along each of its four constituent components.

In short, we hold up each of the 4Ps against three evaluative “yard sticks:”

- How do the findings reflect components of the field? Are the components present, well developed, or not yet fully developed?
- How do the findings compare with our proposed vision of a mature field?
- How do the findings compare with the needs arising from the accelerating frequency and severity of climate change impacts?

The US field of climate adaptation is emerging, but it is not yet equal to the task before it; nor is it evolving quickly or deliberately enough to manage worsening climate threats.

**Table 1: Critical Assessment of the State of the US Adaptation Field**

<b>FIELD COMPONENT AND BASIC DEFINITION</b> (Chapter 2)	<b>Purpose</b> The widely valued goal a field is focused on or organized around. It is centered on the clear delineation of a common problem, and linked to a vision of a world in which that problem is addressed once and for all or in an ongoing manner.
<b>KEY FINDINGS: CURRENT STATE OF THE FIELD</b> (Chapters 3 & 4)	<ul style="list-style-type: none"> <li>• Climate impacts are driving adaptation, yet crisis-driven adaptation is reactive, expensive, and treats symptoms rather than root causes.</li> <li>• There is greater acceptance of the need for adaptation, yet polarization on climate change prevents concerted engagement on mitigation and adaptation.</li> <li>• Some have recognized that resilience requires attention to root causes.</li> <li>• There is new awareness of equity, but little agreement or action.</li> <li>• The adaptation field lacks an all-encompassing vision.</li> <li>• The field needs a unifying values framework to guide adaptation, even if it will be expressed in many locally meaningful visions.</li> <li>• The federal leadership vacuum could spur visioning in communities.</li> <li>• Many communities are not yet aware of the need to adapt.</li> <li>• There is a lack of clear regional, sectoral, and cross-cutting priorities to drive focus.</li> </ul>
<b>VISION OF A MATURE FIELD</b> (Chapter 2)	<ul style="list-style-type: none"> <li>• A well-developed adaptation field creates the nationwide capacity to effectively and equitably close the resilience gap.</li> <li>• The field is singularly focused on working toward a world in which that gap is closed for all.</li> <li>• It understands its mission as preventing, minimizing, and alleviating climate change threats to human well-being and to the natural and built systems on which humans depend.</li> <li>• It works to create new opportunities by addressing the causes and consequences of climate change in ways that solve related social, environmental, and economic problems.</li> </ul>
<b>CLIMATE-DRIVEN AND SOCIETAL DEMANDS ON THE FIELD</b> (Chapter 1)	<ul style="list-style-type: none"> <li>• Humanity is now moving out of the Holocene and into the Anthropocene, and exceeding four out of nine planetary boundaries.</li> <li>• The climate is changing, and society is at rapidly growing risk.</li> <li>• Evidence of climate-driven changes is emerging across the US in the form of extreme events and other progressively more-severe impacts.</li> </ul>
<b>OUR ASSESSMENT OF THE CURRENT STATE OF THE FIELD</b>	<ul style="list-style-type: none"> <li>• Adaptation professionals lack a common definition of the problem due to the heterogeneous nature of climate impacts, the politicized responses to climate change, and the prevailing reactive stance taken to climate impacts.</li> <li>• Adaptation professionals lack a unifying vision of what they should be able to do or what shared goals they could accomplish.</li> <li>• For many, a common purpose built from a shared problem understanding and unifying vision would need to involve social equity and cohesion, but this view is not widely or deeply shared.</li> <li>• Priorities for adaptation investment are values-driven and difficult to reconcile. As a result, there is no field-wide agreement on adaptation priorities.</li> <li>• The field lacks a pervasive sense of urgency.</li> </ul>

**Table 1: Critical Assessment of the State of the US Adaptation Field (continued)**

<b>FIELD COMPONENT AND BASIC DEFINITION</b> (Chapter 2)	<b>People</b> The field actors—individuals, organizations, and networks—that come together to address a particular problem and, in so doing, create a field of practice. Actors may change over time, are networked, and include visible leaders.
<b>KEY FINDINGS: CURRENT STATE OF THE FIELD</b> (Chapters 3 & 4)	<ul style="list-style-type: none"> <li>• New actors and networks have energized the adaptation field, including city networks, community groups, utilities, and the private sector.</li> <li>• Smaller cities and rural areas are at risk of being left out of the action.</li> <li>• Adaptation actors are not working together effectively.</li> <li>• Leadership is distributed and not solidly established; yet, it is increasingly needed to unify and propel the field forward.</li> <li>• There are many opportunities for closer integration between the climate justice movement and the adaptation field.</li> <li>• There is a need to engage under-represented actors, including funders, insurers, investors, workers in related fields, people in rural areas, and youth.</li> <li>• Some existing networks are not utilized effectively for advancing adaptation.</li> </ul>
<b>VISION OF A MATURE FIELD</b> (Chapter 2)	<ul style="list-style-type: none"> <li>• The mature adaptation field is a powerful, widely recognized, confident, respected, and deeply integrated area of work accomplished by highly skilled people who share a common identity.</li> <li>• Individuals, communities, organizations, businesses, and government agencies within the field have taken full ownership of the complementary strategies of climate mitigation and adaptation, implemented in ways that build social cohesion and equity, to achieve the transformational changes required to keep communities safe and thriving.</li> <li>• With ready access to a wide range of relevant expertise, deeply interconnected field actors share goals and collaborate.</li> <li>• Field actors have adopted a culture and practice of adaptive thinking and acting in a world of constant and disruptive change.</li> <li>• Benefiting from widespread social capital, adaptation actors widely share knowledge and resources with each other.</li> </ul>
<b>CLIMATE-DRIVEN AND SOCIETAL DEMANDS ON THE FIELD</b> (Chapter 1)	<ul style="list-style-type: none"> <li>• With the emergence of more-severe and/or more-frequent climate extremes and other impacts across the US, the challenges of adaptation and resilience building have become an everyday reality for decision makers, although the types and magnitudes of risks faced differ significantly.</li> <li>• The convergence of economic and climate crises has illuminated deeper threats to community resilience. Those threats require that a wider range of actors be included in adaptation planning and implementation processes.</li> </ul>
<b>OUR ASSESSMENT OF THE CURRENT STATE OF THE FIELD</b>	<ul style="list-style-type: none"> <li>• The field has seen significant growth in new actors over the past several years, some of whom are well-networked and developing a common identity (particularly city practitioners), but also many others who are not yet linked to each other or across networks.</li> <li>• Connecting beyond existing networks within the field or to people outside the field is insufficient, at present, to capture all the talent and expertise needed to close the resilience gap.</li> <li>• A fundamental tension exists between growing the number and diversity of actors needed to build an effective adaptation field and establishing useful networks and a sense of community.</li> <li>• There is significant danger of smaller cities and rural areas being left behind.</li> <li>• In the absence of strong federal leadership, the field is losing or lacking a well-established and influential cohort of leaders.</li> <li>• The climate justice movement is influencing the field, yet much remains to be done to effectively integrate movement concerns into adaptation practice.</li> </ul>

**Table 1: Critical Assessment of the State of the US Adaptation Field (continued)**

<b>FIELD COMPONENT AND BASIC DEFINITION</b> (Chapter 2)	<b>Practice</b> The actions taken and the knowledge, tools, and skills used to fulfill the field’s purpose. Practice involves mechanisms for innovation, learning, information sharing, collaboration, common action agendas around shared goals, advocacy, and communication within and beyond the field.
<b>KEY FINDINGS: CURRENT STATE OF THE FIELD</b> (Chapters 3 & 4)	<ul style="list-style-type: none"> <li>• The knowledge base on adaptation is improving.</li> <li>• Investment in capacity building has strengthened the field.</li> <li>• Tools supporting adaptation are increasingly available, but remain difficult to select and use.</li> <li>• Science and practice are increasingly working together, yet more collaboration is needed.</li> <li>• The field is experimenting widely, but not yet discerning best practices.</li> <li>• Powerful approaches have spurred real change on the ground, but they are not widely recognized or used as best practices.</li> <li>• Practice is advancing, but barriers stymie progress from planning to action.</li> <li>• Adaptation is increasingly mainstreamed into existing institutions; while this addresses some barriers, there are also important limitations to this approach.</li> <li>• More systemic changes are needed to close the resilience gap.</li> <li>• The field must build capacity for deeper thinking, committed action for equity, greater sophistication and professionalization of practice, and transformative change.</li> </ul>
<b>VISION OF A MATURE FIELD</b> (Chapter 2)	<ul style="list-style-type: none"> <li>• Exemplary models and best practices for effective and equitable adaptation are available, widely known, and backed up with robust evidence.</li> <li>• Scientists and practitioners work closely to distill (and update) core principles and tenets of adaptation knowledge and approaches. They produce, test, and assess innovations in a forward-looking professional culture that is focused on long-term transformative goals.</li> <li>• Effective, co-creative science–practice partnerships are the norm.</li> <li>• Rigorous professional standards and certification are established, based on guiding principles that can be applied to diverse contexts.</li> <li>• The field uses 21st-century communications platforms and tools to convey the urgency of climate action, and to identify and share adaptation stories and lessons learned.</li> <li>• Field actors are skilled in using dialogue to advance mutual understanding and, where possible, consensus around the challenges of transformative change.</li> <li>• Professional trainings enable newcomers to gain proficiency in core concepts, technical and social issues, and ethical principles.</li> <li>• Key competencies needed to build resilience are ubiquitous and drive toward transformation.</li> <li>• Field actors approach adaptation challenges through systems, integrative, holistic, and out-of-the-box thinking, while embracing deep uncertainty and risk-taking.</li> <li>• Tracking of progress and feedback mechanisms support rapid learning, cross-fertilization, and maturation of the field’s practice and enable rapid response to threats and needs.</li> <li>• The field facilitates social networking, trust building, and collaboration at scale.</li> <li>• Actors help communities envision—and achieve—desirable futures.</li> </ul>

**Table 1: Critical Assessment of the State of the US Adaptation Field (continued)**

<p><b>CLIMATE-DRIVEN AND SOCIETAL DEMANDS ON THE FIELD</b> (Chapter 1)</p>	<ul style="list-style-type: none"> <li>• Recent climate-related disasters show the interconnected nature of climate change impacts across sectors, scales, and regions; adaptation, too, must cross those boundaries.</li> <li>• The socio-economic disparity between the 1% and the 99% is growing wider, demanding that adaptation practice address a wider set of challenges.</li> <li>• Growing inequity demands inclusive processes, and embedding adaptation in solutions that address long-standing vulnerabilities and problems in communities.</li> <li>• Response capacities of those affected by climate change are highly uneven.</li> <li>• Rural areas and small cities are receiving less support for growing their adaptive capacity; however, urban areas depend on those rural areas for many of their basic needs (water, clean air, food).</li> <li>• Many types of climate-related disasters are on the rise, and adaptation to more-frequent and more-severe disruptions will only become more difficult.</li> </ul>
<p><b>OUR ASSESSMENT OF THE CURRENT STATE OF THE FIELD</b></p>	<ul style="list-style-type: none"> <li>• The adaptation field’s practice has advanced in a number of important ways in recent years, but the evidence base for what constitutes “best practice” is still weak or spotty.</li> <li>• Despite some progress, practice is not yet advanced to implementation except in limited circumstances.</li> <li>• Incremental progress in adaptation does not match the accelerating pace of climate change.</li> <li>• Communication is better within the adaptation field than to outside actors and the public, perpetuating obstacles to awareness raising and the movement of ideas across different fields of work.</li> <li>• There is limited communication about, and media attention to, adaptation—except when disasters strike.</li> <li>• There is a lack of clarity around what, if any, values are shared across the field, reflecting the lack of a unifying vision or shared goals.</li> <li>• There is a strong preference for integrating adaptation into existing practices and structures (“mainstreaming”), but the approach is limited in that it does not address deeper causes of climate, environmental, and socio-economic crises.</li> <li>• Awareness, understanding, and acceptance of the need for transformative change is present among some, but extremely limited across the field as a whole.</li> </ul>

**Table 1: Critical Assessment of the State of the US Adaptation Field (continued)**

<b>FIELD COMPONENT AND BASIC DEFINITION</b> (Chapter 2)	<b>Pillars</b> The funding and policy support that enables the realization of the field's goals.
<b>KEY FINDINGS: CURRENT STATE OF THE FIELD</b> (Chapters 3 & 4)	<ul style="list-style-type: none"> <li>• International and federal policies have influenced the field.</li> <li>• There are new threats to adaptation policy under the Trump Administration.</li> <li>• Adaptation mandates are emerging in some states; some initiated from the bottom up.</li> <li>• Funding from philanthropy and government has been crucial for field growth.</li> <li>• Foundations are not collaborating effectively.</li> <li>• Strategic interventions are required to help diverse sets of adaptation professionals meet needs and achieve higher impact. These include: policy levers; regional scaling of local efforts; collaboration with professional societies; establishment of standards; and creative, sustained, and coordinated financing and funding mechanisms.</li> </ul>
<b>VISION OF A MATURE FIELD</b> (Chapter 2)	<ul style="list-style-type: none"> <li>• Philanthropic and government funders and private investors are fully committed to funding field building and resilience building until the resilience gap is closed.</li> <li>• Funding is not only available after disasters, but is sustained and coordinated and available for proactive, preventive measures.</li> <li>• Funders help to grow resources commensurate with the threat, build funding coalitions, and inspire new financial instruments and systems to support transformative interventions.</li> <li>• The economic case for adaptation is well established.</li> <li>• Policymakers at all levels embrace the need for mitigation and adaptation, enacting strong resilience legislation and removing legal and institutional barriers to adaptation.</li> <li>• Policy interventions are coordinated with funding instruments and approaches, supporting and requiring stringent mitigation efforts and adaptation practice with concerted attention to social cohesion and equity.</li> <li>• Policies supporting the adoption of best practices and climate-sensitive standards for buildings, infrastructure, and other systems are applied, evaluated, and regularly updated to move communities toward greater resilience in the face of climate disruptions.</li> </ul>
<b>CLIMATE-DRIVEN AND SOCIETAL DEMANDS ON THE FIELD</b> (Chapter 1)	<ul style="list-style-type: none"> <li>• Most nations—including the US—signed the Paris Climate Accord in December 2015, agreeing to limit warming to less than 3.6°F (2°C) above pre-industrial levels by the end of the 21st century, and preferably to less than 2.7°F (1.5°C). The agreement also includes an explicit adaptation goal.</li> <li>• In June 2017, the Trump Administration withdrew the US from the Accord, although many states, cities, universities, and businesses remain committed to achieving the Accord's goals.</li> <li>• Any lag in commitment makes it more challenging to limit warming to levels most consider tolerable and manageable in terms of impacts and adaptation challenges.</li> <li>• Limited funding and staff capacity are among the most frequently mentioned and most impactful barriers to adaptation and resilience building.</li> </ul>
<b>OUR ASSESSMENT OF THE CURRENT STATE OF THE FIELD</b>	<ul style="list-style-type: none"> <li>• Crisis-driven funding from federal and state governments and philanthropy has had an important influence on the adaptation field's development in recent years.</li> <li>• There are, however, no institutionalized, coordinated, or sustained funding streams in support of adaptation, and federal assets are diminishing.</li> <li>• With lacking federal leadership, the field has lost an important pillar of support, placing greater pressures on state and regional policymakers to help advance the field.</li> <li>• Lack of federal leadership weakens the signal to the public and policymakers at state and local levels to take climate action seriously.</li> <li>• Development of the field's pillars is lagging, likely slowing down the development of other field components.</li> </ul>

## 5.2 Approach to Prioritization

In light of this summative assessment of the current state of the US adaptation field, we now turn to the needed interventions to rapidly advance it. Is there a common pattern to field evolution that would offer a systematic approach to prioritizing field-building efforts? Our review of the pertinent field-building, innovation, and collective-impacts literature as well as the critical

needs identified by study participants and uneven patterns of climate change and field development across the US suggest that there is little useful guidance on prioritization that can be applied to the highly diverse and uneven US adaptation field (Appendix C1). Thus, we propose a context-sensitive approach to prioritization (Box 18).

### Box 18: Context-Specific Prioritization of Adaptation Field-Building Actions

Our proposed approach accounts for the fact that field builders/supporters and actors/implementers find themselves in very different contexts with divergent needs. To identify the highest priority field-building interventions from our list of recommended actions, we offer the following step-wise determination process:

**1. Locate yourself in the field-building picture.** Identify your role with respect to the adaptation field (as a thought leader, field builder/supporter, field actor/implementer, or potential contributor to resilience currently outside the field. (See Figure 5, page 21. Recommendations are offered in the respective sub-sections of Section 5.3).

**2. Diagnose and focus.** Determine, within your area of influence, which of the 4Ps needs the most attention by asking these diagnostic questions:

- *Purpose* – Within your sector, region, organization, or area of influence, do people recognize the scope of the problem? How do they define the problem? Is there a vision around which people can come together? Are they galvanized to work on it with urgency? Is the lack of a shared Purpose holding you back?
- *People* – Who are the actors already working on this problem? Who is missing? (Think especially about often under-represented groups.) Are they actively networked? Are there recognizable leaders? Do actors hold a shared identity? Is the lack of engaged People holding you back?
- *Practice* – What are the shared ideas, goals, vision, and values? How strong is your knowledge base? Is there a shared purpose and shared action agenda that people work on collaboratively? What is the level of skill and available capacity? Is innovation being supported? Is the level of Practice holding you back?
- *Pillars* – What is the funding and policy support for advancing the field? What support is available for advancing the practice? How is the lack of supporting Pillars holding you back?

Choose the most critical of these to focus on—for now. If all seem equally lacking, start with the Purpose, which will help you identify the right People to engage.

**3. Partner.** Seek out relevant partners with whom the greatest progress in systemic change can be achieved. Particularly seek out partners in the climate justice community. Going it alone is likely to create fewer, slower, or only temporary and partial outcomes.

**4. Go for impact.** Together, identify the highest possible leverage point to create the greatest impact you can collectively have on your identified field component (one or more of the 4Ps). Then, check your intended field-building activity against the seven strategies for increasing and accelerating impact described in Box 20, and explore ways to strengthen it.



**5. Sequence implementation.** Take up the suggested recommendations from Section 5.3 and related appendices (recommendations per actor group and field component) that emerge from your prioritization exercise and

- Decide what recommendation(s) you can do this year.
- Decide on the next three recommendations to take on over the next two years.
- Decide on the next set of recommendations to take on after that.

**6. Reassess.** Demand or conduct a state-of-the-field assessment after five years, and update recommendations as needed.

### 5.3 Toward a Mature Adaptation Field: Recommendations

The various recommendations offered below draw on different bodies of work and the findings from this study:

- Insights from the field-building literature (see Appendix B);
- Insights from theories and experiences about how to scale the impact of innovative practices (Box 20);
- The critical needs identified by study participants; and
- The uneven patterns of climate change and field development across the US.

We offer a broad set of recommendations to rapidly advance the adaptation field toward maturity, with more detailed recommendations for each of our report's audiences in Appendices C2-20. We believe, with concerted and collective effort, this can and should be achieved within a decade, so as to enable US communities to more adequately reduce the causes of climate change, prepare for the accelerating impacts, and do both with a sustained emphasis on equity and social cohesion.

We recognize that people often do not start with climate change in the work they do, but rather come from other problems to discover climate links. Conversely, adaptation actors often do not start by addressing climate problems in the broader context of social justice or health, economic, and other equity concerns. We thus recommend that all readers incorporate climate and equity concerns as a matter of standard practice.

#### Recommendations for Thought Leaders

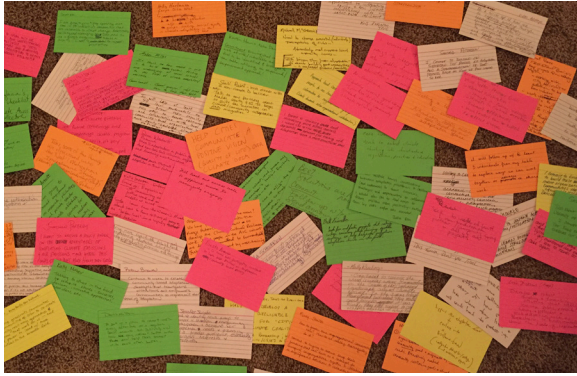
Thought leaders—in any sphere relevant to adaptation field building and closing the resilience gap—are individuals whose views are both authoritative and influential. The best thought leaders balance audacity

with humility, are authentic and trusted, serve as go-to sources in their respective areas of expertise, and tend to be remarkably good listeners. For adaptation field building, the most needed thought leaders have an expansive vision, systemic and integrative thinking, and—preferably—connections and respect within and across sub-fields of adaptation to help bring together a dispersed and heterogeneous community.

The most important thing thought leaders of the adaptation field can do at this time is to press the urgency of climate change (Box 19). They must insist on the necessity to address climate challenges through both mitigation and adaptation, in ways that are sustained over time and enhance equity and justice. Thought leaders should push the field to think bigger, bolder, and deeper about challenges and solutions (Figure 32). Specific key recommendations for this important cross-cutting audience include:

#### Purpose

- Articulate the scope and urgency of climate change, including its intersections with other crises and challenges.
- Facilitate processes in which people define and find common ground around shared challenges that require adaptation in the face of climate change, developing a shared problem understanding and vision of a desirable future.
- Help others see how their diverse concerns fit into a larger, more widely shared problem—and how adaptive solutions can produce resilience and other desired benefits.
- Help people break down seemingly unmanageable problems to make them amenable to community action; expand narrowly defined problems to embrace resilience building.



**Figure 32: Thought leaders made a variety of commitments to advance the adaptation field at an event facilitated by the authors during the National Adaptation Forum 2017.** Source: Joyce Coffee, used with permission

### People

- Promote an approach to adaptation and transformative change that employs a community and relationship perspective, rather than focusing narrowly on technical and economic concerns.
- Use your influence to bring people together around common problems to define a shared adaptation action agenda, including agreed measures of progress and success.
- Develop and implement adaptive solutions together, then track progress and learn.

### Practice

- Become a highly visible and dependable champion for socially just resilience building.
- Disrupt established ways of thinking, and open minds with novel ideas about adaptation and resilience building.
- Openly discuss issues of power and privilege, and make your own fearlessness contagious.
- Facilitate community processes to identify shared visions, values, ideas, and actions around adaptation and resilience; and
- Serve as a role model in how you approach and enact adaptation.

### Pillars

- Help people find a unifying vision and a positive agenda around path-breaking adaptation solutions so that new hope and energy, and new sources of funding and policy support can be unleashed.
- Recognize and relentlessly communicate the need for climate action, the insufficiency of partial solutions, and the need for transformative change.

More detailed recommendations for thought leaders can be found in Appendix C2.

## Recommendations for Field Builders and Supporters

Field builders and supporters include government and philanthropic funders, as well as high-level policymakers whose daily work is building the field of adaptation. Private-sector investors are generally not yet in this category, but we include them here for the important role they are beginning to play, and the much bigger role they could play in the years ahead.

The most important thing that field builders and supporters should do is to expand and stabilize the funding support for the field and to use the most effective leverage points available (including policy) to move adaptation forward rapidly, effectively, and equitably.

Through funding and policy support for field building as well as for implementation activities that advance resilience on the ground, these actors play their most significant role in building, sustaining, and/or enlarging the field's Pillars. Funders and policymakers can also contribute to thought leadership that affects the articulation of the Purpose, the depth and breadth of Practice, and the circle of People involved and reached.

The most important thing field builders and supporters should do is to expand and stabilize the funding support for the field, and to use the most effective leverage points available (including policy) to move adaptation forward rapidly, effectively, and equitably.<sup>140</sup> The task is one of acceleration, scaling up, and ensuring deeper practice (Box 18). Specific recommendations include:

### Pillars

- Convene funders to develop pooled, coordinated, complementary, and sustained funding streams for adaptation, including from programs previously not conceived as climate-related (for example, health, housing, social justice, and job creation); track and evaluate achievements and gaps over time.
- Convene relevant experts to develop and then invest in new funding mechanisms for adaptation.
- Establish funding criteria and preferentially fund resilience-building work that involves:
  - Collaboration across disciplines, sectors, programs, government silos, and differences;

## Box 19: Effective Climate Communication Balances Urgency and Efficacy

Among the leading recommendations in this report is to communicate the urgency of climate change more forcefully, widely, and effectively to mobilize actors around a common purpose. Courageous, visionary leaders must make the case for urgent climate action. The stark realities of climate change and concurrent social, economic, and ecological crises make this a difficult challenge, particularly against the backdrop of a polarized nation.<sup>141</sup>

Effective communication inspires and persuades people; it attracts attention and resources to advance the field; it clarifies a vision for a better future and articulates clear goals. Effective communicators command influence in their areas of work but also reach the broader culture, provide a consistent moral voice, and serve as dependable sources of knowledge and wisdom.

How might they do this? Research and practical experience tell us that communicating urgency must always include a sense of feasibility or efficacy: together, we can rise to the challenge.<sup>142</sup> Communicating urgency should be done using a variety of elements—depicted on the left side of the scale in Figure 33. But urgency without efficacy (communicated through elements shown on the right side of the scale) causes people to retreat, tune out, lose hope, or despair.

By conveying urgency—coupled with efficacy—we can motivate pre-disaster adaptation planning, political leadership, greater public engagement, and acceptance of the necessity to prepare.<sup>143</sup> Success stories are highly motivational, particularly when compared with cases where preventive adaptation actions were not taken. An effective approach is combining a clear threat with a positive vision, concrete goals, a call to shared action, and public commitments to ensure follow-through and accountability.

**Urgency** is that sense that something important must be attended to immediately and cannot wait. It moves us out of the comfort of the status quo to gain the cooperation of others to plan and execute change efforts, and to keep going in the face of obstacles, deep-seated inertia, the ever-present temptation of complacency, or even the necessary small, early wins on the path to deeper transformation.



**Efficacy** gives us the sense that we can affect change (self-efficacy), that we are doing so successfully together with others (collective efficacy), and that the actions we are taking actually make a difference in the ultimate outcome (response efficacy).

Figure 33 : Mobilizing people to close the resilience gap requires that we balance the urgency of climate change with a sense that we can enact effective solutions.

- Definition of indicators; ongoing monitoring and evaluation of progress and success;
  - Periodic, critical assessments of practices to build the evidence base;
  - Communication, dissemination, and learning processes; and
  - Capacity building for socially just adaptation and transformation.
- Invest in systemic approaches to resilience building, including support for adaptation and mitigation policy advocacy work in line with shared goals and values, and promote integrative policies to support implementation.
  - Focus on regional, state, and—where possible—national and international policy levers (such as standard setting, use of funds generated in carbon markets) to scale up best adaptation practices.

### **Purpose**

- Relentlessly communicate the scope and urgency of climate change, along with the efficacy of solutions in your spheres of influence.
- Demand (by way of calls for proposals or through funding criteria) that grantees examine and address climate-related problems in a holistic, systemic fashion (for example, cross sectoral, multiple stakeholders, mitigation and adaptation, justice implications across whole communities).
- Convene funders (across sectors and funding vehicles) to align priorities, complement funding approaches, and jointly fund long-term, comprehensive approaches to closing the resilience gap.

### **People**

- Support smaller convenings and larger sectoral, regional, and national conferences to foster exchange, learning, community building, and identity building for the adaptation field.
- Convene influencers from various fields and sectors to define, augment, and deepen the vision of a desirable future, shared values, and a shared action agenda for adaptation.
- When it comes to building the adaptation field, consider yourselves “in it for the long haul,” rather than changing funding priorities every few years.
- Actively support the work and maintenance of professional and peer-learning networks for adaptation.

### **Practice**

- Model internal collaboration within your own entities, organizations, and agencies.
- Support and engage communication experts to greatly enhance the quality and quantity of communication of adaptation success stories and innovations.
- Support professional training within and outside your organizations and—where competencies are lacking—require deepening of skills and knowledge (particularly in social equity, systems thinking, climate change, communication, adaptive and transformative capacities).
- Deliberately invest in think tanks, research, and entrepreneurial entities for a continuous flow of thought leadership on resilience building and practical adaptive and transformative solutions.
- Invest in “backbone organizations” that can facilitate and coordinate convenings of organizations that do not yet regularly interact but that could fruitfully collaborate on specific adaptation challenges.

More detailed recommendations for each of the sub-audiences among field builders and supporters can be found in Appendices C3-7.

## **Recommendations for Field Actors and Implementers**

The organizations and individuals that already consider themselves “adaptation professionals” make up the largest and most diverse group of actors addressed by this report. Their daily work is to enact adaptation or directly support the planning and implementation of adaptation efforts.

The most important work for adaptation professionals at this time is to make resilience building real on the ground—to rapidly implement mitigation and adaptation in equitable and just ways to make American communities safer for all. Clearly, they cannot do this without the support of the other groups addressed in this chapter. But, field actors must deepen their practice around equity and transformative change; increase the sharing of lessons learned from peers and those outside the peer community; and break down divisions to address resilience challenges holistically. Thus, this group’s key contributions and top priorities lie in the People and Practice components of the field. Key recommendations include:

### People

- Approach adaptation not just as a technical problem, but as a matter of building relationships across silos, organizations, disciplines, sectors, and all manner of difference. In this way, adaptation can be addressed systemically and holistically, meeting the needs and building on the skills, knowledge, and resources of all involved.
- Work toward a common language and shared understanding of the problem, values, purpose, and action agendas for integrated adaptive solutions.
- Form, join, or maintain communities of adaptation practice, peer-learning, and collaborative networks with a common professional identity, and diversify their membership.

- Share professional journeys into resilience-building work with youth, students, and young professionals; include them in your work so as to bring the voices of the next generation to the table and foster a “professional pipeline” into resilience building.

### Practice

- Establish and use a “whole system”<sup>144</sup> or “whole community”<sup>145</sup> approach as standard adaptation practice to jointly define, assess and address problems and work toward systemic solutions.
- Vastly increase and improve communication of resilience-building efforts, particularly by sharing stories of success (adaptation-related policy, funding, practices, uniting across difference, outcomes, etc.) within and beyond communities, networks, and sectors.

## Box 20: Seven Strategies to Accelerate the Impact of Field-Building Activities

The most strategic contributions on how to accelerate, spread, scale up, and deepen social innovations derived from a diverse literature<sup>146</sup> point to several cross-cutting strategies. The first four (Framing, Scaling out, Scaling up, Scaling deep) are frequently described in the literature as occurring sequentially, whereas the next two (Integration and Acceleration) are particularly relevant to and aim at improving the quality and systemic approach of interventions. The final one (Learning) is a necessity consistently called for in any dynamic and complex problem area (Figure 34).

Our more specific recommendations offered in this chapter all fall into one or more of these seven categories. Consider using this text box as a “check” on the field-building interventions you might consider: if planned activities do not contribute in one of these seven ways to rapidly advancing the field, should they be pursued now?

**Framing** – Framing is often the first step required in any effort to work toward bigger change. It brings focus to the central problem around which actors come together; and is a necessary step toward developing a unifying vision and narrative and formulating a shared purpose to work on. Framing large-scale change must connect individual motivations and values to commonly shared values, and is a critical, illuminating process in helping people understand how their individual concerns and efforts fit within the larger common concerns and efforts.

**Scaling out** – Scaling-out tactics aim for greater impact through dissemination of ideas and practices to different geographies and more people. Efforts that have been critically evaluated and found to be successful are replicated in more places through mechanisms such as extension of efforts, franchising, branching out, or—once it is recognized that contexts are unique and require adjustments of standard practices—by spreading core principles and allowing those to be implemented in whatever ways work. Trainings and accreditation systems are example mechanisms central to field building.

**Scaling up** – While often used colloquially for any effort that accelerates change, scaling up here specifically denotes any strategy that aims at changing existing institutions (policies, laws, markets, “rules of

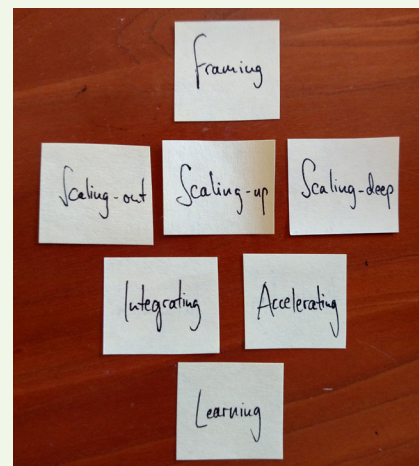


Figure 34: Seven cross-cutting strategies to rapidly increase the impact of field-building activities. Source: Susanne C. Moser, used with permission

the game,” procedures) to generate systematic impact that applies to a great number of situations, and typically engages new or unusual partners in doing so. As such, scaling up aims deeper than scaling out; it aims at institutional change in which powerful actors may be vested. Thus, it often requires political maneuvering, policy advocacy, coalition building, movement building, and protest to effectively change the status quo. Other tactics can be more collaborative and co-creative in nature.

**Scaling Deep** – Scaling deep<sup>147</sup> aims at creating durable change at the cultural roots of society by changing hearts and minds, values, and cultural practices. It is often the result of the limits of scaling out and scaling up and can change framings as well. Tactics include deliberate efforts in changing language and narratives; facilitating difficult dialogues to address deep-seated problems; or creating immersive programs to change beliefs, ideas, and norms. It also entails building (transformative) learning communities and capacity, (re-)building trustful relationships, or reimagining new power relationships.

**Integrating** – Integrating applies holistic thinking and practices to improve outcomes. To overcome silos or segregated efforts, tactics aim to bring together mentally, practically, or institutionally disconnected parts and join them for greater collective impact. Integrating involves learning about system dynamics and occurs through voluntary action or mandates, for example, “bringing the whole system into the room;” identifying shared values and language; coordinating across sectors, entities, differences, and related activities to reinforce each other; or changing institutional structures and approaches to allow systems to be addressed in an integrated fashion.

**Accelerating** – The need for acceleration of responses is particularly relevant to problems that are evolving and themselves speeding up. Acceleration aims at increasing the ability to apply practices more quickly and easily. Tactics involve concerted efforts at experimentation, innovation, and commitment to widespread application of successful pilot tests; removing challenges that make it difficult for entities to work efficiently and collaboratively (such as lack of general operating support or leadership, limited capacity for organizational development, communication, or fundraising); or overcoming barriers to progress by, for example, eliminating bureaucratic red tape, streamlining processes, centralizing information or funding resources.

**Learning** – All large-scale change efforts are inherently dynamic, complex, and move those involved into uncharted territory, which is why building mechanisms for monitoring, rapid feedback, evaluation, and learning into them is a strategic and self-correcting necessity. Tactics range from the informal to the formal, including education and training efforts, peer-learning networks, deliberate monitoring and evaluation practices, and frequent gatherings to review and adjust practices and approaches.

- Break down funding silos that prevent effective collaboration and whole-system adaptation solutions.
- Collaborate, rather than compete, with other adaptation service providers, thereby combining complementary skills, resources, and access to different networks.
- Require critical internal and/or external evaluation of adaptation practices to establish what constitutes best practices; share those practices widely through communication channels, networks, and training and credentialing programs.
- Seek out opportunities to learn about and build capacities for transformative change (Box 16).

#### **Purpose**

- Become a stronger voice for the urgency of climate change and equity while conveying the practical help audiences need to believe they can enact effective solutions.
- Identify shared or overlapping problems (with peers, community partners, and those in other sectors, departments, or agencies) that can be solved more effectively together in ways that close the resilience gap.

#### **Pillars**

- Leaders at local and state levels of government should demand and fund pre-disaster preparedness and resilience building at local and state levels, and establish funding requirements that all post-disaster rebuilding, upgrades, and develop-

ment integrate the best available scientific information on climate change, foster equity, and avoid maladaptation (such as increased greenhouse gas emissions);

- Work with financing experts, investors, practitioners, researchers, and community representatives to explore and pilot innovative funding models for adaptation.
- Create learning cultures within your organizations so they become more adaptive.
- Seek collaborations with researchers, practitioners, and community members to envision a desirable future and establish shared measures of adaptation progress and success to which collaborators are held accountable.

More detailed recommendations for each of the sub-audiences among field builders and supporters can be found in Appendices C8-17.

In addition to these tasks, we have an overarching recommendation for all who already consider themselves part of the adaptation field: identify essential partners outside the field who do not currently consider themselves adaptation professionals; reach out to them to identify shared goals and opportunities for collaboration, and help them see how their work is sensitive to climate change and could contribute to advancing adaptation.

## Recommendations for Supporters and Actors Currently Outside the Field

Outside actors that can play supportive and even instrumental roles in advancing adaptation include: the media; business executives; utilities managers; social service providers; educators; and professional societies

**The most important thing for supporters outside the adaptation field to do is to assess their sector's sensitivities to climate change and disruptions, educate themselves about adaptation, and forge alliances with relevant actors in the adaptation field.**

in fields that are relevant to practically any aspect of life affected by climate change.

The most important thing for this group to do now is to assess their sector's sensitivities to climate change and disruptions, educate themselves about adaptation, and forge alliances with relevant actors in the adaptation field. Specific recommendations include:

### Purpose

- Professional societies: Survey members to identify climate-sensitive problems, enable peer-learning and exchange, and foster dialogue about potential contributions to closing the resilience gap.
- Once links are identified between climate change and your other concerns, strongly communicate the urgency and importance of climate change to those areas of work.

### People

- Professional societies: Foster adaptation/resilience-focused task forces or committees to network, facilitate learning, and identify internal priorities and opportunities for connecting to external adaptation professionals.
- Professional societies: Co-host sessions or conferences with adaptation-specific professional societies, scientific experts, and practitioners on relevant adaptation/transformation topics.
- All professionals: Reach out to research institutions, federal and state agencies, and adaptation-related professional societies to identify entry points into climate change and adaptation, to find relevant adaptation expertise and peer-learning and collaborative networks to join.

### Practice

- Traditional and new media: Launch an "America adapts!" series of news stories that:
  - Highlight novel adaptive/transformation solution ideas;
  - Tell heroic stories of how people come together to face great challenges;
  - Spread maverick stories of how novel or effective uses of science-in-practice resulted in inclusive planning and decision making, and more equitable outcomes; but also
  - Communicate critically what is insufficient adaptation practice by contrasting with more comprehensive approaches.
- Professional societies: Share core ideas from within your field with adaptation-focused professional societies and illustrate the effectiveness of your approaches.
- Professional societies: Work with academia and educators to develop practice-centered curricula on climate change and intersecting crises, and incorporate them into professional development.

- Professional societies: Regularly review, evaluate, and update professional skills and standards in your area of work to ensure they are sensitive to climate change and resilience needs; establish regular communication with educators and trainers to improve professional preparation.
- Professionals in any business, organization, or sector: Establish new information-sharing streams (newsletters, webinars, conferences) to raise awareness about how climate change affects your work and to share best practices with your members or constituencies.

### Pillars

- International and national standard-setting organizations: Collaborate across organizations, academia, and practitioners to establish and regularly update relevant standards.
- All actors currently outside the adaptation field: Explore how your available funding streams can be aligned with climate-resilience goals.

More detailed recommendations for each of the sub-audiences among those currently outside the adaptation field can be found in Appendices C18-20.

## 5.4 Measuring Progress Toward a Mature Field

We believe the recommendations offered here are essential to advancing the US adaptation field. But because we expect the field to mature rapidly, these may no longer be the required actions five years from now.

We thus recommend a review of the field in five years, using the 4P framework if it serves the field well, to assess whether revised or new actions/steps are needed at that time. Clearly, political circumstances and climate change itself may require some important adjustments. At that time, assessors may wish to use and build on the sample indicators provided in order to evaluate progress (Table 2).

We recognize this may still be difficult to do for the nation as a whole, but such indicators could be used in particular regions or sectors, each using graphic displays, such as the “Achievement Rose” depicted in Figure 35. When the rose is “full,” the field will be capable of effectively and equitably responding to emerging climate threats.

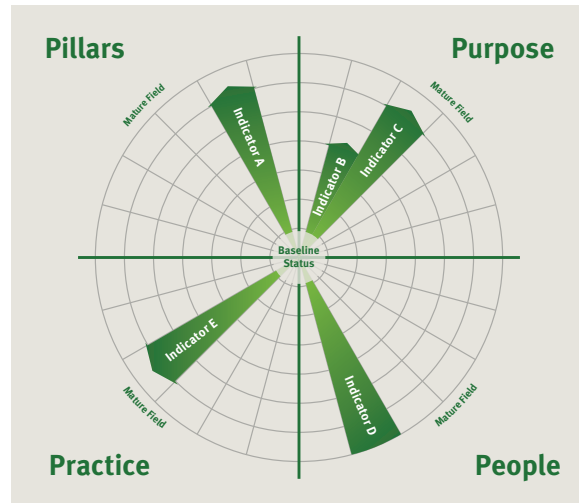


Figure 35: This rose diagram offers a way to visualize progress toward adaptation, organized by the four components of a field.

## 5.5 Clarion Call to Action

As our recommendations make clear, many actors are needed to advance the US adaptation field and close the resilience gap. We will do so more efficiently if we build a shared action agenda—based on a common problem understanding, a shared narrative and common purpose, and a collective sense of responsibility and intentionality. We thus invite our readers to join us in seeing ourselves as vigilant sensors of society and the environment. We ask you to take note of emerging risks, new opportunities, and novel and effective solutions—and to share your observations widely.

We encourage all to serve as relentless questioners. Ask the climate question: are the enduring structures we build meant to withstand—and mitigate—climate change? And ask the equity question: are climate risks and opportunities shared equitably?

There is much that needs to be done, and we each have a unique role to play. We hope readers will join us in growing a widespread awareness of our mutual dependence on the environment and on each other, and in our dedication to achieving our shared goals. We share an interest in learning and measuring our progress together, as the pace and complexity of the problem—unfolding in unique ways across a vast nation—is too large to address, track, or assess alone. Building the field of adaptation and clos-

**Building the field of adaptation and closing the resilience gap will *only* be possible if we work together.**



**Table 2: Sample Indicators to Track and Measure Progress of the Adaptation Field**

<b>Field Component</b>	<b>Indicators of Progress (qualitative/quantitative metrics to be determined)</b>
<b>Purpose</b>	<ul style="list-style-type: none"> <li>• A clear values framework is established and widely known.</li> <li>• The values framework guides the field's purpose.</li> <li>• The adaptation community is united around the common vision of a world in which the resilience gap is closed (through mitigation, adaptation, and social cohesion).</li> <li>• The adaptation community understands its purpose as preventing, minimizing, and alleviating threats to human well-being and creating opportunities for all in addressing climate change.</li> </ul>
<b>People</b>	<ul style="list-style-type: none"> <li>• Non-traditional adaptation professionals count themselves as part of the field.</li> <li>• More diverse, collaborative adaptation efforts are underway.</li> <li>• A diverse set of field leaders is established and widely recognized .</li> <li>• More sector-specific networks are in place.</li> <li>• More connection and exchange occur across networks.</li> <li>• Noticeably more youth are involved in resilience-building efforts.</li> <li>• Adaptation-specific professional societies have grown significantly in membership.</li> </ul>
<b>Practice</b>	<ul style="list-style-type: none"> <li>• Agreed measures of adaptation progress and success are established.</li> <li>• Monitoring and evaluation is part of best practice.</li> <li>• Adaptation is implemented widely.</li> <li>• The need for and benefits of climate adaptation are communicated broadly and effectively.</li> <li>• The economic case for adaptation is widely made and accepted.</li> <li>• Many more boundary organizations effectively connect science and practice.</li> <li>• Professional standards, certification, and training programs are established and used.</li> <li>• Centers for innovation are actively supported.</li> <li>• A shared, evolving action agenda exists.</li> <li>• A collaborative, rather than competitive, spirit prevails.</li> <li>• Dialogic culture is established as part of best practice.</li> <li>• Adaptive thinking and action have significantly increased in competency and depth.</li> <li>• Cross-sector collaborations for holistic solutions are commonplace.</li> </ul>
<b>Pillars</b>	<ul style="list-style-type: none"> <li>• More dedicated funding is available for field building and resilience building.</li> <li>• Funding streams are sustained and pooled.</li> <li>• New financing mechanisms are available for communities of all types.</li> <li>• Those least capable of self-financing are prioritized for funding.</li> <li>• Well-known clearinghouses advertise funding opportunities.</li> <li>• Funders provide support in complementary, well-aligned fashion.</li> <li>• Strong resilience legislation is enacted at all levels of government.</li> <li>• Climate-sensitive standards are established and systematically applied.</li> </ul>

ing the resilience gap, we believe, will only be possible if we work together.

Given the magnitude and diverse facets of the resilience challenge, particularly in the face of resource limitations and power struggles, it is easy to feel helpless.<sup>148</sup> But leaders in the adaptation field can and must do their part to tap into our collective ability to make much-needed changes—making sacrifices, seizing opportunities, or simply deviating from the familiar.

The vibrancy of the adaptation field we witnessed in the course of this study gives us much hope that we

can pull together to do so. The field's collective energy to address this vast challenge stems from love of place and people, passion for our work, determination, and commitment to make a difference (Figure 36). It is fed by a desire to serve, and the lure of opportunities to be creative and solve difficult problems. It is sustained by the friendships that unite us, and sometimes even by the anger and frustration with the status quo that could just as easily divide us. The efforts needed to navigate the transformational changes ahead require nothing less. We urge you to join hands with the many fearless actors who have dedicated themselves to building a resilient future—for all.



**Figure 36: Fearless actors of the adaptation field are working to ensure that our collective actions close the resilience gap.** Source: ACEC Life/Health Trust

# Endnotes

1. See the tracking of global and US insured losses from natural hazard events by the Insurance Information Institute at: <http://www.iii.org/fact-statistic/catastrophes-us>. For the US, NOAA currently tracks the number of extreme climatic events and their losses. See: <https://www.ncdc.noaa.gov/billions/>.
2. Intergovernmental Panel on Climate Change (IPCC). 2014. *Climate Change 2014: Synthesis Report of the Fifth Assessment of the Intergovernmental Panel on Climate Change*. Geneva: IPCC. Several tools are available to track by how much nations have pledged to reduce their emissions by 2030 and how this compares to the Paris Agreement targets (limiting warming to 2°C or less by 2100). See, for example, <https://www.climateinteractive.org/programs/scoreboard/> or <http://climateactiontracker.org/global.html>.

Climate Interactive’s UN Climate Pledge Analysis shows that the actual pledges submitted at the time of ratification still lead to as much as 3.3°C warming above pre-industrial levels (Rogelj et al. 2016, analysis cited in #16 estimates slightly lower numbers), and, as such, are less ambitious than what nations originally pledged (which would have limited warming to 2.2–2.8°C) and what the agreement actually stipulates (1.5–2°C warming).

3. The World Bank. 2012. *4° Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided*. A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics. New York: The World Bank.
4. Spanger-Siegfried, E., J. Funk, R. Cleetus, M. Deas, and J. Christian-Smith. 2016. *Toward Climate Resilience: A Framework and Principles for Science-Based Adaptation*. Cambridge, MA: UCS, p. 2. [Available online at: [www.ucsusa.org/resilience-principles](http://www.ucsusa.org/resilience-principles)].

UCS suggests the resilience gap can be narrowed through additional adaptation and mitigation of climate change. UCS proposes a number of core principles to guide how that gap should be closed, including a strong emphasis on social equity in process and outcome. This dual attention to mitigation and adaptation, undertaken with social equity in mind, is commensurate with Kresge’s understanding of resilience and thus used in this sense in this report. Others previously proposed the concept of an “adaptation gap” (e.g., Chen et al., 2016; UNEP, 2014; Fankhauser and McDermott, 2014; Burton, 2009), defined as the difference between adaptation needs (or an adaptation target set by society) and the adaptation actually implemented. We prefer “resilience gap” for our discussion here due to its explicit emphasis on adaptation, mitigation, and social equity.

Burton, I. 2009. Climate change and the adaptation deficit. In: *The Earthscan Reader on Adaptation to Climate Change*, eds. E. L. Schipper and I. Burton, pp. 89-95. London: Earthscan.

Chen, C., M. Doherty, J. Coffee, T. Wong, and J. Hellmann. 2016. Measuring the adaptation gap: A framework for evaluating climate hazards and opportunities in urban areas. *Environmental Science & Policy* 66: 403-419.

Fankhauser, S., and T. K. J. McDermott. 2014. Understanding the adaptation deficit: Why are poor countries more vulnerable to climate events than rich countries? *Global Environmental Change* 27(1): 9-18.

UNEP. 2014. *The Adaptation Gap Report: A Preliminary Assessment*. Nairobi: United Nations Environment Program. [Available online at: <http://web.unep.org/adaptationgapreport>].

5. Toth, F., and E. Hizsnyik. 2008. Managing the inconceivable: Participatory assessments of impacts and responses to extreme climate change. *Climatic Change* 91(1): 81-101.

World Bank, 2012, see Endnote 3.

Baussion, D. 2015. *When you can’t go home: The Gulf coast 10 years after Katrina*. Washington, DC: Center for American Progress.

Felgenhauer, T. 2015. Addressing the limits to adaptation across four damage-response systems. *Environmental Science & Policy* 50(6): 214-224.

Hauer, M. E., J. M. Evans, and D. R. Mishra. 2016. Millions projected to be at risk from sea-level rise in the continental United States. *Nature Climate Change* 6 (July): 691-698.

Lesk, C., P. Rowhani, and N. Ramankutty. 2016. Influence of extreme weather disasters on global crop production. *Nature* 529(7584): 84-87.

- Liverman, D. 2016. US national climate assessment gaps and research needs: Overview, the economy and the international context. *Climatic Change* 135(1): 173-186.
- Burkett, M., R. R. M. Verchick, and D. Flores. 2017. *Reaching Higher Ground: Avenues to Secure and Manage New Land for Communities Displaced by Climate Change*. Washington, DC: Center for Progressive Reform.
- Hauer, M. E. 2017. Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change* 7(5): 321-325.
- Kulp, S., and B. H. Strauss. 2017. Rapid escalation of coastal flood exposure in US municipalities from sea level rise. *Climatic Change* 142(3): 477-489.
- Saad, A. 2017. Toward a justice framework for understanding and responding to climate migration and displacement. *Environmental Justice*, online first, doi:10.1089/env.2016.0033.
- Brown, M. E., E. R. Carr, K. L. Grace, K. Wiebe, C. C. Funk, W. Attavanich, P. Backlund, and L. Buja. 2017. Do markets and trade help or hurt the global food system adapt to climate change? *Food Policy* 68: 154-159.
- Moser, S. C., K. Dow, and S. P. Tuler. 2017. Out of harm's way: Risk conundrums in coastal areas. In *Risk Conundrums: Solving Unsolvables Problems*, ed. R. E. Kasperson, pp. 189-206, London: Earthscan.
6. Crutzen, P. J. 2002. Geology of mankind: The Anthropocene. *Nature* 415: 23.
- Steffen, W., J. Grinevald, P. Crutzen, and J. McNeill. 2011. The Anthropocene: Conceptual and historical perspectives. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369(1938): 842-867.
- Palsson, G., B. Szerszynski, S. Sorlin, J. Marks, B. Avril, C. Crumley, H. Hackmann, P. Holm, J. Ingram, A. Kirman, M. P. Buendia, and R. Weehuizen. 2013. Reconceptualizing the 'Anthropos' in the Anthropocene: Integrating the social sciences and humanities in global environmental change research. *Environmental Science & Policy* 28: 3-13.
- Waters, C. N., J. Zalasiewicz, C. Summerhayes, A. D. Barnosky, C. Poirier, A. Gałuszka, A. Cearreta, M. Edgeworth, E. C. Ellis, M. Ellis, C. Jeandel, R. Leinfelder, J. R. McNeill, D. d. Richter, W. Steffen, J. Syvitski, D. Vidas, M. Wagerich, M. Williams, A. Zhisheng, J. Grinevald, E. Odada, N. Oreskes, and A. P. Wolfe. 2016. The Anthropocene is functionally and stratigraphically distinct from the Holocene. *Science* 351(6269): aad2622.
7. Leiserowitz, A., Maibach, E., Roser-Renouf, C., Cutler, M., and Rosenthal, S. 2017. *Trump Voters & Global Warming*. Yale University and George Mason University. New Haven, CT: Yale Program on Climate Change Communication.
- Leiserowitz, A., Maibach, E., Roser-Renouf, C., Rosenthal, S., and Cutler, M. 2017. *Climate Change in the American Mind: November 2016*. Yale University and George Mason University. New Haven, CT: Yale Program on Climate Change Communication.
8. Melillo, J. M., T. C. Richmond, and G. W. Yohe eds. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment*. Washington, DC: US Global Change Research Program. [Available online at: <http://nca2014.globalchange.gov/>].
9. Steffen, W., K. Richardson, J. Rockström, S. E. Cornell, I. Fetzer, E. M. Bennett, R. Biggs, S. R. Carpenter, W. de Vries, C. A. de Wit, C. Folke, D. Gerten, J. Heinke, G. M. Mace, L. M. Persson, V. Ramanathan, B. Reyers, and S. Sorlin. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223): 736 (and online pp. 1259855\_1-10).
10. For several years now, the World Economic Forum's Global Risks Report explicitly points to the risks from extreme weather events and the failure to mitigate and adapt to climate change—most recently in 2017: World Economic Forum. 2017. *The Global Risks Report 2017*, 12th edition. Geneva: World Economic Forum.
11. For ongoing updates on how the US insurance industry is responding to climate change risks, see the National Association of Insurance Commissioners at: [http://www.naic.org/cipr\\_topics/topic\\_climate\\_risk\\_disclosure.htm](http://www.naic.org/cipr_topics/topic_climate_risk_disclosure.htm) or follow the Insurers Scorecard prepared by CERES at: <https://www.ceres.org/resources/reports/insurer-climate-risk-disclosure-survey-report-scorecard>. While the risks are widely acknowledged, experts find that US insurers do not adequately account for these risks yet. See: Thistlethwaite, J., and M. Wood. 2017. Scale of climate change, and insurance sector risk management: Looking beyond the horizon. [Available online at SSRN: <https://ssrn.com/abstract=2946352>].

On the role of insurance in climate adaptation, see:

McAneney, J., Crompton, R., McAneney, D., Musulin, R., Walker, G. & Pielke Jr, R. 2013. *Market-based mechanisms for climate change adaptation: Assessing the potential for and limits to insurance and market-based mechanisms for climate change adaptation*, National Climate Change Adaptation Research Facility, Gold Coast. [Available online at: [https://www.nccarf.edu.au/sites/default/files/attached\\_files\\_publications/McAneney\\_2013\\_Market\\_based\\_mechanisms.pdf](https://www.nccarf.edu.au/sites/default/files/attached_files_publications/McAneney_2013_Market_based_mechanisms.pdf)]

Surminski, S., L. M. Bouwer, and J. Linnerooth-Bayer. 2016. How insurance can support climate resilience. *Nature Climate Change* 6(4): 333-334.

Starominski-Uehara, M., and E. C. H. Keskital. 2016. How does natural hazard insurance literature discuss the risks of climate change? *Journal of Insurance Regulation* 35(6): 1-26.

Franzke, C.L.E. 2017. Impacts of a changing climate on economic damages and insurance. *Economics of Disasters and Climate Change*, online first: 1-16. doi:10.1007/s41885-017-0004-3

12. See Endnote 3.

13. All reports released by the consortium are available at: <https://riskybusiness.org/>.

14. US Government Accountability Office. 2017. *Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure*. GAO-17-720. Washington, DC: US Government Accountability Office. [Available online at: <https://www.gao.gov/products/GAO-17-720>].

US Government Accountability Office. 2013. *High-Risk Series: An Update*. GAO-13-283. Washington, DC: US Government Accountability Office. [Available online at: <http://www.gao.gov/assets/660/652133.pdf>].

15. The Paris Agreement entered into force on 4 November 2016. As of October 2017, 169 parties have ratified it. Further details and progress can be tracked here: [http://unfccc.int/paris\\_agreement/items/9485.php](http://unfccc.int/paris_agreement/items/9485.php).

16. Rogelj, J., M. den Elzen, N. Höhne, T. Fransen, H. Fekete, H. Winkler, R. Schaeffer, F. Sha, K. Riahi, and M. Meinshausen. 2016. Paris Agreement climate proposals need a boost to keep warming well below 2°C. *Nature* 534(7609): 631-639.

Figueres, C., H. J. Schellnhuber, G. Whiteman, J. Rockström, A. Hobley, and S. Rahmstorf. 2017. Three years to safeguard our climate. *Nature* 546(7660): 593-595.

17. Davenport, C. 2015. Nations approve landmark climate accord in Paris. The Associated Press. [Reprint available online at: <http://www.ssgates.com/climate-change-textcoding.pdf>].

Obergassel, W., C. Arens, L. Hermwille, N. Kreibich, F. Mersmann, H.E. Ott, and H. Wang-Helmreich. 2016. *Phoenix from the Ashes: An Analysis of the Paris Agreement to the United Nations Framework Convention on Climate Change*. Wuppertal: Wuppertal Institute for Climate, Environment and Energy. [Available online at: [https://wupperinst.org/fa/redaktion/downloads/publications/Paris\\_Results.pdf](https://wupperinst.org/fa/redaktion/downloads/publications/Paris_Results.pdf)].

Dimitrov, R.S. 2016. The Paris Agreement on climate change: Behind closed doors. *Global Environmental Politics* 16(3): 1-11.

Schellnhuber, H. J., S. Rahmstorf, and R. Winkelmann. 2016. Why the right climate target was agreed in Paris. *Nature Climate Change* 6(7): 649-653.

18. For selected commentary on the US withdrawal from Paris, see:

Beer, M. 2017. World leaders respond, US states and cities step up as Trump blunders out of Paris Agreement. *The Energy Mix*, June 2, 2017; available online at: <http://theenergymix.com/2017/06/02/world-leaders-respond-u-s-states-and-cities-step-up-as-trump-blunders-out-of-paris-agreement/>.

Busby, J. 2017. Trump says goodbye to the Paris climate agreement. Here's what that means. *The Washington Post*, June 1, 2017; available online at: [https://www.washingtonpost.com/news/monkey-cage/wp/2017/06/01/trump-says-goodbye-to-the-paris-climate-agreement-heres-what-that-means/?utm\\_term=.547687ed9cc9](https://www.washingtonpost.com/news/monkey-cage/wp/2017/06/01/trump-says-goodbye-to-the-paris-climate-agreement-heres-what-that-means/?utm_term=.547687ed9cc9).

Dolsak, N. and A. Prakesh. 2017. Are we overreacting to US withdrawal from the Paris Agreement on climate? *The Conversation*, June 1, 2017, available online at: <https://theconversation.com/are-we-overreacting-to-us-withdrawal-from-the-paris-agreement-on-climate-78741>

Shao, W. 2017. Trump's decision to withdraw from the Paris accord cedes global leadership to China. *The Conversation*, June 1, 2017; available online at: <https://theconversation.com/trumps-decision-to-withdraw-from-the-paris-accord-cedes-global-leadership-to-china-76279>.

Shultz, G. P. and L. H. Summers. 2017. This is the one climate solution that's best for the environment — and for business. *The Washington Post*, June 19, 2017; available online at: <https://www.washingtonpost.com/opinions/this-is-the-one-climate-solution-thats-best-for-the-environment--and-for-business/>.

United Nations. 2017. US decision to withdraw from Paris climate accord a 'major disappointment'. *UN News Centre*, June 1, 2017; available online at: <http://www.un.org/apps/news/story.asp?NewsId=56882#.WXJ7wLp-FxWx>.

Victor, D. G. 2017. America heads to the exit: What Trump got wrong about Paris. *Yale Environment 360*, June 2, 2017; available online at: <http://e360.yale.edu/features/america-heads-to-the-exit-what-trump-got-wrong-about-paris>.

19. Seki, O., G.L. Foster, D.N. Schmidt, A. Mackensen, K. Kawamura, and R.D. Pancost (2010). Alkenone and boron-based Pliocene  $p\text{CO}_2$  records. *Earth and Planetary Science Letters* 292: 201-211; available online at: <http://dx.doi.org/10.1016/j.epsl.2010.01.037>.
20. Annual tracking of the global carbon budget is available here: <http://www.globalcarbonproject.org/carbonbudget/>.
21. IPCC, 2014, see Endnote 2.

Several tools are available to track by how much nations have pledged to reduce their emissions by 2030 and how this compares to the Paris Agreement targets (limiting warming to 2°C or less by 2100), e.g. <https://www.climateinteractive.org/programs/scoreboard/> or <http://climateactiontracker.org/global.html>. Climate Interactive's UN Climate Pledge Analysis shows that the actual pledges submitted at the time of ratification still lead to as much as 3.3°C warming above pre-industrial levels (Rogelj et al.'s 2016 analysis, cited in Endnote 16, estimates slightly lower numbers), and as such are less ambitious than what nations originally pledged (which would have limited warming to 2.2-2.8°C) and what the Agreement actually stipulates (1.5-2°C warming).

22. The World Bank, 2012, see Endnote 3.
23. See: <http://www.ipcc.ch/report/sr15/>.

Rockström, J., O. Gaffney, J. Rogelj, M. Meinshausen, N. Nakicenovic, and H. J. Schellnhuber. 2017. A roadmap for rapid decarbonization. *Science* 355(6331): 1269-1271.

van den Bergh, J. C. J. M. 2017. A third option for climate policy within potential limits to growth. *Nature Climate Change* 7(2): 107-112.

Walsh, B., P. Ciais, I. A. Janssens, J. Penueles, K. Riahi, F. Rydzak, D. P. v. Vuuren, and M. Obersteiner. 2017. Pathways for balancing CO<sub>2</sub> emissions and sinks. *Nature Communications* 8: 14856.

Seto, K. C., S. J. Davis, R. B. Mitchell, E. C. Stokes, G. Unruh, and D. Ürge-Vorsatz. 2016. Carbon lock-in: Types, causes, and policy implications. *Annual Review of Environment and Resources* 41(1): 425-452.

Detlef, P. v. V., S. Heleen van, R. Keywan, C. Leon, K. Volker, K. Elmar, R. Joeri, S. Michiel, and T. Massimo. 2016. Carbon budgets and energy transition pathways. *Environmental Research Letters* 11(7): 075002.

Climate Action Tracker. 2016. *10 Steps: The 10 Most Important Short-term Steps to Limit Warming to 1.5°C*. Berlin: Climate Action Tracker Partners (New Climate Institute, Ecofys, and Climate Analytics).

Rogelj, J., G. Luderer, R. C. Pietzcker, E. Kriegler, M. Schaeffer, V. Krey, and K. Riahi. 2015. Energy system transformations for limiting end-of-century warming to below 1.5°C. *Nature Climate Change* 5(6): 519-527.

Dangerman, A. T. C. J., and H. J. Schellnhuber. 2013. Energy systems transformation. *Proceedings of the National Academy of Sciences* 110(7): E549-E558.

24. Stefan, R., F. Grant, and C. Niamh. 2017. Global temperature evolution: Recent trends and some pitfalls. *Environmental Research Letters* 12(5): 054001.
25. Walsh, J., D. Wuebbles, K. Hayhoe, J. Kossin, K. Kunkel, G. Stephens, P. Thorne, R. Vose, M. Wehner, J. Willis, D. Anderson, S. Doney, R. Feely, P. Hennon, V. Kharin, T. Knutson, F. Landerer, T. Lenton, J. Kennedy, and R. Somerville, 2014: Ch. 2: Our Changing Climate, in *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, eds. pp. 9-67, Washington, DC: US Global Change Research Program.
26. Desbruyères, D., E. L. McDonagh, B. A. King, and V. Thierry. 2017. Global and full-depth ocean temperature trends during the early twenty-first century from Argo and Repeat Hydrography. *Journal of Climate* 30(6): 1985-1997.
- Ekstrom, J. A., L. Suatoni, S. R. Cooley, L. H. Pendleton, G. G. Waldbusser, J. E. Cinner, J. Ritter, C. Langdon, R. van Hoodonk, D. Gledhill, K. Wellman, M. W. Beck, L. M. Brander, D. Rittschof, C. Doherty, P. E. T. Edwards, and R. Portela. 2015. Vulnerability and adaptation of US shellfisheries to ocean acidification. *Nature Climate Change* 5(3):207-214.
- Doney, S., A. A. Rosenberg, M. Alexander, F. Chavez, C. D. Harvell, G. Hofmann, M. Orbach, and M. Ruckelshaus, 2014: Ch. 24: Oceans and Marine Resources, in *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, eds. pp. 557-578, Washington, DC: US Global Change Research Program.
27. Chen, X., X. Zhang, J. A. Church, C. S. Watson, M. A. King, D. Monselesan, B. Legresy, and C. Harig. 2017. The increasing rate of global mean sea-level rise during 1993-2014. *Nature Climate Change* 7(7): 492-495.
- Dangendorf, S., M. Marcos, G. Wöppelmann, C. P. Conrad, T. Frederikse, and R. Riva. 2017. Reassessment of 20th century global mean sea level rise. *Proceedings of the National Academy of Sciences* 114(23): 5946-5951.
- Dieng, H. B., A. Cazenave, B. Meyssignac, and M. Ablain. 2017. New estimate of the current rate of sea level rise from a sea level budget approach. *Geophysical Research Letters* 44(8): 3744-3751.
- Griggs, G., Arvai, J., Cayan, D., DeConto, R., Fox, J., Fricker, H.A., Kopp, R.E., Tebaldi, C., Whiteman, E.A. 2017. *Rising Seas in California: An Update on Sea-Level Rise Science*. Oakland, CA: California Ocean Science Trust.
- Watson, C. S., N. J. White, J. A. Church, M. A. King, R. J. Burgette, and B. Legresy. 2015. Unabated global mean sea-level rise over the satellite altimeter era. *Nature Climate Change* 5(6): 565-568.
28. Regional averages can differ significantly. See for example:
- DeConto, R., and H. A. Fricker. 2017. Role of Polar Ice Sheets in Future Sea-Level Rise: Implications for California, in *Rising Seas in California: An Update on Sea-Level Rise Science*, Griggs, G., et al., pp. 43-71, Oakland, CA: Ocean Science Trust.
- Dewi Le, B., D. Sybren, and V. Hylke de. 2017. A high-end sea level rise probabilistic projection including rapid Antarctic ice sheet mass loss. *Environmental Research Letters* 12(4): 044013.
- Sweet, W. V., R. E. Kopp, C. P. Weaver, J. Obeysekera, R. M. Horton, E. R. Thieler, and C. Zervas. 2017. *Global and regional sea level rise scenarios for the United States*. Silver Spring, MD: Center for Operational Oceanographic Products and Services, National Ocean Service, National Oceanic and Atmospheric Administration, US Department of Commerce.
- Jeong, S., I. M.N. Bassis. 2016. Accelerated ice shelf rifting and retreat at Pine Island Glacier, West Antarctica. *Geophysical Research Letters* 43(22): 11,720-11,725.
- DeConto, R. M., and D. Pollard. 2016. Contribution of Antarctica to past and future sea-level rise. *Nature* 531 (7596): 591-597.
- Trusel, L. D., K. E. Frey, S. B. Das, K. B. Karnauskas, P. Kuipers Munneke, E. van Meijgaard, and M. R. van den Broeke. 2015. Divergent trajectories of Antarctic surface melt under two twenty-first-century climate scenarios. *Nature Geosciences* 8(10): 927-93d.
29. See the Third US National Climate Assessment for the most recent comprehensive assessment of these types of impacts: <http://nca2014.globalchange.gov/>. The Fourth Assessment is currently underway. A broad review of

socio-economic impacts and several sector-specific assessments have been published since the Third National Climate Assessment, e.g.:

Carleton, T.A. and S.M Hsiang. 2016. Social and economic impacts of climate. *Science* 353(6304): aad9837-1–aad9837-15.

Nelson, M. C., S. E. Ingram, A. J. Dugmore, R. Streeter, M. A. Peoples, T. H. McGovern, M. Hegmon, J. Arneborg, K. W. Kintigh, S. Brewington, K. A. Spielmann, I. A. Simpson, C. Strawhacker, L. E. L. Comeau, A. Torvinen, C. K. Madsen, G. Hambrecht, and K. Smiarowski. 2016. Climate challenges, vulnerabilities, and food security. *Proceedings of the National Academy of Sciences* 113(2): 298-303.

Clayton, S., C. M. Manning, K. Krygsman, and M. Speiser. 2017. *Mental Health and Our Changing Climate: Impacts, Implications, and Guidance*. Washington, D.C.: American Psychological Association and ecoAmerica.

USGCRP. 2016. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. A. Crimmins, J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, eds. Washington, DC: US Global Change Research Program.

Cleetus, R., R. Bueno, and K. Dahl. 2015. *Surviving and Thriving in the Face of Rising Seas: Building Resilience for Communities on the Front Lines of Climate Change*. Cambridge, MA: Union of Concerned Scientists. [Available online at: [www.ucsusa.org/sites/default/files/attach/2015/11/surviving-and-thriving-full-report.pdf](http://www.ucsusa.org/sites/default/files/attach/2015/11/surviving-and-thriving-full-report.pdf)].

Spanger-Siegfried, E., M. Fitzpatrick, and K. Dahl. 2014. *Encroaching Tides: How Sea Level Rise and Tidal Flooding Threaten US East and Gulf Coast Communities Over the Next 30 Years*. Cambridge, MA: Union of Concerned Scientists. [Available online at <http://www.ucsusa.org/sites/default/files/attach/2014/10/encroaching-tides-full-report.pdf>].

30. See Endnote 1.

31. Stern, N. 2016. Economics: Current climate models are grossly misleading. *Nature* 530: 407-409.

32. The point is made extensively in the literature. For example: Kreft, S., D. Eckstein, L. Dorsch, and L. Fischer. 2016. *Global Climate Risk Index 2016: Who Suffers Most from Extreme Weather Events? Weather-related Loss Events in 2014 and 1995 to 2014*. Bonn: Germanwatch.

IPCC (ed.) 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge, UK and New York: Cambridge University Press.

IPCC. 2014. Summary for policymakers. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)], pp. 1-32. Cambridge, UK and New York: Cambridge University Press.

33. Kopp, R.E., D.R. Easterling, T. Hall, K. Hayhoe, R. Horton, K.E. Kunkel, and A.N. LeGrande. 2017. *Potential surprises – compound extremes and tipping elements*. In *Climate Science Special Report: A Sustained Assessment Activity of the US Global Change Research Program* (draft), pp. 610-637, [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. Washington, DC: US Global Change Research Program, Washington, DC.

34. Kintisch, E. 2016. Sea ice retreat said to accelerate Greenland melting. *Science* 352(6292): 1377-1377.

Lindsay, R., and A. Schweiger. 2015. Arctic sea ice thickness loss determined using subsurface, aircraft, and satellite observations. *The Cryosphere* 9(1): 269-283.

35. Screen, J. A. 2017. Climate science: Far-flung effects of Arctic warming. *Nature Geosciences* 10(4): 253-254.

36. Pecl, G. T., M. B. Araújo, J. D. Bell, J. Blanchard, T. C. Bonebrake, I.-C. Chen, T. D. Clark, R. K. Colwell, F. Danielson, B. Evengård, L. Falconi, S. Ferrier, S. Frusher, R. A. Garcia, R. B. Griffis, A. J. Hobday, C. Janion-Scheepers, M. A. Jarzyna, S. Jennings, J. Lenoir, H. I. Linnetved, V. Y. Martin, P. C. McCormack, J. McDonald, N. J. Mitchell, T. Mustonen, J. M. Pandolfi, N. Pettorelli, E. Popova, S. A. Robinson, B. R. Scheffers, J. D. Shaw, C. J. B. Sorte, J.



- M. Strugnell, J. M. Sunday, M.-N. Tuanmu, A. Vergés, C. Villanueva, T. Wernberg, E. Wapstra, and S. E. Williams. 2017. Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. *Science* 355(6332): eaai9214.
- Crist, E., C. Mora, and R. Engelman. 2017. The interaction of human population, food production, and biodiversity protection. *Science* 356(6335): 260-264.
- Newbold, T., L. N. Hudson, A. P. Arnell, S. Contu, A. D. Palma, S. Ferrier, S. L. L. Hill, A. J. Hoskins, I. Lysenko, H. R. P. Phillips, V. J. Burton, C. W. T. Chng, S. Emerson, D. Gao, G. Pask-Hale, J. Hutton, M. Jung, K. Sanchez-Ortiz, B. I. Simmons, S. Whitmee, H. Zhang, J. P. W. Scharlemann, and A. Purvis. 2016. Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment. *Science* 353(6296): 288-291.
- Urban, M. C., G. Bocedi, A. P. Hendry, J.-B. Mihoub, G. Pe'er, A. Singer, J. R. Bridle, L. G. Crozier, L. De Meester, W. Godsoe, A. Gonzalez, J. J. Hellmann, R. D. Holt, A. Huth, K. Johst, C. B. Krug, P. W. Leadley, S. C. F. Palmer, J. H. Pantel, A. Schmitz, P. A. Zollner, and J. M. J. Travis. 2016. Improving the forecast for biodiversity under climate change. *Science* 353(6304): aad8466.
- Barnosky, A. D., E. A. Hadly, J. Bascompte, E. L. Berlow, J. H. Brown, M. Fortelius, W. M. Getz, J. Harte, A. Hastings, P. A. Marquet, N. D. Martinez, A. Mooers, P. Roopnarine, G. Vermeij, J. W. Williams, R. Gillespie, J. Kitzes, C. Marshall, N. Matske, D. P. Mindell, E. Revilla, and A. B. Smith. 2012. Approaching a state shift in Earth's biosphere. *Nature* 486: 52-58.
37. Gao, L., and B. A. Bryan. 2017. Finding pathways to national-scale land-sector sustainability. *Nature* 544(7649): 217-222.
38. Shindell, D., N. Borgford-Parnell, M. Brauer, A. Haines, J. C. I. Kuylenstierna, S. A. Leonard, V. Ramanathan, A. Ravishankara, M. Amann, and L. Srivastava. 2017. A climate policy pathway for near- and long-term benefits. *Science* 356(6337): 493-494.
- Field, C. B., and K. J. Mach. 2017. Rightsizing carbon dioxide removal. *Science* 356(6339): 706-707.
- Turner, G. M. 2012. On the cusp of global collapse? Updated comparison of The Limits to Growth with historical data. *GAIA - Ecological Perspectives for Science and Society* 21(2): 116-124.
39. Kates, R. W., W. R. Travis, and T. J. Wilbanks 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, 109, 7156- 7161.
- Gillard, R., A. Gouldson, J. Paavola, and J. Van Alstine. 2016. Transformational responses to climate change: Beyond a systems perspective of social change in mitigation and adaptation. *Wiley Interdisciplinary Reviews: Climate Change* 7(2): 251-265.
40. Bierbaum, R., A. Lee, J. Smith, M. Blair, L. M. Carter, F. S. Chapin, III, P. Fleming, S. Ruffo, S. McNeeley, M. Stults, L. Verduzco, and E. Seyller, 2014. Ch. 28: Adaptation in *Climate Change Impacts in the United States: The Third National Climate Assessment*, J.M. Melillo, T.C. Richmond, and G.W. Yohe, eds., pp. 670-706. Washington, DC: US Global Change Research Program.
41. References to regional and sectoral reports cited in the NCA adaptation chapter can be found here: <http://nca2014.globalchange.gov/downloads>. Other national overviews and reviews prepared after 2009 include:
- C2ES. 2012. *Climate Change Adaptation: What Federal Agencies are Doing, February 2012 Update*, 71 pp., Center for Climate and Energy Solutions, Arlington, VA. [Available online at <http://www.c2es.org/docUploads/federal-agencies-adaptation.pdf>].
- C2ES. 2013. *State and Local Climate Adaptation*. Center for Climate and Energy Solutions. [Available online at <http://www.c2es.org/us-states-regions/policy-maps/adaptation>].
- Hansen, L., R. M. Gregg, V. Arroyo, S. Ellsworth, L. Jackson, and A. Snover. 2012. *The State of Adaptation in the United States: An Overview*. A Report to the Rockefeller Foundation. Bainbridge Island, WA: ecoAdapt.
- Bierbaum, R., J. B. Smith, A. Lee, M. Blair, L. Carter, F. S. C. III, P. Fleming, S. Ruffo, M. Stults, S. McNeeley, E. Wasley, and L. Verduzco. 2012. A comprehensive review of climate adaptation in the United States: More than before, but less than needed. *Mitigation and Adaptation Strategies for Global Change* 18(3): 361-406.

- Ford, J. D., L. Berrang-Ford, and J. Paterson, 2011: A systematic review of observed climate change adaptation in developed nations. *Climatic Change* 106: 327-336.
- Glick, P., H. Chmura and B.A. Stein. 2011. *Moving the Conservation Goalpost: A Review of Climate Change Adaptation Literature*. Washington, DC: National Wildlife Federation.
- National Research Council. 2010. *Adapting to Impacts of Climate Change. America's Climate Choices: Report of the Panel on Adapting to the Impacts of Climate Change*. Washington, DC: The National Academies Press.
- Moser, S.C. 2009. *Good Morning America! The Explosive Awakening of the US to Adaptation*. Sacramento, CA and Charleston, SC: California Energy Commission and NOAA-Coastal Services Center.
- Preston, B. L., R. M. Westaway, and E. J. Yuen. 2011. Climate adaptation planning in practice: An evaluation of adaptation plans from three developed nations. *Mitigation and Adaptation Strategies for Global Change* 16: 407-438.
42. Vogel, J. K. M. Carney, J. B. Smith, C. Herrick, M. Stults, M. O'Grady, A. St. Juliana, H. Hosterman, and L. Giangola. 2016. *Climate Adaptation: The State of Practice in US Communities*. Cambridge, MA: Abt Associates.
  43. Nordgren, J., M. Stults, and S. Meerow. 2016. Supporting local climate change adaptation: Where we are and where we need to go. *Environmental Science & Policy* 66: 344-352.
  44. Island Press and Kresge Foundation. 2015. *Bounce Forward: Urban Resilience in the Era of Climate Change*. Washington, DC: Island Press.
  45. Pathways to Resilience (P2R) Partners. 2015. *Pathways to Resilience: Transforming Cities in a Changing Climate*. P2R Partners (Movement Strategy Center, Movement Generation, The Praxis Project, Reimagine! RP&E and The Kresge Foundation). Oakland CA. Movement Strategy Center.
  46. Stults, M. and S. Meerow. 2017. *Professional Societies and Climate Change: An analysis of how urban-focused professional societies are integrating climate change into their member engagement activities*. Troy, MI: The Kresge Foundation.
  47. Jobs for the Future. 2017. *Exploring the Green Infrastructure Workforce*. Boston, MA: JFF.
  48. Friedman, L., C. Onike, and K. O'Neil. 2014. *Resilience Field-building Survey*. New York: The Rockefeller Foundation.
  49. Executive Office of the President of the United States. 2016. *Standards and Finance to Support Community Resilience*. Washington, DC: The White House.
  50. Bennett, A. and J. Grannis. 2017. *Lessons in Regional Resilience: Case Studies on Regional Climate Collaboratives*. Washington, DC: Georgetown Climate Center.
- Shi, L. 2017. *A New Climate for Regionalism: Metropolitan Experiments in Climate Change Adaptation*. Dissertation, Department of Urban and Regional Planning. Cambridge, MA: Massachusetts Institute of Technology.
- Institute for Sustainable Communities 2014. *Regional Resilience Primer*. Montpelier, VT: ISC.
51. Park, A. 2014. *Equity in Sustainability: An Equity Scan of Local Government Sustainability Programs*. Washington, DC: Urban Sustainability Directors Network.
- Interspecies equity, while increasingly recognized in the academic literature, is not an explicitly emphasized dimension of equity. See, for example:
- Haughton, G. 1999. Environmental justice and the sustainable city. *Journal of Planning Education and Research* 18: 233-243.
- Lamberton, G. 2005. Sustainable sufficiency – an internally consistent version of sustainability. *Sustainable Development* 13(1): 53-68.
52. OECD. 2011. *Perspectives on Global Development 2012: Social Cohesion in a Shifting World*. Paris: OECD Publishing. [Available online at: [http://www.oecd-ilibrary.org/development/perspectives-on-global-development-2012\\_persp\\_glob\\_dev-2012-en](http://www.oecd-ilibrary.org/development/perspectives-on-global-development-2012_persp_glob_dev-2012-en)]

Stanley, D. 2003. What do we know about social cohesion: The research perspective of the federal government's social cohesion research network *The Canadian Journal of Sociology / Cahiers canadiens de sociologie* 28(1): 5-17.

53. For a history of the concept see:

Schlosberg, D., and L. B. Collins. 2014. From environmental to climate justice: Climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change* 5(3): 359-374.

Bulkeley, H., J. Carmin, V. C. Broto, G. A. S. Edwards, and S. Fuller. 2013. Climate justice and global cities: Mapping the emerging discourses. *Global Environmental Change* 23(5): 914-925.

Mohai, P., Pellow, D., Roberts, J. T. 2009. Environmental justice. *Annual Review of Environment and Resources*. 34(1): 405-430.

Selected references on the topic, pertinent to this report, include:

Steele, W., L. Mata, and H. Fünfgeld. 2015. Urban climate justice: Creating sustainable pathways for humans and other species. *Current Opinion in Environmental Sustainability* 14(June): 121-126.

Margot, H. 2015. Climate justice: A call for leadership. *Environmental Justice* 8(2): 51-55.

Sovacool, B. K. 2013. Adaptation: The complexity of climate justice. *Nature Climate Change* 3(11): 959-960.

Barrett, S. 2013. The necessity of a multiscalar analysis of climate justice. *Progress in Human Geography* 37(2): 215-233.

Shepard, P. M., and C. Corbin-Mark. 2009. Climate justice. *Environmental Justice* 2(4): 163-166.

EJNet. 2002. *Bali Principles of Climate Justice*; available online at: <http://www.ejnet.org/ej/bali.pdf>.

54. See Endnote 4.

55. This Foundation-specific understanding of adaptation and resilience is not uniformly shared, not even entirely among Kresge grantees, much less the wider community, which holds both narrower and broader definitions of adaptation and resilience, as we will show. Moreover, for many the meanings of these terms have changed over time.

56. Transformation is rapidly becoming a critical concept in the academic literature, and (with widely varying understandings) to a lesser extent in some practice circles. We understand transformation as efforts that deeply change systems and their functioning, including their underlying structures and drivers. See, for example:

Berzonsky, C. and S. C. Moser (2017). Becoming homo sapiens sapiens: Mapping the psycho-cultural transformation in the Anthropocene. *Anthropocene*, online first; doi:10.1016/j.ancene.2017.11.002

Göpel, M. 2017. *The Great Mindshift: How a New Economic Paradigm and Sustainability Transformations Go Hand in Hand*. Cham, Heidelberg, New York, Dordrecht, London: Springer International Publishing.

Gillard et al., 2016, see Endnote 39.

Pelling, M., K. O'Brien, and D. Matyas. 2015. Adaptation and transformation. *Climatic Change* 133 (1):113-127.

O'Brien, K., and E. Selboe. 2015. Social transformation: The real adaptive challenge. In *The Adaptive Challenge of Climate Change*, eds. K. O'Brien and E. Selboe, pp. 311-324. New York: Cambridge University Press.

McAlpine, C. A., L. M. Seabrook, J. G. Ryan, B. J. Feeney, W. J. Ripple, A. H. Ehrlich, and P. R. Ehrlich. 2015. Transformational change: Creating a safe operating space for humanity. *Ecology and Society* 20(1): C7-56.

Braun, B. 2015. Futures: Imagining socioecological transformation - An introduction. *Annals of the Association of American Geographers* 105(2): 239-243.

Feola, G. 2014. Societal transformation in response to global environmental change: A review of emerging concepts. *AMBIO* 44(5): 376-390.

Cretney, R., and S. Bond. 2014. "Bouncing back" to capitalism? Grass-roots autonomous activism in shaping discourses of resilience and transformation following disaster. *Resilience* 2(1): 18-31.

- Satterthwaite, D., and D. Dodman. 2013. Towards resilience and transformation for cities within a finite planet. *Environment and Urbanization* 25(2): 291-298.
- Kates, et al., 2012, in Endnote 39.
- Pelling, M. 2011. *Adaptation to Climate Change: From Resilience to Transformation*. London: Routledge.
- Westley, F., P. Olsson, C. Folke, T. Homer-Dixon, H. Vredenburg, D. Loorbach, J. Thompson, M. Nilsson, E. Lambin, J. Sendzimir, B. Banerjee, V. Galaz, and S. Leeuw. 2011. Tipping toward sustainability: Emerging pathways of transformation. *AMBIO* 40(7): 762-780.
- Diaz-Laplante, J. 2007. Humanistic psychology and social transformation: Building the path toward a livable today and a just tomorrow. *Journal of Humanistic Psychology* 47(1): 54-72.
57. In this respect, we diverge from another recent Kresge-sponsored study by Vogel et al., 2016 (see Endnote 42), and Plastrik, P., 2017 (see below), which more broadly defined climate adaptation to include all climate hazard mitigation efforts and normal disaster preparedness efforts even when they did not account for a changing climate.
- Plastrik, P. 2017. *Essential Capacities for Urban Climate Adaptation. A Framework for Cities*. Report developed by the Innovation Network for Communities for the Summit Foundation. Boston: INC.
58. Findings from the grantee materials regarding the grantee–Foundation relationship and specific recommendations to the Foundation are not included in this report, but have been reported separately to The Kresge Foundation.
59. Barber, B.R. 2017. *Cool Cities: Urban Sovereignty and the Fix for Global Warming*. New Haven, CT: Yale University Press.
- Hughes, S. 2015. A meta-analysis of urban climate change adaptation planning in the US. *Urban Climate* 14(Part 1):17-29.
- Bulkeley, et al., 2013, see Endnote 53.
- Castán Broto, V., and H. Bulkeley. 2013. A survey of urban climate change experiments in 100 cities. *Global Environmental Change* 23(1): 92-102.
- Carmin, J., N. Nadkarni, and C. Rhie. 2012. *Progress and Challenges in Urban Climate Adaptation Planning: Results of a Global Survey*. Cambridge, MA: MIT.
- Boswell, M. R., A. I. Greve, and T. L. Seale. 2012. *Local Climate Action Planning*. Washington, DC: Island Press.
- Newman, P., T. Beatley, and H. Boyer. 2009. *Resilient Cities: Responding to Peak Oil and Climate Change*. Washington, DC: Island Press.
- Bulkeley, H. 2010. Cities and the governing of climate change. *Annual Review of Environment and Resources* 35(1): 229-253.
- Lowe, A., J. Foster, and S. Winkelman. 2009. *Asking the Climate Question: Lessons Learned in Effective Adaptation from Urban Leaders Partners*. Washington, DC: Center for Clean Air Policy.
60. O’Neil, K. and C. Onike. 2016. *Field-Building for Social Impact: A Rapid Review*. New York: Rockefeller Foundation Strategic Research Team.
- The Kresge Foundation originally referred the research team to *What it Takes to Build or Bend a Field of Practice*, a helpful quick reference guide compiled by the Spark Policy Institute. It augments O’Neil and Onike’s core elements.
- Spark Policy Institute. ND. *What It Takes to Build or Bend a Field*. Denver, CO: Spark Policy Institute. [Available online at: <https://kresge.org/library/what-it-takes-build-or-bend-field-practice>].
61. Lynn, J. 2014. *Assessing and Evaluating Change in Advocacy Fields*. Denver, CO: Spark Policy Institute, p. 4.

In this paper, Lynn argues that to become a field requires mechanisms to: produce and share knowledge; foster literacy in key concepts and approaches; develop and set professional skills and standards; create and maintain networks of actors to share ideas and spread best practices, and generate adequate support by funding mechanisms and policy.

62. Downes, S., J. Lynn and P. Chung. 2015. *From Paper to Practice: Key Lessons for Foundations Deploying Complex Strategies*. Denver, CO: The Colorado Trust, A Health Equity Foundation.

Plastrik, P. and J. Cleveland. 2009. *Fields, Innovations and Places: Three Different Strategies for Social Innovators*. Boston, MA: Innovation Network for Communities. [Presentation available online at: <https://www.slideshare.net/johncleveland/fields-innovation-places>].

Spark Policy Institute. No date, see Endnote 60.

The Bridgespan Group. 2009. *A Guide and Toolkit for Funders and Nonprofits Committed to Large-Scale Impact*. San Francisco, Los Angeles: The James Irvine Foundation. [Available at: <https://www.bridgespan.org/insights/library/philanthropy/the-strong-field-framework-a-guide-and-toolkit-for/>].

63. Domhoff, G. W. 2009. The power elite and their challengers: The role of nonprofits in American social conflict. *American Behavioral Scientist* 52(7): 955-973.

McAdam, D. 2017. Social movement theory and the prospects for climate change activism in the United States. *Annual Review of Political Science* 20(1): 189-208.

Meyer, D. S. 2006. Building social movements. In *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, S. C. Moser and L. Dilling, eds., pp. 451-461. Cambridge, UK: Cambridge University Press.

Moyer, B., J. McAllister, M. L. Finley, and S. Soifer. 2001. *Doing Democracy: The MAP Model for Organizing Social Movements*. Gabriola Island, BC, Canada: New Society Publishers.

Peet, R., and M. Watts eds. 1996. *Liberation Ecologies: Environment, Development, Social Movements*. London: Routledge.

64. Opp, K. D. 2009. *Theories of Political Protest and Social Movements: A Multidisciplinary Introduction, Critique, and Synthesis*. Routledge, Oxford.

65. Glasberg, D. S. and S. Deric. 2011. *Political Sociology: Oppression, Resistance, and the State*. Thousand Oaks, CA: Pine Forge Press.

66. Plastrik and Cleveland, 2009, p.13, see Endnote 62.

67. For introductions to the goals and campaigns of the (global) climate justice movement, see, for example: <http://demandclimatejustice.org/about/>; last accessed July 19, 2017.

Hall, R. 2013. *Defining Climate Justice*. Available online at: <http://www.peacefuluprising.org/defining-climate-justice-20130521>.

Buckland, K. 2016. Cultural Shifts in the Climate Justice Movement. *Resilience*, The post carbon institute; available online at: <http://www.resilience.org/stories/2016-03-29/cultural-shifts-in-the-climate-justice-movement/>

68. Labor Network for Just Sustainability, and Strategic Practice - Grassroots Policy Project. 2016. "Just Transition" – Just What Is It? An Analysis of Language, Strategies, and Projects. Takoma Park, MD and Berkeley, CA: Labor Network for Just Sustainability and Strategic Practice - Grassroots Policy Project. [Available online at: <http://www.labor4sustainability.org/uncategorized/just-transition-just-what-is-it/>].

Giugni, M., and M. T. Grasso. 2015. Environmental movements in advanced industrial democracies: Heterogeneity, transformation, and institutionalization. *Annual Review of Environment and Resources* 40(1): 337-361.

International Labour Organization (ILO) 2015. Guidelines for a just transition towards environmentally sustainable economies and societies for all. Geneva, Switzerland: ILO; available online at: [http://www.ilo.org/wcmsp5/groups/public/---ed\\_emp/---emp\\_ent/documents/publication/wcms\\_432859.pdf](http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_432859.pdf).

Hadden, J. 2014. Explaining variation in transnational climate change activism: The role of inter-movement spill-over. *Global Environmental Politics* 14(2): 7-25.

Mohai et al., 2009, see Endnote 53.

Rosemberg, A. 2010. Building a just transition: The linkages between climate change and employment. *International Journal of Labour Research* 2(2): 125-162; available online at: [http://www.ilo.org/wcmsp5/groups/public/@ed\\_dialogue/@actrav/documents/publication/wcms\\_153352.pdf](http://www.ilo.org/wcmsp5/groups/public/@ed_dialogue/@actrav/documents/publication/wcms_153352.pdf).

Schlosberg and Collins, 2014, see Endnote 53.

69. Burchardt, H. and K. Dietz. 2014. (Neo)-extractivism – a new challenge for development theory from Latin America. *Third World Quarterly* 35(3): 468-486. Available online at: <https://law.utexas.edu/wp-content/uploads/sites/31/2016/02/Burchardt-Neo-extractivism-%E2%80%93-a-new-challenge-for-development-theory-from-Latin-America.pdf>.

Acosta, A. 2013. *Extractivism and neoextractivism: Two sides of the same curse*. Amsterdam: Transnational Institute. Available online at: [https://www.tni.org/files/download/beyonddevelopment\\_extractivism.pdf](https://www.tni.org/files/download/beyonddevelopment_extractivism.pdf).

70. Barnett, J., and S. O'Neill. 2010. Maladaptation. *Global Environmental Change* 20: 211-213.

Barnett, J., S. O'Neill, S. Waller, and S. Rogers. 2013. Reducing the risk of maladaptation in response to sea-level rise and urban water scarcity. In *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World*. S. C. Moser and M. T. Boykoff, eds., pp. 37-49. London, New York: Routledge.

Juhola, S., E. Glaas, B.-O. Linnér, and T.-S. Neset. 2015. Redefining maladaptation. *Environmental Science & Policy* 55(Part 1): 135-140.

Macintosh, A. 2013. Coastal climate hazards and urban planning: How planning responses can lead to maladaptation. *Mitigation and Adaptation Strategies for Global Change* 18(7): 1035-1055.

71. To do just that, Dr. Elizabeth Sawin of Climate Interactive developed the concept and tools for “multisolving.” See: <https://www.climateinteractive.org/programs/multisolving/>.

72. Cleveland, J., P. Plastrik, J. Crowe, J. Curti, and W. Rickerson. 2016. *Leadership by U.S. Cities: Innovations in Climate Action*. Boston, New York: Innovation Network for Communities, Meister Consultants Group and Bloomberg Philanthropies.

Barber, 2017, see Endnote 59.

Barber, B.R. 2013. *If Mayors Ruled the World: Dysfunctional Nations, Rising Cities*. New Haven, CT: Yale University Press.

It is noteworthy, however, that climate change media attention (based on coverage in five national newspapers) is still very low, overall, and not consistently higher since 2005 (Katrina) or 2012 (Sandy), although US coverage has been improving over the past decade. See ongoing tracking at: [http://sciencepolicy.colorado.edu/icecaps/research/media\\_coverage/index.html](http://sciencepolicy.colorado.edu/icecaps/research/media_coverage/index.html).

73. The 2011 Thai floods, which inundated seven industrial estates, had global supply chain impacts, amassing \$43 billion in estimated damages and economic losses. See detailed discussion and further references in:

Moser, S. C., and J. A. F. Hart. 2015. The long arm of climate change: Societal teleconnections and the future of climate change impacts studies. *Climatic Change* 129(1-2): 13-26.

74. Moser, S. C. 2014. Communicating adaptation to climate change: The art and science of public engagement when climate change comes home. *WIREs Climate Change* 5: 337-358.

75. Numerous studies have shown this to not be the case. See review in: Moser, 2014, in Endnote 74.

76. Pew Research Center. 2016. *America's Shrinking Middle Class: A Close Look at Changes Within Metropolitan Areas*. Washington, DC: Pew Research Center.

77. Post-disaster displacement is increasingly a subject of scientific research. For example:

- Sastry, N. 2009. Displaced New Orleans residents in the aftermath of Hurricane Katrina: Results from a pilot survey. *Organization Environment* 22(4): 395-409.
- Black, R., N. W. Arnell, W. N. Adger, D. Thomas, and A. Geddes. 2013. Migration, immobility and displacement outcomes following extreme events. *Environmental Science & Policy* 27(Supplement 1): S32-S43.
78. Page 20 in Plastrik, 2017, see Endnote 57.
79. The issue has been prominently treated in each IPCC assessment since 1995, but the literature on differential social vulnerability (in the hazards community) and critics of unequal economic development go back to at least the 1970s. Exemplary references from the past seven years, including from prominent US experts as well as urban-focused studies, include:
- Trainor, S. F., M. Calef, D. Natcher, F. S. Chapin, A. D. McGuire, O. Huntington, P. Duffy, T. S. Rupp, L. DeWilde, M. Kwart, N. Fresco, and A. L. Lovecraft. 2009. Vulnerability and adaptation to climate-related fire impacts in rural and urban interior Alaska. *Polar Research* 28(1): 100-118.
- Bolin, B., M. Seetharam, and B. Pompeii. 2010. Water resources, climate change, and urban vulnerability: A case study of Phoenix, Arizona. *Local Environment: The International Journal of Justice and Sustainability* 15(3): 261-279.
- Turner, B. L. 2010. Vulnerability and resilience: Coalescing or paralleling approaches for sustainability science? *Global Environmental Change* 20(4): 570-576.
- Moser, S. C. 2010. Now more than ever: The need for more societally relevant research on vulnerability and adaptation to climate change. *Applied Geography* 30(4): 464-474.
- Emrich, C. T., and S. L. Cutter. 2011. Social vulnerability to climate-sensitive hazards in the southern United States. *Weather, Climate, and Society*. 3: 193-208.
- Kasperson, R. E., and M. Berberian, eds. 2011. *Integrating Science and Policy: Vulnerability and Resilience in Global Environmental Change*. London: Earthscan Publications Ltd.
- Preston, B. L., E. J. Yuen, and R. M. Westaway. 2011. Putting vulnerability to climate change on the map: A review of approaches, benefits, and risks. *Sustainability Science* 6(2): 177-202.
- Romero-Lankao, P., and H. Qin. 2011. Conceptualizing urban vulnerability to global climate and environmental change. *Current Opinion in Environmental Sustainability* 3(3): 142-149.
- Leichenko, R. M., and W. D. Solecki. 2013. Climate change in suburbs: An exploration of key impacts and vulnerabilities. *Urban Climate* 6: 82-97.
- Cutter, S. L., R. L. Schumann, and C. T. Emrich. 2015. Exposure, social vulnerability and recovery disparities in New Jersey after Hurricane Sandy. *Journal of Extreme Events* 01(01): 1450002.
- Weber, S., N. Sadoff, E. Zell, and A. de Sherbinin. 2015. Policy-relevant indicators for mapping the vulnerability of urban populations to extreme heat events: A case study of Philadelphia. *Applied Geography* 63: 231-243.
- Lemos, M. C., Y.-J. Lo, D. R. Nelson, H. Eakin, and A. M. Bedran-Martins. 2016. Linking development to climate adaptation: Leveraging generic and specific capacities to reduce vulnerability to drought in NE Brazil. *Global Environmental Change* 39: 170-179.
- Jones, B. 2017. Natural disasters: Cities build their vulnerability. *Nature Climate Change* 7(4): 237-238.
80. See Endnote 59.
81. Resilience in contemporary social-science literature focused on climate change is often defined with specific reference to self-organization: "Resilience consists of (1) the amount of change a system can undergo and still retain essentially the same structure, function, identity, and feedbacks on function and structure, (2) the degree to which a system is capable of self-organization (and reorganization after disturbance), and (3) the degree to which a system expresses capacity for learning and adaptation" (building on Carpenter et al. 2001, cited in Abesamis, N. P., C. Corrigan, M. Drew, S. Campbell, and G. Samonte. 2006. *Social resilience: A literature review on building resilience into human marine communities in and around MPA networks*. [Available online at: [http://www.reefresilience.org/pdf/Social\\_Resilience\\_Literature\\_Review.pdf](http://www.reefresilience.org/pdf/Social_Resilience_Literature_Review.pdf)].

See also Davidson, D. J. 2010. The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society & Natural Resources* 23(12): 1135-1149.

82. This is widely reiterated in the literature. For example:

Hughes, S. 2015, see Endnote 59.

Eisenack, K., S. C. Moser, E. Hoffmann, R. J. T. Klein, C. Oberlack, A. Pechan, M. Rotter, and C. J. A. M. Termeer. 2014. Explaining and overcoming barriers to climate change adaptation. *Nature Climate Change* 4(10): 867-872.

Klein, R. J. T., G. F. Midgley, B. L. Preston, M. Alam, F. G. H. Berkhout, K. Dow, and M. R. Shaw. 2014. Adaptation opportunities, constraints, and limits. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea and L. L. White, pp. 899-943. Cambridge, UK and New York: Cambridge University Press.

Bierbaum et al. 2012, see Endnote 41.

83. Key review papers, with strong emphasis on communication developments and needs in the US, include:

Moser, S. C. 2016. Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? *Wiley Interdisciplinary Reviews: Climate Change* 7(3): 345–369.

Moser, S. C., and C. Berzonsky. 2015. There must be more: Communication to close to cultural divide. In *The Adaptive Challenge of Climate Change*, K. O'Brien and E. Selboe, eds., pp. 287-310. New York: Cambridge University Press.

Pike, C., S. Eaves, M. Herr, and A. Huva. 2015. *The Preparation Frame: A Guide to Building Understanding of Climate Impacts and Engagement in Solutions*. San Francisco, CA: Climate Access.

Corner, A., and C. Groves. 2014. Breaking the climate change communication deadlock. *Nature Climate Change* 4(9): 743-745.

Moser, 2014, in Endnote 74.

Wolf, J., and S. C. Moser. 2011. Individual understandings, perceptions, and engagement with climate change: Insights from in-depth studies across the world. *Wiley Interdisciplinary Reviews: Climate Change* 2(4): 547-569.

Moser, S. C. 2010. Communicating climate change: History, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change* 1(1): 31-53.

Key resources that can assist with effective climate change communication and engagement include the following:

- Yale Program on Climate Change Communication (regularly providing detailed public-opinion data): <http://climatecommunication.yale.edu/>.
- George Mason University's Center for Climate Change Communication: <https://www.climatechangecommunication.org/>.
- Climate Nexus: <http://climatenexus.org/>.
- Climate Access: <http://www.climateaccess.org>.

84. Stults and Meerow, 2017, see Endnote 46.

85. Welzel, C. 2014. *Freedom Rising: Human Empowerment and the Quest for Emancipation*. Cambridge, UK: Cambridge University Press

Moser, S. C. 2013. Individual and community empowerment for human security. In *A Changing Environment for Human Security: Transformative Approaches to Research, Policy and Action*, L. Sygna, K. O'Brien and J. Wolf (eds.), pp. 279-293. London, New York: Earthscan/Routledge.

Pettit, J. 2013. *Power Analysis: A Practical Guide*. Stockholm: Sida.



O'Lear, S. 2010. *Environmental Politics: Scale and Power*. Cambridge, UK: Cambridge University Press.

Gaventa, J. 2006. Finding the spaces for change: A power analysis. *IDS Bulletin* 37(6): 23-33.

Selected Power Analysis Tools:

<https://www.racialequitytools.org/module/power-analysis>.

<https://www.powercube.net/an-introduction-to-power-analysis/>.

[http://www.syque.com/quality\\_tools/tools/Tools49.html](http://www.syque.com/quality_tools/tools/Tools49.html).

[http://www.sida.se/contentassets/83f0232c5404440082c9762ba3107d55/power-analysis-a-practical-guide\\_3704.pdf](http://www.sida.se/contentassets/83f0232c5404440082c9762ba3107d55/power-analysis-a-practical-guide_3704.pdf).

[https://www.powercube.net/wp-content/uploads/2009/12/exploring\\_power\\_for\\_change\\_intro.pdf](https://www.powercube.net/wp-content/uploads/2009/12/exploring_power_for_change_intro.pdf).

[https://www.powercube.net/wp-content/uploads/2009/11/quick\\_guide\\_to\\_power\\_analysis\\_external\\_final.pdf](https://www.powercube.net/wp-content/uploads/2009/11/quick_guide_to_power_analysis_external_final.pdf).

[https://www.co-intelligence.org/CIPol\\_democSocPwrAnal.html](https://www.co-intelligence.org/CIPol_democSocPwrAnal.html).

86. Useful tools for frame or framing analysis can be found from The Frameworks Institute, available online at: <http://www.frameworksinstitute.org/>.

87. Regrettably, Congress has slated Landscape Conservation Cooperatives (LCCs) for elimination.

88. For more information, see the Rebuild By Design website at: <http://www.rebuildbydesign.org/>. The San Francisco competitions is underway as of this writing.

89. For example, the Massachusetts Institute of Technology's Climate CoLab runs a series of climate change-related innovation competitions, with the aim to crowdsource both mitigation and adaptation solutions. More information is available online at: <https://climatecolab.org/>.

90. See <https://www.fema.gov/sandy-recovery-improvement-act-2013>.

91. Such a program is already being developed by the Water Environment Federation with trainings delivered by utilities. For more information, see the National Green Infrastructure Certification Program online at: <http://ngicp.org/>.

92. See Endnotes 82.

93. Moser, S. C. 2005. Impacts assessments and policy responses to sea-level rise in three U.S. states: An exploration of human dimension uncertainties. *Global Environmental Change* 15: 353-369.

The City of Homer, Alaska, was one of the leading US municipalities to develop such a plan in 2007. It focused primarily on mitigation and was still rather vague about adaptation. The City has initiated a process to update its plan, including an adaptation component, but staff capacity and resource limitations are curtailing ambitions at this time. The initial plan is still online at: [http://www.cityofhomer-ak.gov/sites/default/files/fileattachments/city\\_council/page/6722/climate\\_action\\_plan.pdf](http://www.cityofhomer-ak.gov/sites/default/files/fileattachments/city_council/page/6722/climate_action_plan.pdf).

Moser, 2009, see Endnote 41.

94. Bierbaum et al., 2014, see Endnote 40.

95. A call for such a shift toward risk management emerged clearly out of the Third US National Climate Assessment, efforts such as those initiated by the Risky Business collaborative, and is generally the preferred language in many private-sector contexts. A new scientific journal was created just for that topic. See: Travis, W. R., and B. Bates. 2014. What is climate risk management? *Climate Risk Management* 1:1-4.

The approach is gaining widespread acceptance. See:

Kunreuther, H., G. Heal, M. Allen, O. Edenhofer, C. B. Field, and G. Yohe. 2013. Risk management and climate change. *Nature Climate Change* 3(5): 447-450.

- Jones, R. N., and B. L. Preston. 2011. Adaptation and risk management. *Wiley Interdisciplinary Reviews: Climate Change* 2: 296-308.
96. Mainstreaming is a concept widely discussed in the literature. It first emerged in the 1990s in the sustainable development context. See, for example:
- Nunan, F., A. Campbell, and E. Foster. 2012. Environmental mainstreaming: The organizational challenges of policy integration. *Public Administration and Development* 32(3): 262-277.
- United Nations Development Program (UNDP). 2010. *Screening Tools and Guidelines to Support the Mainstreaming of Climate Change Adaptation into Development Assistance - A Stocktaking Report*. New York: United Nations Development Programme, Environment & Energy Group.
- Mitchell, T., T. Tanner, and E. Wilkinson. 2006. *Overcoming the Barriers: Mainstreaming Climate Change Adaptation in Developing Countries*. Institute of Development Studies & Tearfund.
- Haywood, B. K., A. Brennan, K. Dow, N. P. Kettle, and K. Lackstrom. 2014. Negotiating a mainstreaming spectrum: Climate change Response and communication in the Carolinas. *Journal of Environmental Policy & Planning* 16(1): 75-94.
- Uittenbroek, C. J., L. B. Janssen-Jansen, T. J. M. Spit, W. G. M. Salet, and H. A. C. Runhaar. 2014. Political commitment in organising municipal responses to climate adaptation: the dedicated approach versus the mainstreaming approach. *Environmental Politics* 23(6): 1043-1063.
- Bierbaum, R., A. Lee, J. Smith, M. Blair, L. M. Carter, F. S. C. III, P. Fleming, S. Ruffo, S. McNeeley, M. Stults, L. Verduzco, and E. Seyller. 2014. Ch. 28: Adaptation. In *Climate Change Impacts in the United States: The Third National Climate Assessment*, eds. J. M. Melillo, T. T. C. Richmond and G. W. Yohe, 670-706. Washington, DC: U.S. Global Change Research Program.
- Bierbaum et al. 2012, see Endnote 41.
- Wilbanks, T. J., and R. W. Kates. 2010. Beyond adapting to climate change: Embedding adaptation in responses to multiple threats and stresses. *Annals of the Association of American Geographers* 100(4): 719-728.
97. Many of our respondents expressed different understandings of what mainstreaming entails and what this approach could accomplish. Some used the term consistently with the literature, others used it in a more colloquial way, as in making adaptation “more common.” The degree of integration within and across agencies and sectors varied considerably, and some viewed it as a deliberate integrative strategy while others (particularly those working in smaller communities or in climate-skeptical environments) saw it simply as a necessity to be able to address climate change at all.
98. Rodin, J. 2014. *The Resilience Dividend: Being Strong in a World Where Things Go Wrong*. New York: PublicAffairs.
99. Shi, 2017, pg. 116; see Endnote 50.
100. Klein, R. 2008. Mainstreaming adaptation into development: A means or an end? Paper presented at the Climate Governance and Development Conference, Berlin, Germany, 28-30 September 2008.
- McGray, H., A. Hammill, R. Bradley, E. L. Schipper, and J.-E. Parry. 2007. *Weathering the Storm: Options for Framing Adaptation and Development*. Washington, DC: World Resources Institute.
101. In California, a Senate bill (SB 560) was introduced recently that would require public pension funds to disclose climate risks. Progress of the bill can be tracked at: <http://leginfo.legislature.ca.gov/>. California considered a climate risk disclosure bill in 2008, but it did not pass.
102. CNN, 29 March 2017, “6 Obama Climate Policies that Trump Orders Change.” [Available online at: <http://www.cnn.com/2017/03/28/politics/climate-change-obama-rules-trump/>].
- Jacobson, G. C. 2016. The Obama legacy and the future of partisan conflict: Demographic change and generational imprinting. *The ANNALS of the American Academy of Political and Social Science* 667(1): 72-91.
- Kincaid, G., and J. T. Roberts. 2013. No talk, some walk: Obama Administration first-term rhetoric on climate change and US international climate budget commitments. *Global Environmental Politics* 13(4): 41-60.

103. The Trump Administration's infrastructure policy, advanced through executive order on August 15, 2017 (past the interviewing period), has since proven interviewees' fears right. See: <https://www.whitehouse.gov/the-press-office/2017/08/15/presidential-executive-order-establishing-discipline-and-accountability>.
104. SB 379; text available online at: [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201520160SB379](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB379).
105. AB 2800; text available online at: [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160AB2800](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB2800).
106. See the Alliance for Regional Collaboratives for Climate Adaptation (ARCCA) at: <http://arccacalifornia.org/>.
107. Detailed descriptions and analyses of the work, history, achievements and limits of the Compact and other regional collaboratives, have recently been provided in three independent studies (see Endnote 50).
108. The Georgetown Climate Center has developed profiles of state adaptation plans – a rare effort in compiling state-focused and state-led adaptation work. Available online at: <http://www.georgetownclimate.org/adaptation/index.html>.
109. Funding to environmental justice communities to participate in the process has been provided by the Resources Legacy Fund.
110. *Safeguarding California*, California's state adaptation plan, is being updated as of this writing. Previous versions and future updates are available online at: <http://resources.ca.gov/climate/safeguarding/>.
111. SB 1000; text available at: [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160SB1000](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1000).
112. See Endnote 70.
113. See, for example, Myers, T. A., M. C. Nisbet, E. W. Maibach, and A. A. Leiserowitz. 2012. A public health frame arouses hopeful emotions about climate change. *Climatic Change* 113(3-4): 1105-1112.
114. Grannis, J. 2017. Funding and Financing Adaptation. Presentation offered during an EPA webinar, April 2017.
115. The most commonly referenced study in hazard mitigation is a relatively dated one from 2005 that showed a 4:1 ratio. See:
- Multihazard Mitigation Council. 2005. *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings From Mitigation Activities*. Volume 2 - Study Documentation. Washington, DC: National Institute of Building Sciences. [Available online at [http://www.nibs.org/resource/resmgr/MMC/hms\\_vol2\\_ch1-7.pdf](http://www.nibs.org/resource/resmgr/MMC/hms_vol2_ch1-7.pdf)].
- More recent studies show far greater benefits of proactive hazard interventions. See, for example:
- Neumann, J., D. Hudgens, J. Herter, and J. Martinich. 2010. The economics of adaptation along developed coastlines. *Wiley Interdisciplinary Reviews: Climate Change* 2:89-98, doi:10.1002/wcc.90. [Available online at: <http://onlinelibrary.wiley.com/doi/10.1002/wcc.90/pdf>].
- The National Institute of Building Sciences is in the process of updating its iconic study from 2005. To stay informed, see: <https://www.nibs.org/?page=mmc>.
116. RE.bound Program. 2017. *Leveraging Catastrophe Bonds as a Mechanism for Resilient Infrastructure Project Finance*; available online at: <http://www.refocuspartners.com/wp-content/uploads/2017/02/RE.bound-Program-Report-December-2015.pdf>.
117. See references on collective impact in Chapter 5 (Textbox 20, Seven Strategies to Accelerate the Impact of Field-Building Activities), Endnote 144. An overview of the basic ideas of collective impact is available online at: <http://www.collaborationforimpact.com/collective-impact/> or [https://ssir.org/articles/entry/collective\\_impact](https://ssir.org/articles/entry/collective_impact).
118. In addition to the regional collaboratives emerging around the country, there are multi-state precedents that could serve as models, such as West coast states (CA, OR, and WA) working with British Columbia on ocean acidification; or the Great Lakes states and Canadian Great Lakes provinces working together on water quality and invasive species in the Great Lakes; or the Gulf states working together on coastal resilience.

119. See the very helpful review of leverage points, including the cautious use of them for systemic change in: Meadows, D. 1999. *Leverage Points: Places to Intervene in a System*. In *Sustainability Institute Papers*. Hartland, VT: Sustainability Institute. Available online at: <http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>.
120. One well-known, but not uncritically reviewed, cost curve for greenhouse gas abatement (mitigation) strategies is the one developed by McKinsey & Co, available online at: <http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/greenhouse-gas-abatement-cost-curves>.
121. See Endnote 115.
122. See, for example: Multihazard Mitigation Council (MMC), with the Council on Finance, Insurance and Real Estate. 2015. *Developing Pre-Disaster Resilience Based on Public and Private Incentivization*. Washington, DC: National Institute of Building Sciences [available online at: [https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/MMC/MMC\\_ResilienceIncentivesWP.pdf](https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/MMC/MMC_ResilienceIncentivesWP.pdf)]; and a 2016 Addendum [available at: [http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/mmc/MMC\\_IncentivizationWB\\_Add.pdf](http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/mmc/MMC_IncentivizationWB_Add.pdf)].
123. See, for example, the important work of the University of Pennsylvania's Wharton Risk Management Center, available online at: <https://riskcenter.wharton.upenn.edu/>.
124. See, for example, the Global Investor Coalition ([www.globalinvestorcoalition.org](http://www.globalinvestorcoalition.org)), or Ceres' Investor Network on Climate Risk (INCR) ([www.ceres.org](http://www.ceres.org)) for relevant resources.
125. The Paris Agreement for the first time includes an adaptation goal, but it is vague and thus less compelling. Article 7 of the Paris Accord states: "Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2." See: [http://unfccc.int/paris\\_agreement/items/9485.php](http://unfccc.int/paris_agreement/items/9485.php).
126. The difficulty of arriving at an agreed set of measures of success as well as methods to assess them is extensively described in the scientific literature, and a variety of efforts are underway – through research and practice – to develop measures of progress and success (e.g., within ISC, USDN, the National Estuarine Research Reserve, see: <http://graham.umich.edu/water/nerrs/resources/climate>). All of these efforts ultimately recognize three important challenges: (a) the normative need to agree on basic collective goals to pursue, i.e., the above-mentioned values framework or vision; (b) the need to be flexible so as to allow contextualizing success in specific locales and sectors; and (c) the need for traceability through both quantitative and qualitative indicators and metrics.

One early synthesis of the literature and examples from various sectors were compiled in:

Moser, S. C., and M. T. Boykoff eds. 2013. *Successful Adaptation to Climate Change: Linking Science and Practice in a Rapidly Changing World*. London: Routledge.

127. See: <https://www.nist.gov/topics/community-resilience>.
128. This issue is discussed at length in Moser, S. C., M. A. Davidson, P. Kirshen, P. Mulvaney, J. F. Murley, J. E. Neumann, L. Petes, and D. Reed. 2014. Ch. 25: Coastal Zone Development and Ecosystems. In *Climate Change Impacts in the United States: The Third National Climate Assessment*, pp. 579-618, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe (eds.). Washington, DC: US Global Change Research Program.

More recent research further presses the urgency of dealing with these issues. For example:

Hauer, M. E. 2017. Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change* 7(5): 321-325.

Aerts, J. C. J. H. 2017. Climate-induced migration: Impacts beyond the coast. *Nature Climate Change* 7(5): 315-316.

129. See, for example: Katz, L. F., and A. B. Krueger. 2017. Documenting decline in U.S. economic mobility. *Science*, April 24, doi:10.1126/science.aan3264.

Chetty, R., D. Grusky, M. Hell, N. Hendren, R. Manduca, and J. Narang. 2017. The fading American dream: Trends in absolute income mobility since 1940. *Science* 356(6336): 398-406.

130. Quote from <https://www.economist.com/news/finance-and-economics/21725009-rich-pollute-poor-suffer-climate-change-and-inequality> based on Pizar, W. et al. 2017. What's the damage from climate change? *Science* 356(6345); available online at: <http://science.sciencemag.org/content/356/6345/1330>.
131. The World Bank Group. 2016. *Climate Change Action Plan 2016-2020*. Washington, DC: International Bank for Reconstruction and Development / The World Bank; available online at: <https://openknowledge.worldbank.org/bitstream/handle/10986/24451/K8860.pdf?sequence=2&isAllowed=y> (see Table 2.1, p.10 for the Bank's four priorities).
132. Green, D. 2016. *How Change Happens*. Oxford, UK: Oxford University Press, pp.41-45.  
See also reference in Endnote 85.
133. Pathways to Resilience (P2R) Partners, 2015, see Endnote 45.  
See also: Island Press and Kresge Foundation, 2015 in Endnote 44.
134. A vast body of literature supports both directions of causal change, suggesting a place for both approaches. We would argue, however, that things that are not consciously addressed have a tendency to not become thoroughly or reliably anchored in the new circumstances. Thus, "values change will result in system change" vs. "system change will result in values change" should not be connected by an OR, but by an AND to focus on and solidify desirable value changes.
135. This is also confirmed in the literature. See, for example:  
Bonds, A., and J. Inwood. 2016. Beyond white privilege. *Progress in Human Geography* 40(6): 715-733.  
Schmidt, L., and M. Neuburger. 2017. Trapped between privileges and precariousness: Tracing transdisciplinary research in a postcolonial setting. *Futures* 93: 54-67.  
Boyd, D. 2008. Autoethnography as a Tool for Transformative Learning About White Privilege. *Journal of transformative education* 6(3): 212-225.
136. A finding corroborated frequently in the literature. See, for example: Anguelovski, I., L. Shi, E. Chu, D. Gallagher, K. Goh, Z. Lamb, K. Reeve, and H. Teicher. 2016. Equity impacts of urban land use planning for climate adaptation: Critical perspectives from the global North and South. *Journal of Planning Education and Research* 36(3): 333-348.  
Note also, a considerable amount of Kresge's investment has been precisely to resource groups that authentically represent low-income communities and communities of color to be at the table to shape their climate-resilience futures.
137. The capacities listed in the textbox were compiled from relevant interviews and from a number of sources in the literature:  
Marshall, N. A., S. E. Park, W. N. Adger, K. Brown, and S. M. Howden. 2012. Transformational capacity and the influence of place and identity. *Environmental Research Letters* 7(3): [1249].  
Kofinas, G., D. Clark, G. K. Hovelsrud, L. Alessa, H. Amundsen, M. Berman, F. Berkes, F. S. C. III, B. Forbes, J. Ford, C. Gerlach, and J. Olsen. 2013. Adaptive and transformative capacity. In *Arctic Resilience Interim Report*, ed. Arctic Council, pp. 71-91. Stockholm: Stockholm Environment Institute and Stockholm Resilience Centre.  
Westley, F. R., O. Tjornbo, L. Schultz, P. Olsson, C. Folke, B. Crona, and Ö. Bodin. 2013. A theory of transformative agency in linked social-ecological systems. *Ecology and Society* 18(3): [C7-27] Available online at: <http://www.ecologyandsociety.org/vol18/iss3/art27/>.  
Moser and Berzonsky, 2015, see Endnote 83.  
National Association of Climate Resilience Planners (NACRP). 2017. *Community-Driven Climate Resilience Planning: A Framework*. NACRP. [Available online at: [www.nacrp.org](http://www.nacrp.org).]  
Berzonsky and Moser, 2017, see Endnote 56.

- Moser, S. C., and C. Berzonsky, (in revision). Hope in the face of climate change: A bridge without railing. Manuscript for submission to Environmental Communication.
138. A process described by Paolo Freire as “conscientization.” See: Freire, P. 2008. *Pedagogy of the Oppressed*. 30th Anniversary ed., New York, London: Continuum.
- An excellent resource describing this and related processes in the context of community-driven planning for climate resilience is one created by a coalition of partners, including several that are Kresge grantees, such as Movement Strategy Center; Communities for a Better Environment; Center for Earth, Energy, and Democracy; NAACP; Bay Localize/Rooted in Resilience. NACRP, 2017, see Endnote 136.
139. Coontz, S. 2016. Why the white working class ditched Clinton. *CNN.com*, November 11; available online at: <http://www.cnn.com/2016/11/10/opinions/how-clinton-lost-the-working-class-coontz/index.html>.
- Hochschild, A.R. 2016. *Strangers in Their Own Land: Anger and Mourning on the American Right. A Journey to the Heart of Our Political Divide*. New York, London: The New Press.
- Lerner, M. 2016. Stop shaming Trump supporters. *The New York Times*, Op-Ed; available online at: <https://www.nytimes.com/interactive/projects/cp/opinion/election-night-2016/stop-shaming-trump-supporters>.
- Rondón, A. M. 2017. How to culture jam a populist in four easy steps. *Caracas Chronicles*, January 20; available online at: <https://www.caracaschronicles.com/2017/01/20/culturejam/>. (Also available at *The Washington Post*, January 27, entitled “In Venezuela, we couldn’t stop Chávez. Don’t make the same mistakes we did” at: <https://www.washingtonpost.com/posteverything/wp/2017/01/27/in-venezuela-we-couldnt-stop-chavez-dont-make-the-same-mistakes-we-did/>).
- Roarty, A. 2016. Rural Democrats: Party ignored us, suffered the consequences. *Roll Call*, November 29; available online at: <http://www.rollcall.com/news/politics/rural-democrats-ignored-suffer-consequences>.
- The New Yorker*, November 21, Aftermath: Sixteen Writers on Trump’s America; available online at: <http://www.newyorker.com/magazine/2016/11/21/aftermath-sixteen-writers-on-trumps-america>.
- Thompson, D. 2016. The dangerous myth that Hilary Clinton ignored the working class. *The Atlantic*, December 5; available online at: <https://www.theatlantic.com/business/archive/2016/12/hillary-clinton-working-class/509477/>.
140. Meadows, 1999, see Endnote 119.
141. Chapter 3 of this report as well as several independent analyses, e.g.:
- Nordgren et al, 2016, see Endnote 43.
- Vogel et al., 2016, see Endnote 42.
- Haddow, K. S. 2015. Learning to survive and thrive in a changed climate. In *Living with Climate Change: How Communities Are Surviving and Thriving in a Changing Climate*, J. A. Bullock, G. D. Haddow, K. S. Haddow and D. P. Coppola, eds. pp. 1-34. Boca Raton, FL: CRC Press.
142. Bandura, A. 1977. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review* 34(2): 191-215.
- Magaletta, P. R., and J. M. Oliver. 1999. The hope construct, will, and ways: Their relations with self-efficacy, optimism, and general well-being. *Journal of Clinical Psychology* 55(5): 539-551.
- Moser, S. C. 2007. More bad news: The risk of neglecting emotional responses to climate change information. In *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, S. C. Moser and L. Dilling, eds., pp. 64-80. Cambridge, UK: Cambridge University Press.
- Kotter, J. P. 2012. *Leading Change*. Cambridge, MA: Harvard Business Review Press.
- Hart, P. S., and L. Feldman. 2014. Threat without efficacy? Climate change on US network news. *Science Communication* 36(3): 325-351.
- Moser, 2014, see Endnote 74.

143. IPCC, 2012, see Endnote 32.

Moser, 2005, see Endnote 93.

Island Press and Kresge Foundation, 2015, see Endnote 44.

Knowlton, K., M. Rotkin-Ellman, and P. Sheffield. 2013. Post-Sandy preparedness policies lag as sea levels rise. *Environmental Health Perspectives* 121(7): a208-a209.

Miller, S., G. Kidd, F. Montalto, P. Gurian, C. Worrall, and R. Lewis. 2015. Contrasting perspectives regarding climate risks and adaptation strategies in the New York Metropolitan Area after Superstorm Sandy. *Journal of Extreme Events* 01(01):1450005.

It is noteworthy that a number of studies that examined the barriers and motivations for adaptation action find that crises have not been the dominant drivers of adaptation, nor the appeal to pending crises as articulated by scientists, but that leadership has been the most important factor in launching adaptation efforts. These studies also increasingly call for stronger leadership, locally, regionally, and nationally. See, for example:

Finzi Hart, J. A., P. M. Grifman, S. C. Moser, A. Abeles, M. R. Myers, S. C. Schlosser, and J. A. Ekstrom. 2012. *Rising to the Challenge: Results of the 2011 Coastal California Adaptation Needs Assessment*. Los Angeles: University of Southern California Sea Grant Program.

Nordgren et al., 2016, see Endnote 43.

Shi, 2017, see Endnote 50.

144. A “whole system” approach to adaptation emphasizes that communities depend on the functioning of interdependent lifelines (such as electricity, water, transportation, communication, emergency management, food, fuel) and sectors, which—even if governed in specialized agencies or departments—still interact in real-life settings. Thus, adaptation actions that are sector-specific without considering dependencies and consequences for other sectors are more likely to cause negative side effects and fail to take advantage of possible cost-savings and synergies that only become apparent when working together.

“Whole-system” approaches have been used in a variety of settings, such as programs to address challenges for youth, health care, green buildings, program management, and innovation.

145. A “whole community” approach is an approach promoted in emergency preparedness and beyond to more effectively engage individuals, households, and community organizations in disaster preparedness, response and long-term resilience-building efforts. The approach emphasizes fostering relationships with community leaders and empowering others to lead; understanding community complexity; recognizing community capabilities and needs; building and maintaining partnerships; and strengthening and leveraging the social infrastructure of a community.

146. Abercrombie, R., E. Harries, and R. Wharton. 2015. *Systems Change: A Guide To What It Is and How To Do It*. London: New Philanthropy Capital. Available online at: <http://lankellychase.org.uk/multiple-disadvantage/publications/publication-1-title/>

Bradach, J., and A. Grindle. 2014. Transformative scale: The future of growing what works. *Stanford Social Innovation Review*: 7 pp., available online at: [https://ssir.org/articles/entry/transformative\\_scale\\_the\\_future\\_of\\_growing\\_what\\_works](https://ssir.org/articles/entry/transformative_scale_the_future_of_growing_what_works).

Chertavian, G. 2014. To reach transformative scale, transform the conversation. *Stanford Social Innovation Review*: available online at: [https://ssir.org/transformative\\_scale/entry/to\\_reach\\_transformative\\_scale\\_transform\\_the\\_conversation](https://ssir.org/transformative_scale/entry/to_reach_transformative_scale_transform_the_conversation).

Ford Foundation. 2004. *Asset Building for Social Change: Pathways to Large-Scale Impact*. New York: The Ford Foundation.

Ganz, M. 2010. Leading change: Leadership, organization, and social movements. Chapter 19 in *Handbook of Leadership Theory and Practice: An HBS Centennial Colloquium on Advancing Leadership*, Nohria, N. and Khurana, K. (eds.). Boston: Harvard Business Press. Available online at: <http://marshallganz.usmblogs.com/files/2012/08/Chapter-19-Leading-Change-Leadership-Organization-and-Social-Movements.pdf>.

- Gopal, S., and H. Preskill. 2016. Putting systems thinking into practice. *FSG*. Available online at: [fsg.org/blog](http://fsg.org/blog).
- Hanleybrown, F., J. Kania, and M. Kramer. 2012. Channeling change: Making collective impact work. *Stanford Social Innovation Review*: 10 pp., available online at: [https://ssir.org/articles/entry/channeling\\_change\\_making\\_collective\\_impact\\_work](https://ssir.org/articles/entry/channeling_change_making_collective_impact_work).
- Holton, J. A. 2015. Exploring social movements thinking for leading large-scale change in health and social services systems. *Journal of Corporate Citizenship* (58): 102-118.
- Hurst, A. 2012. Demystifying Scaling. (in 5 parts). *Stanford Social Innovation Review*: 5 pp., available online at: [https://ssir.org/articles/entry/demystifying\\_scaling\\_part\\_1](https://ssir.org/articles/entry/demystifying_scaling_part_1) (and subsequent parts).
- Kania, J., and M. Kramer. 2011. Collective impact. *Stanford Social Innovation Review*: 7 pp., available online at: [https://ssir.org/articles/entry/collective\\_impact#](https://ssir.org/articles/entry/collective_impact#).
- Kania, J., F. Hanleybrown, and J. S. Juster. 2014. Essential mindset shifts for collective impact. *Stanford Social Innovation Review*: 6 pp., available online at: [https://ssir.org/articles/entry/essential\\_mindset\\_shifts\\_for\\_collective\\_impact](https://ssir.org/articles/entry/essential_mindset_shifts_for_collective_impact).
- Koh, H. 2017. Scaling out: For solutions to get to scale, we need strong entrepreneurs who can build on existing breakthrough ideas, rather than creating entirely new ones. *Stanford Social Innovation Review*: 4 pp., available at: [https://ssir.org/articles/entry/scaling\\_out](https://ssir.org/articles/entry/scaling_out).
- Kramer, M. R. 2017. Systems change in a polarized country. *Stanford Social Innovation Review*: 9 pp., available online at: [https://ssir.org/articles/entry/systems\\_change\\_in\\_a\\_polarized\\_country](https://ssir.org/articles/entry/systems_change_in_a_polarized_country).
- McAdam, D. 2017. Social movement theory and the prospects for climate change activism in the United States. *Annual Review of Political Science* 20(1): 189-208.
- McCannon, J., B. Margiotta, and A. Z. Alyesh. 2017. Unleashing large-scale change: Eight ways to grow an unstoppable movement. *Stanford Social Innovation Review*: 3 pp., available online at: [https://ssir.org/articles/entry/unleashing\\_large\\_scale\\_change](https://ssir.org/articles/entry/unleashing_large_scale_change).
- Moore, M.-L., D. Riddell, and D. Vocisano. 2015. Scaling out, scaling up, scaling deep. *Journal of Corporate Citizenship* (58): 67-84.
- Stroh, D. P. 2015. *Systems Thinking for Social Change: A Practical Guide to Solving Complex Problems, Avoiding Unintended Consequences, and Achieving Lasting Results*. White River Junction, VT Chelsea Green Publishing.
- Van Den Bosch, S., and J. Rotmans. 2008. *Deepening, Broadening and Scaling Up: A Framework for Steering Transition Experiments*. Delft, Netherlands: Knowledge Centre for Sustainable System Innovations and Transitions (KCT).
- Waddell, S. 2016. Societal change systems: A framework to address wicked problems. *The Journal of Applied Behavioral Science* 52(4): 422-449.
- Waddell, S., in review. Strategies for societal transitions: Creating societal change systems. Manuscript submitted for publication.
- Walker, J. C. 2017. Solving the world's biggest problems: Better philanthropy through systems change. *Stanford Social Innovation Review*: 11 pp., available online at: [https://ssir.org/articles/entry/solving\\_the\\_worlds\\_biggest\\_problems\\_better\\_philanthropy\\_through\\_systems\\_cha](https://ssir.org/articles/entry/solving_the_worlds_biggest_problems_better_philanthropy_through_systems_cha).
- Westley, F. R., N. Antadze, D. Riddell, K. Robinson, and S. Geobey. 2014. Five configurations for scaling up social innovation: Case examples of nonprofit organizations from Canada. *The Journal of Applied Behavioral Science* 50(3): 234-260.

147. Moore et al., 2015, see Endnote 144.

148. Green, 2016, see Endnote 132.





# THE KRESGE FOUNDATION

[kresge.org](http://kresge.org)



[susannemoser.com](http://susannemoser.com)



[climateresilienceconsulting.com](http://climateresilienceconsulting.com)



[427mt.com](http://427mt.com)