

A GUIDE TO
CLIMATE RESILIENCY & THE
COMMUNITY COLLEGE

A REPORT BY
SARAH WHITE AND TODD COHEN

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AACC • SEED • COWS

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**CLIMATE
RESILIENCY**

HAS BECOME A TOUCHSTONE
FOR CONVERSATIONS ABOUT

**SHARED
PROSPERITY**



**RESILIENCY IS THE STORY
OF MUNICIPALITIES
AROUND THE COUNTRY
REINVENTING THEMSELVES
AS ECONOMICALLY AND
ENVIRONMENTALLY VIBRANT
CENTERS OF COMMUNITY SELF-
RELIANCE. AMERICA'S COMMUNITY
COLLEGES BELONG AT THE HEART
OF THIS NARRATIVE.**

RESILIENCY IS THE WORD OF THE HOUR, a potent but ill-defined term of art in climate and community development circles. At its most fundamental, resiliency indicates a community's ability to withstand a shock — economic, environmental, social. It encompasses a community's work to avert, prepare for, respond to, and recover from a disaster. It is invoked, most commonly, in the aftermath of droughts, storms, wildfire, or floods — the kinds of cataclysm that annually cost billions of dollars to the US economy and untold suffering to its citizens. But resiliency is not the sad story of national decline. Nor can it be reduced to tales of episodic heroism in the face of hostile and impersonal forces of nature. It is, rather, a vision of municipalities around the country reinventing themselves as economically and environmentally vibrant centers of community self-reliance. America's community colleges belong at the heart of this narrative. This *Guide* aims to put them there.

A MISSING LINK

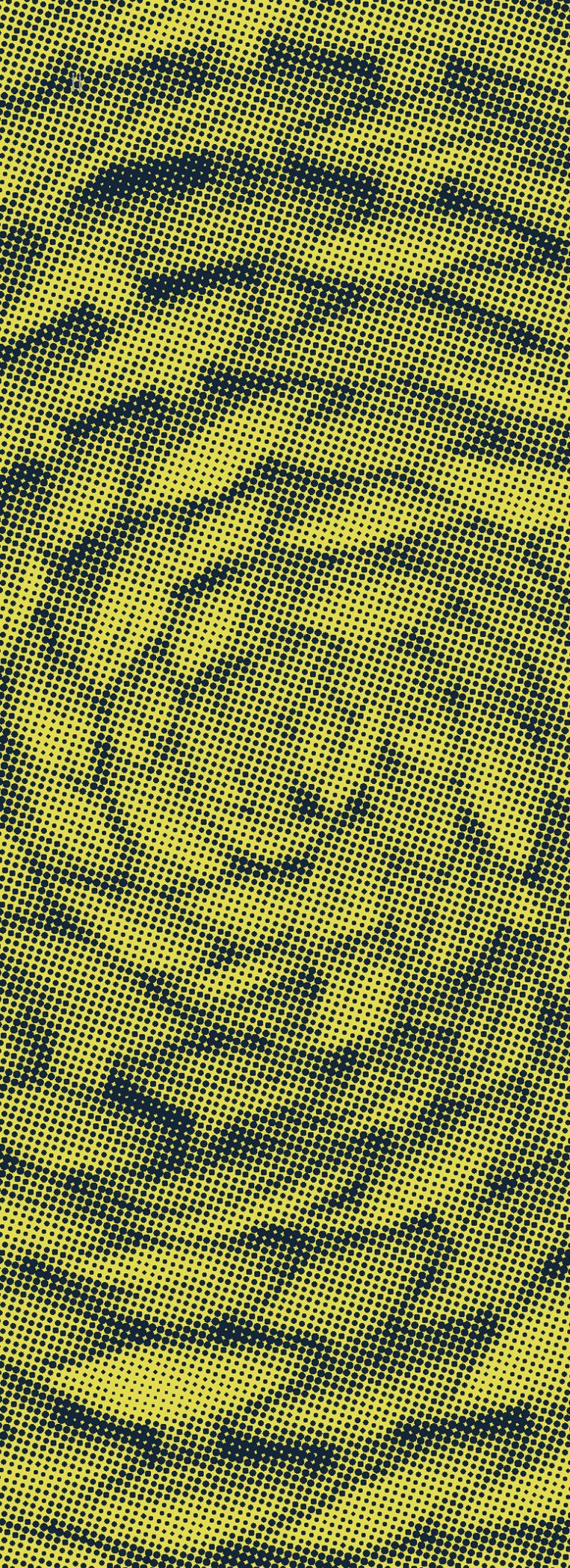
Hundreds, if not thousands, of cities, states, and regions have developed climate adaptation or resiliency plans; few have consulted community colleges in developing them. Most plans call for improvements in education and training, and connection to local economic development, but none of dozens that we reviewed offer a concrete agenda for local workforce development. The major missing piece in these resiliency initiatives? The community college.

Community leaders and elected officials, along with planners and scientists and other resiliency principals, should be calling on local colleges to help mobilize the community and train its workers.

Public engagement in resiliency will turn on livelihoods, not science. Post-disaster redevelopment efforts aimed at public safety need to think also about economic prosperity, which shores up a community as much as sound bridges and reliable transportation. Jobs matter. As high-level resiliency planning pours millions and even billions (as in the case of post-Sandy efforts) of dollars into local redevelopment, who will ensure that the jobs go to local

residents in impacted communities, and who is going to train them to do the work? Resilience requires updating the educational infrastructure to meet the technical demands of rebuilding — and preferably reinventing — the country's physical infrastructure. This cannot be done without the active participation of its community and technical colleges.

Wherever local decision-makers fail to see the importance of skill delivery in building resilient communities, college presidents and trustees should make this case. And every community college needs to pay close attention to emerging opportunities in community resilience planning. Because every college is sitting at the center of a community that is already or soon will be facing challenges from economic and climatic shifts. Each college should be asking itself: How can we add value and voice to the response network, investing in joint initiatives to draw in federal and philanthropic support? How many technical occupations for which we are already educating and training will be impacted by how our region takes shape over the next decade in response to climate change? This *Guide* points the way to some answers.



INTO ACTION: BUILDING RESILIENCE

This *Guide* is designed to help college and community leaders establish a framework for dialogue and action on local climate resiliency.

The Introduction (*Chapter 1*) links the goals of 21st-century community college — equity, access, completion — to the emerging national movement to build resilient communities. Here we explore the scope of the challenge, including the sobering economics of extreme weather, and offer a glossary of related but often confusing terms — mitigation, adaption, vulnerability. And we ask:

What does it mean, exactly, to build resilience? What are its determinants? The answer lies in many factors, some elusive: Critical intangibles like social cohesion, for example, and concrete imperatives like a functional communications infrastructure.

The term climate resilience tends to invoke conversations about infrastructure. We are inundated with images of submerged houses, washed out roads, downed power lines, collapsed bridges. And it's common knowledge that this country needs to repair its crumbling built environment, disaster or not. So the energy around resiliency puts a welcome focus on infrastructure — not just rebuilding it, but reinventing it through greener transit and power and building; sturdier substations, sewer systems, and cell towers — the new bones of an innovative, adaptive America.

Beyond bricks and mortar (or swale and dune), we should also think of resilient infrastructure in terms of more efficient and effective systems for skill delivery, health care, food production, and emergency response.

And there are other matters, equally important.

Building resilience is something more than building sea walls (projected to be a \$9B industry in the next decade) and raising roads. Resiliency relies on *social cohesion*. At its most basic, this means the ability to rely on one's neighbors, which of course runs headlong into this country's potent culture of self-reliance. On a more sophisticated level, however, social cohesion can reflect — and demand — shared power and opportunity, another classic American ideal. Locally, cohesiveness is a function of trust and respect, and is built through informal networks in civil society — congregations, classrooms, neighborhoods, family. Building an individual's or community's *social capital* — measured in part by the extent of their networks — leads to a sense of *agency*, of power, of some measure of control over decisions that affect their lives and livelihoods. Which is why building resilience requires *community engagement*.

A city or state can enhance its physical resilience to climate change by upgrading material infrastructure and improving management of natural capital. A society becomes resilient through improvements in median income, education, health, and wealth, and equal opportunity to participate in and benefit from the activity that produces them. If opportunity, then, is a primary adaptive strategy, community colleges are clearly positioned to play a leading role.

RESOURCES AND OPPORTUNITIES: HOW LOCAL COLLEGES CAN ENGAGE IN A NATIONAL DIALOGUE

Indeed, while this report is about changing weather, it is not about weathering change. The point is not to bounce back, but — particularly in low-income communities already battered by high unemployment, chronic disease, and environmental decay — to leap forward. So while we write about disaster preparedness, response, and recovery,

we are at the same time addressing demands for something larger: vision and leadership and empowerment. Hence the critical role of community colleges — in related curriculum and career pathways, in community leadership and networking, in campus creativity and practice.

Institutions and communities around the country are joining together to create local food systems, urban forests, solar gardens; to redefine land use, integrate transit, green infrastructure, and improve community health networks; to reinvent education by building career pathways that move workers of all skill levels into family sustaining jobs while improving the climate resilience of the neighborhoods in which they live.

In and around this local activity runs an emergent national dialogue on resilient systems. Inquiry and investment have begun to flow in earnest from federal agencies and local governments, philanthropy and academia, labor, business, and non-profit organizations with concerns ranging from environmental justice to national security. In particular, the past few years have witnessed a wave of serious attention to cities as centers of innovation.

This resiliency conversation — and the useful tools it is generating for officials, planners, industries, and activists (including, e.g., adaptation plans, risk assessments, policy recommendations, and engagement strategies) — inevitably, at some point, raises or begs the question of jobs and training. And inevitably stops short of details.

Community colleges have the answers. Some are already at the table; more need to be.

Chapter 2 sets the table, looking at the state and local openings where colleges can enter this conversation, and lifting up opportunities emerging nationally in sectors as diverse as energy, water, housing, hazard mitigation, and healthcare. It also describes, for community leaders in public and private sectors, the critical role of community

and technical colleges in building local resilience. The community college model offers a unique combination of practical, applied education and nimble, interdisciplinary, learning. It is here, in this very American institution, that we are most likely to design a new way of working that brings resilience into a community-focused future. And it is here, in a system founded on principles of local empowerment, that we can find an institutional basis for social cohesion. On a more tactical level, community colleges are ideally situated to be community leaders in the resiliency space: they can and do disseminate reliable information on the social and economic impacts of climate change, help communities prioritize their needs in the context of resiliency, and provide critical material support in times of crisis.

LEADERSHIP, INNOVATION, AND RESILIENCE: A PRACTICAL FRAMEWORK FOR TRANSFORMATIVE CHANGE

Chapter 3 dives into what all of this means for the individual community college, with particular attention to jobs and economic development.

Adaptation to global climate disruption, in the U.S. and around the world, will involve job creation and dissolution, as well as a concomitant shift in skills across the economy. While we don't know exactly what this looks like, we do know that it demands a cross-sectoral approach — all occupational and educational programs need to determine which elements of work and learning contribute to resiliency — and a holistic one, in which colleges splice resiliency and whole-systems thinking into the very DNA of the institution and its programs of study. It is less a matter of teaching engineers to build green vs. grey infrastructure than of adjusting the entire way that the nation's problem-solvers are taught to think. It is about creating the educational environment that fosters

expansive and imaginative new approaches to solving the infrastructure challenges of tightly interconnected systems. Resiliency will not demand eponymous technicians. It will, however, require technically-trained experts of every sort: front-line workers in health and construction, urban planners and civil engineers, landscape designers and installers, farmers and food system entrepreneurs. Training for a resilient future will be benchmarked in large part by technical diplomas, apprenticeships, and associates and applied bachelors degrees. Public services, community health, urban infrastructure, emergency response — these are industry sectors in which a preponderance of workers are trained in community colleges.

In addition to considering the necessary response of community colleges to the job and training impacts of resiliency in specific industry sectors, this chapter looks at the role of the college as community leader and campus innovator. It includes a framework for action in each of these spaces. Not simply theoretical, this framework — a practical resiliency agenda — considers jobs, economic development, training partnerships, and evolving programs of study in case studies of five areas: energy efficiency, emergency response, green infrastructure, healthcare, and cross-sector planning for student success. Each tells the same story: college presidents, administrators, and faculty need to assess the relevance of coursework and campus initiatives, and, more importantly, step into their role as community leaders on climate resilience.

Finally, in *Conclusion*, the *Guide* outlines critical next steps, including:

- Resiliency leadership training for community college presidents and trustees
- A resiliency prioritization and planning rubric for community and technical colleges
- A framework and action plan to connect community and college resiliency efforts

THE AMERICAN COMMUNITY COLLEGE

The nation's 1,167 community colleges are vital to the US higher education system. With total enrollment of 12.8 million, they serve almost half of the country's undergraduates, providing open access to postsecondary education, including academic preparation for transfer to 4-year institutions, workforce development and skills training, and noncredit programs ranging from skill upgrading to community enrichment.

Community colleges are mission-driven. Founded to provide education for the individuals — many of whom are adults — in a designated service region, most community and technical colleges share a basic commitment to:

Reaching all segments of society through an open-access admissions policy that offers equal and fair treatment to all students

Delivering a comprehensive educational program

Serving as a community-based institution of higher education

Teaching and lifelong learning

TOWARDS A RESILIENCY AGENDA FOR THE 21ST-CENTURY COMMUNITY COLLEGE

The initiatives described in this *Guide* only hint at the rich field of action and possibility for community colleges willing to engage the great work before us: building resiliency. The resiliency conversation, while urgent, is young. This paper intends only to frame the subject, not forge a set of clear and comprehensive answers. Community colleges, we hope, will in fact rewrite the questions. In the meantime, a few lessons emerge, suggesting directions for engagement.



IN PROGRAMMING

- Integrate resilient systems-thinking into every program of study, and develop curricula responsive to the particular skill implications of local climate adaptation and mitigation initiatives.
- Update existing coursework in emergency response, public service, urban planning, engineering, information technology, landscape, water, construction, environment, health, and transportation programs; and seek interdisciplinary opportunities between them.
- Pay attention to emerging opportunities nationally and regionally (including, e.g., 111(d), ACA, and the Administration's Climate Action Plan) as policy changes open doors for collaboration, action, and funding.
- Build *climate resilience* through education and training: Review local and regional adaptation plans and populate the vague sections on workforce development with an actual agenda for skill delivery.
- Build *community resilience* through economic opportunity: Work with local industry partnerships, high schools, and community programs (e.g. pre-apprenticeship, adult literacy, English language learning, and employment readiness) to align education with demand, establish or expand stackable credentials, and build career pathways to actual jobs.
- Join labor-management partnerships in training incumbent workers for advancement; seize the resiliency dialogue as an opportunity to improve college relationships with labor unions and other worker institutions.
- Define climate resiliency for your region; work with local government, workforce intermediaries, and industry partnerships to assess emerging labor market demand and skill needs driven by climate resiliency initiatives.
- Explore new partnerships in customized training for incoming and incumbent city and county workers, particularly in environmental services, engineering, urban planning, transportation, emergency response, and public health.
- Above all, hew to the college's core mission, and share it with all community stakeholders: **Post-secondary success leads to economic opportunity, and initiatives to advance it should thus be a keystone strategy in the architecture of community resilience.**



ON CAMPUS

- Become a living laboratory of resilience; use the campus as a demonstration and teaching asset for engaging students and the community, modeling, for example, stormwater management or renewable energy systems.
- Fortify and expand sustainability work — both mitigation and adaptation initiatives — already happening across campuses; use existing college sustainability committees to initiate and expand the resiliency conversation.
- Align college adaptation and hazard mitigation planning, which colleges are already required to do, with local and regional efforts.
- Establish the campus as a safe haven — whether this is because of high ground, microgrids, or weapon-free zones — and a stable, reliable operations center for times of crisis.
- Enhance campus awareness and preparedness through education, training, and simulations; develop an all-hazards response plan that engages and supports the different capacities for resilience of individuals on campus: administrators, faculty, staff, and students.
- Insert resiliency conversations into campus planning on green initiatives; and also work to embed resiliency in institutional strategic planning at every level.
- Build on the last decade’s advances in sustainability education to prepare students to help their own communities mitigate and adapt to the most severe impacts of climate change.
- Assess vulnerability and prepare adaptive responses in collaboration with other community colleges around the country: **Join the Alliance For Resilient Campuses (see page 13).**



WITH COMMUNITY

- Colleges are anchor institutions and community assets that can serve as regional catalysts in the movement to build resilient places. Prepare campuses not only to be an operations base during a disaster, but to serve as an operational base for quotidian community transformation.
- Use the bully pulpit to explore resiliency — its imperatives and its possibilities — with a broad audience.
- Provide educational resources on climate change and adaptation to the community at large.
- Partner with community groups; mediate conversations to ensure that outsiders bearing resilience plans build up and onto local projects and priorities — which may or may not go under the formal title of “resilience.”
- Broker conversations. Adaptation strategies developed in rooms dominated by scientists and environmentalists tend to seek technical solutions to a social problems; community groups will return the resiliency dialogue to community health and economic inclusiveness.
- Practice local workforce development in new ways — work with cities and transit authorities and regional planning bodies in addition to individual employers.
- Include all voices. Community activists and environmental justice groups need to share power with economic development and employer interests; colleges have the clout to keep everyone at the big table — where the investment decisions are made — when some seek to busy the more plebeian voices with tangential “community” conversations.
- Convene scientists, industry and community leaders, and policy-makers to shape climate action plans and determine workforce implications; **Make the college visible as an essential partner in any resiliency planning process.**



**RESILIENCY IS ABOUT
COMMUNITY ACTION,
INGENUITY, AND
INNOVATION.
EVERYWHERE, FROM THE GROUND UP,
AMERICANS ARE
BUILDING SOMETHING
BETTER.**

INTRODUCTION: RESILIENCY AND THE COMMUNITY COLLEGE

The mission of the 21st-century community college lies not just in promoting goals of equity, access, and completion in the education of current and future generations of American workers, but in empowering them to build cleaner, safer, healthier, and economically viable communities. In its inaugural report, the AACCC's 21st-Century Commission¹ argues that beyond “ensuring that millions of diverse and often underserved students attain a high-quality college education,” community colleges must reinvent themselves as part of a new national future, one more prosperous and equitable, and more recognizable as the land of opportunity described in the dreams of a prior century.

This *Guide* suggests that such a transformation aligns directly with the current groundswell of investigation and support for building resilient communities. Originally grounded, perhaps, in disaster response and recovery, the concept today is being broadly applied to socio-economic development. Indeed, resilience has become a touchstone for conversations on prosperity, broadly defined: from international economic organizations to community-based groups in neighborhoods, cities and counties across the United States; from City Halls and Statehouses to the White House; from philanthropic boardrooms to policy shops to industry associations and educational institutions around the country.

Resiliency and the Community College explains this emerging vision of a nimble, adaptive, inclusive society, and examines how its embrace of social and natural capital intersects with the emerging education and employment demands of regional economies designed for resilience. In practical terms, it summarizes the urgent national conversation around the ruinous impacts of climate change, extreme weather and attendant emergencies, both the immediate and the slow burn.

It is time for more community colleges to participate in this dialogue, providing leadership wherever possible or appropriate; and for other stakeholders engaged in resiliency conversations to bring community colleges — with their local roots, educational infrastructure, and institutional capacity — to the table.

The community college, as a workforce developer, as a community educator and convener, and as a site of model practice and planning, can and should be central to designing a coherent and sustainable local response to the existential threats down the block. This report offers some suggestions on how to do so.

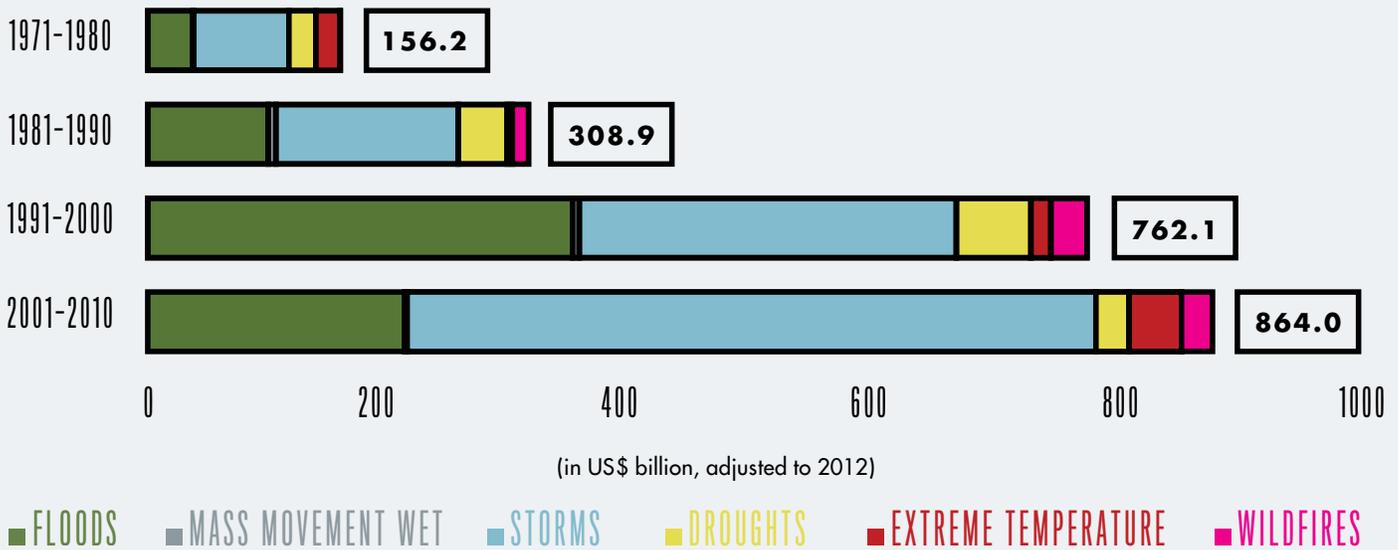
ONE IF BY LAND; TWO IF BY SEA

To envision entry points for action (narrowly, in adaptation planning, and more broadly, in building resilience, of which more in a minute), community colleges need to envision the scope of the challenge. Every region of the country is distinct. But in every community, without any need to engage in the politics of causality, there is clear evidence that we are increasingly besieged by extreme weather and the related havoc in health, productivity, infrastructure, and economic development. The same story comes from the National Academy of Sciences² and the evening news: extreme precipitation events, intensified droughts, superstorms, wildfires, increased flooding.

Globally, from 1971-2012, economic losses from extreme weather totaled \$2.4T, with the vast majority incurred in past two decades (*see figure 1*).³ The US, topping the list in costliest single events with Katrina and Sandy, saw \$388B in economic damage from just the ten most expensive crises since 1992. Between 2011 and 2013, the US government alone spent more than \$136B in response to drought, flood, storm, wildfire, and extreme temperatures, to which we might add the \$120B annual health expenditure on related illness (heat stroke, asthma, etc.).⁴

FIG 1

REPORTED ECONOMIC LOSSES BY DECADE AND HAZARD TYPE



SOURCE: WORLD METEOROLOGICAL ORGANIZATION

Looking ahead, the Risky Business Project calculates the potential near term “costs of inaction” on climate change: some \$35B in annual losses in coastal property and infrastructure; 10 percent or more decline in agricultural yields; significantly reduced labor productivity of outdoor workers (3 percent), increased energy demand costing ratepayers an estimated \$12B.⁵

An adequate response requires transformative change, collaboration on the ground in and between all affected communities. It is more than emergency response. It is more than piecemeal adaptation to an evolving climate. It is about building resilience. Because the new normal does not consist of individual, sporadic “disasters” that can be met one at a time, by any single group or institution. Colleges will need to partner with local and state planning bodies, industries, and community groups to develop innovative and integrated responses to the sobering catalogue of current challenges and future risks: protecting groundwater resources and water quality; securing energy generation and distribution even as demand increases;

building and maintaining a reliable transportation infrastructure; increasing food security; advancing public health.⁶

The education, workforce and community implications of responding to these challenges are considered below. But in order to assess those, we must first discuss distribution. Not all communities will be impacted equally. The solutions here are as much social as technological. Because vulnerability — and adaptive capacity — are determined by factors like age, income, and the geography of opportunity.

Which communities will be most resilient? Have the greatest adaptive capacity? Do most to mitigate the coming storm? And how can community colleges best be of service toward these ends? These are some of the questions raised in this paper, and which we encourage colleges and other community institutions, across public and private sectors, to explore together.

RESOURCES

THE ECONOMICS OF EXTREME WEATHER AND CLIMATE CHANGE

Risky Business: The Economic Risks of Climate Change in the United States

offers a thorough, non-partisan economic assessment of serious short-term risk (5-25 years), by region, in five areas: coastal property and infrastructure, agriculture, energy, labor productivity, and human health. Michael R., Bloomberg, Henry Paulson, and Tom Steyer co-chaired the The Risky Business Project, convening a national committee of government, academic, and industry luminaries across the political spectrum to commission research and produce a June 2014 report under the direction of Executive Director Kate Gordon.

Explore the findings online at: riskybusiness.org

The National Climate Assessment examines current and future climate change impacts on US agriculture, water, human health, energy, transportation, forests, and ecosystems. Produced by a team of more than 300 experts guided by a 60-member Federal Advisory Committee, the report was reviewed by the public and experts, including a panel of the National Academy of Sciences, before its release in July 2014.

The full report, together with summarized highlights, including regional and sectoral analyses, can be found online at nca2014.globalchange.gov

Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970-2012). Released in 2014 by the World Meteorological Organization, the Atlas quantifies weather and disaster loss and damage data across time and around the world, in order to assess vulnerability and resilience, improve data collection, and increase preparedness.

Available at www.wmo.int/pages/prog/drr/transfer/2014.06.12-WMO1123_Atlas_120614.pdf

Safeguarding California: Reducing Climate Risk. This update to the 2009 California Climate Adaptation Strategy, released by the state's Natural Resources Agency in July 2014, reviews scientific indicators of climate impacts on lives, livelihoods, and natural resources, outlining threats, vulnerabilities, and possible policy responses in nine areas: Agriculture, Biodiversity and Habitat, Emergency Management, Energy, Forestry, Ocean and Coastal Ecosystems and Resources, Public Health, Transportation, and Water. The 300-plus-page report reflects an attempt at a comprehensive regional policy and preparedness and includes clear signals for local actors, including community colleges.

To get a sense of the astonishing breadth of adaptation planning in just one state, see: resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf

INTO ACTION: BUILDING RESILIENCE

What is resilience? Currently the preferred term of art in climate matters, resilience is often conflated with related concepts of climate adaptation or sustainable development. Resiliency itself is a poorly defined indicator but useful concept that moves beyond the mortality rates and economic loss of any given disaster, and looks at how individuals and communities survive — even flourish — in the aftermath of an extreme shock. Drawing lessons from resilient communities leads us to consider preparedness in terms far broader than emergency response.

Indeed, while this report is about changing weather, it is not about weathering change. The point is not to bounce back, but — particularly in low-income communities already battered by high unemployment, chronic disease, and environmental decay — to leap forward. So while we write about disaster preparedness, response, and recovery, we are at the same time addressing demands for something larger: vision and leadership and empowerment. Hence the critical role of community colleges — in related curriculum and career pathways, in community leadership and networking, in campus creativity and practice.

Climate change exacerbates existing socio-economic pressures, particularly in marginalized communities. Low-income neighborhoods are hit hardest by environmental and economic impacts. Poor and working-class households pay a larger portion of income on energy and food, and will shoulder a disproportionate share of anticipated climate-driven price spikes in both areas. Racial disparities plague climate-related health impacts: Communities of color experience higher rates of asthma, higher incidence of mortality in heat waves, and greater exposure to toxins.⁹

Despite a strong legacy of local action and leadership in addressing environmental issues within many of these communities, such battles may have been engaged with

TERMINOLOGY TOWARD A COMMON LANGUAGE

Many institutions and literatures — from disaster relief to climate science to urban planning — use a variety of related but not always congruent terms to describe similar challenges and responses. For the purposes of this report, we offer a set of common, non-technical definitions to clarify discussion, particularly for audiences unfamiliar with the language of risk, hazard, and resilience.

HAZARDS are physical threats: the hundred-year floods happening with alarming frequency along the nation's waterways; the rising seas that amplify the devastation of coastal storm surges; the droughts threatening agricultural production and municipal water supplies across the southwest; the deluges destroying homes and roads in the Northeast and the Midwest; the homicidal heat waves searing large swathes of summertime America; and the gradual warming that catapults vector-borne diseases into new and distant corners of the country.

ADAPTIVE CAPACITY measures the ability of a particular community to respond to the impacts of climate change, and cope with its adverse effects — typically this depends on the quality, awareness, willingness, and resources of key institutional change-agents (e.g., government, education, business, labor, and community groups)

VULNERABILITY gauges risk to people, sectors, and regions, determined by topography both physical (e.g. coastal infrastructure) and socio-economic (e.g. wealth distribution). Some would locate the roots of resilience at the intersection of these first three factors: hazards, adaptive capacity, and vulnerability.⁷

SUSTAINABILITY typically embraces forms of economic development designed to minimize the destruction of natural capital while improving standards of living.

ADAPTATION encompasses a host of community strategies — from groundwater management and stormwater infrastructure to integrated transit and land use planning — to counter current or anticipated climate disruptions.

MITIGATION refers to policies and practices designed to impede climate change, such as the reduction of greenhouse gas production through energy efficiency measures and renewable energy generation.

RESILIENCY indicates a community's ability to withstand a shock — economic, environmental, social. It encompasses a community's work to avert, prepare for, respond to, and recover from a disaster. But it embodies something larger: The roots of resilience, and the things community colleges and other anchor institutions can do to strengthen them, can be found in various combinations of all of the factors described above.

These terms and concepts are fluid, inter-related, even at times conflictive. Many interventions at once mitigate and adapt to climate change: distributed solar generation, for example, both reduces greenhouse gas emissions (mitigation) and increases the ability of individuals or institutions to maintain power during grid disruptions (adaptation). In the technical literature, sustainability emphasizes efficiency, while resilient systems demand redundancy. Adaptive capacity implies a degree of nimbleness and dynamism absent from the scientific models of resilience, which suggest stasis — the ability to maintain business as usual. We have no truck with the finer points of these academic arguments. The etymology of resilience, like the epistemology of climate change, is beyond the scope of this paper. Suffice it to say that resilience as imagined here, and increasingly employed in forward-thinking communities around the country, is a big-tent idea, a broad and holistic vision of social possibility — a form of buoyancy, as it were — emerging from an integrated vision of community, economic, and environmental health.⁸

a very different vocabulary of mitigation and resistance, and can be misread — or, more commonly, entirely overlooked — by outside, top-down, or technologically-driven initiatives to build resiliency. It is precisely the most vulnerable who have the least voice in larger regional and national conversations about climate change. Local institutions that have the power to amplify those voices, like community colleges, can play a critical role in ensuring that the nation's current preoccupation with resiliency (*see chapter 2*) builds up and upon local concerns and initiatives.

But what does it mean, exactly, to build resilience? What are the determinants? Many factors, some elusive: Critical intangibles like social cohesion, for example, and concrete imperatives like a functional communications infrastructure.

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Building resilience is something more than building sea walls (projected to be a \$9B industry in the next decade) and raising roads. Resiliency relies on *social cohesion*. At its most basic, this means the ability to rely on one's neighbors, which of course runs headlong into this country's potent culture of self-reliance. On a more sophisticated level, however, social cohesion can



reflect — and demand — shared power and opportunity, another classic American ideal. Locally, cohesiveness is a function of trust and respect, and is built through informal networks in civil society — congregations, classrooms, neighborhoods, family. Building an individual's or community's *social capital* — measured in part by the extent of their networks — leads to a sense of *agency*, of power, of some measure of control over decisions that affect their lives and livelihoods. Which is why building resilience requires *community engagement*.

Planners need to engage communities. And community members need to learn tools and strategies and skills for engagement. Community colleges can facilitate both the conversations and the skills development. In the cases described elsewhere in this report, students receive more than technical and academic training; effective community colleges also deliver concrete lessons in leadership — how to run a meeting, make a presentation, plan a project, gather data, and persuade through evidence.

Resilience emerges from a cohesive social fabric, where cohesiveness is determined by economic inclusivity rather than cultural homogeneity.¹⁰ Inclusiveness matters. A community's resilience in the face of “natural” disasters is determined in large part by socially constructed vulnerabilities, such as the degree of access to health care, food security, and employment and training.

A city or state can enhance its physical resilience to climate change by upgrading material infrastructure and improving management of natural capital. A society becomes resilient through improvements in median income, education, health, and wealth, and equal opportunity to participate in and benefit from the activity that produces them. If opportunity, then, is a primary adaptive strategy, community colleges are clearly positioned to play a leading role.

SETTING THE TABLE RESOURCES, OPENINGS, OPPORTUNITIES

Resiliency is a story of action, ingenuity, innovation. Everywhere, from the ground up, and with support in the highest places, Americans are building something better. A number of people interviewed for this paper didn't want to talk about resilience. Its connotations of "withstanding" seemed to limit agency, shorten the horizon, circumscribe a better future. It meant, to some, giving up. But resiliency as we imagine it is not a narrative of individuals battered helplessly by impersonal forces of nature, nor is it the story of institutions hunkering down to survive a storm in systems or neighborhoods already foundering in economic or environmental despair. It is a story of possibility.

Institutions and communities around the country are joining together to create local food systems, urban forests, solar gardens; to redefine land use, integrate transit, green infrastructure, and improve community health networks; to reinvent education by building career pathways that move workers of all skill levels into family-sustaining jobs while improving the climate resilience of the neighborhoods in which they live.

In and around this local activity runs an emergent national dialogue on resilient systems. Inquiry and investment have begun to flow in earnest from federal agencies and local governments, philanthropy and academia, labor, business, and non-profit organizations with concerns ranging from environmental justice to national security. In particular, the past few years have witnessed a wave of serious attention to cities as centers of innovation.

This resiliency conversation — and the useful tools it is generating for officials, planners, industries, and activists (including, e.g., adaptation plans, risk assessments, policy

recommendations, and engagement strategies) — inevitably, at some point, raises or begs the question of jobs and training. And inevitably stops short of details.

Community colleges have the answers. Some are already at the table; more need to be.

The nation's two-year colleges are critical to developing a workforce with the technical know-how to build and maintain resilient systems, and can, in the process, model resilient approaches across entire regions and individual campuses. They can and do build partnerships with business, labor, and community, and in doing so connect a technically proficient workforce to related jobs in every sector. They can and should build resiliency into every corner of the curricula. Because resiliency, like sustainability or even "green jobs", entails an approach to systems thinking, and, as we discuss elsewhere in this report, an addition of new skills to many existing programs of study, more than any one occupational or academic track.

Faculty and administrative leadership need to figure out where their colleges are already engaged in related work (perhaps not even yet called "resiliency") that could be expanded, and to identify new openings for engagement. Whether translating a national trend into a meaningful

Community colleges have the answers. Some are already at the table; more need to be.

local conversation, convening regional partnerships, or enhancing related programs of study, community colleges should be prepared to seize emerging opportunities in climate resiliency.

FEDERAL INITIATIVES

On November 1, 2013, President Obama signed an Executive Order establishing an Interagency Council on Climate Preparedness and Resilience — chaired by the White House and including more than 25 federal agencies — and a task force of state, local, and tribal leaders to advise it. Their recommendations will be finalized this fall. In the meantime, the Administration has begun to address local demands for tools to strengthen resilience. With at least nine “billion-dollar disasters” on the books in 2013 alone, Americans are alarmed by their exposure to extreme weather and other effects of climate change.¹¹ A number of federal opportunities are emerging in response, sometimes in unlikely spots. And as the Administration’s Climate Action Plan continues to roll out over the coming year, agencies will be charged with “modernizing” policy and practice in order to support local climate resilience through rulemaking, technical assistance, and funding opportunities in sectors from transportation and health care to water management and disaster relief.¹²

For more information, see:

www.whitehouse.gov/administration/eop/ceq/initiatives/resilience

We highlight here a few related trends — in and outside of the Administration’s formal climate resilience initiatives — of most interest to community colleges, whether because of their potential implications for jobs and training, their clear prospects for partnership development, or their possible infusion of new and innovative resources.

SECTION 111(D) — OR, THE CLEAN POWER PLAN

Colleges should pay attention to what might seem obscure colloquies on “111d”. The rule is a game-changer. Based on Section 111(d) of the Clean Air Act, the Environmental Protection Agency (EPA) is setting standards to reduce

power plant carbon emissions by 30% by 2030.

Under the EPA’s proposed Clean Power Plan, individual states can meet established carbon reduction targets through a combination of measures, including a) reducing existing power plant emissions, b) shifting production from coal to natural gas, c) reducing electricity demand through improved energy efficiency measures, and d) increasing renewable energy production. The proposed rule, which will be finalized in June 2015, promises to drive significant expansion of the efficiency and renewables sectors. Colleges will want to watch market signals sent by the development of state compliance plans, with initial versions due in June 2016.

Details available online at:

www2.epa.gov/carbon-pollution-standards

HUD — RESILIENCE BY DESIGN

The Department of Housing and Urban Development (HUD) has signaled increased intent to enforce Section 3, which directs the agency to provide economic opportunities to public housing residents as well as low-income workers and businesses in communities with HUD-funded projects. This means, essentially, targeting employment, training, and contracting to the local beneficiaries of HUD housing, economic development, and infrastructure investments. If the federal government renews its commitment to retrofit the nation’s public housing stock for energy and water efficiency, and to promote healthier and more affordable housing throughout low-income neighborhoods, labor market demand in related sectors may increase significantly. In a promising development last year, HUD partnered with US Department of Energy (USDOE) to incentivize public housing authorities to join DOE’s Better Buildings Challenge, expanded to improve efficiency in commercial and multi-family residential sectors.¹³ Section 3 applies not just to public housing, but to all community development assistance over \$200k, comprising billions of dollars of annual investment in community improvement, brownfield development, lead abatement, and more. And a separate stream — Community Development Block Grant

(CDBG) Disaster Recovery funds — may now be allocated specifically to resiliency (or “pre-emergency mitigation”) efforts for buildings and public services.¹⁴ Community colleges have been frequent partners in CDBG projects; they might seek increased engagement by aligning career pathway bridge programs with section 3 directives and with HUD resiliency investments. Colleges could also join local partnerships pursuing new HUD opportunities like the National Disaster Resiliency Competition, based on the Department’s groundbreaking Rebuild By Design initiative, developed in the wake of Superstorm Sandy.

For more information, see: portal.hud.gov/hudportal/HUD?src=/program_offices/economic_resilience; and http://portal.hud.gov/hudportal/HUD?src=/program_offices/fair_housing_equal_opp/section3/section3

FEMA — LEARNING FROM KATRINA AND SANDY

The Federal Emergency Management Agency (FEMA) is developing new resiliency-based guidelines for State Hazard Mitigation Plans (required as a condition for receiving certain types of federal non-emergency disaster assistance). For the first time, the state plans must take into account climate vulnerability. FEMA will also run pilot programs integrating the work of state, local, tribal, and non-profit recovery efforts. This planning and partnership work, particularly where it is embedded into local resiliency initiatives, will be of interest to colleges as anchor institutions in impacted communities. Colleges will also want to participate in these processes as they update campus planning for emergency response, and work with community stakeholders to determine the kinds of skills and training that will be in increased demand from preparedness, response, and reconstruction initiatives.

More information at:

www.fema.gov/multi-hazard-mitigation-planning



THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

NIEHS funds Worker Education and Training Programs at colleges, universities, and labor unions around the country. The National Partnership for Environmental Technology Education (PETE) is in the midst of a five-year project to make NIEHS-approved worker training nationally available through over 100 community college partners.

PETE's Community College Consortium for Health and Safety Training (CCCHST) trains workers, technicians, and supervisors to protect themselves and their communities from exposure to hazardous materials encountered during waste and disaster site cleanup, Brownfields redevelopment, transportation of hazardous materials, and response to related spills and releases. The program also targets contractors, subcontractors, and public officials serving USDOE facilities.

More information at:

www.niehs.nih.gov/careers/hazmat/awardees/pete.cfm

For related curriculum and training opportunities, see www.nationalpete.org

HHS & RESILIENT HOSPITALS

The US Department of Health and Human Services (HHS) is launching an initiative to help hospitals in particular and the healthcare industry in general improve sustainability and resiliency. Through public-private partnerships and pilot projects in 15 states, HHS intends to develop and disseminate best practices, and to help train public health professionals and local leaders to prepare their communities for the health consequences of climate change. A key resource will be the NIEHS *Sustainable and Climate Resilient Health Care Facilities Guide*. Colleges will want to pay attention here to a potentially broad spectrum of emerging training needs in building operations and maintenance as well as allied health fields, particularly given the key role of front-line workers in managing waste, water, and energy efficiency, as well as hazardous materials and infection control. Worker health and safety may not otherwise receive adequate attention in efforts focused on physical infrastructure. It is of paramount concern in times of emergency, when health care workers are more likely to be injured, but also when retrofitting older building stock as part of preparedness or recovery (because of lead, asbestos, etc). Resiliency measures themselves, ironically, may endanger workers without adequate training. While some may imagine back up power systems, for example, as

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sleek, Jetsons-style photovoltaic microgrids, to hospitals it typically means generators. Which means storing lots of fuel on site, with attendant risks of toxic spills and health hazards.

THE AFFORDABLE CARE ACT (ACA) & COMMUNITY HEALTH

While the U.S. Center for Disease Control and Prevention provides excellent guidance to local communities in assessing climate-related health hazards and targeting appropriate interventions, it is perhaps the ACA's broad emphasis on community health that will be most critical to building resilience and broadening the skills and occupations necessary to do so.¹⁵

Community Health Workers (CHWs) lifted up in the ACA have long played a critical role in public health and prevention, particularly in underserved communities. The ACA creates opportunities for CHWs to play a broader role as patient navigator, providing outreach and assistance with enrollment, and eventually working with patients to negotiate the healthcare system. Community based care coordination, particularly in the management of chronic conditions, can improve patient health, reduce costlier, crisis-based medical interventions, and — in a key incentive to fund CHW positions — help hospitals avoid penalties for high rates of readmission.

CHW programs vary widely across the country in scope and structure, with no standardized training, certification, or career paths. Community colleges, working in partnership with public agencies, healthcare providers, and labor unions, could be instrumental in defining and professionalizing the field in a non-exclusionary manner. The new or expanded occupations — and the mechanisms for funding them — have yet to be formalized, but a number of training initiatives are underway, including, for example, significant investment by the Centers for Medicare and Medicaid Services (CMS) Innovation Center, which is currently supporting 24 multi-million-dollar pilot projects involving community health workers or patient navigators.

WATER WORKS

The country's rising concerns about urban water quality — as well as management (e.g. flooding, run-off, and heat islands) and supply issues — are being addressed across agencies, with leadership at the Environmental Protection Agency (EPA). The EPA recently launched a Green Infrastructure Collaborative to improve stormwater management and community resilience. Federal agencies will work with NGOs and other partners to provide funding and technical assistance to at least 25 communities across the country for green infrastructure projects, such as rooftop gardens and urban forests, and for integrated stormwater management and hazard mitigation plans. Other agencies, such as the Department of Transportation (DOT) and HUD will integrate green infrastructure guidance into existing training programs. Demand for related skill development may be felt across community college programs in urban planning, engineering, and landscaping, and campus installations are ideal teaching and learning projects.

For more information: water.epa.gov/infrastructure/greeninfrastructure/index.cfm

While urban interests predominate, the focus is not simply on cities. The US Department of Agriculture (USDOA) is working with farmers and families to address epic drought in the West, which threatens not only agriculture, but also the viability of rural communities facing significant decline in the availability and quality of drinking water. Sustainable agriculture programs at non-metro community colleges should take note.

RESILIENT GRIDS: SMART, RELIABLE, AND DECENTRALIZED

Many federal agencies see dependable power as a key component of resiliency. This is perhaps most evident in USDOE's ongoing interest in decentralized electricity generation to increase resilience and reliability of supply, together with the agency's continued efforts to improve demand-side efficiency across sectors — including impressive work to standardize and advance credentialing.¹⁶

But there are other efforts afoot. HUD CDBG-DR planning addresses distributed generation through Combined Heat and Power systems; the Department of the Interior recently announced \$10M in technical assistance for tribal resilience planning, including support for a wide variety of adaptation and mitigation initiatives; and the USDA this year awarded \$236M to eight states to improve rural electric infrastructure and create jobs through the deployment of smart grid technology. All of this bodes well for community colleges with renewable energy and energy efficiency programs, though given the continued vicissitudes of regional markets and the increasingly vertical integration of renewable energy firms, it may make most sense to incorporate such training into existing programs of study.

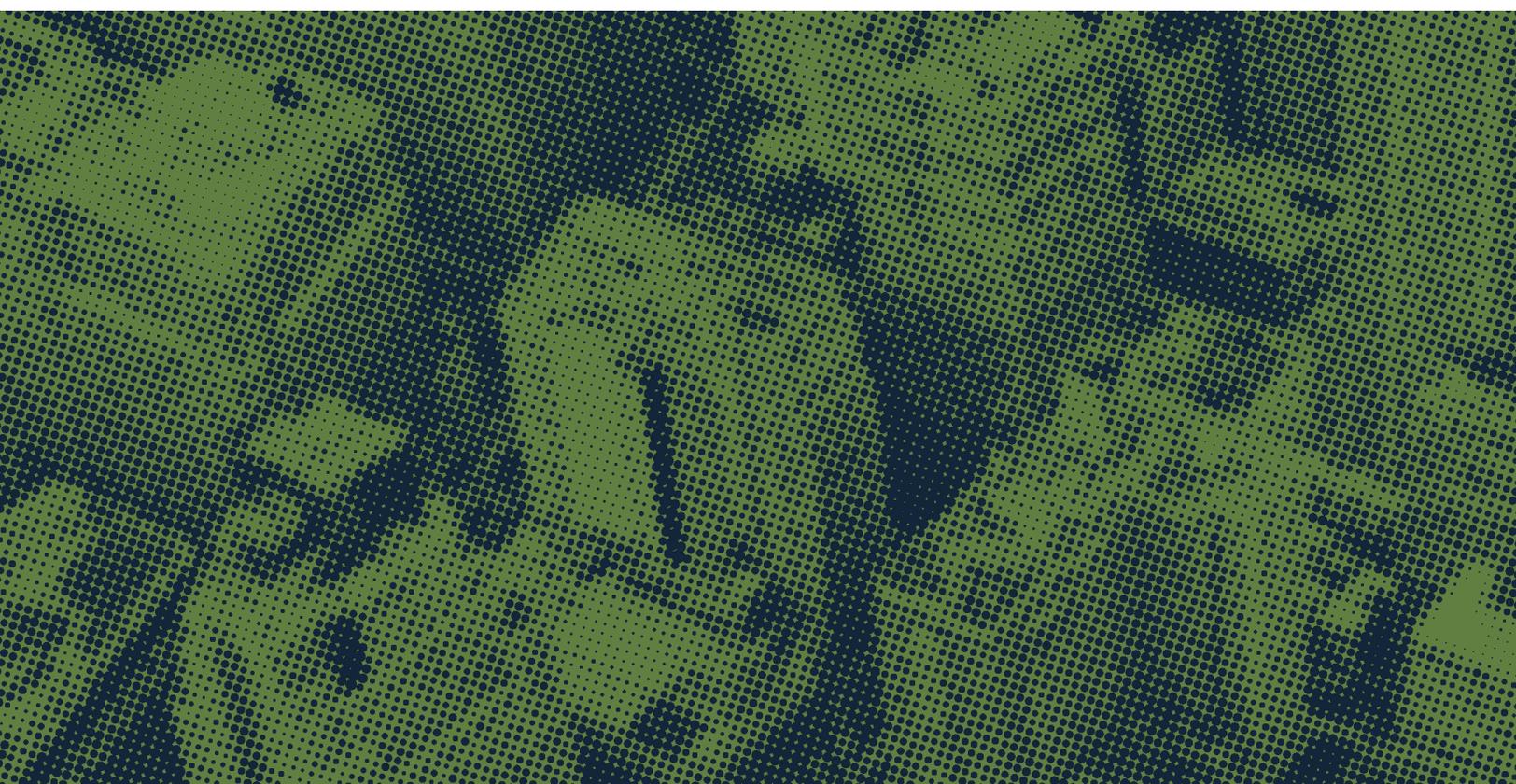
It should be emphasized that these federal initiatives are not being foisted on a skeptical nation, but indicative of secular trends. A bipartisan project on state energy policy, led by former Senator Jeff Bingaman (D-NM) and former Secretary of State George Shultz, just released a report documenting how many states, even in deeply conservative regions hostile to the language of climate change, are

taking action to develop and implement strategies for resilience, including renewable energy and energy efficiency.¹⁷

PHILANTHROPY

A number of American philanthropic leaders, including the Kresge, Rockefeller, and Surdna Foundations, are investing directly in place-based resiliency initiatives around the country. Their programs offer significant opportunities — if not for direct funding, then for strategic partnership and planning and education — of which community colleges should be aware. We highlight two major resiliency initiatives below.

These prescient efforts are imperfectly aligned with related work to transform American systems of education, training, and economic development. Community colleges can and should be leaders in connecting the two intimately related but exquisitely siloed streams of funding and thought. The broad public and philanthropic investment in the advancement of low-income families through employment and training, and the delivery of technical skills to a



critical mass of workers seeking the post-secondary credentials increasingly required to participate successfully in American economic growth, is surely as much a part of building resilience as energy and environmental solutions.

100 RESILIENT CITIES:

The Rockefeller Foundation, based in New York City, helped guide the recovery planning process after Sandy, and chose resilience as its centennial initiative for efforts around the world. The Foundation is currently selecting the second global cohort of what will eventually total 100 resilient cities in which to invest. Each gets a chief resilience officer to lead municipal resilience efforts, as well expert support — from public, private, and NGO sectors — for development and implementation of resilience strategies tailored to the chosen community. US cities in the first cohort of 32 included San Francisco, Oakland, New York, New Orleans, Los Angeles, Jacksonville, El Paso, Berkeley, and Boulder.

Community colleges interested in developing resilience initiatives should check to see if they are in or could be become part of the Rockefeller purview. Despite a broad definition of resilience, initial interventions tended toward

highly technical solutions; a number of local leaders and community colleges we interviewed for this report were unaware of Rockefeller Foundation's resiliency efforts within their own cities. The Initiative runs a blog and a website that define core characteristics shared by resilient cities, illustrated with evolving examples that will be of interest and use to community college faculty, leadership, and campus system designers.

See: www.100resilientcities.org

CLIMATE RESILIENCE AND URBAN OPPORTUNITY INITIATIVE

The Kresge Foundation, based in Troy, MI, a long-time funder of both post-secondary reform and environmental transformation, recently launched a city-based but more community-focused climate resiliency initiative. The Foundation's expansive definition of resilience, which embraces climate adaptation, climate mitigation and social cohesion, focuses on equity and self-determination in low-income communities. Where possible, colleges should reach out to grant recipients (place-based nonprofit organizations and related collaboratives as they develop) to



align planning, education, and implementation efforts. The Kresge Initiative's resources and definitions, in addition to its movement-building capacity, will be of use to colleges interested in pursuing a resiliency agenda.

See: kresge.org/library/climate-resilience-and-urban-opportunity-initiative

PLANS AND INTERMEDIARIES

Numerous nonprofit organizations, academic researchers, policy centers, activist groups, design consultancies and climate intermediaries are exploring resiliency. It's the new green. It is outside the scope of this paper to do a full literature and resource review. What we've included are a few key examples of initiatives relevant to community colleges, including a handful of prominent climate adaptation, action, or resiliency plans. Colleges can plunder selectively when thinking about advancing associated programs of study, pursuing related community partnerships, or implementing similar policies and practices on their own campuses.

ICLEI USA — a membership association of cities and counties committed to climate action, clean energy, and sustainability — established the Climate Resilient Communities program in 2010 to help local governments understand their vulnerability to extreme weather and develop resilient systems in response.¹⁸ In 2013, ICLEI partnered with the National League of Cities, the US Green Building Council, and the World Wildlife Fund to launch the Resilient Communities for America (RC4A) campaign. Designed to “rally local leadership and empower local governments” with free technical resources, RC4A aims to build climate-resilient cities and counties through adaptation, mitigation, disaster preparedness, infrastructure renewal, and economic development.

See www.resilientamerica.org

ALLIANCE FOR RESILIENT CAMPUSES (ARC)

Second Nature, the lead supporting organization for the American College & University Presidents' Climate Commitment, launched the Alliance for Resilient Campuses (ARC) in May 2014. ARC calls for

National cooperation among colleges and universities to understand and communicate the implications of climate change, assess real impacts in real places, improve capacities to respond, and strengthen our ability to act together to create an innovative and resilient common future.

The Alliance is partnering with Resilient Communities for America (see above), as well as government, industry, and NGO allies. Two community colleges, Gateway Technical College (WI) and Central Community College (NE), are among the founding signatories.

Information, resources, and a sign-on letter for Presidents and Chancellors willing to incorporate resilience into their college's operations and principles, is available at secondnature.org/programs/resilience/alliance

CLIMATE ACTION PLANS

Hundreds of states, cities, counties, tribes, businesses, and educational institutions have developed some version of a climate action plan, whether it is called adaptation or preparedness or sustainability or resiliency guidance. The California Global Warming Solutions Act requires local governments to develop climate action plans. But even in more conservative parts of the country, cities and counties that have borne the brunt of weather catastrophe — and most have, in one form or another¹⁹ — are making plans in response. Here are some leaders.²⁰

NEW YORK CITY

PlaNYC is the acme of adaptation planning. The “sustainability and resiliency blueprint” for New York, it was inaugurated in 2007 and is updated annually.

www.nyc.gov/html/planyc/html/home/home.shtml

After the devastation of Sandy, the city developed a companion scheme for rebuilding: *PlaNYC: A Stronger, More Resilient New York* (June 2013), s-media.nyc.gov/agencies/sirr/SIRR_singles_Lo_res.pdf

NEW YORK STATE

Also in the wake of superstorm Sandy, New York’s Governor convened a diverse group of experts from academia, business, the not-for-profit community, engineering, finance, real estate, and the federal government to develop a 21st-century resilience strategy for the state. The result: *NYS2100 Commission: Recommendations to Improve the Strength and Resilience of the Empire State’s Infrastructure* www.governor.ny.gov/assets/documents/NYS2100.pdf

CHICAGO

The *Chicago Climate Action Plan* offers an ambitious mitigation strategy combined with a smaller selection of adaptation measures. Responding directly to scientific and economic projections describing various possible scenarios of the city’s climate future, the plan pivots quickly from a dire global prognosis to the promise of immediate improvements in local standards of living.

The plan and progress reports available at

www.chicagoclimateaction.org

MIAMI-DADE COUNTY

Miami-Dade’s *Climate Change Action Plan* is part of a larger *GreenPrint* — an ambitious long-range sustainability plan designed by a host of stakeholders in a process that included more than 100 public meetings. Details of the process, implementation plan, goals, and scorecard can be found online at www.miamidade.gov/greenprint/home.asp

The culminating climate plan opens with a 2010 remark from Dr. Jane Lubchenco, then under-secretary for oceans at the U.S. Department of Commerce: “I like to think of mitigation as avoiding the unmanageable, whereas adaptation is managing the unavoidable. We must do both in order to solve the problem of climate change.” Available online at: www.miamidade.gov/greenprint/pdf/climate_action_plan.pdf

CALIFORNIA

Safeguarding California: Reducing Climate Risk

This state adaptation plan is described in the introduction, and is online at:

resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf

OAKLAND

A masterpiece of comprehensive, coalition-driven resiliency planning, the Oakland Climate Action Plan and its development are ably described in Catalina Garzon et al., *Community-Based Climate Adaptation Planning: Case Study*

of Oakland, California (Pacific Institute for the California Energy Commission, 2012)

www.energy.ca.gov/2012publications/CEC-500-2012-038/CEC-500-2012-038.pdf

The *Oakland Energy and Climate Action Plan* and related documents are available at

www2.oaklandnet.com/Government/o/PWA/s/SO/OAK025294

The nation's two-year colleges are critical to developing a workforce with the technical know-how to build and maintain resilient systems, and can, in the process, model resilient approaches across entire regions and individual campuses.

LOS ANGELES TRADE-TECHNICAL COLLEGE

In accordance with its commitment to become climate-neutral by 2050, Los Angeles Trade-Technical College — a signatory to the American College and University President's Climate Commitment²¹ and an early leader in green education and training — developed its Climate Action Plan in 2010:

college.lattc.edu/green/climate-action-plan/

CAMPUS ACTION PLANS

Engaging in community adaptation and resiliency planning is not a new and discrete endeavor. Most community colleges have sustainability, hazard mitigation, and disaster response plans. Part of the work of building resiliency is to expand and link these efforts.

Colleges should, at a minimum, prepare for climate change

through review of predicted regional impacts, which can be found in local adaptation and resiliency plans, in the resources listed in the Introduction to this *Guide*, and at many state and federal agencies, such as the National Oceanic and Atmospheric Administration: www.noaa.gov/climate.html. Interested colleges can consult FEMA's *Campus Ready*, a planning tool designed to help administrators to a) anticipate and manage a variety of hazards affecting campus operations, and b) prepare to serve as key emergency management partners to federal, state, local, tribal, territory and private sector organizations.

See www.ready.gov/campus.²²

Some colleges have moved from planning into action through emergency response and crisis management partnerships with local government. **Gateway Technical College** in Southeastern WI, for example, serves as the anchor for the country broadband network allowing interoperability for police, fire, and schools. And Gateway is prepared to serve as a center for community support in times of crisis. The college has developed crisis intervention teams networked with local social services.²³

RESILIENCY JOBS, COMMUNITIES, COLLEGES

Adaptation to global climate disruption, in the U.S. and around the world, will involve job creation and dissolution, as well as a concomitant shift in skills across the economy. While we don't know exactly what this looks like, we do know that it demands a cross-sectoral approach — all occupational and educational programs need to determine which elements of work and learning contribute to resiliency — and a holistic one, in which colleges splice resiliency and whole-systems thinking into the very DNA of the institution and its programs of study.²⁴ It is less a matter of teaching engineers to build green vs. grey infrastructure than of adjusting the entire way that the nation's problem-solvers are taught to think. It is about creating the educational environment that fosters expansive and imaginative new approaches to solving the infrastructure challenges of tightly interconnected systems. Resiliency will not demand eponymous technicians. It will, however, require technically-trained experts of every sort: front-line workers in health and construction, urban planners and civil engineers, landscape designers and installers, farmers and food system entrepreneurs. Training for a resilient future will be benchmarked in large part by technical diplomas, apprenticeships, associates and applied bachelors degrees. Public services, community health, urban infrastructure, emergency response — these are industry sectors in which a preponderance of workers are trained in community colleges.²⁵

The work for colleges, together with community and industry, is to determine which jobs are at once most critical to and most impacted by the demands of resiliency. What are the implications for education and training? How will new skills be integrated into existing pathways and credentials? Finding the answer is part of a process community colleges know well: partner with business, labor, local government, and community groups to determine

(and create) demand for particular occupations and industries, and establish what sorts of skill innovation is needed. The good news is that this does not require an entirely new investment or way of doing business: colleges can build on the good work of the past decade to integrate sustainability principles and greener skills throughout the curriculum and across the campus.

JOBS AND ECONOMIC DEVELOPMENT

Climate threats demand changes in public service delivery and regional infrastructure. Preparation, response, and recovery to disasters is no longer a matter of coordinating emergency services — though modernizing these will be critical — but an economic imperative for cross-sectoral, long-range resiliency planning. This includes overlapping initiatives for climate mitigation and adaptation, in addition to concerted efforts to mend frayed social safety nets in vulnerable communities around the country.

Almost a decade ago, FEMA estimated that every dollar invested in natural hazard mitigation returns to taxpayers an average of \$4 saved in post-disaster damages.²⁶ It makes sense, then, that planning for climate disruption typically centers on preparedness. But climate mitigation is far cheaper in the long run than most serious adaptation efforts, and can in fact drive job-creation and economic growth.²⁷

American cities are strapped for cash. Mayors and Councils, therefore, are prioritizing mitigation strategies by thinking about the largest sources of urban emissions: energy (generation and consumption) and transportation. Solutions lie in greening related systems. Resilient cities are focusing on energy and water efficiency, distributed renewable generation, transit, biking and walking. They are

SECTORS AND PROGRAMS

A review of the resiliency literature and interviews with stakeholders around the country point up some obvious areas of priority.

Climate change and natural disasters affect multiple sectors simultaneously:

WATER declining groundwater resources and water quality; demand for improved storm- and waste-water management

ENERGY disruption of generation and distribution even as demand for power increases; demand for energy efficiency and reliable electricity supply, including smart grids, microgrids and distributed generation

TRANSPORTATION decline and vulnerability of ports and airports, roads and bridges, subways and railroads; increased demand for public and multi-modal transit (e.g. bus, streetcar, bike and pedestrian alternatives)

FOOD production impacted by flood, drought, soil erosion, and the increase in pests and disease; food security threatened by related price spikes and ongoing disparities in distribution

HEALTH diminished air, water, and food quality; increase in extreme temperatures; spread of vector-borne disease

EMERGENCY RESPONSE increased scope and intensity of natural disasters; increased demand for all-hazard coordination in public services

Crosscutting all of these is a host of rapidly evolving **information and communications** industries, including, for example, telecommunications, information technology, data management, bioinformatics, and cyber security.

The inter-related infrastructure of energy, water, waste, transportation, communications, and public health — particularly in metro areas, which are susceptible to multiple system collapse and where 80 percent of US population lives — are in desperate need of improvement, diversification, even transformation, if they are to prove resilient to the impacts of climate change.

Community colleges are training the technicians who can construct, maintain, improve and transform these systems. Key program areas, some of which are explored in the case studies below, include:

ARCHITECTURE AND CONSTRUCTION
BUILDING SCIENCE AND BUILDING OPERATIONS
HVACR, SHEET METAL AND
ELECTRICAL APPRENTICESHIPS
ENERGY EFFICIENCY AND RENEWABLE ENERGY
LANDSCAPING, DESIGN, AND PERMACULTURE
WATER AND WASTEWATER MANAGEMENT

SUSTAINABILITY AND
ENVIRONMENTAL SCIENCE
CIVIL, MECHANICAL, AND ELECTRICAL
ENGINEERING TECHNOLOGY
EMERGENCY RESPONSE, INCLUDING
FIRE, POLICE, AND EMT
NURSING AND ALLIED HEALTH FIELDS
INFORMATION TECHNOLOGY

developing viable transportation options by reforming land use and zoning practices and improving infrastructure; moving to zero waste for municipal, residential, and commercial sectors by providing comprehensive recycling and organics collection and processing; reducing heat islands by protecting and expanding the urban forest; and improving health through green space and urban agriculture. Most of these are adaptive strategies as well, and will be joined, of course, by the straightforward work of raising roads and runways, widening culverts, restoring wetlands, upgrading water treatment plants, and reinforcing bridges, sewers, and substations.²⁸

Many of these are projects which can and should be replicated on college campuses and advanced through college practice. They can save money and teach students. All require technical and/or policy innovations which, while not creating entirely new occupations, may require new skills or approaches that will need to be incorporated throughout related programs of study. And of course many community colleges are already deeply engaged in this work, though they may not yet call it “resiliency.”

All of these efforts have implications for jobs and work. Green infrastructure, for example, generally requires more intensive operations and maintenance, which means more local jobs, and jobs that persist beyond the initial construction phase. But the demand is unclear — local research will determine who pays for, trains for, hires for, and does the work. Retrofits typically involve contracted construction and landscaping services. But who maintains the green infrastructure once the roofers, plumbers, planners and planters are done? Will existing municipal workers, for example, with some additional training, manage a city’s green infrastructure?

Community colleges can — and do, as we describe elsewhere in this *Guide* — work with local government,

workforce intermediaries, and industry partnerships to determine appropriate local answers. They can also help municipal leaders pay attention to employment and training in every climate-related conversation. Publically funded projects or procurement systems can keep jobs local through community workforce agreements, which ensure that investments in adaptation or mitigation simultaneously benefit local communities, drive quality job development, and open doors to career pathways for marginalized populations. This, too, is building resilience.

It is less a matter of teaching engineers to build green vs. grey infrastructure than of adjusting the entire way that the nation’s problem-solvers are taught to think.

These are the discussions that community colleges can and should have with the cities and counties in which they operate. It is a dialogue that happens at many levels. Students and professors may participate in the development and implementation of resiliency projects, as we discuss below, at the same time executive leadership works to keep these issues front and center at community decision-making tables.

SECTORS AND TRAINING: COLLEGES, COMMUNITIES AND INNOVATION

Chapter 2 identified emerging trends in resilience planning and key associated sectors, namely, energy, water, transportation, health, and emergency response. Here we consider a few of these sectors in more detail, exploring related jobs, training, and community college engagement.²⁹

ENERGY FROM EFFICIENCY TO RESILIENCY

State compliance with Section 111(d) of the Clean Air Act, as prescribed by EPA's proposed Clean Power Plan, may drive the expansion of energy efficiency (EE) initiatives across the country (*see above, page 8*). Community colleges are well-positioned to meet any subsequent increase in labor market demand, having been leaders in energy efficiency education over the past decade. Delivering skills through both stand-alone programs and career pathways within broader programs of study, community colleges offer everything from certificates to applied bachelors degrees in related fields of study (e.g. energy auditing, HVAC/R, building operations and maintenance, etc.).

Why start a discussion of new ideas on resilience with something as old hat as energy efficiency? To demonstrate possibility and promise within reach. To grasp the gestalt of resiliency, colleges need not develop entire new initiatives; they can fine-tune existing green construction programs and expand their principles to related fields of study and practice. What's more, bridges and pathways in energy efficiency offer logical entry points for low-income workers to enter and advance in high quality careers.

Los Angeles Trade Technical College, for example — which serves one of the lowest income communities in the country, and where the majority of students neither have a high-school degree nor speak English as a native language — has built successful, competency-based on-ramps to clean energy careers through construction prep and pre-apprenticeship and training academies for under-prepared students, leading to two stackable certificates (Energy Systems Technology Fundamentals and Weatherization & Energy Efficiency), and an AS Degree (Renewable Energy with Energy Efficiency Emphasis).³⁰ Up the coast in Washington State, Edmonds Community College offers a variety of sophisticated Energy Management Pathways to a student body composed primarily of adult workers. Based on skill profiles developed in partnership with Cascadia College, Washington State University, and a variety of industry partners, and funded by grants from the US

Department of Labor and the National Science Foundation, Edmonds' 19-credit Energy Efficiency Technician Certificate and 17-credit Energy Management Core lead to stackable certificates in commercial lighting, energy accounting, residential auditing, building operations, and project management, which in turn ladder into two Energy Management degrees: associate of technical arts (96 credits) or associate of applied science-transfer (106 credits).³¹ The latter opens the door to an Administrative Management (Business) degree at Central Washington University, and will ideally articulate to a of applied science degree at South Seattle College.

South Seattle's new Sustainable Building Science Technology BAS is a unique 90-credit degree that takes journey- and associates-level workers through a four-quarter sequence of advanced courses in building science, energy codes, building codes, and facility management. Developed in collaboration with over forty local businesses, the BAS is the latest innovation from a college with deep roots in South Seattle's industrial corridor, and a tradition of working in partnership with municipal, neighborhood, and labor leaders. South Seattle CC did not, in the words of one leader "drink the green tea." While other training providers in recent years rushed to sell short-term clean energy certificates with tenuous connections to employer demand, South Seattle was working to integrate sustainability across the curriculum and campus operations. They began with a simple but profound strategy: Ask scientists — and focus on economic and community development. Beyond developing a degree program, the college wanted to "build an infrastructure of knowledge around economic opportunity." This meant working closely with dozens of area employers; developing rigorous programs that could produce a workforce with higher math and science capacity; teaching leadership and policy as well as technical skills; and collaborating with other colleges.³² It is an approach that itself embodies principles of resilience.

These are exemplary programs, innovative and robust, but not singular. Community colleges by their very nature expand the sort of educational and economic opportunity that undergirds resilient communities, and have in many regions taken the lead in responding to two decades of policy-driven fits and starts in energy efficiency. The SEED Center and others have lifted up myriad examples of excellence from the hundreds of colleges with energy efficiency programs. They are led by pioneers like Lane College in Oregon. Its nation-leading programs in building operations and campus sustainability started over thirty years ago with inquiries into energy management, and the college continues to innovate through new efforts like the Northwest Water & Energy Education Institute.³³ While the expansion of training has in some cases preceded the growth of jobs, much good work has been done during recessionary and other moments of slack demand to strengthen and standardize the supply side of the energy efficiency labor market. National efforts to document and validate required skills, benchmark career pathways in residential and commercial efficiency through certification schemes, and distinguish high quality programs and instructors bring value and order to an often chaotic training frontier.³⁴

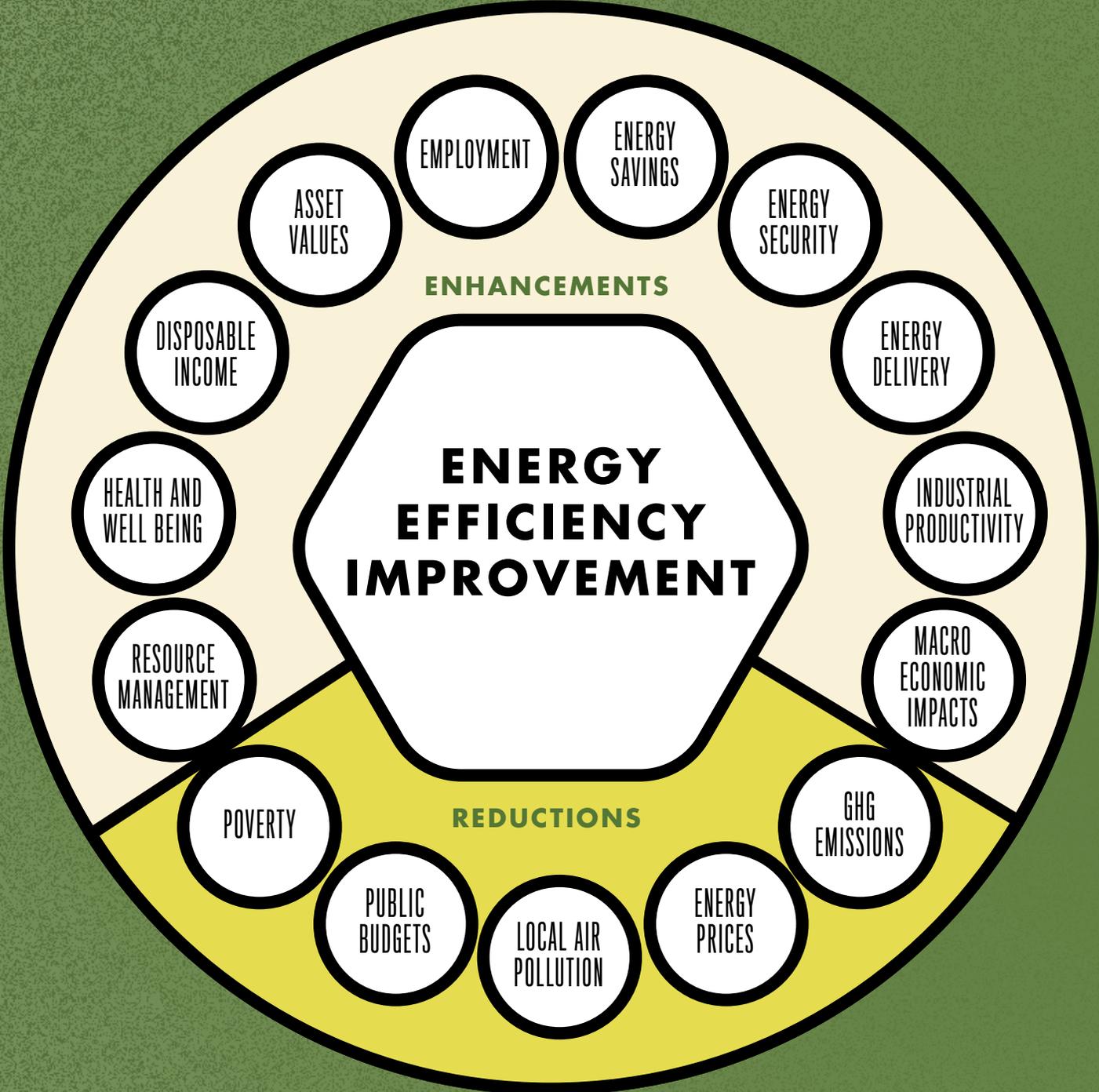
What is new here is not the content but the context. Energy efficiency in context of resiliency is a multi-layered response to climate risk. And this broader view of the industry widens the field of EE-related jobs and training: beyond energy auditors and weatherization crews, we see outcome brokers, community health workers, manufacturing technicians, procurement specialists, and others come into focus. Energy efficiency and resiliency principles will need to be integrated throughout related curricula, and can be employed to improve quality of life on campuses and in neighboring communities.

The International Energy Agency (IEA), in a new report measuring the real value of energy efficiency investment, finds that including health and well-being outcomes

boosts cost-benefit ratios as high as 1:4 in building energy retrofits. In addition, the productivity and operational impacts of industrial efficiency measures can generate benefits up to 250 percent greater than the value of actual energy savings.³⁵ The quantitative results are impressive: worldwide, “harnessing economically viable energy efficiency investments” could potentially “boost cumulative economic output through 2035 by USD \$18T,” larger than the entire current US economy. But it is the report’s simple graphic description of returns to EE investment that demonstrates the centrality of the industry to resiliency (*see figure 2, page 22*). Efficiency is typically categorized either as a) a mitigation strategy, reducing demand for energy reduces greenhouse gas emissions; or b) an adaptive one, reducing heating and cooling needs helps to offset temperature extremes that are increasing in degree and duration. According to the IEA, energy efficiency also *measurably* increases energy affordability and reliability (by reducing “the amount of energy assets exposed to extreme weather events”), as well as indoor air quality, health, employment, productivity, and wealth.

This constellation of energy efficiency’s socio-economic co-benefits reflects the interdependent, cross-sectoral imperatives of resiliency.

FIG 2 **ENERGY EFFICIENCY CO-BENEFITS**
This constellation of co-benefits reflects the interdependent, cross-sectoral imperatives of resiliency.



ADAPTED FROM THE INTERNATIONAL ENERGY AGENCY

EMERGENCY RESPONSE ON PORTS, PREPAREDNESS, AND WORKFORCE DEVELOPMENT

Emergency response is often the first thing that comes to mind when considering employment and training needs for disaster preparedness. Perhaps, given the broad scope of climate resilience, we should move beyond curriculum for first-responders, and imagine 21st-century emergency response in terms of a broader community answer — a community's adaptive capacity, as it were, in the face of multiple hazards. Many colleges are teaching and implementing disaster preparedness, as discussed earlier in reference to the FEMA and PETE programs. This is laudable and necessary. Colleges are also, however, responding to the emergencies of inequality and unemployment, the catastrophic preponderance of poor-quality jobs, and the multitude of low-skilled workers and underprepared learners who need to be brought up to speed in order to build and sustain a more resilient America.³⁶

The resiliency story at Florida's Hillsborough Community College (HCC) is not just about developing a robust, cross-program hazard response curriculum, but about engaging the community to do so. HCC serves more than 46,000 students on five campuses in Hillsborough County FL, which includes the Tampa metro. From employer engagement to regional adaptation planning, HCC is redefining its approach to workforce development, seeking new and resilient responses to a rapidly evolving labor market — and built environment.

HCC began thinking seriously about hazardous materials training after the 2010 Gulf oil spill. When the Deepwater Horizon dumped nearly five million barrels of crude oil into the Gulf of Mexico, stakeholders up and down the Florida coast scrambled to find workers and training programs suited to respond. Oil in the gulf was not on anyone's radar screen. Neither, really, was the vast storehouse of fuel sitting at Port Tampa Bay — a major international hub moving 34 million tons of cargo a year through a metro area of four million people.

HCC's vice president for workforce training engaged the Port Authority's vice president of planning in a conversation about disaster preparedness and first responders, starting with the firefighters who would need to contain any conflagration at the state's largest port. As a result, HCC built more extensive hazardous material training into all programs for emergency response professionals — emergency medical technicians, paramedics, firefighters, law enforcement. This was a significant effort, as the college specializes in education and training for health and public service occupations (36 percent and 29 percent of workforce enrollment, respectively).

One conversation led to more. An on-site company that recycles oil, for example, wanted to engineer a cleaner process for the industry. They called HCC and are working with the college to develop chemical engineering technician training — cutting edge clean economy work in a world not traditionally considered "green."³⁷ Another opportunity arose when Gulf Marine was looking for welders. HCC delivered training at the port, negotiated internships for students, and eventually doubled enrollment — with plans to launch an accelerated weekend program. The college expects further opportunities to open as the expansion of the Panama Canal drives even more shipping through the 5,000-acre Port Tampa Bay.

The challenge and the opportunity, says Dr. Ginger Clark, HCC's vice president for workforce training, is that there is no playbook.³⁸ Broad conversations about disaster preparedness, climate adaptation, worker advancement, and other elements of resilience begin organically. The specific shape and texture of ensuing plans are determined by the partnership. Community colleges, she argues, are uniquely suited to draw out such conversations and develop a framework for action.

To Clark, talking about resiliency entails something more than a conversation about job training: it is a fundamental inquiry into the kind of leadership colleges can provide to their communities. She explains that despite the presence of active civic organizations, no one in Tampa was connecting the dots between the city, the regional planning bodies, and the transit authorities. This was a job for HCC. Colleges can be excellent community facilitators. Indeed, Clark suggests, precisely because they are multi-dimensional institutions (training, modeling, convening,

resiliency initiatives, and determine their implications for job training. In Tampa, HCC began by mapping hazard mitigation and workforce demand in a single place-based asset: the port. Subsequent training opportunities arose because of that initial work developing job task analyses (JTAs) for environmental recovery and cleanup. But it also introduced a new challenge: a distributed workforce model. What does a training partnership look like if the port uses contractors for disaster preparedness and recovery planning? Door-to-door models for employer engagement

Precisely because they are multi-dimensional institutions (training, modeling, convening, educating), community colleges should be on the front lines in tackling multi-dimensional challenges like climate resilience.

educating), community colleges should be on the front lines in tackling multi-dimensional challenges like climate resilience.

One key task will be mapping the disaster preparedness biome for entrepreneurial problem-solvers — figuring out how to keep track of and align the many emerging

no longer work. The ecosystem of workforce professionals is changing, observes Clark, and they must adapt accordingly. Building resilience involves a new paradigm of community engagement in which colleges must reach beyond traditional chambers and business associations to city and county leadership, the coast guard, the port authority, and partners not yet imagined.

Education for resilience was never a matter of talking to a particular firm or group of firms about training a particular set of employees — resiliency by definition crosses sectors. In practice, this means building resiliency thinking, tools, and strategies into existing career pathways. Disaster preparedness and response involves more than hazmat training for emergency personnel; it includes cybersecurity, information technology, transportation, and remediation, among other things. HCC is determined not to repeat the mistakes of so many in the heady days of green investment, when colleges around the country bet the campus on a specific set of jobs. Instead, HCC is thinking about developing a resilient workforce more generally, in a nimble array of core programs that can respond to evolving demand. Community colleges can be community leaders, but they are also bound of course, by the imperatives of enrollment and completion. Which is another sound argument for integrating related proficiencies across existing curricula — building resiliency, once defined, into a 21st-century skill set — in a way that delivers value for both college and community. Otherwise, like innumerable sustainability initiatives, the push for resiliency will bang open doors and draw in multitudes — until personnel changes, champions move on, markets shift, and enrollment drops. Resiliency is not a boutique product, in theory or in practice.

To Clark, an emphasis on resilience returns community colleges to their core mission. At a time when many two-year colleges are moving toward a state college model by offering bachelors of applied science degrees, the questions of access and student success that are central to the conversation on resiliency and opportunity are in some cases driving community colleges back to first principles: student advancement, community service, inclusive

education. Where the University of Central Florida engages resilience in terms of engineering and research, for example, HCC translates it into community engagement — jobs, training, economic development.

Just as HCC worked with the planning council responsible for the region's resiliency and disaster recovery plan, the college is working with the port and the city to rethink business as usual. The task, Clark says, is to "first understand what resiliency is and what it requires of us, before we start training the workforce," and to "align college efforts with initiatives emerging from the community."

The college is well-suited to establish and convene knowledge-based community partnerships (where everyone learns what everyone does, and how they connect), and to then move partners collectively toward an integrated plan. The next phase is harder, and critical: "figuring out who is driving the train — who maintains, implements, and enforces a resiliency or adaptation plan." This must be determined at the community level. It is thus imperative that the vital interests of all members of the community are represented. And they all are, somewhere. But they are not yet all connected.

In the end, the partnerships matter more than the plan. It is there, Clark suggests, that sprawling metro areas can begin to build the ineffable but essential ingredient of resiliency: social cohesion.

URBAN PLANNING AND GREEN INFRASTRUCTURE THE COMMUNITY AS LIVING LABORATORY³⁹

Cities typically manage and treat their water — drinking, waste, and storm run-off — with a deteriorating system of over-burdened gutters, pipes, and tunnels. Water system failures are increasingly common, leading to flooding, service disruption, and sewage overflows. On coasts, riverbanks, and floodplains, systems built to 100-year flood standards are faltering with the increased prevalence of severe precipitation events. Cities in arid regions fare no better, with drought reducing the reliability of water supplies and parched land unable to absorb sudden, severe precipitation.

One key adaptive strategy is to integrate more green infrastructure, which can mimic the natural water cycle using vegetation and soil. Deploying technologies like permeable surfaces, green roofs, bioswales and rain gardens is improving stormwater management, water quality, and CO₂ emissions in Milwaukee, Philadelphia, and other cities. Water infrastructure investments can also create local economic opportunities, leading to jobs in the construction, utility, and water management sectors, in landscaping and ecosystem services, and, indirectly, manufacturing.

Because of this, in cities across the country, community colleges, public sector unions, environmental advocates, businesses, and municipal leaders are talking about green infrastructure and its potential contribution to more resilient systems for urban stormwater, wastewater, and drinking water management (*see above, page 11*). They are not, however, always talking to one another — or about parallel initiatives in urban planning, community health, and ecosystem services. This sort of integration, spearheaded by community colleges and benchmarked by community engagement, is particularly impressive in Oakland, CA.

The Peralta Community College District, an environmental and sustainability leader in Alameda County, comprises four East Bay campuses, including Laney and Merritt

Colleges in Oakland. Three Peralta initiatives merit attention here: a symposium, a creek, and a jobs plan.

In April 2014, the Peralta Community College District, together with the Institute for Sustainable Policy Studies and Sustainable Pacific Rim Cities, held a **Resilient and Sustainable Cities Symposium** at Laney College in Oakland. *Resilient Cities and Pre-Disaster Planning: Linking Together Regional and Community Partners* aimed to advance Bay Area resiliency work by lifting up related partnerships between colleges, elected officials, community groups and businesses, and by celebrating the selection of Alameda, Berkeley, Oakland and San Francisco to be part of the Rockefeller Foundation's 100 Resilient Cities initiative.

The true value of the symposium, according to organizers and participants, was in opening a space for dialogue that transcended sectoral and institutional siloes. Representatives from city, community, and education joined together in analyzing issues from fire and food security to climate action and environmental justice.

These sorts of wide-ranging public conversations are critical, according to Dr. David Ralston, an urban planner with the city of Oakland, faculty member in Merritt's Environmental Program, and fellow at the college's Institute for Sustainable Policy Studies. Ralston reports that he still gets "blank stares" when he talks about resiliency — the very reason the SEED Center decided to write this report. Ralston finds it useful to locate resilience in the connection between sustainability and community health, given the country's current interest in healthy cities, and the county's ongoing concern with air and water pollution. He also ties resiliency to conversations on adaptation and mitigation, and their potential impact on the thing of perhaps most concern to low-income communities in the East Bay: jobs.

To make all of this part of a community college curriculum, perhaps as a new four-year degree, Ralston and his

colleagues are thinking about creating a hub at Merritt and Laney that would develop related career paths — possibly to jobs in public administration with a focus on resiliency. In his dual roles at the college and at the city, Ralston sees an opportunity to create a unique degree program with a much more applied focus than anything the state colleges offer. To help articulate and advance this vision of a college-community-city partnership around resiliency, he is running for the District Board. In the mean time, through his work at Merritt, Ralston is already helping to develop educational programs with direct links to community groups and local resilience projects.

Merritt's Workforce Development & Applied Sciences Division includes the Landscape Horticulture Department, which offers eight stackable certificates and four associates degrees, including an associate of science in landscape design and construction. The department also oversees the Merritt College Environmental Management and Technology (ENVMT) Program which has been educating East Bay residents for more than fifty years in fields ranging from watershed management and urban farming to climate change and alternative energy. The affiliated environmental center — "Self-Reliant House"⁴¹ — also serves as a base for Merritt's Institute for Sustainable Policy Studies and the East Bay Watershed Center.

The interdisciplinary ENVMT program at Merritt offers a variety of certificates, a transfer curriculum, and two associate of science degrees:

- Greening the Urban Environment: Design, Planning, Environmental Justice; and
- Ecological Restoration, Ranger, Naturalist and Outdoor Education.

The program is at once an academic and a hands-on, community-based learning initiative. Students begin each term with a connect-the-dots mapping exercise (see page 31). They know from the start that part of their

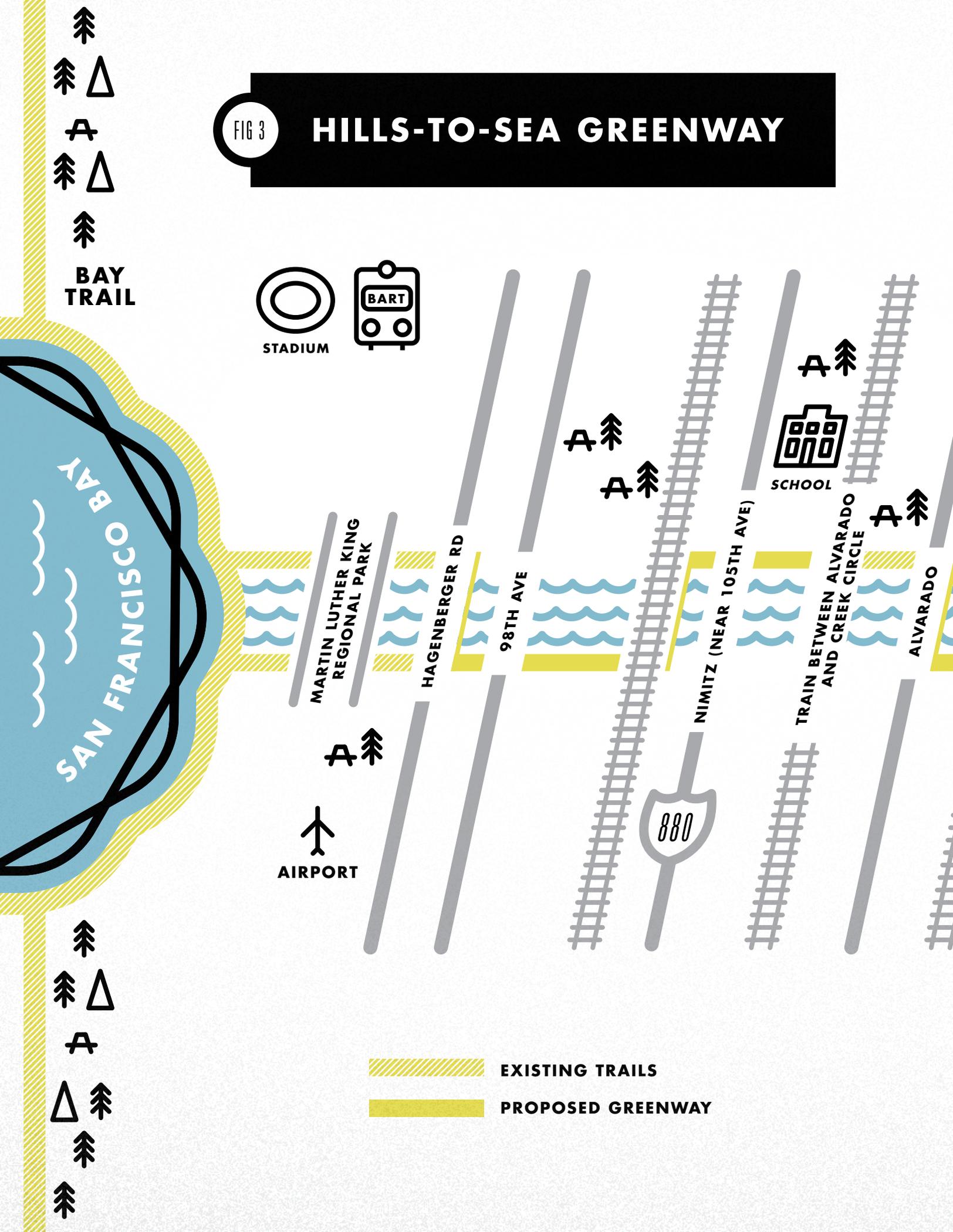
work is to identify local assets and infrastructure projects and partner with related environmental and community groups, learning how to build out a resiliency initiative in the "real world." Students may help design and develop a project, and initiate the community conversations necessary to advance it. Or they may identify an ongoing effort, like the creek restoration described below, and organize a conference to help publicize and advance that work. In either case, Merritt's vision of resilience is more about skills for democratization than engineering; social cohesion than emergency response. And all of it is built around a plan for green infrastructure and a curriculum on environmental management, with skills both technical and social.

Two efforts embody this approach to green infrastructure and community engagement: the San Leandro Creek Greenway Project and the Green Works Development Program.

In each case, the community college played a critical role as both incubator and shepherd. The foundational concerns were not on the city's radar screen; and the city, in any case, lacked resources to lead such initiatives. Through these and similar projects, students witness firsthand how a city can move from resistance to involvement: the college convenes a conversation, secures stakeholders and funding, and suddenly municipal leaders are rushing to get a place at the table, observes Ralston.

The San Leandro creek drains a 48-square mile watershed and runs more than six miles from Lake Chabot in the East Bay Hills to Martin Luther King, Jr. Shoreline Park, meandering through low-income areas of Oakland, and connecting parks, trails, natural resources, schools, and transit nodes. Restoring it is part of an envisioned "**Hills to Sea**" greenway (figure 3). Proposed by students and faculty at Merritt, greenway development is baked into urban planning and environmental management classes,

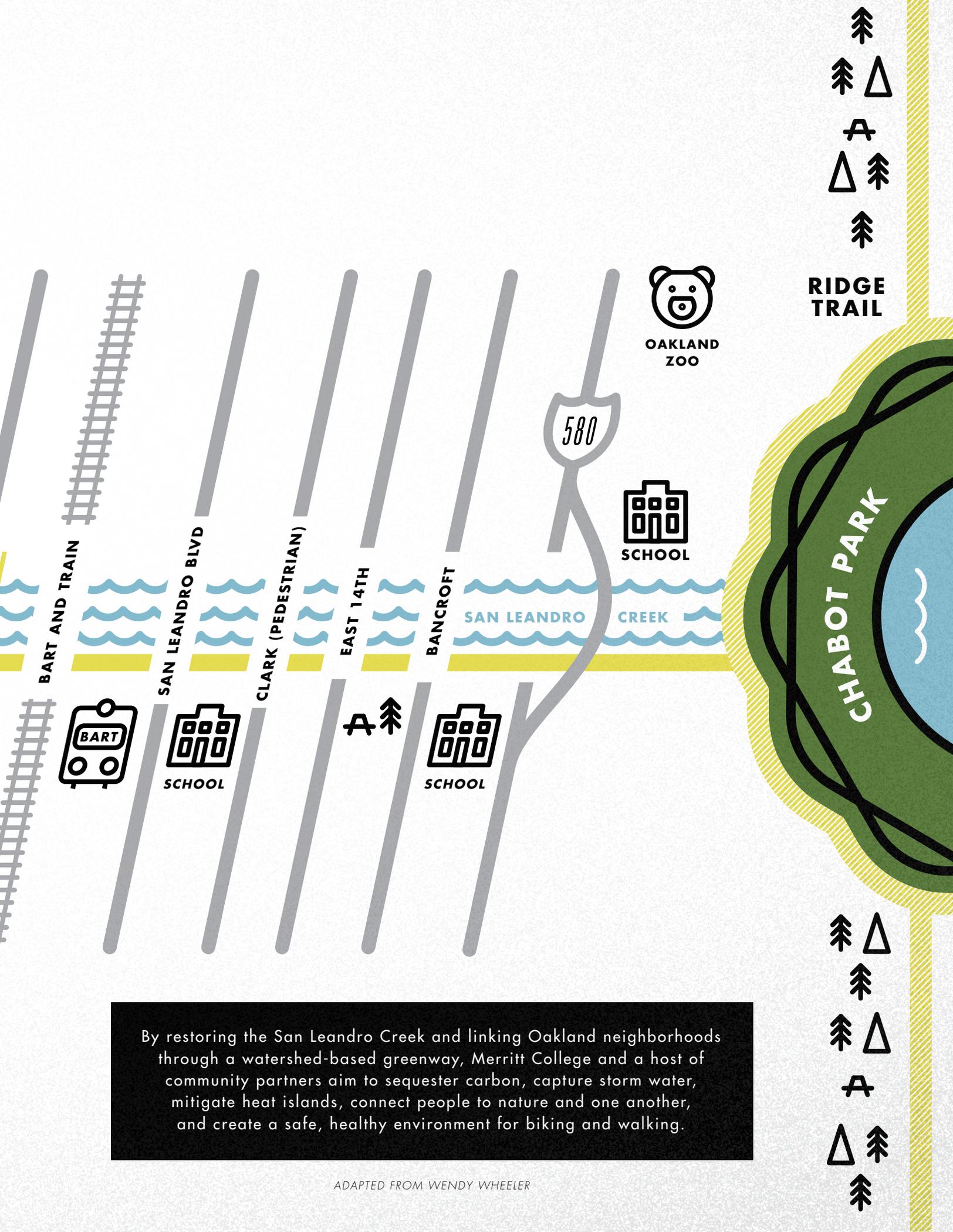
FIG 3 HILLS-TO-SEA GREENWAY



BAY TRAIL



EXISTING TRAILS
PROPOSED GREENWAY



By restoring the San Leandro Creek and linking Oakland neighborhoods through a watershed-based greenway, Merritt College and a host of community partners aim to sequester carbon, capture storm water, mitigate heat islands, connect people to nature and one another, and create a safe, healthy environment for biking and walking.

ADAPTED FROM WENDY WHEELER

RIDGE TRAIL



OAKLAND ZOO



SCHOOL

SAN LEANDRO CREEK



SCHOOL



SCHOOL



BART



and thus doesn't require separate college program funding up front. Project advocates have landed several grants, including \$250,000 from the California Department of Transportation and a technical assistance award from the National Park Service. Merritt and other greenway partners will eventually go after additional state and local monies to fund specific portions of the project. The goal, says Ralston, is to first get plans and priorities in place. Greenway organizers want to ensure that the community-visioning effort at the heart of the project continues to guide its development, and that community voices are not drowned out by the professional project managers and consultant teams that will inevitably follow from any major funding.

As part of a regional climate action planning process, Bay Area cities have to map priority conservation areas for green and open space. Merritt wanted to take this a step further and landed on watershed-based greenways as a model of how urban forestry can sequester carbon, capture storm water, mitigate heat islands, connect people to nature, and create a safe, healthy environment for biking

There is a critical role for community colleges wherever cities lack will or resources, says Ralston. But the work has to be done in concert with the community. In this case, Merritt began to convene "connect the dots" meetings around the greenway (*figure 4*), and worked with Bay Localize — who was already organizing dozens of environmental justice groups, activists and scholars on food policy, forestry, transportation, health, environmental justice, and watershed preservation to advocate for inclusive adaptation planning.

In 2013, Bay Localize produced *Mapping Our Future: A Work Plan for Public Engagement & Equity in Climate Adaptation Planning in the San Francisco Bay Area*, which outlines an inclusive plan for community resilience, including measures to connect residents in the bay's most vulnerable neighborhoods with jobs generated by adaptation plan implementation.⁴²

A number of related questions emerged from the greenway conversations: Who will maintain it? What about jobs? The college's environmental technology program

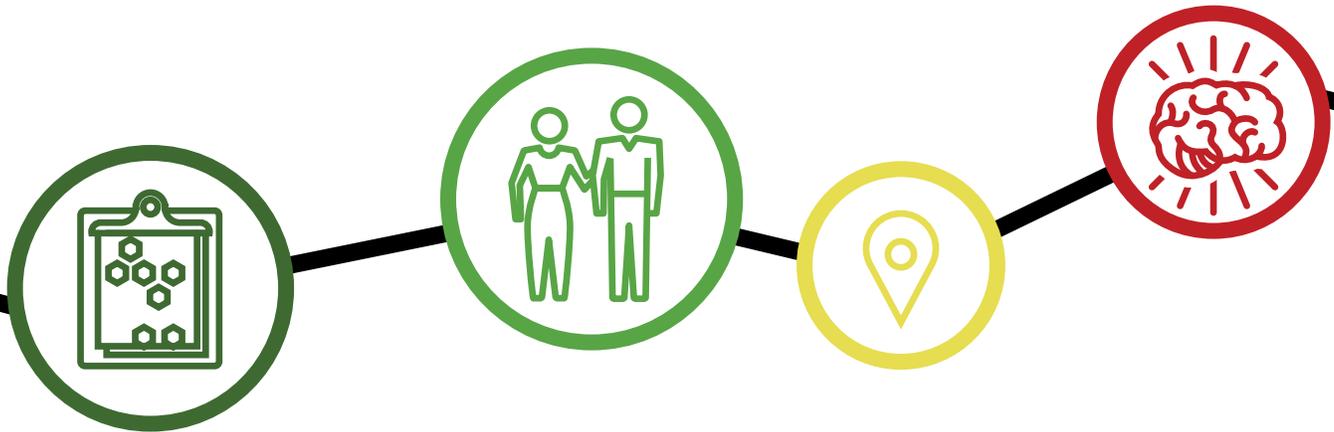
developed a green jobs track addressing less capital-intensive approaches than, say, renewables — watershed management, landscape architecture, etc. This programming is part of an ambitious jobs program known as Green Works Development (GWD).

Green Works Development, modeled on Oakland's Green Jobs Corps, began in 2010 as a pilot collaboration between the Oakland school district,

Merritt College, and the city of Oakland, which contributed \$200,000 in urban redevelopment funds. Training local high school students on paid summer projects in local parks, the program covered generalized instruction in green landscaping and horticulture, environmental planning, and sustainable building techniques.

A community college participates in operationalizing resiliency — economic and environmental — as convener, leader, and educator.

and walking. Community stakeholders were hungry for this, notes Ralston; they were tired of ad-hoc, minimalist responses to climate and environmental hazards. Thus what had been a mandate for open space became a window for the city to think comprehensively about urban renewal, community development, and climate action planning.



CONNECTING THE DOTS

FIG 4

Merritt's Connecting The Dots model facilitates resiliency planning and asset-mapping conversations with students, municipal leaders, and community groups. The college convenes diverse stakeholders to engage in "ongoing conversations about connecting with each other and where we live." Dots can be people, places, organizations, and ideas.

ADAPTED FROM MERRITT COLLEGE ENVIRONMENTAL PROGRAM, INSTITUTE FOR SUSTAINABLE POLICY STUDIES

The WPA-style program, developed through an organic, place-based process, connected environmental education, local kids, neighborhood engagement, on the job training, and green infrastructure. It now runs as an informal network of local business, nonprofit, education, and government agencies interested in developing sustainable public works, like the San Leandro Creek Restoration where it began. GWD engages local residents and opens doors into community college academic or apprenticeship pathways, leading to jobs in stewardship or public works. The program is currently working with the CA Department of Labor, the City of Oakland, and the Peralta Community College District to establish an arboriculture apprenticeship at Merritt College linking local residents to emerging jobs in urban forestry.

Equity, according to Ralston, drives project design: in order to address concerns that a top-down approach could lead to gentrification, GWD focuses on developing not just local jobs but local expertise — and a deep sense of community ownership. Neighborhood groups request improvements to greenways, parks, and watersheds, and then work with planners and crews from the community college to develop and install them. It is a remarkable process in which a community college participates in operationalizing resiliency — economic and environmental — as convener, leader, and educator.

HEALTH RESILIENT WORKERS, RESILIENT SYSTEMS⁴³

Health. Water. Climate Change. Community colleges like Merritt are connecting the dots. And the international climate community, too often focused on energy solutions alone, has begun to take note of these critical relationships as well. Christiana Figueres, executive secretary of the U.N. Framework Convention on Climate Change, was succinct in her summary for the World Health Organization in Geneva this summer: "Changes to rainfall patterns is causing a scarcity of clean, safe water to some places and floods to other places, with the respective host of health problems and food insecurity to each. And global temperature increase is expanding the range of vector- and water-borne diseases."⁴⁴

Five years ago, The Lancet named climate change "the biggest global-health threat of the 21st century." Organizations like Healthcare Without Harm are stepping up to the challenge, arguing that the healthcare sector needs to reduce the carbon footprint of its facilities, build resilient health systems based on community services delivered in distributed clinical settings, and pursue a mitigation agenda by factoring health costs into energy policy.⁴⁵ Elsewhere in this paper we have discussed climate and health in the context of community health workers, hospital preparedness, hazardous materials management, and the disproportionate vulnerability of low-income communities to climate-related health conditions, like asthma and heat stroke. Here we lift up an example of innovation in healthcare worker training and career advancement as a strategy for resilience.

Imagine a modern, resilient hospital. Most people think of highly skilled doctors and nurses striding through gleaming techno-centers, not housekeepers managing the spread of infectious disease with dry mops, or hospital workers managing potentially hazardous oil depots for back-up generators. But training front-line service workers in hospitals may be one of the best bulwarks of resilience, both by ensuring practice that could make healthcare facilities leaders in climate adaptation and mitigation,

and by providing solid opportunities for economic and educational advancement to low-income workers. Community colleges have played a significant role in doing just that, through collaboration with innovative labor-management partnerships around the country.

The Healthcare Career Advancement Program (H-CAP) is a national network of Service Employee International Union (SEIU) locals and healthcare employers who are partnering on workforce education and training. The affiliated H-CAP Education Association comprises 15 labor/management and labor-based training organizations that include over 900 employers and more than 600,000 workers. Beginning with a USDOL grant in 2010, H-CAP partnered with community colleges to develop a green health care program focused on workers whose jobs rank fairly low in the hierarchy of health care occupations and who are not typically viewed as agents of transformation. The pilots, which established career pathways for hospital environmental services (EVS, or housekeeping) and frontline Building Services Department (BSD) workers, ran for more than two years in Los Angeles, Seattle, DC/Maryland, and New York City.

H-CAP's EVS Green Careers Project does not employ the language of resilience. But it embodies the concept fully in its attention to health care's triple bottom line: people (patients, workers and the community), planet, and profits (institutional viability). And impressive project outcomes demonstrated that EVS workers, with the right training, are ideally positioned within hospitals to make the triple bottom line concrete.

The Project provided training to incumbent frontline workers in 7 modules, totaling 12-14 hours, as well as 6 hours of additional customized training determined by the particular goals of different hospitals. Worker and supervisor pairs were then taught to co-lead the training modules on water and energy efficiency, waste reduction, and lowering the incidence of Hospital Acquired Infections

(HAIs). H-CAP enrolled close to 3,000 workers in the training pilots. Roughly 95 percent were people of color. Half were women. And several hundred were immigrants from non-English speaking countries (ranging from Albania to Vietnam).

The EVS Green Careers Project also wanted to create a college-level “Sustainability in Health Care” certificate program as a means to more fully train workers in sustainable health-care practices and to provide them with a credential that they could use for career or academic advancement. The course was developed under the leadership of North Seattle College, with input from labor-management committees and college partners in the four regions around the country. The first class ran in May of 2011 at North Seattle and later in the year at colleges in Los Angeles, New York and DC/Maryland. Seventy workers have since earned the certificate. Each course used project-based learning to help workers gain the skills to develop, lead, and support systems change projects at their hospitals. Students analyzed current practices in their hospitals to identify areas of inefficiency, waste, or potential exposure to hazardous materials, and by doing so increased their problem-solving abilities, job-relevant knowledge, and sustainability skills. Students in the pilot put this analysis into practice within the labor-management committees of their respective hospitals, where many then led related projects. Completing the course was a pre-requisite for the project’s newly negotiated green lead positions, and served as an on-ramp to post-secondary pathways for related occupations.

The story of Washington State is particularly instructive. The green health care program at North Seattle College emerged in the larger context of the state’s Hospital Employee Education and Training Program (HEET). Created by the state legislature in 2008, the competitive HEET grants fund labor, management, and college partnerships to advance the careers of health care workers.

HEET’s most essential and unique feature is the partnership at the center of any project. Labor, management, and education come together to develop projects that help the diverse health care workforce gain the skills they need to move into more advanced roles. The partnership is *essential* in that HEET explicitly requires real partnership of labor, management, and education. HEET partners meet regularly to design, implement, monitor, and restructure the project when required. The partnership is *unique* in that it creates shared ownership over innovation. This contrasts with the education system’s more traditional advisory/approval relationship with industry as well as labor and management’s standing training fund resources, which help individual workers with educational expenses. To be sure, these systems are essential: they connect existing pieces of the system in meaningful ways. But they do not transform the system. In contrast, HEET partnerships are a force for innovation, consistently generating new ideas, approaches, and strategies beyond the boundaries of those traditional systems.

HEET partnerships provide the foundation for programmatic innovation and success. New strategies to train workers — changing course time or location, customizing content or developing new modes of delivery, altering entrance requirements and student supports, to name just a few — grow from that base. In HEET partnerships, colleges have designed tools and strategies tailored to the needs of workers in the health care industry. And they have been able to count on the partnership of labor and management to make changes within worksites that support success as well.

Over the course of six years, with roughly \$2M invested each year, *more than 20 community colleges* have engaged in the work, building new partnerships with dozens of employers and unions across the state. While some partnerships lasted for only a year, some projects and partnerships have evolved across the entire period. And the product of these partnerships — changes to assessment and entry-standards, integration of basic and occupational

DOE, DOL, AND NSF PROJECTS RELATED TO CLEAN ENERGY

Renewable energy and energy efficiency are sectors central to resiliency. They are not by any means the whole story, as this *Guide* demonstrates. But they are areas where federal, state, and local policy initiatives are expected to drive industry expansion, and with it, a demand for technical education and training.

The US Department of Energy has compiled a series of useful tables of related grant-funded initiatives at energy.gov/eere/education/federal-energy-and-manufacturing-workforce-training-programs

The US Department of Labor offers an online database of TAACCCT grantees, searchable by programs of study at www.careeronestop.org/taaccct/taaccct.aspx

The National Science Foundation posts Advanced Technological Education Grantees by topic and in award maps at www.nsf.gov/ate

skills, worksite delivery of education, scheduling of work and training so that workers can engage in both, case management and personal support, cohorts of co-workers moving through classes, greater use of simulations at all levels of skill — are impressive.

HEET has built the skills of hundreds of health care workers. More than 800 students have enrolled in some 1200 classes since the first HEET grant. Workers have moved from entry-level to nursing positions across the course of the grant. The full-time equivalents (FTEs) in the community college system have averaged 65 per year. HEET students are overwhelmingly female, substantially more racially diverse than the state population, and many are well-established in their work and family lives (the median age of HEET students is around 38). Half of these workers have never completed education past high school.

Improving and diversifying the healthcare workforce, in ways green and not, and transforming skill delivery, with or without explicit reference to climate change, bolsters resiliency. Insofar as they provide new and accessible opportunities for education and advancement to low-income workers, particularly women of color, and improve public health, these initiatives are creating communities of workers and families better prepared to face — even thrive in — a climate of uncertainty.

Other examples of SEIU innovation in healthcare suggest directions for community college initiatives and potential partnerships. In New York, a union and front-line worker-based Disaster Response, Recovery and Resilience Building Pilot Program for Healthcare is being implemented in areas affected by Hurricane Sandy. Funded by an Award from the National Institutes of Health/National Institute for Environmental Health Sciences, the program is led by the SEIU Education and Support Fund, the Service Employees International Union, and SEIU's United Healthcare Workers East local union representing almost 250,000 healthcare workers at acute care hospitals, clinic, nursing homes and home care employers in the region.⁴⁶ The program recognizes that training for resiliency includes training front-line workers for disaster management, starting with their own health and safety. The notoriously high rates of occupational injuries in healthcare increase in the hazardous conditions typical of emergency response. Not only are injured or ill workers unable to provide needed patient care during a disaster, but these workers also add to the community patient surge in times of emergency. Other healthcare sectors, too, are critical. Numerous pandemic plans, for example, identify the critical role of home health workers; few include provisions for related education and training.

CROSS-SECTOR RESILIENCY A CONSORTIUM FOR STUDENT SUCCESS AND CAREER ADVANCEMENT

Another project that aims to build resilience by addressing post-secondary success for marginalized workers is the Northeast Resiliency Consortium (NRC), a collaboration of seven colleges in four states funded by a USDOL Trade Adjustment Assistance Community College and Career Training Grant (TAACCCT).

Partners include Passaic County Community College (NJ), Atlantic Cape Community College (NJ), LaGuardia Community College (NY), Kingsborough Community College (NY), Capital Community College (CT), Housatonic Community College (CT), and Bunker Hill Community College (MA), as well as Achieving the Dream and the Carnegie Foundation for the Advancement of Teaching.

The consortium, formed to serve trade-impacted and low-skill adults, is dedicated to capacity-building based on four strategies critical to workforce development and post-secondary success:

- Accelerated learning to speed the acquisition of credentials
- Advanced technology to support learning and completion
- Employer engagement to shape curriculum and provide job opportunities
- Support services to enhance post-secondary persistence and labor market success

From these approaches, the consortium plucks a stout basket of workforce and adult education chestnuts — e.g., competency-based, industry-recognized, stackable credentials; credit for prior learning; contextualized math; credit-bearing, work-based learning; career guidance — and a number of technological gems, including online advising, adaptive learning platforms, gaming technology, and simulation.

These approaches will be implemented or strengthened in programs across three industry sectors critical to disaster preparedness and response: information technology, health, and energy/environment. Targeted occupations include Paramedics, Medical Coders, Electronic Health Records Technicians, Community Health Workers, Cyber Security Specialists, Computer Support Specialists, Mobile Application Developers, Energy Industry Technicians, Green Building and Maintenance Technicians, and Construction Management Personnel. Related programs of study in which the partner colleges have shown most interest to date include emergency management, food and food service, mobile app development, sustainability, and community health.⁴⁷

NRC has also begun a discussion on core competencies in resilience — roughly defined as adaptation to both natural catastrophe and economic change. Over the next two years, the consortium's action plan includes:

- Deciding upon a core definition of resiliency for the NRC
- Defining and categorizing resilience competencies — and an assessment strategy — with industry and other partners
- Establishing a national resiliency advisory council
- Validating the competencies with input from NRC colleges and partners as well as the national advisory council

The seven partner colleges will then determine how to best refine and align programs of study with NRC resiliency competencies, and start to offer programs of study incorporating them. Finally, in September 2016, the consortium will hold a resiliency summit to evaluate progress and assess prospects for making the resiliency competencies available to a broader network of community colleges.

TOWARDS A RESILIENCY AGENDA FOR THE 21ST-CENTURY COMMUNITY COLLEGE

The brief cases reviewed here and many others — from different cities, different sectors — only hint at the rich field of action and possibility for community colleges willing to engage the great work before us: building resiliency.

The resiliency conversation, while urgent, is young. This paper intends only to frame the subject, not forge a set of clear and comprehensive answers. Community colleges, we hope, will in fact rewrite the questions. In the meantime, a few lessons emerge, suggesting strategies for engagement.



IN PROGRAMMING

- Integrate resilient systems-thinking into every program of study, and develop curricula responsive to the particular skill implications of local climate adaptation and mitigation initiatives.
- Update existing coursework in emergency response, public service, urban planning, engineering, information technology, landscape, water, construction, environment, health, and transportation programs; and seek interdisciplinary opportunities between them.
- Pay attention to emerging opportunities nationally and regionally (including, e.g., 111(d), ACA, and the Administration's Climate Action Plan) as policy changes open doors for collaboration, action, and funding.
- Build *climate resilience* through education and training: Review local and regional adaptation plans and populate the vague sections on workforce development with an actual agenda for skill delivery.
- Build *community resilience* through economic opportunity: Work with local industry partnerships, high schools, and community programs (e.g. pre-apprenticeship, adult literacy, English language learning, and employment readiness) to align education with demand, establish or expand stackable credentials, and build career pathways to actual jobs.
- Join labor-management partnerships in training incumbent workers for advancement; seize the resiliency dialogue as an opportunity to improve college relationships with labor unions and other worker institutions.
- Define climate resiliency for your region; work with local government, workforce intermediaries, and industry partnerships to assess emerging labor market demand and skill needs driven by climate resiliency initiatives.
- Explore new partnerships in customized training for incoming and incumbent city and county workers, particularly in environmental services, engineering, urban planning, transportation, emergency response, and public health.
- Above all, hew to the college's core mission, and share it with all community stakeholders: **Post-secondary success leads to economic opportunity, and initiatives to advance it should thus be a keystone strategy in the architecture of community resilience.**



ON CAMPUS

- Become a living laboratory of resilience; use the campus as a demonstration and teaching asset for engaging students and the community, modeling, for example, stormwater management or renewable energy systems.
- Fortify and expand sustainability work — both mitigation and adaptation initiatives — already happening across campuses; use existing college sustainability committees to initiate and expand the resiliency conversation.
- Align college adaptation and hazard mitigation planning, which colleges are already required to do, with local and regional efforts.
- Establish the campus as a safe haven — whether this is because of high ground, microgrids, or weapon-free zones — and a stable, reliable operations center for times of crisis.
- Enhance campus awareness and preparedness through education, training, and simulations; develop an all-hazards response plan that engages and supports the different capacities for resilience of individuals on campus: administrators, faculty, staff, and students.
- Insert resiliency conversations into campus planning on green initiatives; and also work to embed resiliency in institutional strategic planning at every level.
- Build on the last decade's advances in sustainability education to prepare students to help their own communities mitigate and adapt to the most severe impacts of climate change.
- Assess vulnerability and prepare adaptive responses in collaboration with other community colleges around the country: **Join the Alliance For Resilient Campuses (see page 13).**



WITH COMMUNITY

- Colleges are anchor institutions and community assets that can serve as regional catalysts in the movement to build resilient places. Prepare campuses not only to be an operations base during a disaster, but to serve as an operational base for quotidian community transformation.
- Use the bully pulpit to explore resiliency — its imperatives and its possibilities — with a broad audience.
- Provide educational resources on climate change and adaptation to the community at large.
- Partner with community groups; mediate conversations to ensure that outsiders bearing resilience plans build up and onto local projects and priorities — which may or may not go under the formal title of “resilience.”
- Broker conversations. Adaptation strategies developed in rooms dominated by scientists and environmentalists tend to seek technical solutions to a social problems; community groups will return the resiliency dialogue to community health and economic inclusiveness.
- Practice local workforce development in new ways — work with cities and transit authorities and regional planning bodies in addition to individual employers.
- Include all voices. Community activists and environmental justice groups need to share power with economic development and employer interests; colleges have the clout to keep everyone at the big table — where the investment decisions are made — when some seek to busy the more plebeian voices with tangential “community” conversations.
- Convene scientists, industry and community leaders, and policy-makers to shape climate action plans and determine workforce implications; **Make the college visible as an essential partner in any resiliency planning process.**

WHAT IS TO BE DONE?

Almost every major report and initiative on U.S. climate solutions indicates that a resilient future requires a plenitude of skilled workers to build it.

It is time for the resiliency planners — thought-leaders in government, nonprofit, philanthropic, industrial, and academic sectors — to take that next step, and start a conversation with the institutions at the heart of America’s skill delivery system: community colleges.

And it is time for community colleges to recognize how many of the occupations for which they are already training will be impacted in the next decade by regional responses to climate change. College presidents, administrators, and faculty need to assess the relevance of coursework and campuses, and, more importantly, step into their role as community leaders on climate resilience.

The many national advisors and experts who contributed to this *Guide* identified a number of tools necessary to advance this work. Building these tools will be critical next steps. The top three:

RESILIENCY LEADERSHIP TRAINING FOR COMMUNITY COLLEGE PRESIDENTS AND TRUSTEES

If the resiliency movement wants colleges involved, and it should, given the potential to engage a strong community advocate — an activist ambassador to educate, inform, and mobilize — then it needs to invest in raising the level of related discourse among executive leaders at local technical colleges.

A RESILIENCY PRIORITIZATION AND PLANNING RUBRIC FOR COMMUNITY AND TECHNICAL COLLEGES

Community colleges would also benefit enormously from support in identifying and capturing opportunities to advance local resiliency agendas through education, training, outreach, and campus practice, some of which they may already be pursuing.

A FRAMEWORK AND ACTION PLAN TO CONNECT COMMUNITY AND COLLEGE RESILIENCY EFFORTS

Finally, both college and community leaders need guidance in the steps required not just to come to the same resiliency table, but to productively engage in common, concrete, local resiliency initiatives.



CONCLUSION START NOW

Building systems to improve opportunity can improve resilience. Beyond specific adaptive strategies like storm water management, improved transportation infrastructure, and quality public health systems, a society's capacity for adaptation is increased by broader strategies to promote equity and sustainability, including, for example, poverty reduction, higher skill development, and more efficient and accountable institutions. Constructing pathways to decent work for low-income, low-skill workers can improve the chances of those most vulnerable to the wide-ranging dislocations (economic, geographic, health, etc.) driven by climate change.

Community colleges are ideally positioned to help ensure that low-income, under- and unemployed workers can advance into family-sustaining careers, while the communities in which they live improve resilience to climate insecurity. They also provide the technical training necessary to reimagine and rebuild the nation's infrastructure, the community leadership to insist that this be done, and the vision to begin in their own backyards. Start now. You probably already have.

NOTES

- 1 American Association of Community Colleges: *Reclaiming the American Dream, Community Colleges and the Nation's Future: A Report from the 21st-Century Commission on the Future of Community College* <http://aacc.wpengine.com/wp-content/uploads/2014/03/21stCenturyReport.pdf>. On the 21st Century Initiative, see also: http://www.aacc.nche.edu/AboutCC/21st_century/Pages/default.aspx and <http://www.aacc21stcenturycenter.org/>
- 2 *Climate Change, Evidence and Causes: An overview from the Royal Society and the US National Academy of Sciences* (2014)
- 3 The World Meteorological Organization, *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes* (2014), pp. 9, 22. UN data show that the last decade saw five times as many natural disasters as the 1970s.
- 4 Daniel J. Weiss and Jackie Weidman, *Disastrous Spending: Federal Disaster-Relief Expenditures Rise amid More Extreme Weather*, Center for American Progress (April 29, 2013)
- 5 Kate Gordon, *Risky Business: The Economic Risks of Climate Change in the United States* (June 2014), pp. 3-5.
- 6 *The National Climate Assessment* (July 2014) catalogues in detail the potential sectoral impacts of climate change and interrelated challenges to people, economies, and natural resources. <http://nca2014.globalchange.gov/>
- 7 See, e.g., Cynthia Rosenzweig et al., eds., *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network* (Cambridge University Press, 2011).
- 8 This language of resilience borrows directly from Sarah White, Laura Dresser, and Joel Rogers, *Greener Reality: Jobs, Skills, and Equity in a Cleaner U.S. Economy* (COWS, 2012). For a concrete list of policies and recommendations suggested by this broader definition of resilience internationally, see the report of the United Nations Secretary-General's High-Level Panel on Global Sustainability, *Resilient People, Resilient Planet: A Future Worth Choosing* (2012).
- 9 D. Andrus, N. Siddiqui, and M.R. Cooper, *Climate Change, Environmental Challenges and Vulnerable Communities: Assessing Legacies of the Past, Building Opportunities for the Future* (The Joint Center for Political and Economic Studies, 2012); Ellen Kersten et al., *Facing the Climate Gap: How Environmental Justice Communities are Leading the Way to a More Sustainable and Equitable California* (USC Program for Environmental & Regional Equity and University of California, Berkeley College of Natural Resources, 2012); *The Health Impacts of Climate Change on Americans* (The White House, June 2014). See also, Daniel J. Weiss, Jackie Weidman, and Mackenzie Bronson, *Heavy Weather: How Climate Destruction Harms Middle and Lower-Income Americans* (Center for American Progress, November 2012).
- 10 In the voluminous literature on inclusive economic growth, the resiliency of shared prosperity, and the imperatives of trust, a useful collection of short essays can be found in the *OECD Yearbook 2014: Resilient Economies; Inclusive Societies*. On the role of social capital in climate resiliency, see Laurie Mazur, "Cultivating Resilience in a Dangerous World," in *The Worldwatch Institute's State of the World 2013: Is Sustainability Still Possible?*
- 11 NOAA National Climatic Data Center, "Billion-Dollar Weather/Climate Disasters," <http://www.ncdc.noaa.gov/billions/>
- 12 Details can be found in *The President's Climate Action Plan* (Executive Office of the President, June 2013), available at <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>
- 13 The workforce and credentialing aspects of DOE's Better Buildings Initiative will be of particular interest to community colleges: <http://energy.gov/better-buildings>.
- 14 Preliminary information on the Competition is available at http://portal.hud.gov/hudportal/documents/huddoc?id=FactSheet_071514.pdf. On HUD's work with the Rockefeller Foundation and others to develop Rebuild by Design, see <http://www.rebuildbydesign.org/>. See also <http://www.nyc.gov/html/cdbg/html/plan/read.shtml> on the use of CDBG-DR for post-Sandy resiliency initiatives in New York, which fundamentally redefined the parameters of disaster recovery.
- 15 On the role and training of community health workers in the ACA, see: Randall B. Bovbjerg et al., *Opportunities for Community Health Workers in the Era of Health Reform* (The Urban Institute, December 2013); on public health and healthcare systems as key to resilience, see: the CDC's *Assessing Health Vulnerability to Climate Change* (2014) available at <http://www.cdc.gov/climateandhealth/pubs/AssessingHealthVulnerabilitytoClimateChange.pdf>
- 16 See, e.g., <https://www4.eere.energy.gov/workforce/>
- 17 *The State Clean Energy Cookbook: A Dozen Recipes for State Action on Energy Efficiency and Renewable Energy* (The Steyer-Taylor Center for Energy Policy and Finance and the Hoover Institution, Stanford University, 2014)
- 18 See http://www.icleiusa.org/climate_and_energy/Climate_Adaptation_Guidance/climate-resilient-communities-program. While designed for member officials, the site has useful fact sheets and case studies of city initiatives around the country.
- 19 It might not be climate change, but we certainly can't deny the irony. One morning this past August, while intense heat, wildfires, and drought continued to plague the West Coast, a police scuba team had to investigate more than 70 vehicles on Interstate 94 in Detroit, checking for drivers trapped in the submerged vehicles after the metro's heaviest rains in a century. Ryan Koronowski, "Long Island Town Gets Over a Foot of Rain as Downpours Hit the East Coast" (*Climate Progress*, August 13, 2014).
- 20 The Institute for Sustainable Communities compiled detailed case studies of the history, process, and content of prominent climate action plans, including Chicago, New York, and Miami, in: *Promising Practices in Adaptation & Resilience: A Resource Guide for Local Leaders, Version 1.0* (2010), available at http://sustainablecommunitiesleadershipacademy.org/resource_files/documents/Climate-Adaptation-Resource-Guide.pdf; Version 2.0 (2012) offers updates and additional case studies, including some less well-known efforts: http://www.mayorsinnovation.org/images/uploads/pdf/6_-_Adapt._Res._Guide_cover%2C_3-8%2C_63-70.pdf
- 21 More than 500 college and university sustainability and climate action plans can be found online as part of the ACUPCC Reporting System. See <http://www.presidentclimatecommitment.org/>
- 22 For related training opportunities in *Emergency Planning for Higher Education* see: www.training.fema.gov/EMIWeb/edu/emergencyPlanning.asp. Colleges can also prepare students for civic engagement through local Community Emergency Response Team (CERT) programs. See <http://www.fema.gov/community-emergency-response-teams>.
- 23 Email communication with Dr. Bryan Albrecht, President, Gateway Technical College, 10/15/14. Gateway Technical College's Health and Emergency Response Occupations (HERO) Center is a fire medic and EMS industry hub for real-life, scenario-based training, disaster simulation and technology-equipped classroom instruction. For more information, see www.gtc.edu.
- 24 An excellent related model is the SEED Center's Green Genome Initiative: Todd Cohen and Mindy Feldbaum, *The Community College Green Genome Framework: Integrating Sustainability and Clean Technology Workforce Development Into an Institution's DNA* (SEED 2012)

25 The Advanced Technology Environmental and Energy Center (ATEEC) is an excellent source for related education and training programs, job task analyses, and technician careers. See www.ateec.org.

26 Daniel J. Weiss and Jackie Weidman, *Pound Foolish: Federal Community-Resilience Investments Swamped by Disaster Damages* (Center for American Progress, June 2013), p.2. Note that the vocabulary of disaster preparedness overlaps awkwardly with that of climate disruption: in the former, hazard mitigation means “adapting buildings, infrastructure, and natural systems that will allow communities to better withstand high winds and rain ocean storm surge, unusually high temperatures, wild fires, and drought” — in other words, climate adaptation.

27 On the decoupling of GDP growth and GHG emissions in cities around the world, see: Carbon Disclosure Project, *Wealthier, Healthier Cities: How Climate Change Action is Giving Us Wealthier, Healthier Cities* (2013).

28 For a round-up of U.S. cities managing climate risks, see: Cathleen Kelly and Arpita Bhattacharyya, *Storm-Ready Cities: How Climate Resilience Boosts Metro Areas and the Economy* (Center for American Progress, October 2013).

29 For a whirlwind tour of earlier college and university contributions to adaptation and sustainability through education, research, operations, and community engagement, see the many excellent examples and recommendations laid out by the ACUPCC in Georges Dyer and Jennifer Andrews, *Higher Education's Role in Adapting to a Changing Climate* (Second Nature, 2011). More resources and toolkits are available at both the American College and University Presidents' Climate Commitment site (www.presidentclimatecommitment.org) and that of their lead supporting organization, Second Nature (www.secondnature.org).

30 Details available online at <http://college.lattc.edu/laec/>. For LATTC insights on developing and integrating industry-aligned clean energy career pathways in community colleges, see Marcy Drummond et al., *Defining Your College's Competitive Advantage: A Blueprint for Building High Quality Green Programs of Study* (January 2013)

31 Details online at www.edcc.edu/energy. Interview with Alison Pugh, MBA, Energy Management Director and Instructor, Edmonds Community College, 3/7/14.

32 Interviews with South Seattle College faculty and administrators, including Pinky Dale, Ellen Gordon, Lauren Hadley, Mike Porter, and Tim Walsh, 3/6/14. See also: <http://www.southseattle.edu/programs/bas/sustainable-building-science-technology/>

33 See <https://www.lanec.edu/sustainability>, and <http://www.nweei.org/>.

34 DOE's *Better Buildings Workforce Guidelines* offer an industry-driven framework for commercial efficiency education and training: <https://www4.eere.energy.gov/workforce/projects/workforceguidelines>. On the residential side, see the *Guidelines for Home Energy Professionals* at <http://energy.gov/eere/wipo/guidelines-home-energy-professionals-certifications>. The Interstate Renewable Energy Council is a leader on standards for clean energy education and training, including energy efficiency; see, e.g., <http://www.irecusa.org/standards-development/>. See also the Energy Efficiency Standardization Coordination Collaborative's *Standardization Roadmap: Energy Efficiency in the Built Environment* (American National Standards Institute, 2014). Finally, a detailed, inclusive, resilient strategy for workforce development in energy efficiency can be found in Carol Zabin et al., *Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities* (UC Berkeley Donald Vial Center on Employment in the Green Economy, 2014)

35 IEA, *Capturing the Multiple Benefits of Energy Efficiency* (2014), pp.19-23. Figure 2 adapted from chart on p.20.

36 The dismal results of the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) 2012 survey came as no surprise to many technical and community college educators. 36 million adults have low literacy and numeracy skills; the majority of these are black or Hispanic, and most are working. *Time for the U.S. to Reskill? What the Survey of Adult Skills Says* (OECD, 2013), and *Literacy, Numeracy, and Problem Solving in Technology-Rich Environments Among US Adults: Results from the Program for the International Assessment of Adult Competencies 2012* (National Center for Education Statistics, Institute of Education Sciences, and U.S. Department of Education, 2013).

37 HCC, with a nationally recognized sustainability team, has been a leader in organizing campus efforts around more traditionally “green” work, including permaculture; the college offers certificates, diplomas and degrees in environmental science, water quality, aquaculture, and the like. The focus here is on their technical programs in, e.g., fire science and firefighting, criminal justice and law enforcement, public safety communications, and emergency medicine.

38 Interviews with Ginger Clark, PhD, Vice President of Workforce Training, Hillsborough Community College, 1/30/14 and 8/21/14.

39 The Oakland summary relies in large part on interviews with David Ralston, PhD, Professor of Environmental Management and Technology and Institute of Sustainable Policy Studies Fellow, Merritt College, Oakland CA, 3/25/14, 8/28/14, and 10/15/14. Figures 3 & 4 were adapted from materials shared in personal email communications with Ralston and fellow greenway advocate Wendy Wheeler, 10/4/14.

40 The Symposium was planned well before the Rockefeller announcement, but organizers reached out to foundation representatives to be sure to advance inclusion and the alignment of both efforts.

41 The Self-Reliant House is Merritt's living laboratory, featuring photo-voltaic panels, solar hot water heating, energy-efficient window technology, advanced lighting and space heating, recycled and sustainably harvested materials, straw-bale construction, green roof and roof water catchment, rain barrels, edible gardens, and a wildlife garden with native and drought-resistant plants. For more information on the Merritt College ENVMT program, see <http://www.ecomerritt.org/>.

42 For a copy of the Bay Localize report and information on the ensuing Resilient Communities Initiative, see www.baylocalize.org.

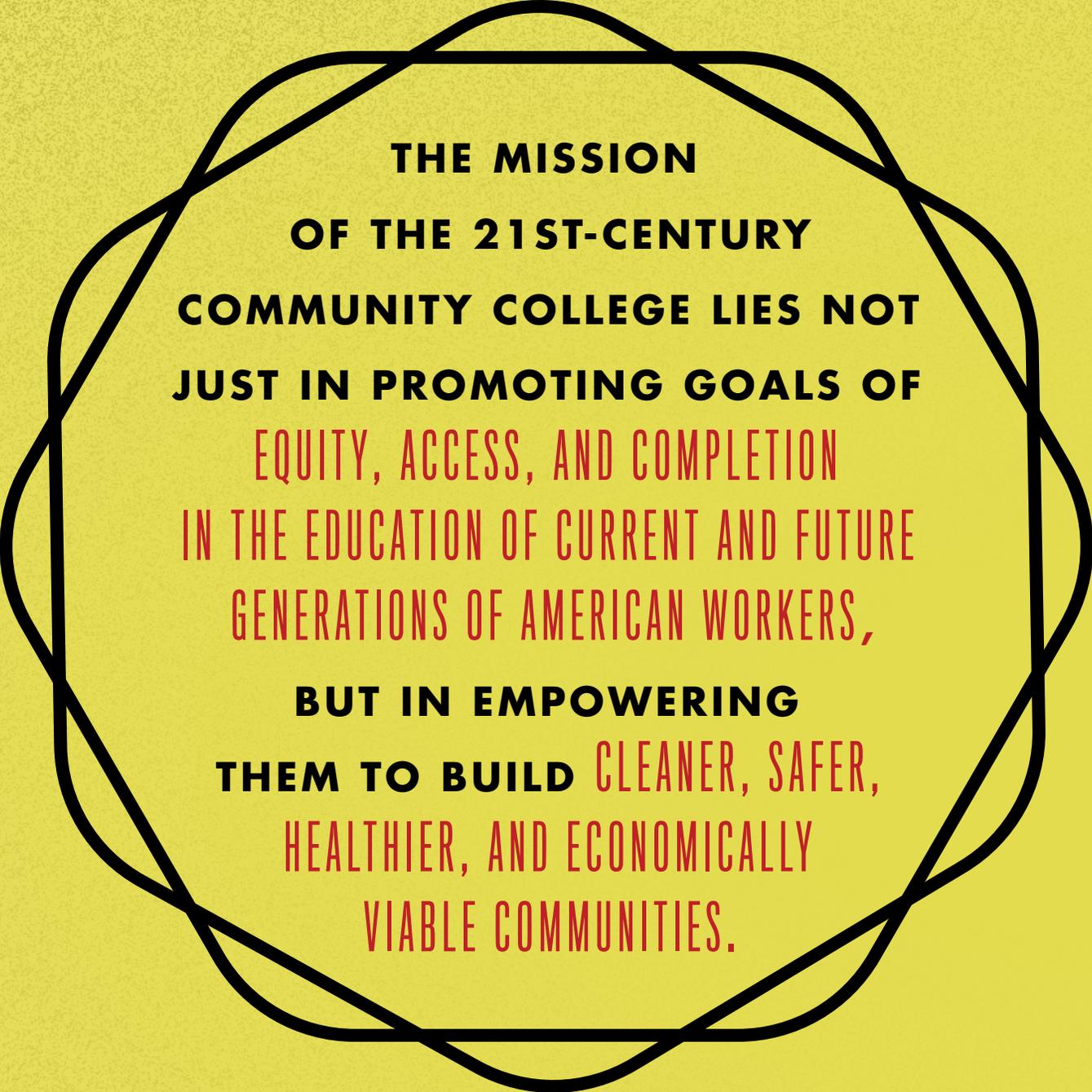
43 Data on the EVS pilots are from *Greener Reality: Jobs, Skills, and Equity in a Cleaner U.S. Economy* (COWS, 2012). The section on HEET derives from Laura Chenven and Laura Dresser, *Turn up the HEET! Reflections on Washington's Six Years of Investment and Innovation in the Health Care Workforce* (COWS and H-CAP, 2014).

44 Josh Karliner and Gary Cohen, *Health Care and Climate Catastrophes*, McClatchy-Tribune New Service, 9/2/14.

45 Robin Guenther and Gary Cohen, “Energy to Heal: Health Care, Climate Change, and Community Resilience,” *Community Development Investment Review* (Federal Reserve Bank of San Francisco, March 2014).

46 Interview with Mark Catlin, Occupational Health and Safety Director, SEIU.

47 Interviews with Mike Powell, NRC Executive Director, 3/18/14, 8/13/14, and 10/19/14.



**THE MISSION
OF THE 21ST-CENTURY
COMMUNITY COLLEGE LIES NOT
JUST IN PROMOTING GOALS OF
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BUT IN EMPOWERING
THEM TO BUILD CLEANER, SAFER,
HEALTHIER, AND ECONOMICALLY
VIABLE COMMUNITIES.**

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ABOUT AACC

As the voice of the nation's community colleges, the American Association of Community Colleges (AACC), delivers educational and economic opportunity for 13 million diverse students in search of the American Dream. Uniquely dedicated to access and success for all students, AACC's nearly 1,200 member colleges provide an on-ramp to degree attainment, skilled careers and family-supporting wages. Located in Washington, D.C., AACC advocates for these not-for-profit, public-serving institutions to ensure they have the resources and support they need to deliver on the mission of increasing economic mobility for all.

ABOUT COWS

Based at the University of Wisconsin-Madison, COWS is a national think-and-do tank that promotes "high road" solutions to social problems. These treat shared growth and opportunity, environmental sustainability, and resilient democratic institutions as necessary and achievable complements in human development.

COWS is nonpartisan but values-based. We seek a world of equal opportunity and security for all.

ABOUT SEED

This publication is a product of the SEED Center, an initiative of the American Association of Community Colleges and ecoAmerica. With its more than 460 community college members, SEED (Sustainability Education and Economic Development) aims to advance sustainability and green workforce development practices at community colleges by sharing innovative practices to help college administrators, faculty, and staff to build the green economy.



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