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CHAPTER 27

Bioregional Planning and Design

An Urban-Rural Approach to
Climate Change Resilience
and Adaptation

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This chapter, *Bioregional Planning and Design: An Urban-Rural Approach to Climate Change Resilience and Adaptation*, is an extension of the digital textbook. It was cowritten in 2024 by Keith Pezzoli, Senior Teaching Professor, UC San Diego; Paul Watson, President/CEO of the Global Action Research Center; Haley Kavar, Director of Education and Partnerships for the UC San Diego Bioregional Center; and Angelina G. Lopez, Director of Research and Community Engagement for the UC San Diego Bioregional Center.

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Learning Objectives

1. **Explain the concept of a bioregion and bioregional transition**, emphasizing how the imaginative aspect envisions place-based ecological democracy and Indigenous-led decision-making and wisdom as essential elements for promoting justice in climate action plans, designs, and adaptation strategies.
2. **Understand the importance of the New Urban Agenda** within the UN's 2030 Sustainable Development Goals, emphasizing its commitment to improve the linkages and interdependencies in urban-rural relationships, helping heal the urban-rural metabolic rift.
3. **Assess efforts that the UN's IPCC and COP are making** to align climate change adaptation efforts with the UN's 17 Sustainable Development Goals—especially the goals specific to hunger; sustainable cities and communities; infrastructure; climate action; life on land; and peace, justice, and strong institutions.
4. **Define climate action planning and provide examples of design for sustainability** in Southern California and Northern Baja California including nature-based forms of adaptation using blue and green infrastructure.
5. **Explain how nature-based solutions to climate change impacts can** enhance community health, wealth, and well-being, while eradicating the root cause of wicked problems.
6. **Describe how community-university research teams and youth activists** can work together to build community power, spur climate action, and innovate direct participatory democracy, while confronting systemic racism and other forms of oppression.

Overview

Climate change poses a critical threat to human civilization in the twenty-first century, with global efforts under way to build resilience and support adaptation locally and at the level of the **bioregion**. The concept of the bioregion integrates biogeography with climate, culture, and local socio-political and economic relationships, emphasizing the interdependence of urban, rural, and working lands and open spaces. Yet, these efforts are hindered by a persistent bias toward cities and metropolitan areas in the discourse and application of sustainable, climate-resilient development.

This chapter presents a bioregional approach to reduce city-centric bias and make the transition to climate-resilient development more likely. Bioregional theory and action concentrate attention on urban-rural linkages and flows connecting a city, its peri-urban area, rural places, working lands, water resources, and wild spaces, utilizing diverse biocultural concepts, practices, and scales. Bioregional activities include, for example, integrated watershed management, foodshed planning, wildfire corridor risk assessment, green/blue infrastructure development, agroecology, sustainable farming, and ecological design that regenerates biodiversity and ecosystem services. Bioregional-scale initiatives incorporate **traditional ecological knowledge (TEK)**, the accumulated knowledge, land ethics, and practices of Indigenous and local communities cultivated over millennia. TEK is rooted in long-term interactions with the environment, including, but not limited to, agriculture, hunting, fishing, medicinal plant use, and sustainable land and water management. The bioregional perspective illuminates the disproportionate burden borne by those who are Black, Indigenous, or people of color in the face of adverse climate effects, encompassing both urban and rural environments globally.

In our exploration of **bioregional planning**—which cultivates sustainable, equitable, and resilient human-nature relationships within a specific bioregion—coupled with bioregional design as an urban-rural climate adaptation approach, we emphasize the crucial role of countervailing narratives and storytelling. Effective bioregional storytelling is essential, harnessing the power of bioregional imagination for collective

changemaking in the pursuit of life on Earth that is verdant, peaceful, healthy, and just. Bioregional storytelling takes diverse forms, from poetic and philosophical to technical and analytical. In this chapter, our focus is on bioregional storytelling that weaves together wisdom traditions, convergence research, and community science.

WISDOM TRADITIONS The term *wisdom tradition* represents the shared reservoir of knowledge, beliefs, and practices transmitted across generations within communities. These encompass the collective wisdom, insights, and teachings that guide individuals and communities in comprehending the essence of existence, ethical conduct, and the pursuit of a purposeful life. Illustrations of wisdom traditions grounded in land ethics and regenerative practices are evident in Indigenous knowledge systems and creation stories.

CONVERGENCE RESEARCH This is a transdisciplinary, problem-solving, and solutions-oriented approach to scientific investigation that breaks free from conventional academic constraints. It fosters collaborative innovation by bridging otherwise siloed disciplines and sectors. Team-driven projects concentrate on a wide range of complex societal challenges. The approach links knowledge to action, aiming to understand and improve project-targeted conditions by comprehensively examining, for example, the intersectionality of socioeconomic dynamics, cultural perspectives, technology, built environments, and ecological systems.

COMMUNITY SCIENCE The term *community science* represents a paradigm shift in scientific inquiry, reshaping the conventional relationship between communities and universities. It empowers communities to take the lead in identifying civic priorities for innovation and establishes collaborative partnerships with researchers to address these needs authentically. Emphasizing bidirectional learning, it ensures equitable and meaningful benefits for both communities and researchers. Through collaborative action research, community science generates new use-inspired, problem-solving, and solutions-oriented knowledge—making it a good companion to convergence research.

This chapter unfolds through four sections that are aligned with four modules embedded in a companion video lecture recorded as part of

the University of California's online Bending the Curve course (<https://btc.ucsd.edu/>).

Section X.1 introduces the interconnected dynamics of climate change, globalization, and urban-rural industrialization. It identifies the contributions of bioregional and Indigenous-led planning to **climate resilience** and adaptation, emphasizing efforts by global institutions and the State of California. Climate resilience can be defined as the ability to withstand and recover from climate change impacts, such as extreme weather events, fires, floods, and droughts, along with associated socio-political and economic stresses. Special attention is given to the UN's 2030 Sustainable Development Goals (SDGs), New Urban Agenda, and **Intergovernmental Panel on Climate Change (IPCC)**, with an emphasis on urban-rural linkages. Section X.1 underscores the significance of Indigenous traditional ecological knowledge and the bioregion as a spatial justice framework for bolstering climate change resilience and adaptation across the **urban-rural continuum**. The urban-rural continuum refers to the seamless gradient between urban and rural areas, emphasizing their interconnectivity rather than treating them as distinct and isolated entities. This concept highlights linkages between urban and rural spaces, recognizing that effective management and development require integrated approaches that consider the complex interactions across this continuum.

Section X.2 provides an overview of climate action planning and climate-resilient development pathways, describes climate action localization, and illustrates the bioregional transition. The review merges science, imagination, and story with an emphasis on the bioregion as a territorial and cultural framework useful for healing the urban-rural metabolic rift—an environmental paradox embedded in capitalist systems. This section offers a global comparative perspective that illustrates the narrative power of two crucial concepts: bioregional imagination and bioregional justice. These concepts inform climate action planning that is converging land ethics, food justice, and food democracy, opening promising vectors for socioecological change needed for place-based climate resilience and adaptation.

Section X.3 underscores the importance of building trusted community-university partnerships willing and able to cultivate inclusive

and equitable participatory processes in strategic planning, design, and public decision-making. We feature several examples including the AGILE—**A**dvancing **G**reen **I**nfrastructure for **L**earning and **E**quity—Project. Other examples include projects in the Cali-Baja bioregion spanning the US-Mexico border and Indigenous lands. Section X.3 conveys a commitment to amplify marginalized voices, especially in cases where the authentic participation of those with low incomes or those who are Black, Indigenous, or people of color is hindered by entrenched racism, xenophobia, misogyny, and other forms of oppression.

Section X.4 examines the transformative potential inherent in youth-led climate action and community engagement, presenting the younger generation as impactful agents in dismantling systemic oppression. Young leaders energize participatory democracy and community power in placemaking and placekeeping, creating conditions for communities to shape their destinies. Section X.4 concentrates on education and experiential learning in youth-led climate action. We identify benefits that are created when students have access to applied research projects and experiential learning opportunities, enabling them to actively contribute to local urban, rural, and bioregional problem solving—especially solutions-oriented research dedicated to enhancing understanding and fostering climate-friendly development and data justice.

This chapter emphasizes the importance of localization within a bioregional framework while critically exploring how this framework connects to global dynamics. It recognizes the challenges posed by globalization, which perpetuates city and metro-centric biases in worldwide development and resource allocation. This perpetuation continues to place rural areas, working lands, and BIPOC (Black, Indigenous, and People of Color) communities at a severe disadvantage. This chapter highlights opportunities to confront and overcome this biased and unsustainable development.

27.1 Climate Change and the New Urban Agenda: Creating Wellsprings with Traditional Ecological Knowledge

Navigating modernity's perfect storm

We stand at a critical juncture in human history, where a convergence of crises and unparalleled opportunities is taking place concurrently. The twenty-first century Anthropocene, a new epoch in deep geological time signifying the ascendance of humans as a significant influence on Earth systems, presents imminent threats and an urgent need to make pivotal decisions.

The problematic trajectory of modernity is laid bare as human civilization confronts a *perfect storm*, a convergence of five interconnected challenges arising from problematic human-nature interactions: (1) climate change; (2) ecological degradation; (3) extensive and widespread loss of soil and biodiversity; (4) escalating disparities in the resilience and regenerative capacity of human settlements, working lands, and waters; and (5) the globalization of chronic and infectious diseases, posing threats to the health and well-being of billions of humans and other life forms. This perfect storm manifests in visible disparities and inequities across many features of society, including land use, housing, employment, mobility, food production, communication systems, and overall well-being. The widespread inequity in access to resources and opportunities contributes to social, economic, and environmental injustices that are intensifying as this perfect storm gains momentum.

Should problem-solving and solutions-oriented efforts focus on the neighborhood, city, town, county, state, or depend on a global entity like the UN? Alternatively, might climate mitigation and adaptation stand a better chance of success if based on watersheds, strategic alliances, or bioregions?

In this opening section of the chapter, we set the stage by depicting pivotal roles of local, urban-rural, and bioregional entities and strategies in climate change planning and design. Emphasis is placed on

regenerating ecosystems, enhancing community wealth, and improving well-being, especially in underserved communities where most of the residents are Black, Indigenous, or people of color. Simultaneously, this section highlights the urgent need to establish global connections for local and bioregional initiatives, giving rise to innovative forms of ecological democracy. These may take shape as transboundary eco-democratic institutions, research-to-action networks mobilizing community-university partnerships, and trans-bioregional alliances. Conceptually, the bioregion serves as a valuable spatial justice lens, offering an integrated urban-rural, socioecological imaginary (story) useful in advancing an urban-rural approach to climate adaptation.

Planetary urbanization and urban-rural linkages

In 1950, only 30% of the world's population lived in urban areas. By 2000 this figure had grown to 47% in 2020 it was 56%, and by 2050 the city-dwelling proportion of humanity is expected to reach nearly 70%. Our species is urbanizing. But this does not quite capture the full picture. There is blurring of the distinct boundaries between urban and rural settlements on a global scale, giving rise to territorial concepts like the urban-rural continuum and urban-rural hybridization. In this shifting landscape, the characteristics traditionally associated with rural areas, such as agricultural activities and open landscapes, are becoming intertwined with urban elements, like large-scale energy infrastructure and economic diversification. Simultaneously, urban areas are experiencing influences from rural life and livelihoods as seen in, for example, urban agriculture and efforts to bolster local self-sufficiency and sustainability, by way of deeper connection to the land.

This phenomenon reflects a dynamic shift in the spatial and functional attributes of settlements, challenging conventional dichotomies and highlighting the interconnectedness of urban and rural environments. The rural-urban continuum concept emphasizes the need for holistic and context-specific approaches in planning and policymaking to address the evolving nature of human settlements. The quest for sustainable urbanization has evolved significantly since the planning and design professions began to embrace this concept in the late 1980s. The

emphasis on sustainable, resilient rural development has been slower to take hold. But that is beginning to change.

The Center for American Progress (based in Washington, DC), for example, advocates a “Path to Rural Resilience in America” in their report of that name, which spells out an actionable rural agenda for an “asset-based, wealth-building approach to community development by investing in local people, institutions, and firms—and by building on the wisdom of homegrown development hubs and community institutions such as broadband cooperatives.” Still largely missing, however, are actionable conceptual frameworks, theories of change, and practices designed to strategically interlink urban and regional challenges in the face of climate change and other troubling trends. That gap is slowly closing, largely due to failures in business as usual.

Bioregions: a useful urban-rural territorial and cultural imaginary

The term *bioregion* is part of a narrative inviting individuals to contemplate their immediate surroundings, whether a neighborhood, city, or transborder metropolis. It prompts reflection on the intricate web of connections between people and the diverse ecosystems that sustain life in a particular location. In the realm of personal experience, a bioregion becomes synonymous with the “life-place” that individuals call home. Peter Berg and Raymond Dasmann, in their seminal work from 1977, illuminate the dual nature of the term, encompassing both the physical landscape and the collective consciousness developed around sustainable living practices within that place.

In essence, a bioregion is part of a narrative framework (story) that encourages individuals to engage with and understand how land, water, natural resources, and ecosystems are fundamental to their existence (be it right under their own two feet, or far away). The development of human-made environments unfolds within the contours defined by climate, topography, flora, fauna, soil, and water. The complex interplay between social and economic activities shapes diverse forms of human settlement and land use, spanning urban, rural, and working lands, and interfaces between urban and wildland areas. These activities contribute to the dynamic relationship between human endeavors and the natural

ecosystems inherent to a specific bioregion. The recognition of this intertwined connection underscores the importance of understanding and navigating the delicate balance between human actions and the ecological fabric of a given bioregion.

Patrick Geddes is one of the early pioneers of modern bioregionalism. In 1909, Geddes advocated for a holistic approach to building, working, and living in harmony with the land. Geddes introduced the “valley section,” a bioregional perspective that considers the city in relation to its nearby rural areas and their functions. This approach brought attention to the livelihoods of woodsmen, hunters, shepherds, gardeners, and fishermen, upon which city people depend. The trajectory of scholarly interest in bioregionalism has seen fluctuations over the past six decades. It emerged strongly in the US during the back-to-the-land cultural movement of the 1960s, experienced a lull in the 80s and 90s, and has witnessed a notable resurgence around 2000 to the present.

Currently, there exists a diverse and expanding body of bioregional work, encompassing projects, academic programs, government initiatives, consulting services, and knowledge-to-action networks. This work underscores the increasing influence of bioregional theory and practice on the world stage. Positioned as a compelling alternative to the unsustainable status quo, these efforts advocate for geographically centered, place-based strategies. The focus is on addressing environmental and social issues while fostering justice in the creation and sharing of community wealth across co-located urban, peri-urban, and rural areas.

In this chapter, we explore how cultural constructs impact public policies, steer technological innovations, and shape the trajectory of technological development. Recognizing and understanding the role of imagination and storytelling is crucial for analyzing the social dynamics influencing technology adoption, acceptance, and resistance.

Bioregional principles and commitments

The essence of bioregional theory and practice revolves around a core tenet: humans, as inherently social beings, need healthy relationships with each other and Earth’s interconnected web of life—land, water, habitat, ecosystems, plants, and animals—to survive. Yet, the collective capacity of humanity to secure such relationships in modern times remains

elusive. The idea of a bioregion, along with the vision of a bioregional transition, provides a concrete, place-based narrative to confront climate change, underscoring the importance of connectivity in resilient and adaptive strategies. In this regard, Thayer advocates for “a mutually sustainable future for humans, other life-forms, and earthly systems through a spatial framework where people live as rooted, active, participating members of a reasonably scaled, naturally bounded, ecologically defined territory, or life-place.”

The bioregional approach for the twenty-first century cannot be solely about securing healthy and regenerative relationships within specific biocultural places; it must also cultivate relationships across bioregions in ways that uphold bioregional justice. This involves preventing unfair and harmful extractions from people and resources in one bioregion by those in another.

This chapter advocates a twenty-first century bioregionalism with core commitments: (1) fostering human-scale connections in urban and rural communities to nurture a caring, inclusive sense of belonging and secure attachment; (2) integrating nature and human settlements in ways that holistically instill land ethics, eco-efficiency, equity, and green cultural values into systems of production, distribution, consumption, and daily life—honoring the traditional ecological knowledge and life-ways of local Indigenous peoples in tangible compensatory ways; (3) recognizing and valuing how wildlands, ecosystems, and rural workers enable cities to exist; (4) promoting equitable and just community-based participatory processes for local, bioregional planning and decision-making; and (5) establishing global trans-bioregional alliances for climate-resilient urban-rural placemaking and placekeeping. These core commitments align with efforts to meet the UN’s 2030 Sustainable Development Goals (see Figure 27.1.1.).

UN’s 2030 Sustainable Development Goals and New Urban Agenda

Seventeen Sustainable Development Goals (SDGs) were adopted by all 193 members of the United Nations in 2015. SDG Goal 11 seeks to “make cities and human settlements inclusive, safe, resilient and sustainable,” with Target 11a aimed at supporting “positive economic, social



FIGURE 27.1.1 United Nations 17 Sustainable Development Goals (SDGs).
Reproduced with permission from the United Nations.

and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.” The SDGs are interconnected and interdependent. To achieve Goal 11, progress meeting the other SDGs is crucial.

During 2016, the UN’s General Assembly convened the Habitat III Conference on Housing and Sustainable Urban Development in Quito, Ecuador, to reinvigorate the global commitment to sustainable urbanization (SDG 11). The Habitat III Conference, a convening of subnational and local governments, parliamentarians, civil society, Indigenous peoples and local communities, the private sector, professionals and practitioners, the scientific and academic community, and other relevant stakeholders, focused on implementing SDG 11. Conference participants created and widely distributed a New Urban Agenda (NUA). The NUA embodies a shift away from metro-centric bias, embracing place-based language that emphasizes the need for integrated planning and development strategies recognizing the interdependencies between urban and rural regions. It also promotes social inclusion and addresses issues of urbanization and urban poverty. The agenda promotes inclusive,

sustainable, and resilient urbanization while addressing specific challenges faced by rural areas.

The NUA emphasizes the necessity of bridging the urban-rural divide through balanced investments, equitable access to resources, and well-coordinated policies to foster sustainable development and enhance the quality of life in both urban and rural areas. A key component of the NUA is strengthening **climate adaptation** through urban and regional planning and design. It advocates for integrated, participatory planning processes that incorporate climate change adaptation measures. These include designing resilient infrastructure capable of withstanding climate-related events, such as floods, heat waves, and rising sea levels.

One of the most notable aspects of the NUA is its **focus on localization**. Historically, nation-states have struggled as organizing entities to effectively address the global climate crisis. Nation-states, by design, prioritize their borders and political interests, leading to conflicts when climate policies clash with economic or political priorities. As a result, states often focus on short-term national gains rather than long-term global solutions. This has driven cities, towns, counties, and regions to take the lead on climate action. Local governments and communities are becoming more agile in setting ambitious sustainability targets, implementing innovative practices, and mobilizing their constituencies to enact meaningful change. Their flexibility allows for quicker adaptation and experimentation with localized solutions.

While local planning and decision-making aren't immune to the short-sighted pressures of business-as-usual (BAU) practices, which may fail to account for intergenerational equity, local action remains essential. Localities, where the impacts of climate change are most intensely felt, have a better opportunity to enact climate solutions that are context-specific—whether at the scale of a neighborhood, district, city, or even a watershed—especially when they are resourced appropriately and guided by principles of equity, diversity, and inclusion.

The Intergovernmental Panel on Climate Change is responding to this challenge by connecting the expertise of scientists with two distinct leadership levels: **treetop leadership** at the national level, such as heads of state and senior government officials, and a wide range of **grassroots**

or sub-national leaders, including mayors and community-based organizations. This approach aims to foster collaboration across scales, ensuring both national and local efforts align for impactful climate action.

Urban systems and the Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) stands as a cornerstone in our understanding of climate change; it is the leading international body that provides policymakers scientific information and options for mitigating and adapting to climate change. Simultaneously, the 2030 Agenda for Sustainable Development, embodied in the Sustainable Development Goals (SDGs), establishes a comprehensive framework for societal, economic, and environmental sustainability. The synergy between the IPCC and SDGs, with their interconnected pursuits, is augmented by the New Urban Agenda (NUA). The NUA is no longer confined to urban areas as discrete entities; it calls attention to the need to improve urban-rural linkages and interdependencies, representing a significant shift toward recognizing the continuum between urban and rural spaces.

The NUA can help create synergy at the intersection of the IPCC's actionable knowledge and the SDGs. Scientific insights from the IPCC not only guide climate action but also inform policies that resonate with the broader aspirations of the SDGs. Concurrently, the NUA introduces a spatial dimension, emphasizing the interconnectedness of urban and rural spaces in achieving sustainability goals. A common theme has emerged across the IPCC, SDGs, and NUA discourses concerning climate change resilience and adaptation—an emphasis on Indigenous lifeways and traditional ecological knowledge (TEK).

The NUA acknowledges the rights of Indigenous peoples to their lands, territories, and resources. It emphasizes the importance of respecting Indigenous rights and promoting their full and effective participation in decision-making processes related to urban and rural development. This includes recognizing and valuing the contributions of Indigenous culture, ways of knowing, and practices within urban as well as rural contexts.

The NUA acknowledges the importance of Indigenous TEK in understanding and adapting to climate change, emphasizing the value of

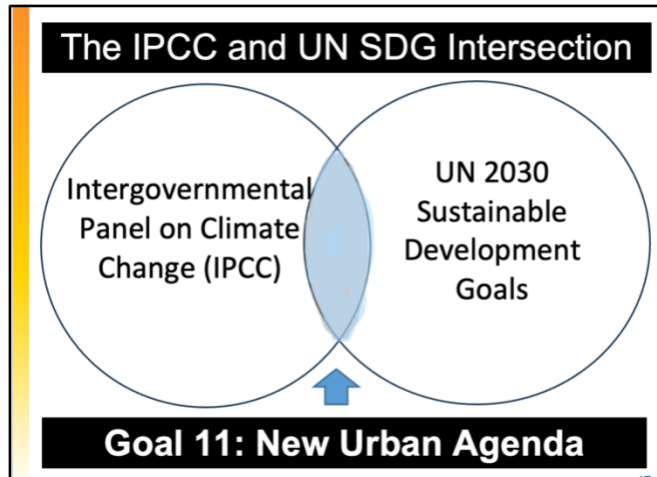


FIGURE 27.1.2 IPCC contributions to policymakers, including scientific information and options for mitigating and adapting to climate change, share overlapping values and aims with the United Nations 17 Sustainable Development Goals (SDGs). Image from the authors.

Indigenous peoples' traditional practices, such as sustainable land management techniques and resilience strategies, which have been developed over generations and can contribute to climate change mitigation and adaptation efforts in urban as well as rural areas.

The NUA recognizes that Indigenous communities often bear the brunt of the impacts of climate change, including in urban areas where they may face additional challenges such as displacement, loss of traditional livelihoods, and cultural erosion. It acknowledges how Indigenous-led cultural revitalization enables Indigenous communities to adapt to climate change while preserving their cultural identity and lifeways.

In a similar vein, the IPCC also addresses the value of Indigenous lifeways and knowledge in its reports and assessments. The IPCC encourages the integration of Indigenous knowledge (IK) and local knowledge (LK) alongside scientific data in climate change assessments to develop more comprehensive and contextually relevant adaptation and mitigation strategies. The term *Indigenous knowledge* refers to the understandings, practices, and worldviews of Indigenous peoples. IK is rooted in cultural traditions, histories, and spiritual beliefs, typically passed down

orally and through cultural practices that regenerate the identity and survival of Indigenous communities.

Controlled burns are a good example of IK related to land management and ecological stewardship. These burns are deliberately set, low-intensity fires conducted under controlled conditions to manage the landscape, reduce wildfire risk, and promote ecosystem health. Indigenous peoples in many parts of the world have used controlled burns for thousands of years as a sustainable practice deeply integrated into their cultural and spiritual traditions. Controlled burns are especially important in fire-prone areas like California, where both state and federal agencies have increased their reliance on this method to mitigate wildfire risk, including potential health impacts associated with extreme smoke events.

Local knowledge, on the other hand, is typically specific to a community or a region and is not necessarily tied to Indigenous peoples. LK evolves over time, often based on empirical observations of the local environment. For example, in many coastal communities, fishers have developed localized knowledge about ocean currents, fish migration patterns, and tidal changes through generations of observation and experience.

Traditional ecological knowledge and California's climate change assessments

Traditional ecological knowledge (TEK) is a term sometimes used to include both IK and LK. But this is a sensitive subject. Many Indigenous people distinguish TEK from more general local or community-based knowledge systems because it includes spiritual and cultural dimensions that are fundamental to Indigenous ways of life. Indigenous peoples often stress the importance of acknowledging their sovereignty over TEK, as it is closely tied to their land rights and self-determination. Non-Indigenous people in government, business, universities, planning agencies, and national parks, among other places, are beginning to recognize the value of TEK. This recognition cuts both ways. Sometimes non-Indigenous use of TEK terminology is self-serving appropriation. Other times it is honorable and mutually beneficial for Indigenous and non-Indigenous interests. The recognition of TEK is a first step toward

addressing historical injustices and possibly securing tangible, just forms of reconciliation and collaboration.

The State of California now incorporates a tribal and Indigenous communities summary report in its *Statewide Summary Report* of its climate change assessment. Of all counties in the USA, Southern California's San Diego County has the highest number of reservations (sovereign Native nations). None of these reservations are on the coast. The Kumeyaay peoples' historical mobility across the diverse landscapes of what is now San Diego County, Imperial County, and Baja California in Mexico, from desert habitats to coastal areas, highlights their deep connection to the land and the seasonal rhythms that governed their way of life. However, the current location of reservations away from the coast disrupted these traditional practices, limiting the ability of tribal members to access resources vital for their social, cultural, and economic well-being.

The absence of coastal reservations in San Diego County, despite the historical reliance of the Kumeyaay people on coastal resources, underscores the broader pattern of dispossession and marginalization experienced by Indigenous communities in California and across the United States. The failure to recognize and protect tribal land rights has perpetuated cycles of poverty, environmental degradation, and cultural loss among Native American populations. In the face of these challenges, Indigenous communities have demonstrated resilience and adaptability, striving to preserve their cultural heritage and traditional knowledge for future generations.

Efforts to revitalize traditional practices, reclaim ancestral lands, and engage in sustainable resource management are essential for eRevitalizing Indigenous lifeways, restoring governance over ancestral territories, and practicing land-based stewardship are not symbolic gestures, rather, they are necessary acts of justice for the survival, dignity, and self-determination of Indigenous peoples in California and beyond. Colonization violently dispossessed Indigenous nations of their lands, languages, and governance systems, and these harms continue through contemporary policies and conservation regimes that exclude Indigenous leadership. Just and accountable collaboration among Indigenous and non-Indigenous actors (including governments, conservation organizations,

and the public) must directly confront this history by returning land, power, and decision-making authority. The Land Back movement, led by Indigenous peoples across the United States, calls for the restoration of ancestral lands and the full exercise of tribal sovereignty and demands material support, not rhetorical acknowledgment.

The near-total absence of tribal landholdings along California's coast is not accidental; it is the result of deliberate colonial processes, including forced removal, land theft, broken treaties, and ongoing denial of Indigenous land rights in favor of extractive and elite coastal interests. Today, most tribal lands in California are confined to fragmented reservations, rancherias, and allotments that severely limit cultural practice, economic autonomy, and land-based livelihoods. This imposed immobility continues colonial control over Indigenous life and land, forcing Indigenous communities to struggle for survival within constrained geographies. In response, Indigenous peoples are advancing Land Back and other place-specific organized strategies to reclaim land, restore cultural continuity, and ensure that future generations inherit not only memory, but living territory.

The Landback movement and traditional ecological knowledge wellsprings

The Landback movement has gained momentum in recent years, fueled by growing awareness of Indigenous rights, environmental justice concerns, and solidarity efforts with other marginalized communities. While progress has been made in some cases, challenges remain, including legal barriers, political opposition, and the complexities of land ownership and management in a settler colonial society. Overall, the Landback movement represents a powerful expression of Indigenous resistance and resilience, challenging dominant narratives of conquest and dispossession and advocating for the restoration of Indigenous lands, rights, and sovereignty.

Maintaining TEK is crucial not only for conservation of ecosystem services, biodiversity, ecological restoration, and enhancing prospects for climate change resilience and adaptation, but also, as importantly, for tribal cultural health, identity, and continuity. Today, efforts are under way among Indigenous communities to revitalize TEK and practices

related to subsistence living and traditional tribal lifeways—including activities involving cultural preservation, land stewardship, and sustainable resource management. Justice in this context hinges on trusted relationships, equitable and just means for engagement, planning, and decision-making. One of the most promising aspects that may come out of this tumultuous, potentially promising period is the emergence of TEK as an inspirational wellspring, that is, a vital source for visioning Indigenous bioregions and the value of **reinhabitation** as seeding the ground for **nature-based solutions** to climate change. *Reinhabitation* refers to the practice of living sustainably within a specific locale, where a community meets most of its fundamental needs for food, water, and shelter from local sources. This approach enables resilience and sustainability through regenerative land and bioregional resource stewardship. Nature-based solutions include actions that incorporate natural features and processes to protect, conserve, restore, sustainably use, and manage natural or modified ecosystems to address socio-environmental challenges while providing measurable co-benefits to and benefit both people and nature.

27.2 Transformative Climate Action Planning: Healing the Urban-Rural Metabolic Rift with Bioregional Justice

Finding ways to strengthen climate change resilience and adaptation

This section integrates science, imagination, and storytelling with a focus on the bioregion as a territorial, place-based, biocultural imaginary to strengthen climate change resilience and adaptation. This section calls out capitalism's urban-rural metabolic rift as one of the core structural problems that stand in the way of progress. The emphasis is on the transformative potential of bioregional imagination and bioregional justice in climate action planning and design, particularly in contexts where political borders fragment vital ecosystems, cultures, and governance.

Indigenous bioregions and reinhabitation

Recovering bioregional awareness is key to bringing about effective climate action planning and adaptation. The bioregional perspective views human settlements as inextricably embedded in and dependent upon more-than-human relationships and ecosystems. This is not a new viewpoint. It has ancient roots in human cognition and survival instincts. Anatomically modern *Homo sapiens* first appeared on Earth roughly 200,000 years ago during the late Pleistocene epoch. Up until 40,000 years ago, we were not the only humans on Earth. At least six other human species coexisted at the same time, with some interbreeding among them. As our ancient ancestors migrated and inhabited diverse landscapes worldwide—deserts, mountain ranges, coastal areas, broad plains, and forests—they developed the capacity to survey, sense, comprehend, and manipulate their surroundings to meet their needs. Survival hinged on knowing where to find sustenance, shelter, and essential resources.

For thousands of years the evolutionary survival of humans in changing environments demanded exquisite sensitivity to the distinctive characteristics of their bioregion. Kumeyaay Indigenous scholar Anthony Pico

describes how the Kumeyaay “took advantage of the different climatic zones in the [Cali-Baja, Southern California, Northern Baja California] region, surviving fluctuations in the climate by rotating domestic crops and living off varieties of food sources in the different ecological systems.” Michael Connolly Miskwish, a Kumeyaay historian, environmental consultant, and student of sociocultural anthropology, sheds additional light on his Kumeyaay ancestors’ Indigenous lifeways:

From Coastal marshes to Mountain wetlands, the Kumeyaay practiced a sophisticated form of environmental management. Fire was certainly one of the greatest tools used by the Kumeyaay and other Indian peoples in California. Fire opened land and allowed transitional plants useful for food and medicines to become available. The new plants attracted game animals used for food, clothing, and tools. The intentional setting of fires also prevented the accumulation of fuel in forested lands and prevented catastrophic fires that destroy adult trees. In the dryer areas, drainage was dammed using rocks and plant material to trap sediment. This helped to raise the water table and allowed the creation of wetlands. The harvest of resources was done according to rules established from centuries of learning. Methods were taught, from generation to generation. [Michael Connolly Miskwish (2017: 26), *A Historical Kumeyaay Textbook*.]

Gary Snyder, a widely cited bioregional thought leader, poet, and environmental activist, laments how the displacement of many present-day individuals such as peasants and Indigenous people from their ancestral lands has subjected these *original inhabitants* to marginalization and exploitation. Snyder has chided urban elites since the 1960s for failing to appreciate the intelligence and wisdom gained by Earth’s original inhabitants (people living close to the land). Snyder underscores the vital importance of localized, millennia-old subsistence patterns crafted by communities intimately connected to their specific regions. In 1995, Snyder issued this bioregional call to action:

Those who envision a possible future planet, ... where we live by the green and the sun, have no choice but to bring whatever science, imagination, strength, and political finesse they have to the support



FIGURE 27.2.1 Map of the Cali-Baja bioregion. Reproduced with permission from Keith Pezzoli and Michael Connolly Miskwish.

of the inhabitory people—natives and peasants of the world. In making common cause with them, we become “*reinhabitory*.”

The call to “reinhabit” bioregions, or “re-indigenize” bioregions, suggests a transformative process that urges a profound reconnection and active engagement with the natural environment and ecosystems within a specific territory. This endeavor entails cultivating a heightened sense of place-based consciousness and realigning human-nature relationships with the regenerative capacities of local ecosystems. At its core, reinhabitation signifies a departure from globalized, extractive, and unsustainable practices, advocating instead for a more symbiotic

coexistence with the land and its diverse communities—both human and more-than-human life forms. Central to this approach is a strong land ethic and a deep appreciation of Indigenous knowledge.

The escalating climate emergency poses significant threats to humanity and other living systems on Earth. Sharp increases in catastrophic impacts are spurring climate action globally, creating opportunities to pursue locally rooted, regenerative, and place-based development. However, localization alone does not guarantee a transition toward more equitable and just community development. Therefore, it is crucial to strategically, inclusively, and intelligently leverage all strains of climate action planning and adaptation for mutual benefit.

Integrating climate-resilient development pathways, climate action planning, and climate adaptation planning

Climate action planning, climate adaptation planning, and the quest for climate-resilient development pathways are three interrelated strategies essential for addressing the multifaceted challenges posed by climate change. Climate action planning generally refers to the process by which governments, organizations, communities, and other entities develop strategies and actions to mitigate the impacts of climate change and adapt to its effects. This involves a systematic approach to understanding local climate vulnerabilities, setting goals for reducing greenhouse gas emissions, and implementing measures to enhance resilience to climate-related risks. Climate action planning aims to create a sustainable and resilient future by addressing both the causes and consequences of climate change through a proactive, comprehensive, and coordinated approach.

Climate adaptation planning has a more specific focus that takes a systematic approach to identify the threats and hazards that might impact a community given plausible future climatic condition. The process involves assessing the risk posed by these threats or hazards and positioning the community to avoid or minimize the consequences of climate related disruptions. Climate action planning tends to focus mainly on reducing greenhouse gas emissions to mitigate future climate impacts. In contrast, climate adaptation planning concentrates on adjusting to and managing the current and anticipated impacts of climate change.

Mitigation efforts include the reduction of greenhouse gas emissions by improving building design, transportation, and the energy supply, while also promoting the reuse, recycling, and refurbishment of products. Adaptation in the form of nature-based solutions shows up as blue and green infrastructure (for example, afforestation, reforestation, regenerative agricultural practices that build healthy soil as a carbon sink, landscaping that utilizes water-conserving plants and techniques, and ecological restoration of riparian habitat, coastal wetlands, and kelp forests). See Figure 27.2.2.

Climate-resilient development pathways aim to maintain ecosystem functions at local, bioregional, and larger scales for human, ecosystem, and planetary health. We have compiled key aspects of climate-resilient development pathways, climate action planning, and climate adaptation planning in Table 27.2.1.

Combining climate-resilient development pathways, climate action planning, and climate adaptation planning provides a comprehensive strategy for addressing climate change. Each approach targets different but complementary, overlapping aspects of the climate challenge.



FIGURE 27.2.2 Nature-based solutions. Reproduced with permission from the USGS.

FIGURE 27.2.1 Key aspects of climate resilient development pathways, climate action planning, and climate adaptation planning

Aspect	Climate-Resilient Development Pathways	Climate Action Planning	Climate Adaptation Planning
Primary Focus	Integrating adaptation and mitigation to advance sustainable development with a focus on equity and system transitions	Mainly focuses on reducing greenhouse gas emissions (mitigation)	Mainly focuses on adjusting to the impacts of climate change (adaptation)
Key Activities	- Combining mitigation and adaptation actions - Promoting equitable, regenerative development - Fostering system transitions - Implement nature-based solutions	- Implementing renewable energy sources - Enhancing energy efficiency - Promoting sustainable transportation - Reducing waste	- Building flood defenses - Improving water management - Developing extreme heat action plans - Protecting ecosystems, green and blue infrastructure
Goals	To achieve sustainable development by integrating and balancing mitigation and adaptation efforts while ensuring equity	To limit future climate change by reducing the amount of greenhouse gases released into the atmosphere	To reduce vulnerability and increase resilience to climate change already occurring or anticipated
Timeframe	Focuses on long-term sustainability, ensuring that mitigation and adaptation efforts are aligned and equitable over time	Focuses on long-term reduction of emissions to mitigate future climate impacts	Focuses on both short-term and long-term measures to cope with immediate and future climate impacts
Scope	Encompasses global, national, and local perspectives, integrating various scales to ensure comprehensive sustainable development	Often has a global or national perspective, aligning with international agreements such as the Paris Agreement	Typically has a local, regional, bioregional perspective, addressing specific vulnerabilities and impacts relevant to a particular territory
Examples of Measures	- Developing inclusive governance structures - Enhancing community resilience - Promoting sustainable land use practices	- Carbon pricing - Electrifying transportation - Implementing energy-efficient building codes	- Constructing seawalls - Retrofitting infrastructure to withstand extreme weather - Enhancing agricultural practices to cope with changing weather patterns
Policy Instruments	Integrated policies that promote both adaptation and mitigation, supported by governance mechanisms and community engagement	Regulations and incentives to reduce emissions, such as carbon taxes, cap-and-trade systems, and renewable energy mandates	Policies aimed at increasing resilience, such as zoning laws, building codes, and emergency preparedness plans

The IPCC defines climate-resilient development pathways as “trajectories that strengthen sustainable development and efforts to eradicate poverty and reduce inequalities while promoting fair and cross-scalar adaptation to and resilience in a changing climate. They raise the ethics, equity, and feasibility aspects of the deep societal transformation needed to drastically reduce emissions to limit global warming (e.g., to 2°C) and achieve desirable and livable futures and well-being for all. See Figure 27.1.1.

The bioregional framework

The bioregional framework aligns well with climate-resilient development pathways. It is built on a solutions-oriented story imagining how human communities can live and work sustainably and regeneratively within Earth’s dynamic web of life. The term *bioregion* literally means “life territory” or “life place”—it combines the Greek word for life (*bios*) with the Latin word for territory (*regia*). In view of rising concerns about the vulnerabilities created by dependence on global supply lines, proponents of the bioregional framework place the dynamics of “localization” in a global context.

Localization is a place-based strategy that has the potential to challenge the extractive systems established through settler colonization by returning control of land, resources, and economic decision-making to local and Indigenous communities. Rather than allowing wealth to be extracted and accumulated elsewhere, localization advances community wealth-building models, such as community land trusts, agricultural and worker cooperatives, Indigenous-led enterprises, and shared commons, that anchor land in collective stewardship, prevent displacement, and circulate wealth locally. Tools supporting this bioregional transition include food sovereignty as a governance framework that restructures land access, production, and local markets, adapting in place, eco-districts, biocapacity, ecological footprint analysis, BALLE (Business Alliance for Local Living Economies), LOIS (local ownership and import substitution), community-based natural resource management (CBNRM), relocalization, and reinhabitation.

Bioregional planning and design activities that put us on a positive climate-resilient development pathway include, for example, integrated

watershed management, foodshed planning, wildfire corridor risk assessment, green/blue infrastructure development, agroecology, sustainable farming, and ecological design that regenerates biodiversity and ecosystem services. Bioregional-scale initiatives incorporate traditional ecological knowledge and land ethics rooted in Indigenous wisdom traditions cultivated over millennia. The bioregional perspective sees the disproportionate burden suffered by individuals who are Black, Indigenous, or people of color in the face of adverse climate effects, encompassing both urban and rural environments. All this generates critically constructive momentum. But there are serious structural problems that thwart progress; two of which are noted below.

First, most bioregions worldwide are fragmented by international borders and a myriad of other jurisdictional boundaries, imposed barriers, and fortified walls. This fragmentation complicates, if not outright hinders, bioregional-scale collaboration and integrated land and watershed management. Second, there is a persistent city-centric, metropolitan bias in urban and rural development. This bias is highly problematic and arguably contributes to the precarious state of democracies in the United States and other countries today. Robert Thayer compellingly argues this point in his 2020 article “A Bioregional Bridge Across the Urban-Rural Divide.” The bioregional narrative shifts the focus beyond the urban-metro bias to emphasize how a city relates to its surrounding peri-urban, working lands and wild spaces. The UN’s New Urban Agenda and 2030 Sustainable Development Goals begin to address this second obstacle by highlighting the importance of urban-rural linkages.

Herein lies one of humanity’s most promising endowments: the power of imagination, and more specifically, the power of bioregional imagination. Our ability to envision and collectively share the fruits of our imagination is an indispensable asset for solving wicked problems like climate change.

Bioregional imagination

There is a voluminous literature that explores the imagination as an object of study. Jean-Paul Sartre’s interpretation of imagination is one of the best. As detailed in his book *The Imaginary*, Sartre provides a philosophical underpinning to the significance of bioregional imagination.

Sartre argues that “imagination is not an empirical power added to consciousness, but it is the whole of consciousness as it realizes its freedom.”

As cultural, story-driven human beings, we envision the natural world and its systems in certain imagined ways. Scholars in science and technology studies identify such perceptual predispositions as *imaginaries*. For instance, the societal tendency to view human-nature relations in a particular binary way has grounds in a collectively reproduced *socioecological imaginary*. Of course, there are always exceptions to the rule: outliers, nonsubscribers. Consensual story validation writ large (that is, the ongoing reproduction of widely held/accepted cultural norms, beliefs, and expectations) always has contingencies. Stories that lose meaning and/or functional utility, or that get unjustly targeted for repression and erasure, drop out of mainstream use. By the same token, a prevailing cultural tendency to view human-technology relations in a certain way (for example, technological progress in and of itself will somehow save us from climate disruption) is reproduced by a *socio-technical imaginary*.

Engaging bioregional imagination under equitable and just conditions can enable people to develop a stronger sense of place, identity, and responsibility toward the natural world. In this light, bioregional imagination is an exercise of human freedom and creativity, enabling societies to reimagine their relationship with the natural world.

The bioregional transition

Contributors to bioregional imagination and the bioregional transition extend beyond self-proclaimed bioregionalists, encompassing a wide range of scholarly and professional fields. Environmental studies and ecology researchers investigate the ecological intricacies of bioregions, exploring how unique landscapes function as integrated systems. Geographers map and analyze the biogeophysical and spatial dimensions of bioregional territories. Anthropologists and community-based leaders study the cultural dimensions, Indigenous knowledge, wisdom traditions, and collective practices rooted in specific bioregions. Social scientists, including sociologists and political scientists, examine the social structures and governance models shaping interactions within and between bioregions.

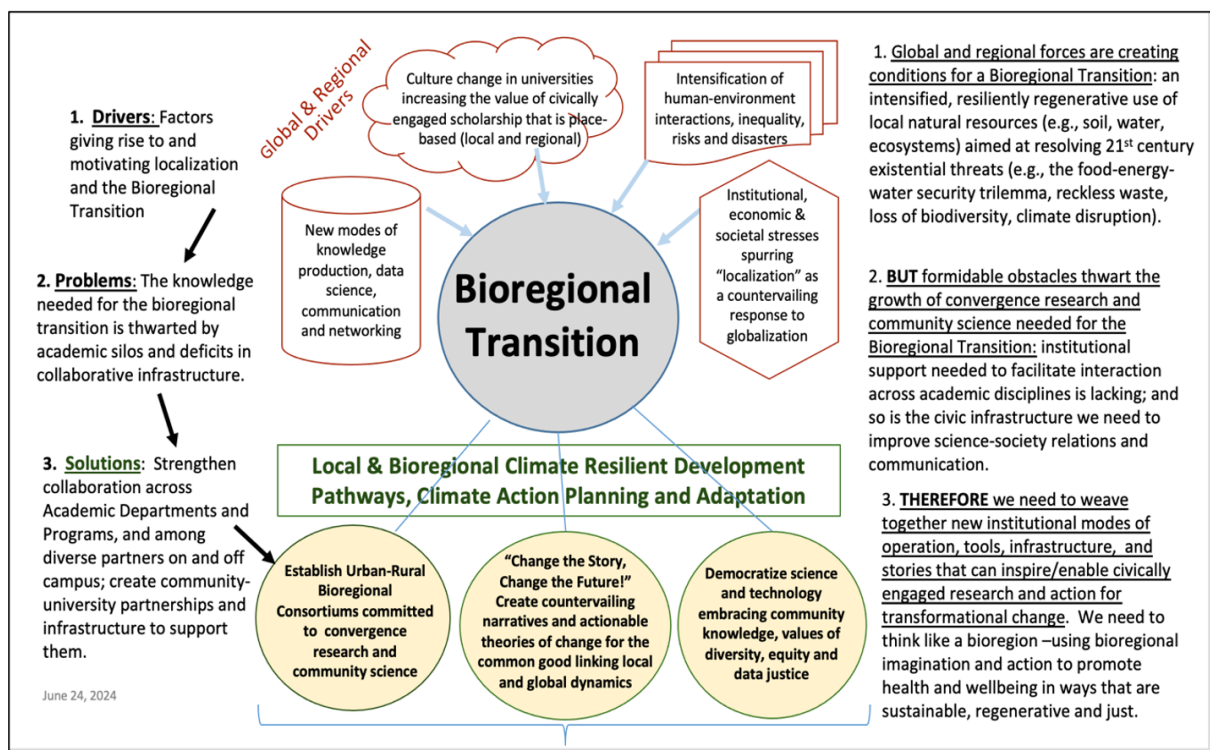


FIGURE 27.2.3 And-but-therefore storyboard. Reproduced with permission from the Bioregional Center for Sustainability Science, Planning and Design.

Two distinct yet complementary ways to imagine and strategically plot a just and climate-friendly bioregional transition are shown in Figure 27.2.3 and Figure 27.2.4. Figure 27.2.3 is in the format of an and-but-therefore story. Figure 27.2.4 is in the format of a theory of change illustrating conditions and interventions on a strategic pathway toward a preferred desirable outcome (north star).

The urban-rural metabolic rift

When conceptualizing and subsequently pursuing climate-resilient development pathways, it is essential to address long-standing concerns about widening inequities in urban-rural resource flows and relationships. These concerns trace back to the Industrial Revolution's inception in the late eighteenth century, a transformative era that marked the shift from agrarian economies to industrialized and urbanized societies. This period was characterized by significant technological advancements

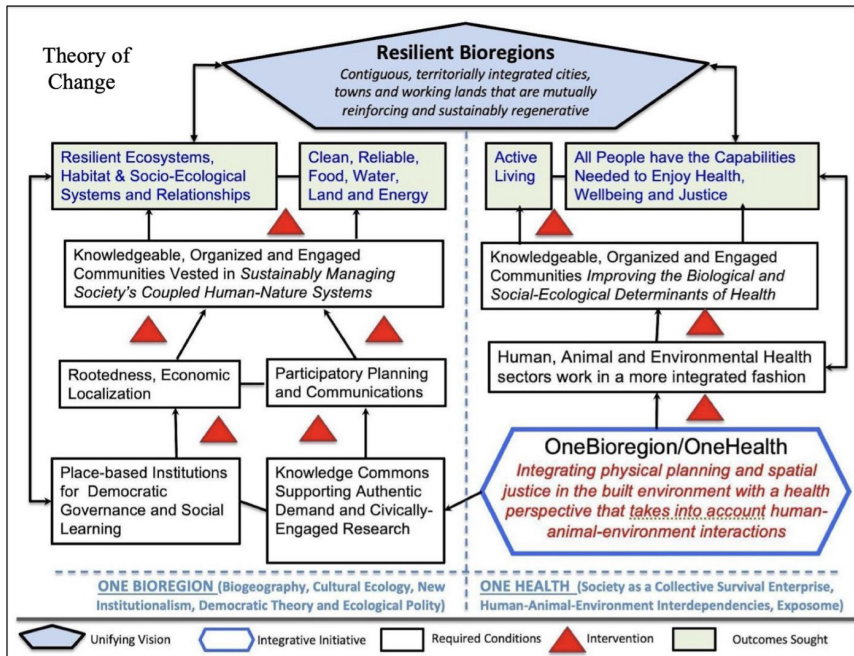


FIGURE 27.2.4 Theory of change. A flow chart illustrating the integrative OneBioregion/OneHealth initiative including required conditions, interventions to reach the resilient bioregion north star. Reproduced with permission from the Bioregional Center for Sustainability Science, Planning and Design.

such as the development of the steam engine, mechanized textile manufacturing, and innovations in iron production. Karl Marx and others have attributed this impactful spatial justice problem to an “urban-rural metabolic rift” endemic to capitalism. This rift highlights the systemic extraction of resources from rural areas to fuel urban industrial growth, leading to environmental degradation and socioeconomic disparities that persist today.

Marx argued that capitalism creates a rift in the social metabolism by extracting resources from rural areas and concentrating them in urban centers, leading to environmental degradation and the depletion of soil fertility. This process separates the cycle of nutrient replenishment, resulting in long-term ecological harm. In volume 1 of *Capital*, as cited by Cooper in 2021, Marx characterizes the “rift” concept:

Capitalist production collects the population together in great centres, and causes the urban population to achieve an ever-growing

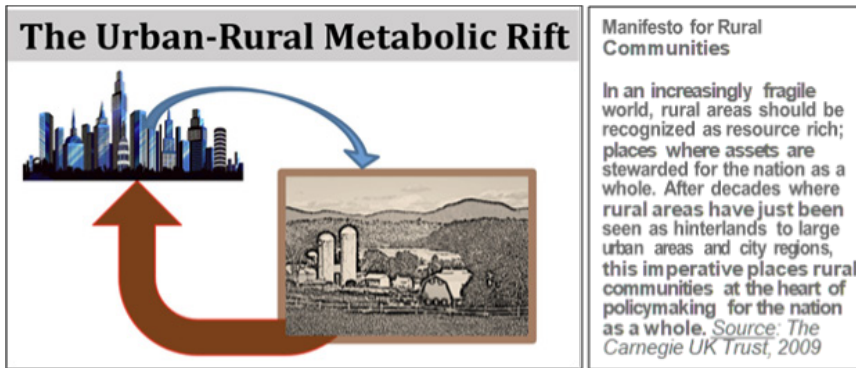


FIGURE 27.2.5 The urban rural metabolic rift. Reproduced with permission from the Bioregional Center for Sustainability Science, Planning and Design.

preponderance ... it disturbs the metabolic interaction between man and the earth, i.e. it prevents the return to the soil of its constituent elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal natural condition for the lasting fertility of the soil.

Urban centers heavily depend on rural areas for the provision of food, water, energy, and raw materials to sustain their urban lifestyles. However, this extraction of resources often leads to environmental degradation, such as deforestation, soil erosion, water pollution, and depletion of nonrenewable resources, in the rural areas. Furthermore, urban areas generate large amounts of waste, including solid waste, wastewater, air pollutants, and greenhouse gas emissions (GHGs). The disposal of these wastes can have adverse effects on rural communities and ecosystems, leading to contamination of water sources, soil degradation, and air pollution.

The urban-rural metabolic rift also encompasses social and economic disparities between urban and rural areas. The concentration of wealth, opportunities, and infrastructure in urban centers often leads to the marginalization and impoverishment of rural communities, as resources are disproportionately channeled toward urban development while rural needs are neglected.

The UN's 2030 Sustainable Development Goals, including the New Urban Agenda (Goal 11: sustainable cities and communities) and climate

action (Goal 13), underscore this key point. The UN's Habitat III Conference in 2016 inspired the New Urban Agenda, emphasizing the need for localization to address climate change and other pressing issues. Entry 71 on the New Urban Agenda's list of principles and commitments documents how localization has become a high priority, promoting integrated and inclusive urban-rural development to ensure equitable resource distribution and enhance resilience across all communities:

Entry #71. We commit ourselves to strengthening the sustainable management of resources ... in a way that considers urban-rural linkages, functional supply and value chains vis-à-vis environmental impact and sustainability and that strives to transition to a circular economy while facilitating ecosystem conservation, regeneration, restoration and resilience in the face of new and emerging challenges.

(Source: UN Habitat III Conference 2016 New Urban Agenda Commitments to Localization, <https://habitat3.org/wp-content/uploads/NUA-English-With-Index-1.pdf>)

To claim that the bioregion is the most promising territorial scale for transitioning to climate-friendly sustainable development does not assume that localization will necessarily be a progressive process. This warrants two notes of caution.

First, care must be taken when closely associating culture and homeland—this begs the question, Whose culture matters? Says who? *Homo sapiens* have always been a mobile species, and cultures sometimes clash violently. Modernity's ethno-nationalists and fascists can exploit culture-place relationships to their advantage, leading to policies of exclusion and racial injustice. An ethno-nationalist is an individual or group that advocates for the political, cultural, and territorial dominance of a specific ethnic group within a nation-state. Ethno-nationalism emphasizes the belief that a particular ethnic group, often tied by a shared ancestry, language, or culture, should have sovereignty over a territory, and it tends to exclude or marginalize other groups that do not fit within that dominant ethnic identity. Ethno-nationalists might exploit the concept of bioregionalism by framing a particular (privileged) culture

as inherently tied to a specific place, using that connection to justify exclusionary or xenophobic practices.

Second, it is also crucial to consider how the prospects for a viable and just twenty-first-century bioregional transition must go beyond securing healthy and regenerative relationships within isolated biocultural places; it must also cultivate relationships across bioregions in ways that uphold bioregional justice.

Bioregional justice

Bioregional justice raises socio-spatial, moral, and ethical concerns about unfair and harmful human and natural resource extractions from a particular territory. On a planetary scale, the bioregional justice lens provides a way to call out inequities that arise when entities based in one bioregion recklessly extract resources from a bioregion outside of their own, thereby enriching themselves at the expense of those living in the degraded, exploited bioregion. As used here, the term *reckless* refers to extraction with a blatant lack of care from a place-based sustainability standpoint. Reckless rampant extraction leaves the exploited bioregion in ruins, with a greatly reduced capacity to regenerate its social, economic, and ecological systems, undermining the survival and well-being of its inhabitants. One of the consequences is the rise of climigration—people’s movement out of their city, town, or village as a result climate change impacts exacerbated by ecological degradation that makes staying home too risky. Climigration is not a new phenomenon.

In most regions around the world there are original inhabitants—Indigenous people—whose ancestors freely traversed their bioregional range, while sometimes freely migrating into other bioregions as climatic or other conditions changed over thousands of years. During the dawn of human history, this freedom of migration was less restricted. At the same time, the capacity for large-scale, trans-bioregional extraction by humans was very limited. However, over the past 500 years of globalization and colonization, bioregional enclaves have emerged, where unfair and detrimental extractions from people and resources in one bioregion by those in another have become commonplace. The history of settler colonialism in North America, including California, traces back to the late fifteenth century with Christopher Columbus’s

voyages. European powers, especially Spain, Portugal, England, France, and the Netherlands, engaged in centuries-long settler colonialism in the Americas that subjected Indigenous peoples to violence, displacement, and loss of life due to conflicts, diseases, and forced labor. Achieving bioregional justice in California requires acknowledging and addressing this historical injustice inflicted upon Indigenous peoples. Reconciliation and compensation are essential steps in fostering genuine healing.

Additionally, no less significant, the enduring legacy of slavery and racism experienced by African Americans underscores the need for similar considerations in bioregional efforts to enhance climate change resilience and adaptation. Acknowledging and redressing these historical injuries is fundamental to building a more equitable and just climate-friendly future.

27.3 Community-University Partnerships: Enabling Place-Based Climate Change Engagement and Connectivity

Community-university partnerships

A slow but significant cultural shift is occurring within institutions of higher education in the USA and beyond. This shift is evident in efforts to foster more engaged, local forms of research, teaching, and community connection, which bodes well for progressive bioregional transitions. The success of these transitions hinges on place-based story lines that inspire imagination and tangible action. Community-university partnerships have a vital storytelling role to play in linking the social sciences, humanities, physical and life sciences, engineering, and management. It's time for all hands on deck.

Establishing rooted community-university partnerships

Rooted community-university partnership aligns theory building and local action in education, research, and community engagement. It does so in place-based ways that intentionally democratize science, technology, education, and training. "Rooted" partnerships are like the roots of a plant that spread out in multiple directions. Instead of a top-down, hierarchical structure, these partnerships form a network of interconnected relationships. Rooted community-university partnership combines grassroots and treetops.

Currently, most community-university partnerships and knowledge-action collaboratives concerned with climate change lack the types of connections and means to identify, measure, visualize, and map urban-rural relationships and interdependencies in smart and connected ways linking local and bioregional scales. Yet, this kind of local integrative capability is essential to the urgent task of making city-regions climate friendly, resilient, and ecologically regenerative. The three cases we highlight in this chapter move us from (b) to (c) in Figure 27.3.2.

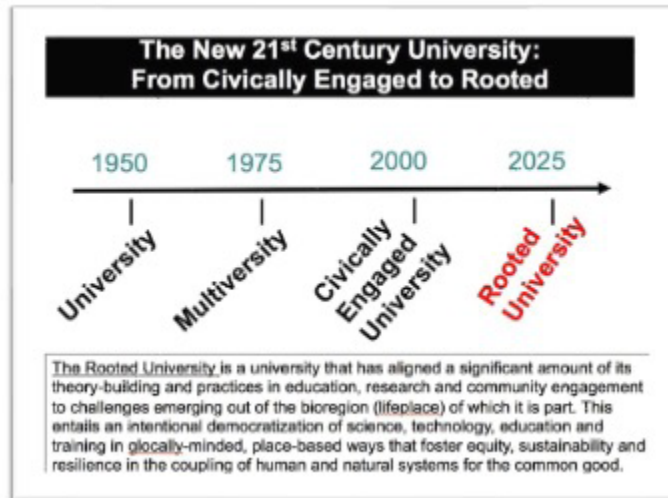


FIGURE 27.3.1 The rooted university. Reproduced with permission from the Bioregional Center for Sustainability Science, Planning and Design.

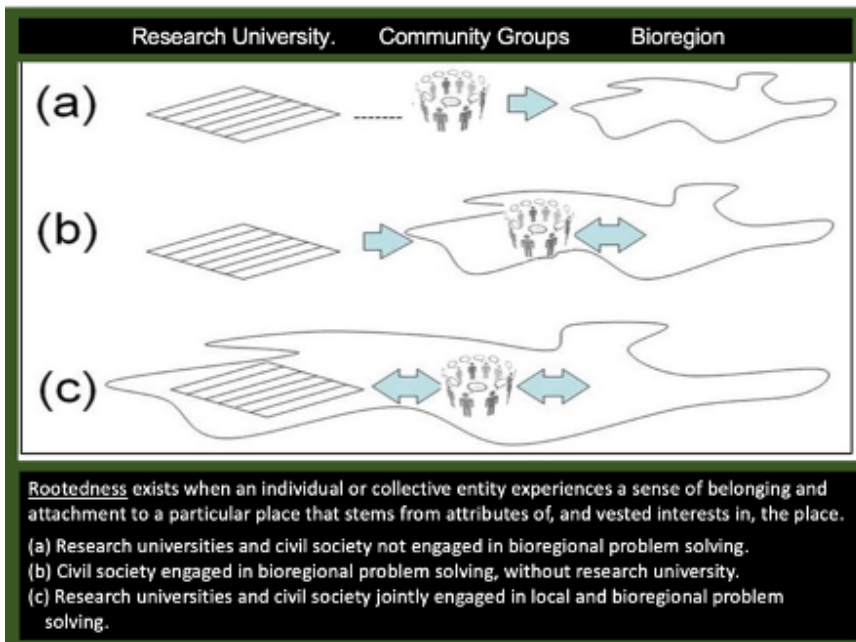


FIGURE 27.3.2 The rooted university and civil society jointly engaged in local and bioregional problem solving. Reproduced with permission from Joe Ravetz and the Bioregional Center for Sustainability Science, Planning and Design.

Collaborative partnerships: community knowledge and data justice

The collaborative and participatory nature of rooted university activities can help bridge the gap between research and practice, serving the communities most vulnerable to climate change. Authentically including the “Demos” (will of the people) is key to ensuring the ethical creation, management, use, and sharing of information and knowledge. Data justice must be established intentionally. Yet, securing data justice, attuned to the Demos, is elusive given deep contemporary flaws in how information and knowledge are created and shared.

To democratically foster trust and equity in ideation, strategic thinking, and decision-making processes, marginalized communities must have control over their data and how they articulate (create, share) narratives they consider essential. This claim does not assume that marginalized communities are monoethnic blocks devoid of fractious divisions. Often, marginalized communities are fraught with ideological and other divisions, including contested and conflicting values. Life is an ongoing negotiation process at all levels, rife with inequities in who sets and enforces the rules.

By prioritizing ethics, knowledge diversity, and data justice, rooted universities can facilitate open access to data—when deemed appropriate by those legitimately and ethically involved—in ways that are transparent and accountable. This approach can help strengthen community participation in shaping sustainable solutions that directly impact their lives, particularly in the face of difficult, complex, ambiguous, and conflicting conditions. Rooted universities are well positioned to co-generate knowledge-action collaboratives in alliance with communities, especially now given the rapid rise of artificial intelligence (AI) following decades of research and development.

To anchor this discussion in applied work taking place in the Cali-Baja bioregion, we turn here to briefly reflect on three exemplary community-university partnerships. The three cases include (1) Advancing Green Infrastructure for Learning and Equity (the AGILE Project in San Diego County, CA); (2) Environmental Justice In California’s Lithium Valley (a grassroots community-based movement in Imperial County, CA, with demands concerning the onset of a lithium extraction industry); and (3)

Cross-Border Commons (a transnational environmental conservation initiative in the San Diego–Tijuana city-region).

All three cases are notable for their progress as forward-looking collaboratives that embrace globally minded bioregional imagination and activism within the Cali-Baja bioregion. All three cases are inclusively integrating diverse forms of knowledge and action to improve the collective well-being of people and living Earth systems, and placing climate and data justice at the heart of community knowledge generation, curation, and sharing. The first two cases (AGILE and Lithium Valley) concentrate on the US side of the Cali-Baja bioregion. The third case (Cross-Border Commons) is pursuing local and bioregional solutions with an emphasis on establishing equitable and just transborder relationships and collective stewardship.

The AGILE initiative: Advancing Green Infrastructure for Learning and Equity

The AGILE initiative is led by UC San Diego's Bioregional Center for Sustainability Science, Planning and Design (the Bioregional Center, or BioREG) jointly with the Global Action Research Center (Global ARC). The Global ARC is a nonprofit community-based organization that specializes in creating community-university partnerships. AGILE addresses urbanization and climate change by focusing on green infrastructure, including nature-based solutions, and education with a focus on underserved and vulnerable communities. Green infrastructure includes natural and semi-natural features designed to restore ecosystems and mitigate climate impacts, such as trees, permeable surfaces, and watersheds. It enhances community resilience by managing flooding, reducing carbon pollution and urban heat, and providing communal spaces.

The AGILE mission is to bridge the gap between academic research and real-world applications, empowering communities to create sustainable and equitable solutions to their most pressing challenges. The Global ARC establishes trusted collaborative partnerships with local communities, integrating scientific research with grassroots knowledge to cocreate actionable strategies for social and environmental well-being.

A cornerstone of the AGILE Project is active community engagement. The project team works closely with residents, community leaders, and

organizations to ensure that their voices are heard and their needs are addressed. This participatory approach helps to build trust and fosters a sense of ownership among the community members. By integrating community knowledge with scientific research, the project seeks to develop innovative solutions that can be scaled and replicated in other contexts. The design aspect of this effort aligns with the UC San Diego World Design Capital mission. AGILE aims to innovate climate-friendly landscape ecological design and infrastructure—making it sustainable, resilient, and just, attuned to human-animal-environment interactions. The AGILE team operates out of a community engagement workshop space provided by the Design Lab at UC San Diego.

Figure 27.3.3 shows the Pueblo San Diego County watershed, featuring Chollas Creek. It is one of the most polluted in the United States. Urban development has paved over natural land, leading to severe flooding problems, exacerbated by climate change. Efforts are under way to restore the earth's capacity to absorb stormwater. Figure 27.3.3 is a watershed-scale asset map of potential sites for creating green infrastructure including urban agriculture and food forests. The yellow polygons in the image show 810 vacant lots, about 150 of which the AGILE team, including hundreds of student data collectors (who crowdsourced the data as part of a university course requirement), determined to be good sites for community gardens supported by green infrastructure (for example, bioswales, food waste composting systems).

The site assessment considered land ownership, biogeography, hydrology, socioeconomic factors, environmental public health conditions, and public interest. The Bioregional Center's community-university partnership, with support from UC Global Food Initiative, City of San Diego, EPA, and the landowner, transformed one of these vacant lots into a demonstration site for urban agriculture, including a food forest and community hub for composting food waste. The site is now also functioning as a community-based climate justice learning hub for urban agriculture and composting and has a youth-led climate justice learning center.

The AGILE partnership integrates convergence research and community science, benefiting a wide range of participants. This partnership has the potential to establish green infrastructure equity improvement districts (eco-districts). The goal is to expand the AGILE Network by

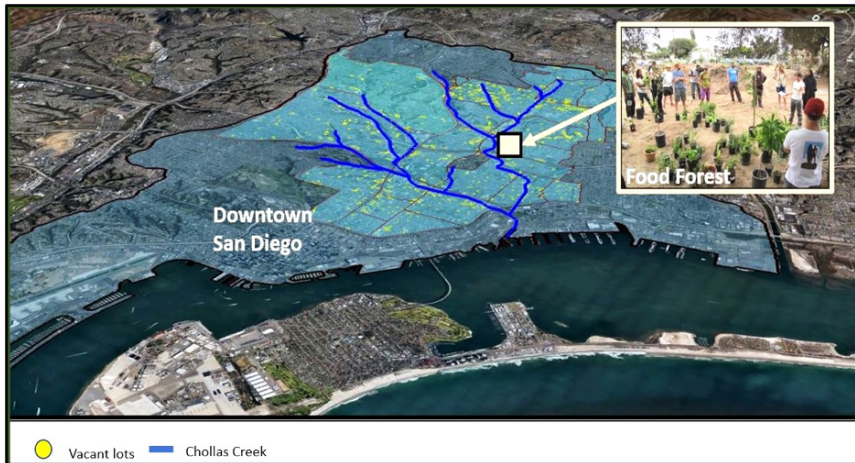


FIGURE 27.3.3 The AGILE initiative: Advancing Green Infrastructure for Learning and Equity. Reproduced with permission from the Bioregional Center for Sustainability Science, Planning and Design.

integrating physical, cyber, and civic infrastructures into connected learning hubs. These hubs will facilitate robust community planning and decision support at the local scale while considering bioregional and global dynamics. This effort can be described as urban acupuncture in the body of the bioregion.

The Comite Civico del Valle collaborative: seeking environmental justice in California’s Lithium Valley

Imperial Valley, now also known as Lithium Valley, is in Southern California’s Imperial County. It is a distressed area facing high unemployment, seasonal and low-paying agricultural jobs, extreme heat, and air quality issues due to the drying out of the Salton Sea. Currently, the region is preparing for large-scale lithium extraction from the Salton Sea’s geothermal brines, crucial for electric vehicle batteries. There are serious concerns about potential environmental and social impacts on vulnerable communities.

The nonprofit community advocacy organization Comite Civico del Valle is at the forefront of the bioregional justice movement in Imperial Valley. The organization has successfully increased electric vehicle charging infrastructure in the county, promoting local green jobs, boosting tourism, enhancing STEM education, and reducing air

pollution. Their holistic advocacy emphasizes the interconnectedness of ecosystems and communities, advocating for equitable distribution of environmental benefits and burdens.

Comite Civico del Valle is leading efforts to ensure responsible lithium extraction that benefits local communities. Recently, it filed a lawsuit against Controlled Thermal Resources, challenging the environmental review of their lithium extraction project. Luis Olmedo, executive director of Comite Civico del Valle, argues that the review is “deeply flawed” and fails to address critical issues such as air quality, hazardous waste, and water supply. This lawsuit underscores the organization’s commitment to holding developers accountable and ensuring that the community’s concerns are addressed.

To further protect the community, Comite Civico del Valle has pushed for a lithium extraction excise tax to fund Salton Sea restoration and local infrastructure, public services, and community projects. However, this tax faces potential obstacles from a proposed state constitutional amendment that could make it harder to pass new taxes.

Olmedo, advocating for the interests of his communities, emphasizes how it is unfair for corporate entities living outside Imperial Valley



FIGURE 27.3.4 California-Mexico 2030 Summit, April 19–20, 2023. Photo by Keith Pezzoli.

communities to exploit the valley's human and natural resources in ways that degrade local people and land to the detriment of future generations. Olmedo shared the organization's concerns about lithium extraction at the California-Mexico 2030 Summit, organized by the UC Alianza Mexico Center on April 20, 2023. His experience at Comité Cívico del Valle, engaging with policymakers and stakeholders at all levels to advocate for just bioregional development that considers the broader impacts of resource extraction and emphasizes local sustainability, contributed a relevant perspective to the summit's goal. The summit focused on advancing a sustainable and climate-resilient binational economy, fostering collaborations, and addressing policy challenges needed to strengthen ecological democracy, governance, and sustainability in vulnerable communities impacted by climate change.

Enabling transnational environmental conservation: the Cross-Border Commons

The UC San Diego Center on Climate Justice has established a Cross-Border Commons, a groundbreaking transnational environmental conservation initiative in the Cali-Baja bioregion. The Cross-Border Commons connects the Tijuana River Estuary in San Diego with Los Laureles Canyon in Tijuana, creating a continuous political, social, and ecological zone to protect shared water and environmental resources.

Los Laureles Canyon is home to approximately 85,000 people. The rapid urbanization taking place in this canyon is mostly low income and unregulated. Consequently, there are serious environmental problems, including increased pollution, inadequate infrastructure for waste management, and vulnerability to floods and landslides during extreme weather events. (See the Clean Currents Coalition: <https://cleancurrentscoalition.org/coalition-projects/tijuana-river-mexico/> and a UCSD-TV documentary at <https://www.uctv.tv/shows/Los-Laureles-Canyon-Research-in-Action-16256>.)

Over the past decade, Los Laureles Canyon has lost 70% of its open space due to unregulated urban growth, lacking proper sewer and water management infrastructure. The Cross-Border Commons initiative is addressing these issues by developing green and blue infrastructure, such as micro basins and water catchment systems, to protect the estuary.

In addition, robust cultural programs for environmental education are being implemented. The project is guided by a coalition of state and municipal governments, grassroots organizations, communities, and universities on both sides of the border, building upon the work of many activists, community leaders, and academic initiatives that have engaged with this environmentally vulnerable area over the years.

The Cross-Border Commons initiative proposes to bundle undeveloped parcels in Los Laureles Canyon into an archipelago of conservation, establishing a political framework for a transnational environmental zone. This framework aims to establish a land conservancy, using a community trust fund to acquire land and support sustainable conservation programming. Furthermore, the project is investing economic resources and educational and research programs to increase community awareness and infrastructural capacity in Los Laureles Canyon, recognizing the Tijuana River Estuary as a bioregional and ecological asset.

The vision for the transboundary land conservancy expands notions of conservation beyond protection. By design, figuratively speaking, the conservancy will link otherwise fragmented “islands on the land.” The corridors linking these spaces will serve as a life-sustaining matrix of green and blue infrastructure, good for people and the planet. Lowen-haupt Tsing and colleagues refer to vital sites of this sort as patches (see their 2024 book: *Field Guide to the Patchy Anthropocene: The New Nature*). The Cross-Border Commons envisions an archipelago of networked protected lands that will be adopted and managed by coalitions linking universities and cultural, civic, and environmental NGOs. These coalitions will mobilize economic resources, encourage community participation, and curate conservation programs, promoting long-term environmental health and sustainability. The hydrological-environmental resources of the bioregion will become common ground, a de-bordered shared landscape, a living laboratory, to innovate inclusive bottom-up socioecological planning with nature-based solutions, eco-strategies, and eco-technologies to restore the habitat and support biodiversity. The excerpt below from Center on Global Justice (<https://gjustice.ucsd.edu/spatial-justice/>) provides details:

The Cross-Border Archipelago: Aspirational Planning and Design Interventions

[N]ative plant restoration, reforestation and deep root planting on slopes, water catchment and stream daylighting, erosion control along water routes, constructed mini-wetlands, gray water hydro-filtration channels, swales and Kumeyaay rock drop infrastructure, rewilding through revegetation, gabion terracing and eco-technologies for slope stabilization, topsoil regeneration and activation, native plants seed propagation for pollinators, removal of high-risk non-native species, establishing and reinforcing biodiversity corridors and support systems for bird and animal migration.

The kinds of interventions listed in the excerpt are urgently needed to advance climate change mitigation and adaptation and at the same time build alternative equitable means for locally providing basic needs: food, water, energy, livelihoods both urban and rural, secure and safe habitat, and working lands that are ecologically resilient and regenerative for generations to come. The holistic approach considers human-animal-environment linkages, and it values Indigenous ecological knowledge.

The beating heart of the Cross-Border Commons is UC San Diego's Center on Global Justice's knowledge-action network of Community Stations. There are currently four stations operating across the Cali-Baja bioregion, each focused on a unique set of urban and environmental issues. Moving away from traditional charity or "applied research" models, the Community Stations embrace a collaborative, horizontal approach where both the university and the community are active partners. This mutual exchange fosters the coproduction of knowledge and solutions, grounding the partnership in trust and long-term commitment. See UC San Diego Community Stations: Public Spaces that Educate: <https://communitystations.ucsd.edu/>.

27.4 Youth-Led Climate Action: Rooted Pedagogy Building Community Power

Climate action and community power

This section explores the vital role of community power in addressing disparities in health and well-being, with a particular focus on youth leadership. It addresses several key questions: What can we learn from youth-led initiatives in this domain? Why is it essential to integrate youth-driven community power building into climate change mitigation and adaptation strategies? Can youth significantly contribute to building community power? The success of the Young Environmental Justice Advocates Academy (YEJAA), an experiential learning program led by a community-university partnership between the Global ARC and the Bioregional Center for Sustainability Science, Planning and Design (Bioregional Center), provides a powerful example. Based in San Diego, California, YEJAA creates a safe, inclusive learning space for young leaders to take on active roles in environmental justice advocacy, demonstrating how youth can be instrumental in driving systemic change.

Now in its fourth year, YEJAA, initiated by the Global ARC, incorporates curriculum and teaching contributions from UC San Diego's Bioregional Center. This collaboration highlights the importance of multigenerational cooperation, with youth leaders bringing fresh perspectives while seasoned professionals and elders offer wisdom and guidance. The Global ARC and Bioregional Center have a long-standing partnership spanning over a decade. The Global ARC, a nonprofit organization, facilitates community engagement by connecting grassroots movements with policymakers and researchers. Their work strengthens civic engagement, enhances community use of science and technology, and facilitates bidirectional learning between communities and universities.

Using a place-based approach rooted in popular education, the Global ARC promotes **authentic demand** through activities that support grassroots organizing, research, strategic planning, and community

campaigns. Popular education, deeply political and committed to progressive social change, nurtures critical consciousness by helping communities understand and challenge structural inequities, including racism, gender bias, and other forms of oppression. It fosters experiential, community-driven learning useful in efforts aimed at transforming unjust systems and building inclusive, sustainable futures. This model demonstrates that youth-led community power building is not only possible but imperative for achieving climate resilience. Youth are uniquely positioned to challenge the status quo, innovate, and push for transformative solutions. See Figure 27.4.1 through Figure 27.4.4 for excerpts of the YEJAA curriculum, designed to enable young people to gain the knowledge, tools, and skills to be effective leaders and rooted community changemakers.

The Global ARC approach to engaging youth in popular education supports the development of authentic demand in several ways, ranging from assisting residents in getting organized to providing research, strategic planning, and campaign support to develop organizations and

 The Global ARC <i>Global Action Research Center</i>		
THE CURRICULUM	CONTENT	TIME
- The young people learn about Climate Change, Local Environmental Justice issues, and Nature-Based Climate Solutions. - Throughout the Academy, youth have several opportunities to meet and work with other organizations and youth in the Environmental Justice Movement, providing graduates with several pathways for continued engagement in the movement post Academy. - They develop a Public Education campaign that informs their peers, parents, community residents, and policy makers about these solutions, using skills built through training and experience. They document the community's perspective and present a report to policy makers at the city, county, and state levels.	Climate Science: What is happening to our planet? How is it affecting our local community?	Nine (9) Hours
	Nature-Based Solutions: What can we do to save our communities?	Nine (9) Hours
	Understanding Power: Who has the authority to address our concerns?	Three (3) Hours
	Community Education: Bringing Community Voices into the Public Dialogue	Nine (9) Hours

FIGURE 27.4.1 The Young Environmental Justice Advocates Academy (YEJAA) curriculum. Reproduced with permission from the Global Action Research Center.

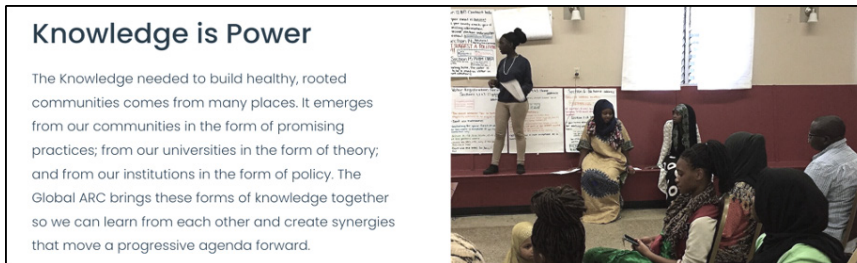


FIGURE 27.4.2 Knowledge needed to build healthy, rooted communities. Reproduced with permission from the Global Action Research Center.

Youth Environmental Justice Advocates Academy

Students are strengthening their knowledge, skills and ethics to:



Connect research to action with a serious commitment to addressing the authentic demands of environmental justice communities. To do this well you have to be well-informed, culturally sensitive, and trusted as a good storyteller. The Zines students produce is proof positive that they gain this knowledge and crucial set of skills.

Advocate education and learning in distressed communities, including their own communities, most impacted by climate change on top of social and environmental health problems. Student gain an understanding of how climate change impacts communities of color especially hard, and in ways made worse by racism, histories of toxic dumping, and widening disparities in health. They learn to see the connections!

Become Leaders, making their voice and the voice of their peers heard—articulating critically constructive, actionable ideas about the root cause of problems and potential solutions. Their community engagement builds on promising local and bioregional efforts (e.g., green infrastructure, planting trees, community gardens, water harvesting, composting systems, bioswales, etc.). They shine as youth leaders/activists.

FIGURE 27.4.3 Strengths gained as a Youth Environmental Justice Advocate. Reproduced with permission from the Global Action Research Center.

social movements. Authentic demand registers effectively when the people affected by a policy are at the decision-making table, have access to the same knowledge and information as others around the table, have an influential voice in the decision, and are connected and accountable to an organized constituent group.

YEJAA's 3-month curriculum helps young people learn about local environmental justice issues; meet and work with others within the environmental justice movement; and learn how to develop a public education project that will engage their peers, parents, and community



Civically Engaged Research

The application of social science research methodology in service of a community for a particular purpose. It is the use of the tools developed by social science to answer the questions raised by a community and fully involves that community in the development and implementation of the research as well as the interpretation of the data collected and the application of the findings.

FIGURE 27.4.4 Community science: Co-designing civically engaged research. Reproduced with permission from the Global Action Research Center.

residents. In the process, the young people gain knowledge about environmental justice issues and then take on the responsibility of sharing that knowledge with their respective communities. In addition to gaining knowledge, the young people gain some skills to become advocates. Those skills include how to (1) research their own communities to identify environmental injustices; (2) turn their research into action; and (3) most importantly, become leaders within the environmental movement. Their combined knowledge and skills serve as the foundation for conducting civically engaged research and building community power.

Storytelling in research communication aimed at building community power

On June 7, 2024, one of the YEJAA cohorts graduated. The YEJAA graduates, all seniors in high school, were awarded certificates of completion jointly signed by the Global ARC and Bioregional Center. The 2024 graduating class of 23 students successfully acquired advocacy skills, including the ability to design and publish multimedia for research communication purposes in their respective communities. The students collectively produced a zine—a self-published, small-circulation booklet (that is, mini *magazine*). They titled their zine *People and Planet Over Profit*. Sections of the zine touched on the meaning of environmental justice, CO2 emissions, food deserts, food swamps, food justice, resilience, and strategies for building community wealth.

Zines are effective tools for research communication, popular

education, and grassroots organizing because of their accessibility, flexibility, and creative potential. As a medium, zines excel at simplifying complex information, making it accessible using visuals, concise text, and engaging stories. The student authors worked closely with community members, leveraging their zine to present their findings in creative ways that resonate with a broader audience. The broad distribution capabilities of zines, in both print and digital formats, further enhance their reach and impact. Interactive elements, such as questionnaires and calls to action, can deepen reader engagement, turning passive consumption into active participation.

Zines empower readers with critical knowledge on important issues. The collaborative creation process of zines fosters peer learning and community involvement, making education a shared, horizontal experience rather than a top-down dissemination of information. Zines can be tailored to reflect the cultural and social contexts of their audiences, enhancing the relevance and relatability of the educational content. By incorporating various modes of communication, such as visual, textual, and interactive elements, zines cater to different learning styles, making education more inclusive and engaging.

For grassroots organizing, zines build community power and mobilize action by amplifying marginalized voices and sharing vital resources. They serve as platforms for stories and perspectives that might be overlooked by mainstream media, democratizing information and advocacy. By raising awareness on key issues and providing practical steps for involvement, zines inspire and mobilize readers to act. Additionally, zines can share information about resources, upcoming events, and local organizations, fostering networks of support and collaboration within communities.

The graduating class of 2024 connected research to action with a serious commitment to addressing the authentic demands of their environmental justice communities. To do this well, they had to become well-informed, culturally sensitive, and trusted as good storytellers. Their zine documented how people living in San Diego's affluent Kensington neighborhoods tend to live 10 years longer than people living in their own less-privileged San Diego neighborhoods (for example, City Heights, San Ysidro). The YEJAA students learned how their communities are the

places with the most climate change impacts, which are exacerbated by other intersecting socioeconomic and environmental health problems. Specifically, the YEJAA students learned how racism, histories of toxic dumping, inadequate tree canopy coverage, failing infrastructure, and widening health disparities in communities of color significantly worsens climate change impacts.

The lessons YEJAA students learn are not limited to understanding deficits compounded by oppression. Nor are the lessons limited to strategies to rectify those deficits (that is, rightfully acquire important goods and services that are missing). The lessons learned also include an asset-based perspective of strengths within their struggling communities. Strengths include experience gained by making the most out of difficult situations (life lessons and survival skills), determination, values recognizing the worth of diversity and inclusion, and local community knowledge needed now more than ever. Youth learn the need for connection across diverse types of struggles, and the need to cultivate mutual aid and communitarianism in tangible, relatable ways where people live.

Rooted pedagogy and asset mapping

In addition to running multiple cohorts annually of the YEJAA, the GlobalARC + Bioregional Community-University Partnership also runs a Rooted Pedagogy and Asset Mapping initiative. This initiative aligns with UC San Diego's mission as an Ashoka-designated Changemaker Campus. Ashoka is a global organization constituting the world's largest network of social entrepreneurs; it provides the leading designation for social innovation in higher education. Launched in 2008, Ashoka focuses on transforming higher education to inspire and support a new generation of social entrepreneurs and changemakers. As a Changemaker Campus, UC San Diego integrates social innovation and changemaking into campus curriculum, culture, and community.

The GlobalARC + Bioregional Community-University Partnership is playing a pivotal role in UC San Diego's ecosystem for changemaking and changemaker education. In 2024, the partnership was awarded a UC San Diego Course Development and Instructional Improvement grant to help build university infrastructure for interdisciplinary, cross-campus collaboration in research, education, community engagement, and advocacy.

The grant project, titled *ROOTED Pedagogy: Improving Course Learning Outcomes with Community-Engaged Fieldwork and Data Collection*, builds on 5 years of prior work. The effort is positioned as a key driver of the rooted university transition, which is essential for supporting a climate-friendly and just bioregional transition, as described in the previous sections in this chapter.

The Global ARC-BioREG Community-University team, based in the Urban Studies and Planning Department at UC San Diego, has been steadily improving its Rooted Pedagogy initiative since 2019. As used in this context, the term *ROOTED* refers to **R**esearch **O**pportunities that **O**ptimize **T**eaching and **E**xperiential Learning through **D**ata-Collection. The ROOTED Pedagogy initiative is developing ways to enhance existing courses that incorporate data collection assignments into their curriculum for purposes of community-engaged, experiential learning beneficial to both students and the community partners involved. The operational design and development of this effort is supported by multiple sources, including the UC Office of the President Global Food Initiative, the UC San Diego Academic Senate, the UC Course Development and Instructional Improvement Program, and the National Science Foundation and US Department of Agriculture by way of a Regional Food Systems Security collaboration with the San Diego Supercomputer Center's Convergence Research Institute.

The ROOTED Pedagogy initiative aims to make it easier for instructors, students, and research assistants to do community-engaged pedagogy campus-wide. The effort merges a dual commitment to advancing convergence research and community science. Additional campus allies at UC San Diego include the GIS and Data Lab at the Geisel Library, Information Technology Services, Teaching and Learning Commons, Eight College Community Engagement Provost, the Changemaker Institute, and the Learning-Aligned Employment Program.

The rooted pedagogy approach has been an integral part of a UC Urban Studies and Planning course, USP2: Urban World System, for the past 6 years. USP is an introductory class covering planetary urbanization, urban-rural linkages, sustainability, and climate justice. USP2 is mandatory for all undergraduate Urban Studies and Planning students at UC San Diego, forming part of a trilogy of required lower-division

courses (USP 1, 2, and 3). USP2 has large enrollments since it fulfills the Jane Teranes Climate Change Education Requirement. All students at UC San Diego are required to take at least one course with a substantial focus on climate change.

The technical aspect of the rooted pedagogy entails the integration of an online open-access survey instrument called LimeSurvey with software called SuAVE (Survey Analysis via Visual Exploration). Students codesign the survey with community partners to do neighborhood asset mapping, data analysis, and visualization—spurring research-to-action, research-to-policy connections for public benefit. USP2 final projects created by hundreds of students between 2018 and 2024 map and assess diverse features of food systems and urban forestry. For example, completed surveys documented 700 vacant lots assessed for their suitability as community gardens or food forests; 100 edible urban landscapes analyzed through cultural and food security lenses; and tree canopy coverage along 20 streets, comparing heat islands and shade relief in affluent neighborhoods with those in low-income, underserved areas. The final projects take the form of written reflections about the student experience collecting data, along with an online interactive gallery where students and community partners can see and analyze the data.

27.5 Summary and Next Steps

The chapter's central aim is to equip young people with actionable ideas and strategies rooted in bioregional imagination and justice. This includes understanding and strengthening the power of rooted community-university partnerships that are enabling climate-friendly bioregional transition to take place and connect around the world. But the chapter's intent goes beyond this; it also aims to help students figure out their roles in addressing climate change.

Our world finds itself in a dire situation. There should have been a clarion call for all hands on deck three or four decades ago. Now, to meet this challenge, we must plan for both mitigation and adaptation. All sectors of our society must identify their role and act upon it. Educators, policymakers, scientists, business community, and residents—all must act now. Youthful creativity, ingenuity, and commitment are crucial to success. Youth bring a fresh perspective, boundless energy, and innovative ideas that are indispensable in crafting a climate-friendly resilient future. Youth are the torchbearers of tomorrow, equipped with the potential to drive significant change. Climate change is not just a global crisis; it is a local one as well. Thinking both globally and locally is imperative for effective climate adaptation planning. By employing bioregional imagination and applied community science, we can create solutions that are grounded in the unique ecological, cultural, and social contexts of our bioregions. This means understanding the intricate connections between urban and rural areas, recognizing that actions taken in one part of a bioregion can have profound impacts on another. It also means embracing the concept of “glocalization”—where local actions contribute to global solutions and vice versa.

Educational institutions, like UC San Diego's Center on Global Justice, Bioregional Center, Design Lab, and World Design Capital, together with community partners like the Global Action Research Center

and Comité Civico del Valle, are leading the way by providing spaces for innovation and community engagement. Such initiatives exemplify how academic, and community partnerships can drive forward-thinking solutions that are resilient, sustainable, and just. Let's rise to the challenge and spur the just transitions we need for climate-friendly, verdant, healthy, and regenerative development good for all people and the planet.

Sources for the Figures

Figure 27.1.1: United Nations. Social Development for Sustainable Development. <https://social.desa.un.org/2030agenda-sdgs>.

Figure 27.1.2: Figure created by Keith Pezzoli, Paul Watson, Haley Kavar, and Angelina Lopez.

Figure 27.2.1: This map was co-created on Esri using open-access map data by co-author Keith Pezzoli and Michael Connolly Miskwish for the Bioregional Center's Cali-Baja 2030 Bioregional Plan Initiative.

Figure 27.2.2: USGS, public domain image database: <https://www.usgs.gov/media/images/nature-based-solutions>.

Figure 27.2.3: Graphic reproduced from Bioregional Center for Sustainability Science, Planning and Design, UC San Diego.

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Figure 27.3.1: Graphic reproduced from Bioregional Center for Sustainability Science, Planning and Design, UC San Diego.

Figure 27.3.2: Bioregional Center for Sustainability Science, Planning and Design, UC San Diego. Adapted from Joe Ravetz's conceptual bioregional work on the Peri-Cene: <https://peri-cene.net/>.

Figure 27.3.3: Bioregional Center for Sustainability Science, Planning and Design, UC San Diego. Map created by using open-access Google Earth imagery.

Figure 27.3.4: Photo by Keith Pezzoli.

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Figure 27.4.2: Graphic reproduced from Global Action Research Center.

Figure 27.4.3: Graphic reproduced from Global Action Research Center.

Figure 27.4.4: Photograph reproduced from Global Action Research Center.

Sources for the Text

27.1. Climate Change and the New Urban Agenda: Creating Wellsprings with Traditional Ecological Knowledge

- Aberley, D. 1999. Interpreting bioregionalism: a story from many voices. In *Bioregionalism*, McGinnis, M. V. (ed.). Routledge, New York, NY.
- Berg, P., and Dasmann, R. 1977. Reinhabiting California. *Ecologist* 7(10), 399–401.
- Brand, G., et al. 2023. Embedding Indigenous knowledges and voices in planetary health education. *Lancet Planetary Health* 7(1), e97–e102. [https://doi.org/https://doi.org/10.1016/S2542-5196\(22\)00308-4](https://doi.org/https://doi.org/10.1016/S2542-5196(22)00308-4).
- Connolly Miskwish, M. 2007. *Kumeyaay: A History Textbook. Vol 1: Precontact to 1893*. Sycuan Press, San Diego, CA.
- Hosen, N., et al. 2020. Adaptation to climate change: does traditional ecological knowledge hold the key? *Sustainability* 12(676), 1–18. <https://doi.org/http://dx.doi.org/10.3390/su12020676>.
- Hubbard, E., et al. 2023. Where are you at? Re-engaging bioregional ideas and what they offer geography. *Geography Compass* 17(10), e12722. <https://doi.org/https://doi.org/10.1111/gec3.12722>.
- IPCC. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Pörtner, H.-O., et al. (eds.)]. Cambridge University Press, New York, NY. <https://doi.org/10.1017/9781009325844>.
- Kimmerer, R. W. 2013. *Braiding Sweetgrass for Young Adults: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*. Milkweed Editions, Minneapolis, MN.
- Klein, N. 2014. *This Changes Everything: Capitalism vs. the Climate*. Simon & Schuster, New York, NY.
- Pico, A. 2024, February 14. The Kumeyaay Millenium. Kumeyaay.com (blog). <https://www.kumeyaay.com/the-kumeyaay-millenium.html>.
- Sennett, R., et al. 2018. *The Quito Papers and the New Urban Agenda*. Routledge, Taylor & Francis, New York, NY.

27.2. Transformative Climate Action Planning: Healing the Urban-Rural Metabolic Rift with Bioregional Justice

- Akimowicz, M., et al. 2022. Searching for a conceptual nexus? A critical analysis of community, place, and territorial approaches to rural development. *Annals of Regional Science* 71(1), 9–26. <https://doi.org/10.1007/s00168-022-01125-x>.
- Amorim-Maia, A. T., et al. 2022. Intersectional climate justice: a conceptual pathway for bridging adaptation planning, transformative action, and social equity. *Urban Climate* 41, 101053. <https://doi.org/10.1016/j.uclim.2021.101053>.
- Berry, W. 2010. *Imagination in Place: Essays*. Counterpoint, Berkeley, CA.
- Cilliers, E. J., et al. 2022. Scaling up of nature-based solutions to guide climate adaptation planning: evidence from two case studies. *Frontiers in Sustainable Cities* 4. <https://doi.org/10.3389/frsc.2022.624046>.
- Cooper, M. 2021. Marx, the environment, and “metabolic rift.” <https://www.workersliberty.org/story/2021-09-21/marx-environment-and-metabolic-rift#ftn15>.
- Fanfanim, D. 2018. The urban bioregion as form and project of the co-evolution between urban and rural domain: the case of the Florence metropolitan area. *International Journal of Engineering & Technology* 7(1.4). <https://doi.org/10.14419/ijet.v7i1.4.9264>.
- Hester, R. T. 2006. *Design for Ecological Democracy*. MIT Press, Cambridge, MA.
- IPCC. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Pörtner, H.-O., et al. (eds.)]. Cambridge University Press, New York, NY. <https://doi.org/10.1017/9781009325844>.
- Kiddey, R. 2022. David Graeber & David Wengrow. 2021. *The dawn of everything: a new history of humanity*. London: Penguin/Allen Lane; 978-0-241-40242-9 Hardback £30. *Antiquity* 96(386), 500–502. <https://doi.org/10.15184/aqy.2022.7>.
- Lynch, T., et al. 2012. *The Bioregional Imagination: Literature, Ecology, and Place*. University of Georgia Press, Athens.
- Lysaker, O. 2024. *Re-imagining Ecological Democracy: Caring for the Earth in the Anthropocene*. Routledge, New York, NY.
- Makondo, C. C., and Thomas, D.S. G. 2018. Climate change adaptation: linking indigenous knowledge with western science for effective adaptation.

- Environmental Science & Policy* 88, 83–91. <https://doi.org/10.1016/j.envsci.2018.06.014>.
- Moore, J.W. 2017. Metabolic rift or metabolic shift? Dialectics, nature, and the world-historical method. *Theory and Society* 46(4), 285–318. <https://doi.org/10.1007/s11186-017-9290-6>.
- Muys, B., et al. 2023. From biocities to bioregions and back: transforming urban-rural relationships. In *Transforming Biocities: Designing Urban Spaces Inspired by Nature*, Scarascia-Mugnozza, G. E., et al. (ed.). Springer International, Cham.
- Pezzoli, K. 2017. The bioregionalization of survival: sustainability science and rooted community. In *Insurgencies and Revolutions: Reflections on John Friedmann's Contributions to Planning Theory and Practice*, Rangan, H., Ng, M. K., and Porter, L. (eds.). Routledge, New York, NY.
- Pico, A. 2024, February 14. The Kumeyaay Millenium. Kumeyaay.com (blog). <https://www.kumeyaay.com/the-kumeyaay-millenium.html>.
- Sale, K. 2000. *Dwellers in the Land : The Bioregional Vision*. University of Georgia Press, Athens.
- Sartre, J.-P., and Elkaïm-Sartre, A. 2004. *The Imaginary: A Phenomenological Psychology of the Imagination*. Routledge, New York, NY.
- Schweizer, S., et al. 2013. Changing the conversation about climate change: a theoretical framework for place-based climate change engagement. *Environmental Communication* 7(1), 42–62. <https://doi.org/10.1080/17524032.2012.753634>.
- Snyder, G. 1995. *A Place in Space: Ethics, Aesthetics, and Watersheds: New and Selected Prose*. Counterpoint, Washington, DC.
- Thayer, R. L. 2020. A bioregional bridge across the urban-rural divide. In *Bioregional Planning and Design: Volume I, Perspectives on a Transitional Century*, Fanfani, D., and Matarán Ruiz, A. (eds.). Springer, Cham.

27.3. Community-University Partnerships: Enabling Place-Based Climate Change Engagement and Connectivity

- Cooper, A. M., et al. 2020. Monitoring and mitigation of toxic heavy metals and arsenic accumulation in food crops: a case study of an urban community garden. *Plant Direct*, 4(1), e00198.
- Charles, A., et al. 2020. Community science: a typology and its implications for governance of social-ecological systems. *Environmental Science & Policy* 106, 77–86. <https://doi.org/10.1016/j.envsci.2020.01.019>.

- Cruz, T., and Forman, F. 2022a. *Socializing Architecture: Top-Down, Bottom-Up*. Still image. MIT Press, Cambridge, MA, and Hatje Cantz, Berlin.
- Cruz, T., and Forman, F. 2022b. *Spatializing Justice: Building Blocks*. MIT Press, Cambridge, MA, and Hatje Cantz, Berlin.
- Lowenhaupt Tsing, A., et al. 2024. *Field Guide to the Patchy Anthropocene: The New Nature*. Stanford University Press, Redwood City, CA.
- Palahí, M., et al. 2020. *Investing in Nature as the True Engine of Our Economy: A 10-Point Action Plan for a Circular Bioeconomy of Wellbeing*. Knowledge to Action 02, European Forest Institute. https://efi.int/sites/default/files/files/publication-bank/2020/EFI_K2A_02_2020.pdf.
- Pezzoli, K. 2023. Forward. In *The Routledge Companion to Ecological Design Thinking: Healthful Ecotopian Visions for Architecture and Urbanism*, Kanaani, M. (ed.). Routledge, New York, NY.
- Pezzoli, K. 2018. Civic infrastructure for neighborhood planning. *Journal of the American Planning Association* 84(2), 191–193. <https://doi.org/10.1080/01944363.2018.1424559>.
- Pezzoli, K., Williams, K., and Kriletich, S. 2011. A manifesto for progressive ruralism in an urbanizing world. *Progressive Planning* 186(Winter), 16–19.
- Rabinowitz Bussell, M., et al. 2021. A bridge to civic empowerment: a rooted university approach to creating equitable university-community partnerships and just power relations. In *Learning from Arnstein's Ladder: From Citizen Participation to Public Engagement*, Lauria, M., and Slotterback, C. (eds.). Routledge, New York, NY.

27.4. Youth-Led Climate Action: Rooted Pedagogy Building Community Power

- Eckstein, B. J., and Throgmorton, J. A. 2003. *Story and Sustainability: Planning, Practice, and Possibility for American Cities*. MIT Press, Cambridge, MA.
- Korten, D. C. 2015. *Change the Story, Change the Future: A Living Economy for a Living Earth*. Berrett-Koehler, Oakland, CA.
- Mallon, M. N., Foster, E., and Nichols, J. 2023. *Exploring Inclusive and Equitable Pedagogies: Creating Space for All Learners*. Association of College & Research Libraries, Chicago, IL.
- Shepherd, Q. 2024. *Transforming Education: Building Foundations for Systemic Change and Empowered Communities*. Rowman & Littlefield, Blue Ridge Summit, PA.

- Rabinowitz Bussell, M., Bliesner, J., and Pezzoli, K. 2017. UC pursues rooted research with a nonprofit, links the many benefits of community gardens. *California Agriculture* 71(3), 139–147.
- Rechtschaffen, D. J. 2016. *The Mindful Education Workbook: Lessons for Teaching Mindfulness to Students*. Norton, New York, NY.
- Veland, S., et al. 2018. Narrative matters for sustainability: the transformative role of storytelling in realizing 1.5°C futures. *Current Opinion in Environmental Sustainability* 31, 41–47. <https://doi.org/https://doi.org/10.1016/j.cosust.2017.12.005>.

Chapter Glossary

Glossary Items

<i>Term</i>	<i>Definition</i>
Authentic demand	An element of community-based planning, design, and organizing, where dialogue occurs equitably among legitimate representatives of the relevant constituencies. It ensures that the voices of marginalized and underserved communities are included, heard, and influential.
Bioregion	A territorial concept that integrates biogeography with climate, culture, and local socio-political and economic relationships, emphasizing the interdependence of urban, rural, working lands, and open spaces.
Bioregional planning	A type of planning that cultivates sustainable, equitable, and resilient human-nature relationships within a specific bioregion, considering its unique characteristics such as climate, topography, flora, fauna, and culture.
Climate adaptation	Modifications humans make to built and natural environments to minimize damage and enhance benefits in response to current and anticipated climate change impacts. This involves proactive measures to increase resilience and sustainability, ensuring that communities can effectively cope with and thrive despite changing climate conditions.
Climate resilience	The ability to withstand and recover from climate change impacts, such as extreme weather events, fires, floods, and droughts, along with associated socio-political and economic stresses.
IPCC	Intergovernmental Panel on Climate Change, the leading global entity that tracks and publicly shares the most current climate science and assessments of global climate changes.
Nature-based solution (NBS)	An action that incorporates natural features and processes to protect, conserve, restore, sustainably use, and manage natural or modified ecosystems to address socio-environmental challenges while providing measurable co-benefits to and benefit both people and nature (US Dept. of the Interior definition).
Reinhabitation	The practice of living sustainably within a specific locale, where a community meets most of its fundamental needs for food, water, and shelter from local sources. This approach enables resilience and sustainability through regenerative land and bioregional resource stewardship.

Continued

Glossary Items (*continued*)

<i>Term</i>	<i>Definition</i>
Traditional ecological knowledge (TEK)	The accumulated knowledge and practices of Indigenous and local communities, rooted in their long-term interactions with their environment, including agriculture, hunting, fishing, medicinal plant use, and sustainable land and water management.
Urban-rural continuum	The seamless gradient between urban and rural areas, emphasizing their interconnectivity rather than treating them as distinct and isolated entities. This concept highlights linkages between urban and rural spaces, recognizing that effective management and development require integrated approaches that consider the complex interactions across this continuum.