

Bioregioning: Pathways to Urban-Rural Reconnection

Abstract There is a metabolic rift running through our economy and culture, and it is distracting our attention from care for the biosphere. To heal this rift, the diverse groups of people that make up humankind need a shared purpose that everyone can relate to and support. A strong candidate for that shared purpose is care for the bioregion – *bioregioning* – as an activity that creates value. In this article, I present a number of design actions and case studies that demonstrate how design can contribute to system change, for example via the reconnection of urban and rural ecosystems, the design of social infrastructures that enable the emergence of new enterprises, and the deployment of technology.

Keywords

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1 “The term metabolic rift was coined by the environmental sociologist John Bellamy Foster to describe the alienation between humans and nature that has opened up with the growth of the modern economy.” John Thackara, “Healing the Metabolic Rift: Designing in Social-Ecological Systems,” *Thackara.com* (blog), January 13, 2013, <http://thackara.com/most-read/john-thackara/>. Also see John Bellamy Foster, Richard York, and Brett Clark, *The Ecological Rift: Capitalism’s War on the Earth* (New York: Monthly Review Press, 2011); and John Bellamy Foster, “Marx’s Theory of Metabolic Rift: Classical Foundations for Environmental Sociology,” *American Journal of Sociology* 105, no. 2 (1999): 366–405, available at <https://doi.org/10.1086/210315>.

2 Christopher Landry, “Joanna Macy and the Great Turning,” *The Video Project* video, 26 minutes, accessed January 2, 2019, <https://www.video-project.com/Joanna-Macy-and-the-Great-Turning.html>, also available at <http://www.joannamacyfilm.org/>.

3 Robert L. Thayer, *LifePlace: Bioregional Thought and Practice* (Berkeley: University of California Press, 2003).

4 Cormac Russell, “Asset-Based Community Development—5 Core Principles,” *nurtureddevelopment.org* (blog), June 2, 2017, <https://www.nurtureddevelopment.org/blog/asset-based-community-development-5-core-principles/>.

5 John Thackara, *How to Thrive in the Next Economy: Designing Tomorrow’s World Today* (London: Thames & Hudson, 2015).

6 Richard Mabey, *The Unofficial Countryside* (London: Collins, 1973).

7 “Study Unearths Vibrant Urban Foraging Community in Baltimore,” Center for a Livable Future at Johns Hopkins Bloomberg School of Public Health, December 4, 2017, <https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/news-room/News-Releases/2017/study-uneartths-vibrant-urban-foraging-community-in-baltimore.html>; also see Colleen M. Synk, Brent F. Kim, Charles A. Davis et al., “Gathering Baltimore’s Bounty: Characterizing

Care, Value, Place

A cultural disconnection between the man-made world and the biosphere lies behind the grave challenges we face today. We either don’t think about rivers, soils, and biodiversity at all – or we treat them as resources whose only purpose is to feed the economy. This metabolic rift¹ distracts our attention from care for our own life support system; as a result, it also leaves us starved of meaning and purpose.

To heal the metabolic rift, a shared focus is needed that diverse groups people can relate to, and support, whatever their other differences. A strong candidate for that connective idea is the bioregion. A bioregion re-connects us with living systems, and each other, through the places where we live. It acknowledges that we live among watersheds, foodsheds, fibersheds, and food systems – not just in cities, towns, or the countryside. A bioregion is shaped by characteristics of the natural environment rather than by man-made divisions – its geology; topography; climate; soils; hydrology and watersheds; agriculture; biodiversity, flora and fauna, vegetation.

Bioregions are not just geographic locales. They embody the interconnection of our minds and nature’s at a molecular, atomic, and hormonal level. A bioregion, in this sense, repairs the unity of mind and world that has been fractured by modernity.² A bioregion is literally and etymologically a *life-place* (in Robert Thayer’s words³) that is definable by natural rather than political or economic boundaries. Its geographic, climatic, hydrological, and ecological qualities – its metabolism – can be the basis for meaning and identity because they are unique. And just as ecological systems are unique to each place, so, too, are the social assets of a bioregion – the individuals, groups, networks, and cultures that make up what Cormac Russell calls its associational life.⁴ In a bioregion, the word growth takes on a new meaning, which is measured in terms of improvements to the health and carrying capacity of the land, and in the resilience of communities. And because value is created in a bioregion by the stewardship of living systems, rather than the extraction of natural resources, a bioregion frames the next economy, not the dying one we have now.

The design of connections between places, communities, and nature is widespread, and accelerating.⁵ These new undertakings may be diverse, but a green thread connects them: the understanding that caring for the health of a place and of the persons who inhabit it are parts of one story. With this *care for place* as their frame, communities are connecting the “what is” with the “what if?” across a range of activities, including regional food hubs, High Nature Value farming, fibershed and grain chains, biorefining, forest and watershed recovery, land-based learning, code clubs, and the maker movement.

Civic Ecology

Cities are an integral part of the bioregional story; they do not exist separately from the land they are built on and the resources that feed them. The English writer Richard Mabey was one of the first to suggest that the concepts of urban and rural are outdated. In *The Unofficial Countryside*,⁶ first published in 1973, Mabey describes his explorations of crumbling city docks, railway goods yards, sewage farms, and disused factory wastelands. He recounts his realization that even the most unpromising, blasted, and neglected urban landscape is capable of supporting life. “A crack in the pavement is all a plant needs to put down roots,” Mabey recorded, “provided it is not actually contaminated there is scarcely a nook or cranny anywhere which does not provide the right living conditions for some plant or creature.” Many of these plants are edible; herbal fruits, leaves, and edible flowers grow on walls and roadsides, between paving stones, and in other untended spaces. A

study by researchers at Johns Hopkins University in Baltimore, for example, found that foragers collected from 140 different kinds of plants and fungi around that city alone.⁷

Reconnecting cities to their bioregions – their *re-wilding*⁸ – is not about the creation of wide open spaces and new parks. In past centuries, such civic spaces were called the green lungs of towns, but recent approaches are all about nurturing patches of biodiversity – some of them tiny – and linking them together in mosaics and archipelagos. By attending to flows, bio-corridors, and interactions inside cities as well as in the countryside, *bioregional urbanism*⁹ nurtures the health of the ecosystem as a whole. It thinks about metabolic cycles and the capillarity of the metropolis, in which rivers and bio-corridors are given pride of place. A growing number of blogs and platforms support this work. The Urban Nature Atlas,¹⁰ for example, contains more than one thousand examples of nature-based solutions from across 100 European cities; and The Nature of Cities¹¹ platform hosts 650 professional contributors from around the world.

When nature is rediscovered at as a measure of value, a startling question arises: “Pull the weed out of its crack in the sidewalk – or let it grow?” As the realization dawns on us that biodiversity is a key indicator of urban health, a growing number of people are inclined to welcome back the weeds. It turns out that there is often more biodiversity in cities than outside them. When researchers in the UK visited parks, golf courses, abandoned warehouses, and household gardens around the city of Leicester, they discovered that urban vegetation stores ten times more carbon dioxide than previously assumed.¹² Public and private gardens, too, have enormous potential¹³ to act as archipelago-like nature reserves for pollinating insects, whose populations have been plummeting across the U.S. and Europe. The UK’s 15 million backyard gardens cover about 270,000 hectares – more than the all the country’s official nature reserves combined.¹⁴ With the life-enhancing properties of connection in mind, Seattle’s Pollinator Pathway Program¹⁵ links together urbanism, farming, and wilderness recovery into a connected whole. Local artist and ecological designer Sarah Bergmann coordinates with Seattle’s citizens, urban planners, engineers, and parks departments to replant and connect small areas of public and privately owned urban land; the resulting corridors are intended to “create organized backbones of connectivity within our simplified systems, creating a baseline of health – and a planned conversation between cities, farms, and wilderness. Considering these relationships – such as by avoiding all invasive species, choosing plants that are native to a bioregion, and using underutilized space to not displace sprawl – is key.”¹⁶

When biodiversity is put at the top of the agenda, a multiplicity of design tasks follows. There are cemeteries, watercourses, avenues, gardens, and yards to adapt; roadside verges, green roofs, and facades to plant; and even (potentially) sports fields, vacant lots, abandoned sites, and landfills to be repurposed. Abandoned buildings and ruins, empty malls, and disused airports must be adapted, not to mention the abandoned aircraft that will be parked there before too long. In Vienna, design firm Biotope City is developing micro green spaces as part of an effort to transform the 5.4 hectare site and surrounds of the former Coca Cola production plant in Vienna.¹⁷ In the Jaeren region of Norway, whose landscape has been battered by the footprint of the oil economy, architect Knut Eirik Dahl taught young designers to look for and appreciate the tiniest examples of biological life in among the people, goods, and buildings: solitary plants, rare lichen, rare insects.¹⁸ This was low-cost, hands-on work – also known as *dirty sustainability*. Also inspired by the power of the small to enrich the big, 45,000 vacant lots in Allegheny County, Pittsburgh, are being brought back to life, one by one.¹⁹ Neighborhoods are enlivened block by block.

Behaviors, Motivations, and Barriers of Foragers in an Urban Ecosystem,” *Urban Forestry and Urban Greening* 28 (2017): 97–102.

8 For example, see Kevin Sloan, “Re-wilding: Cities by Nature,” *The Nature of Cities*, April 30, 2017, <https://www.thenatureofcities.com/2017/04/30/re-wilding-cities-nature/>; Richard T. Corlett, “Restoration, Reintroduction, and Rewilding in a Changing World,” *Trends in Ecology & Evolution* 31, no. 6 (2016): 453–462, <https://doi.org/10.1016/j.tree.2016.02.017>.

9 Also known as civic ecology, or ecological urbanism. For example, see Marina Alberti, *Cities That Think like Planets: Complexity, Resilience, and Innovation in Hybrid Ecosystems* (Seattle: University of Washington Press, 2016).

10 Visit <https://naturvation.eu/atlas> for more information.

11 Visit <https://www.thenatureofcities.com/> for more information.

12 Zoe G. Davies, Jill L. Edmondson, Andreas Heinemeyer et al., “Mapping an Urban Ecosystem Service: Quantifying Above-Ground Carbon Storage at a City-Wide Scale,” *Journal of Applied Ecology* 48, no. 5 (2011): 1125–34, DOI: <https://doi.org/10.1111/j.1365-2664.2011.02021.x>.

13 Myla F. J. Aronson et al., “A Global Analysis of the Impacts of Urbanization on Bird and Plant Diversity Reveals Key Anthropogenic Drivers,” in *Proceedings of the Royal Society B* 281, no. 1780 (2014): 20133330, DOI: <https://doi.org/10.1098/rspb.2013.3330>.

14 Michael McCarthy, “How to Turn Your Garden into a Nature Reserve,” *Independent* (blog), June 19, 2006, <https://www.independent.co.uk/environment/how-to-turn-your-garden-into-a-nature-reserve-404681.html>.

15 Visit <http://www.pollinator-pathway.com/> for more information.

16 “The Pollinator Pathway: Why,” *pollinatorpathway.com*, accessed February 6, 2019, <http://www.pollinatorpathway.com/why/>.

17 “Biotope City is based on the idea that, as a consequence of the environmental changes, a strategy of cooperation between city and nature is greatly needed: the mechanisms of self-regeneration, inherent to nature, need to be

used today to mitigate further constraints of urban living conditions.” Helga Fassbinder, “A Biotope-City Quartier for Vienna,” *biotope-city.com*, December 24, 2018, <https://biotope-city.com/en/2018/12/24/a-biotope-city-quartier-for-vienna/>.

18 “Mosaic::Reading—The City as Biotope” was a master studio at Bergen Arkitektsskole run during the autumn term 2009 by Gisle Løkken, Magdalena Haggärde, Kjerstin Uhre, and Knut Eirik Dahl. For more information, visit <http://fieldsof-exploration.blogspot.com/>.

19 John Thackara, “Back to the Land 2.0: A Robust Design Agenda for Bioregions,” in *Archifutures Volume 4: Thresholds*, ed. Sophie Lovell and Fiona Shipwright (Barcelona: dpr-barcelona, 2017), 192; “Lots to Love: About,” lotstolove.org, accessed February 9, 2018, <http://www.lotstolove.org/about/>.

20 Marina Alberti, “Invisible City Life: The Urban Microbiome,” *The Nature of Cities*, December 3, 2014, <https://www.thenature-ofcities.com/2014/12/03/invisible-city-life-the-urban-microbiome/>; also see <http://urbaneco.washington.edu/wp/>.

21 “Urban Barcode Project: About the Program,” DNA Learning Center: Barcoding 101, accessed February 9, 2019, <https://www.dnabarcoding101.org/programs/ubp/>.

22 Visit <http://nativemaps.org/node/1383/%20and%20https://landexplorer.ccl> for more information.

23 “How to Guide Transition Core Resourcing,” *REconomy Project*, accessed February 11, 2019, <http://www.reconomy.org/wp-content/uploads/2015/05/Transition-Core-Resourcing-FINAL.pdf>; also see “Practical Guides for Community Economic Change,” *REconomy Project*, May 15, 2015, <http://reconomy.org/practical-guides-for-community-economic-change/>.

24 Alex Heffron, “It’s Not WHAT You Eat, It’s HOW It’s Produced That Matters,” *Medium*, January 16, 2019, <https://medium.com/@AlexHeffron88/its-not-what-you-eat-it-s-how-it-s-produced-that-matters-8b61d0618a52>.

Some sites of renewal can be even tinier. Microbes play a key role in the function of ecosystems, including urban ones. They contribute to biodiversity, nutrient cycling, pollutant detoxification, and human health. Thus the sustainability of cities over the long term is inextricably linked to microbes and their evolution.²⁰ In New York’s Urban Barcode Project, high school students use DNA technology to explore biodiversity in parks, gardens, offices, and schools. They inspect each site for invasive plant or animal species, monitor disease vectors, identify exotic or endangered food products in markets, and detect food mislabeling.²¹

Citizen science is an important signal that greening a city and its bioregion will involve the collaborative monitoring of living systems and the creation of channels among those affected. Maps of a bioregion’s ecological assets are needed—its geology and topography, its soils and watersheds, and its agriculture and biodiversity.²²

Food and Fiber Systems

A bioregional approach to development enriches economic re-localization efforts, which measure where resources come from, help to identify leakages in the local economy, and explore how these leaks might be plugged by locally available resources.²³ One such leak centers around food. Few city people realize that the food they eat is impoverishing the soil and contributing to the loss of biodiversity. They are far removed from fields that were once rich in topsoil, which are now depleted. City people are preoccupied—to put it mildly—with what they eat. Food platforms that emphasize where food comes from, and how the food we eat is produced, are now booming.²⁴

The design of new distribution platforms for food play an important role in urban-rural reconnection. *La Ruche Qui Dit Oui* for example—literally, “the hive that says yes”—is the brainchild of French industrial designer and chef Guilhem Cheron. *La Ruche* combines the power of the Internet with the combined energy of social networking to bridge the gap separating small-scale food producers from their customers. When a person starts a local hive, she recruits neighbors, friends, and family to join—the ideal number seems to be thirty to fifty members—and the group then looks for local food producers to work with. The farmers offer their products online at a desired price, and hive members pay 20% on top that to cover a fee for the hive coordinator, a service fee to *La Ruche*, plus taxes and banking costs. *La Ruche* makes money as a service provider, but it is not an intermediary. The farmers receive the price they quote, and because the system is totally transparent, everyone involved knows what happens to every cent transacted. With food platforms like *La Ruche*, the focus is not just on production. These services embody a whole systems approach in which the interests of farm communities, local people, the land, watersheds, and biodiversity are considered together—with stewardship as a shared value.

A particular challenge for design is that the re-localization of regional food and fiber systems entails transition from a linear to a holistic, social, ecological approach to agriculture. Farmers are far more than producers of agricultural commodities for the city in this story. They become the stewards of an agro-ecological system in which water, soil, landscape, energy, and biodiversity are interdependent. Social farming²⁵ and care farming,²⁶ which engage citizens’ direct participation in farm-based activities, reduce the social isolation that impacts so negatively on the well-being of small farmers in particular—but these urban-rural relationships have to be enabled.²⁷ Agro-ecological agriculture begins with an analysis of the carrying capacity of the land, and then attends to crop cultivation and rearing animals in ways that regenerate the soils and biodiversity. Described in the European Forum

on Nature Conservation and Pastoralism (EFNCP) as High Nature Value Farming,²⁸ each location is understood and designed as an ecosystem within a bioregional web of natural systems.

The grain chain – the supply process that brings seeds and grains from fields to tables – is another domain where designers can transform the notion of design for system change into a series of practical relationships. Many people yearn for a healthy alternative to industrial bread, which is filled with artificial additives and preservatives and may have sat on the grocery store shelf for years. Real or artisanal bread, in contrast, denotes microbial vitality – in the food system, and therefore in our bodies, too. But a healthy grain system requires more than a single local bakery. We need to reduce the distances between where grain is grown, the flour milled, the dough baked, and the bread consumed. A multitude of local actors need to work together for us to create a healthy grain system: farmers, seed brokers, food hubs, local mills, processing facilities, farmers markets, and local distribution platforms. In the UK, the Community Grains Association²⁹ and co-ops such as #OurField³⁰ are designing grain chains as whole systems. For #OurField, forty citizens co-invest in a field and decide, together with the farmer, what to grow, how to grow it, and what happens with the crop. Decisions are taken on the online platform Loomio.³¹ This cooperative approach supports more skilled jobs per loaf for local people, and keeps more money circulating in the local economy. Other initiatives that decentralize the agricultural commodity system include Australia's AgriDigital³² and The GrainChain.³³ The latter platforms use blockchain technologies to connect multiple activities on one platform.

As with bread, so, too, with fiber. In Northern California, a platform called Fibershed develops regional fiber systems that build soil and protect the health of the biosphere. It does this by reconnecting the components of a bioregional system vertically – from soil to skin.³⁴ Its annual Wool and Fine Fiber Symposium³⁵ brings together regional producers, shearers, artisans, designers, knitters, fiber entrepreneurs, and clothes-wearing citizens. All manner of issues are discussed: flock health, rotational grazing, weed management, predator issues, breeding, milling, and processing capacity. When these discussions identify gaps in the system, steps are taken to fill them. Fibershed has begun development of a new California Wool Mill, for example, and is developing vocational training program in which shepherds and graziers are re-cast as “ecological doctors of the land.”³⁶

These grain and fiber experiments – together with a multitude of food system projects – turn the commodity agriculture system on its head. Rather than drive the land to yield more output per acre, production is determined by the long-term health of the soil; its health and carrying capacity are constantly monitored. Decisions are made by the people who work the land and know it best. Prices are based on yields the land can bear, and on revenues that assure security to the farmer. The language used is one of system stewardship rather than “productivity.”

The Circular Economy

A bioregioning approach changes the way artifacts are designed and made. It adds a missing dimension – the ecology and ecological systems – to our current systems of production and consumption. Economic circularity can support bioregioning efforts, as it seeks to protect our environments from cycles of endless growth.

As things stand today, circular economy approaches to production combine technical innovation and new business models to close material and product loops. But, just as building new roads increases car traffic, circular economy rebound occurs in the form of leakage – the material impacts of support services that today's hyper-connected businesses rely on. Energy and resources are needed to get staff to

25 For example, see Maurizio Lanfranchi and Carlo Giannetto, “Sustainable Development in Rural Areas: The New Model of Social Farming,” *Calitatea* 15, no. S1 (2014): 219–23.

26 For example, see Jan Hassink and Majken Van Dijk, eds., *Farming for Health: Green-Care Farming across Europe and the United States of America* (Dordrecht: Springer Science & Business Media, 2006).

27 Linda Lobao and Curtis W. Stofferahn, “The Community Effects of Industrialized Farming: Social Science Research and Challenges to Corporate Farming Laws,” *Agriculture and Human Values* 25, no. 2 (2008): 219–40.

28 “What We Do,” European Forum on Nature Conservatism and Pastoralism, accessed February 9, 2019, <http://www.efncp.org/what-we-do/>; also see High Nature Value Farming, accessed January 23, 2019, <http://www.high-nature-value-farming.eu/>.

29 Visit <https://www.communitygrains.com/> for more information.

30 #OurField's twitter page, accessed January 2, 2019, <https://twitter.com/ourfieldproject?lang=en>; “NESTA ShareLab Fund Application—#OurField,” vimeo video, posted by “ourfield,” December 9, 2016, <https://vimeo.com/195049849>.

31 Visit <https://www.loomio.org> for more information about Loomio.

32 Visit <https://www.agridigital.io/about> for more information.

33 The GrainChain is due to launch in 2019. Visit <https://grain-chain.io/> for more information.

34 “About Our Mission & Vision,” *Fibershed*, accessed February 9, 2019, <https://www.fibershed.com/about/>.

35 Visit <https://www.fibershed.com/programs/education/symposia-presentations/2018-wool-fine-fiber-symposium/> for more information.

36 “Wool Mill Vision,” *Fibershed*, accessed February 11, 2019, <https://www.fibershed.com/programs/textile-economy/wool-mill-vision/>.

37 Ina Praetorius, "The Care-Centered Economy: Rediscovering What Has Been Taken for Granted," *Heinrich Boll Stiftung Publication Series Economy + Social Issues*, vol. 16, accessed January 2, 2019, http://us.boell.org/sites/default/files/the_care-centered_economy.pdf.

38 "IUCN to Enhance Countries' Restoration Efforts under the Paris Climate Agreement as Bonn Challenge Passes 160 Million Hectares," *International Union for Conservation of Nature (IUCN)*, November 16, 2017, <https://www.iucn.org/news/forests/201711/iucn-enhance-countries%E2%80%99-restoration-efforts-under-paris-climate-agreement-bonn-challenge-passes-160-million-hectares>; "The Challenge," *The Bonn Challenge*, accessed February 9, 2019, <http://www.bonnchallenge.org/content/challenge>.

39 Rob Finlayson, "Asean Guidelines for Agroforestry Development Set to Revolutionize Land Use in Southeast Asia," *Swedish International Agricultural Network Initiative (SIANI)*, January 21, 2019, <https://www.siani.se/news-story/asean-guidelines-for-agroforestry-development-set-to-revolutionize-land-use-in-southeast-asia/>.

40 "Imagine an 'Ecological Certification' for Urban Design. What Are Such a Certification's Key Elements?," *The Nature of Cities*, August 17, 2017, <https://www.thenatureofcities.com/2017/08/16/imagine-ecological-certification-urban-design-certifications-key-elements/>.

41 Gunnar Rundgren, "Counting Apples or Oranges—Climate Change Stats vs Food Systems Thinking," *arc2020.eu*, January 8, 2019, <http://www.arc2020.eu/counting-apples-or-oranges-climate-change-stats-vs-food-systems-thinking/>.

42 Huw van Steenis, "Defective Data is a Big Problem for Sustainable Investing," *Financial Times*, January 21, 2019, <https://www.ft.com/content/c742edfa-30be-328e-8bd2-a7f8870171e4>.

43 "Task Force on Climate-Related Financial Disclosures," *United Nations Environment Programme—Finance Initiative*, accessed February 9, 2019, <https://www.unepfi.org/>

work, collect trash, provide water, ensure sanitation, power the cloud, and so on. We still use more raw materials in the system than can be made available through; there are simply not enough recyclable raw materials to put a stop to the continuously expanding extractive economy.

A circular bioregional framework could reduce such leakage by making *health of place* the value benchmark rather than production outputs measured—abstractly—in terms of money and "Gross Value Added."³⁷ If health of place is to replace money as a shared value metric, we will have to describe and measure "health" with greater precision than we do now. Forest and landscape restoration, for example, has made tremendous inroads into global policy: dozens of countries recently pledged to restore 160 million hectares of forest³⁸—greater than the size of India. But the program's potential is constrained by the absence of common standards to measure restoration outcomes.³⁹ The efforts of urban ecologists associated with The Nature of Cities platform are also stymied by a lack of metrics—their Ecological Certification for Urban Design remains a work in progress.⁴⁰ Food system researchers are exposed to a large volume of data about the contribution of food and agriculture to global warming, but these data are often contradictory.⁴¹ Inside the financial system itself, institutional investors who control more than a quarter of global assets seek to integrate sustainable principles—but ambiguous or defective data is holding them back.⁴²

On the positive side, there are also two promising developments in the search for substantial metrics. The first is that the powerful financial interest groups mentioned above recognize the problem, and are working on it. The Task Force on Climate-related Financial Disclosures (TCFD),⁴³ for example, convened in 2015 by the United Nations Financial Stability Board and chaired by Mike Bloomberg, has already enabled more than 500 global institutions to disclose high-level climate-related exposures and continues to run scenario analysis on a regular basis.⁴⁴

The second positive development is that some physical properties of place can and are being measured. There is broad consensus among researchers on the key indicators that denote healthy soil, for example—the amount of organic matter it contains, its compaction, water infiltration rates, and species richness. A growing number of farmers and other land stewards are adopting their practices accordingly,⁴⁵ and new soil care tools and apps are being developed to help them. An app called Sectormentor, for example, enables small farms (sometimes in concert with citizen scientists) to test soil samples quickly and affordably.⁴⁶

As the range of and applications for shared metrics grows, our next priority is to adopt a broader, systems-oriented perspective to the health of living systems. As articulated by Gunnar Rundgren, we need to develop food and agriculture systems that *combine* "the production of good and nutritious food with carbon sequestration, soil fertility, bio-diversity, human relations and culture in the same regenerative landscape."⁴⁷

How System Change Happens

So is a future based on care for place truly a realistic prospect? The signals of change in this article are real—and there probably a million more.⁴⁸ However, a pointed question arises: Are small local initiatives an adequate response to the global challenges we face collectively?

Many in government and the public and private sectors would say that large-scale solutions are essential for us to effectively contend with our most complex challenges. But others know that scaling up is not how healthy nature works. Every ecological and social context is unique, and the practices now emerging—or being rediscovered—are based on an infinity of local conditions. No single project

is the magic acorn that will grow into a mighty new oak tree but, just as healthy forests are extremely diverse, we are seeing a healthy level of diversity in social innovation all over the world. System change is the consequence of multiple interacting processes and events that unfold at different tempos. The German word *Eigenzeit* – proper time – describes the phenomenon well. A bacterium, a forest, or an economy each have very different timescales of change – but they are all interconnected. The history books also contain numerous examples of profound transformations that seemed impossible in their time – until they happened: the end of slavery in the United States, women gaining the right to vote in England, or the end of apartheid in South Africa. A famous quote commonly attributed to Nelson Mandela, “It always seems impossible until it’s done,” has inspired millions of people, and rightly so.

The notion of a collaborative care economy might sound poetic, but it also sounds vague. Where (one might ask) is its manifesto? What about its political program? Who will implement it? These are fair but old-fashioned questions. Although political discourse and the media are filled with passionate demands for change, they are addressed to a legacy political system that is powerless to respond. The most potent drivers of change – and the least discussed – are the inescapable laws of biophysics. The thermo-industrial economy is dying, and its replacement is emerging – not via policy, but through the myriad practical changes and adaptations made by people and the ecological systems they live in ... as they reweave and reestablish relationships sundered by modernity.

This account – of a quietly unfolding transformation – is consistent with the way scientists explain how complex systems change. By their account, a variety of changes, interventions, disruptions, and oppositions accumulate across time until the system reaches a tipping point. Then, at a moment that cannot be predicted, a small release of energy triggers a much larger release, or phase shift, and the system as a whole transforms. This theory of change is not speculative. The most profound social transformations in the past happened in just this way. Neither agricultural revolution twelve thousand years ago, nor the scientific revolution that has shaped history since the seventeenth century, were the consequence of policy – nor were they proclaimed by revolutionaries. On the contrary – our values, goals, and collective behaviors are changing across multiple concrete actions taken over time.

Designing for system change, we are learning, involves establishing the appropriate *enabling conditions*. One important enabling condition is a capacity for ecological thinking, and the ability to see patterns of life as a connected whole.⁴⁹ Western cultures have lost a sense of connection between humanity, place, and nature – but a cultural yearning to reconnect is widespread. The new priority is *relationships*. Biologist Andreas Weber’s book *Matter and Desire* points out that this is how nature works, too – the practice of ecology is “the forging of relationships.”⁵⁰

Another important enabling condition for system change is the reconnection of urban and rural. Although most policymakers and pundits are confident that migration to cities will continue without pause, an opposite trend is also emerging. A growing number of urban citizens seek relationships with the rural, and want to play an active role in a city’s life support system – its agriculture, soils, and ecosystems. Projects that embody this cultural shift include new food distribution models, land-sharing cooperatives, social farming and care farming, ecological restoration, fiber and grain networks, local energy consortiums, and the maker and upcycling movements. As we saw with the Fibershed model, the best of these projects links soil health to food quality, public health with land health, and scientists’ biodiversity expertise with educational programs promoting citizen science. There is much to discover.

Reconnecting the city with its bioregion is not about leaving home to live

[climate-change/tcfd/#](#); FSB, “Task Force Publishes Recommendations on Climate-Related Financial Disclosures,” news release no. 20/2017, June 29, 2017, <http://www.fsb.org/2017/06/task-force-publishes-recommendations-on-climate-related-financial-disclosures/>.

44 Van Steenis, “Defective Data is a Big Problem for Sustainable Investing.”

45 Niels Corfield’s Facebook page, accessed January 23, 2019, <https://www.facebook.com/nielscorfieldland/>.

46 Visit <https://soils.sectormentor.com/> for more information.

47 Gunnar Rundgren, “A Regenerative Food System is Both a Means and an End,” *Garden Earth—Beyond Sustainability* (blog), January 2, 2019, <http://gardenearth.blogspot.com/2019/01/a-regenerative-food-system-is-both.html>.

48 Daniel Strain, “Getting to Drawdown: Q&A with Paul Hawken,” *Future Earth* (blog), August 8, 2017, <http://futureearth.org/blog/2017-aug-8/getting-drawdown-qa-paul-hawken>.

49 John Thackara, “Ways of Knowing,” *Thackara.com* (blog), September 13 2013, <http://thackara.com/learning-design/ways-of-knowing/>.

50 Andreas Weber, *Matter and Desire: An Erotic Ecology* (White River Junction: Chelsea Green Publishing, 2017); also see Andreas Weber and David Hornsby, “A Biology of Wonder,” *Beshara Magazine*, accessed January 2, 2019, <https://besharamagazine.org/well-being-ecology/andreas-weber-a-biology-of-wonder/>.

51 Visit <http://xskool.com/> for more information.

52 John Thackara, "Xskool Workshops," *Thackara.com* (blog), accessed January 2, 2019, <http://thackara.com/xskool/>.

53 Visit <https://goodworkinstitute.org/the-fellowship/> for more information.

54 Yongqi Lou, Francesca Valsecchi, and Clarissa Diaz, *Design Harvests: An Acupuncture Design Approach towards Sustainability* (Gothenburg: Mistra Urban Futures, 2013), 6.

55 Visit <https://www.urbanrural-bridge.com/> for more information.

56 Visit <https://www.urbanrural-bridge.com/#farmer-institute> for more information.

57 Visit <https://www.urbanruralbridge.com/#app> for more information.

58 Franklin Hiram King, *Farmers of Forty Centuries: Permanent Agriculture in China, Korea, and Japan* (1911; Mineola: Dover Publications, 2004).

59 Tracie McMillan, "How China Plans to Feed 1.4 Billion Growing Appetites," *National Geographic*, February 2018, <https://www.nationalgeographic.com/magazine/2018/02/feeding-china-growing-appetite-food-industry-agriculture/>.

60 Chris Smaje, "Of Cates and Hedges," *Small Farm Future* (blog), January 19, 2019, <https://smallfarmfuture.org.uk/2019/01/of-cages-and-hedges/>.

61 Zhang Yu, "When Academic Knowledge Meets Farmers, Crop Yields Increase," *China Daily*, last updated September 11, 2018, <http://www.chinadaily.com.cn/a/201809/11/WS5b-971d49a31033b4f4655527.html>.

62 Kate Whiting, "China Is Sending Science Students to Live with Rural Farmers—And Crop Yields are Skyrocketing," *World Economic Forum*, September 18, 2018, <https://www.weforum.org/agenda/2018/09/china-is-sending-science-students-to-live-with-rural-farmers-and-crop-yields-are-skyrocketing/>.

63 Zhenling Cui et al., "Pursuing Sustainable Productivity with Millions of Smallholder Farmers," *Nature* 555 (2018): 363–66, <https://www.nature.com/articles/nature25785>.

in a yurt. In a series of xskool⁵¹ workshops I curated in 20 countries – under the thematic umbrella #BackToTheLand2.0 – we uncovered multiple new ways for urbanites to re-connect with the land.⁵² These ways tend to be part-time, but long-term. They involve an exchange of value, not just paying money. They involve a commitment to share knowledge, land, and equipment using new technology. They often involve the design of service platforms to help people to share resources of all kinds – from land to time – and the development of novel forms of governance that enable collaboration among diverse groups of people. They find inspiration in historical links between town and country – but reinvented in an age of social innovation and networks.

These insights inspired the founders of Etsy to create the Good Work Institute in upstate New York. The Institute's keystone activity is a six month fellowship for change leaders who are already present and active in the Hudson Valley. Among a cohort of 30 fellows that I met on a recent visit were the founder of a real bread company, a publisher, an urban farmer, a podcast producer, an outdoors educator, a festival producer, a public librarian, and a currency designer. The centerpiece of each fellowship is a Place Project in which participants design new ways to use and connect existing assets. Examples under development that I heard about included a carpooling route, a media studies center expansion, a local currency, and a community bill of rights. This Good Work Fellowship⁵³ is not just about projects, personal development is also key. Time is protected in the program for periods of deceleration – reflection, meditation, journaling, and other ways to process what are otherwise intense experiences. The fellowship is also designed for the long term: at the end of their six months, fellows join a network of hundreds of local leaders in local hubs located in Poughkeepsie, Newburgh, and Kingston. Their knowledge and connections are sustained by trained facilitators.

Design Harvests, in China, is another exemplary design program focused on urban-rural reconnection. During five years of design research on Chongming Island near Shanghai, teams led by Professor Yongqi Lou at Tongji University explored the creation of new services linking city and rural in which heritage and resources are shared and stewarded by diverse stakeholders. The interconnectedness and interdependence of natural, human, and industrial systems is a defining feature of Design Harvests. As Lou points out, "In traditional Chinese ideology, humanity and nature have always been regarded as a whole."⁵⁴ Also in China, the Urban-Rural Bridge⁵⁵ community is developing new services to support the new rural economy. Its Farmer Institute⁵⁶ disseminates agro-ecological best practices that build soil, store carbon, and revitalize biodiversity. This work is supported by a Co-op Lab that explores new ways to use local resources, and a platform called Urb App⁵⁷ that connects people in cities with rural food producers. Urban-Rural Bridge is also developing eco-villages, and a range of ecotourism services. Western readers have long regarded Mrs. F.H. King's *Farmers of Forty Centuries*, which celebrates China's agricultural history, as an inspiring resource.⁵⁸ China still has more people in farming than most industrialized countries, and more than ninety percent of all farms in China are less than 2.5 acres even today.⁵⁹ China is well-placed to be a living school,⁶⁰ at a national scale, it already is. The country's Science and Technology Backyard platforms,⁶¹ which operate in 21 provinces and cover a wide range of crops, take agricultural scientists to live in villages where they explore, with farmers, the best use of new agricultural options such as pest management and the use of legumes as alternatives to fertilizers.⁶² Although some 200 million smallholdings are not yet plugged into these information networks, the potential of technical connectivity to amplify social and cultural connectivity is immense.⁶³

Smart Villages, New Rural Economies

Smart villages seek to use digital technologies to support rural activities and connect them with digital networks and weave them into wider social fabrics.⁶⁴ Smart village initiatives will enable rural communities to develop new services that recombine location, connection, and social co-presence in novel ways. Attention from e-commerce giants has added an interesting dynamic to this movement. Although their core activity is distribution rather than territorial development, that model is evolving. In 2017, JD.com announced plans to open 1,000 bricks-and-mortar convenience stores daily across China.⁶⁵ It was receiving 50,000 applications a day from Chinese migrant workers tempted by the prospect of working closer to home while also earning a decent wage.⁶⁶ Similarly, more than 600,000 local convenience stores have joined Alibaba's Ling Shou Tong fulfillment network since its launch in 2017.⁶⁷ Without being *too* naive about the business logic that drives the online giants, these convenience stores could surely play a dynamic role in the new rural economy as hubs for Science and Technology Backyard programs that are already underway.

Social Innovation and Relational Design

For biologists, the health of an ecosystem lies in the vitality of interactions between its component species.⁶⁸ This lesson applies equally to a bioregion's innovation system. The process enabling a variety of formal and informal, large and small stakeholders to work together is a key success factor.

A third enabling condition for system change, therefore, is the design of place-specific social infrastructures that connect actors and local assets and foster viable new enterprises: food co-ops, community kitchens, neighborhood dining, edible gardens, food distribution platforms, craft breweries, bake houses, productive gardens, cargo-bike hubs, maker spaces, tool libraries, recycling centers, and the like. New social and business models are key elements of this infrastructure: the sharing economy, mobility as a service, civic ecology, food and fiber sheds, transition towns, bioregions, housing as a service, and the care economy. Platform-based cooperatives in particular are effective ways to provide fair compensation for services provision among the people who make those services valuable.

In North Wales, Arloesi Pontio Innovation⁶⁹ is also connecting the "What is?" with the "What if?" at the scale of its region. Pontio's mission – the word means *bridge* in Welsh – is to use relational design to connect assets with high potential that are currently disconnected. North Wales' mountains, clean air, biodiversity, abundant fresh water, and seaside have already attracted a network of small companies whose activities include producing climbing equipment and offering extreme sports, wellness, health, and adventure tourism. Pontio connects these enterprises to research at Bangor University in sports science, systems design, and psychology. Its Relational Design Master's degree⁷⁰ focuses on wellbeing, adventure, and tourism. As Pontio Innovation's director Andrew Goodman puts it, "Connecting place, people, knowledge, and technology can create new value – but assets do not readily connect themselves. Relational Design is about connecting the 'what is?' with the 'what if?' in a regional context."⁷¹ The outcomes are services, livelihoods, and enterprises. Many schools, community hubs, farms, shops, and learning centers in North Wales are looking for novel ways to engage with new publics. Pontio Innovation helps them develop such new services and programs as citizen science, ecological artist, and land-based learning initiatives.

In South West England, the Dartia watershed is the hub for a diverse ecosystem of social and environmental innovators: the Transition Towns movement was born in nearby Totnes, and Schumacher College is located on the Dartington Learning Estate (which was founded in 1930).⁷² The Bioregional Learning Center⁷³

64 "In Smart Villages, traditional and new networks and services are enhanced by means of digital, telecommunication technologies, innovations and the better use of knowledge, for the benefit of inhabitants and businesses. Digital technologies and innovations may support quality of life, higher standard of living, public services for citizens, better use of resources, less impact on the environment, and new opportunities for rural value chains in terms of products and improved processes." Phil Hogan, Corina Crețu, and Violeta Bulc, *EU Action for Smart Villages* (Brussels: EU Directorates General for Agriculture and Rural Development, Regional Policy, and Mobility and Transport, 2016), available at https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/looking-ahead/rur-dev-small-villages_en.pdf.

65 Ashley Armstrong, "Chinese Online Retailer JD Plans to Open Hundreds of Unmanned Shops, ahead of Amazon," *The Daily Telegraph*, December 14, 2017, <https://www.telegraph.co.uk/business/2017/12/14/chinese-online-retailer-jd-plans-open-hundreds-unmanned-shops/>.

66 "JD.com Promises '1000 Stores a Day,'" *Inside Retail Asia*, April 17, 2017, <https://insideretail.asia/2018/04/17/jd-com-promises-1000-stores-a-day/>.

67 Karen Hao, "Alibaba Is Trying to Reinvent China's Mom-and-Pop Stores," *Quartz*, January 5, 2018, <https://qz.com/1171743/alibaba-is-trying-to-reinvent-chinas-mom-and-pop-stores/>.

68 Jane Memmott, Rachel Gibson, Luisa Gigante Carvalheiro et al., "The Conservation of Ecological Interactions," in *Insect Conservation Biology: Proceedings of the Royal Entomological Society's 23rd Symposium*, ed. Alan Stewart, Timothy R. New, and Owen T. Lewis (Wallingford: cabi, 2007), 226–44.

69 Visit https://tickets.pontio.co.uk/online/default.asp?doWork::WScontent::loadArticle=Load&BOParam::WScontent::loadArticle::article_id=30E72E32-EFE6-4EE6-94C8-E719DAC9F0BF&sessionlanguage=&SessionSecurity::linkName for more information.

70 Visit <https://www.bangor.ac.uk/courses/postgraduate/>

relational-design-masters-by-research for more information.

71 Personal communication with the author; also see John Thackara, "Relational Design (MScRes)," *Thackara.com* (blog), accessed February 17, 2019, <http://thackara.com/pontio-masters/>.

72 Jane Brady, *The Mile Upstream Project* (Plymouth: Westcountry Rivers Trust, 2017), available at <https://issuu.com/westcountryriverstrust/docs/totnes-mile-upstream-project>.

73 Visit <https://bioregion.org.uk/> for more information.

74 Visit <http://wrt.org.uk/> for more information.

75 Isabel Carlisle, "How Do I Love Thee? Let Me Count the Ways.... Coming Back to Being Indigenous to Place in the Dart Valley," *TransitionNetwork.org*, December 22, 2013, <https://transitionnetwork.org/news-and-blog/how-do-i-love-thee-let-me-count-the-ways-coming-back-to-being-indigenous-to-place-in-the-dart-valley/>.

76 Visit <https://atelier-luma.org/en/> for more information.

77 Visit <https://atelier-luma.org/en/projects/algae-lab> for more information.

78 "Africa's Culture of Sharing Can Help Solve Some of the Continent's Challenges," *eNCA*, March 1, 2017, <https://www.enca.com/opinion/africas-culture-of-sharing-can-help-solve-some-of-the-continent-biggest-challenges>.

79 "This is the moment to change our development model, from a growth-oriented and extraction of natural resources oriented model to something that is more holistic ... a collective well-being of both humans and non-humans ... a view of design in tune with the radical interdependence of all life. In designing tools, objects, and institutions, we are designing ways of being." Arturo Escobar, "Farewell to Development: An Interview with Arturo Escobar," *Great Transition Initiative: Toward a Transformative Vision and Praxis*, accessed January 2, 2019, <https://www.greattransition.org/publication/farewell-to-development>.

80 The notion of a "plan of life" was first perceived by the

is another connector of actors and organizations. And the West Country Rivers Trust⁷⁴ enables citizen participation in river and wetland restoration, and leads clean energy and community-led health care projects in the region. Based on the trust's detailed scientific analysis of the rivers' social and ecological assets, it coordinates practical activities including river bank repair, drain contents monitoring, and the establishment of rain gardens that use storm water runoff. The trust is also installing drinking water purification stations, and improving waterway access for kayaks ... but not for cows. Isabel Carlisle,⁷⁵ founder of the Bioregional Learning Centre, hopes that in the medium term a "Dartia Guild" will be created to bring a wondrous variety of river shed stakeholders together: a large estate, farms, a water treatment plant, a plant nursery, a pub, a supermarket, a restaurant, a school, house and boat owners, a dock, and more.

At Atelier Luma in southern France,⁷⁶ another cohort of designers and artists is discovering new kinds of value among the social and ecological assets of the Camargue bioregion. Their stewardship approach keeps track of where resources come from, identifies leakages in the local economy, and explores how to plug them using local skills and resources connected together. Its Algae Lab⁷⁷ exemplifies this whole system approach. Designers Eric Klarenbeek and Maartje Dros put locally-grown algae through a manufacturing process whose materials remain local from start to finish. Other design teams are working with materials native to the Camargue: salt, bamboo, rice, wool, sunflowers – even stone. The production system is designed to work at a regional scale, but product and process designs are shared digitally with other regions.

History as Innovation

The new rural economy reveals its greatest potential when we re-visit history for inspiration. The past contains multiple examples of social innovation that we can learn from today. The sharing economy, for example, has been greeted in the Global North as a novelty in recent times – but solidarity systems have existed for centuries. Ever since water was shared as a common resource in Iran 8,000 years ago, people have been collaborating and sharing resources to better raise and educate their families, take care of the land, and support each other in times of difficulty. The mutualization of risk among traditional networks of reciprocity and gift dates back centuries. Social systems based on kinship and the sharing of resources have deep roots in most cultures. In Australia, indigenous peoples have cared for place as a commons for at least 50,000 years. There are an estimated 3,000 different words for sharing in African cultures.⁷⁸ And in Latin America, alternatives to development include the concepts *Buen Vivir* (The Good Life)⁷⁹ and *Planas Vida* (Plans for Life).⁸⁰ These visionary mindsets hold much that we might learn from today.

The diverse ways poor people meet their daily needs are usually described as impoverished, or lacking in development. But in 35 years as a guest in what used to be called the developing world, I have come to a startling conclusion: living sustainably is second nature for people who cannot depend on the high entropy support systems of the industrial world. Their survival practices have enormous potential today. We need to ask: who has answered a similar question in the past? How might we learn from – and improve – what worked before?

Technology has an important role to play here: the infrastructure supporting and enabling today's social relationships to flourish. Digital networks will make the re-emergence of gift exchange possible. Mobile devices and the Internet of Things make it easier for local groups to share equipment and space; monitor the health of fields, the air, rivers and forests; or manage trust decentralized ways. Learners in a bioregion or across bioregions can foster and maintain collaborative discovery the

same ways that IT professionals do: via wikis, as the FabLab community does,⁸¹ or, as the members of the Tech for Good podcast community do, via GitHub.⁸² A bioregion's knowledge infrastructure can take advantage of the same platforms used by millions of software developers – but that data/learning/sharing community needs to be designed.

Knowledge Ecologies

The regeneration of communities and ecosystems involves a variety of learning challenges. In ecological restoration, for example, the scale and complexity of available data is formidable. An ecology metrics list on Github contains more than three thousand terms – from molecular phylogenetics to microrefugia, from myrmecology to ecophysiology.⁸³ Ecological agriculture involves the development of new forms of land tenure, distribution models, processing facilities, financing, and training. Many technical solutions also exist: the Climate Tech Wiki⁸⁴ lists hundreds of mitigation and adaptation technologies, from advanced paper recycling to urban forestry. Exploring social and cultural assets can involve a range of skills and capabilities: a geographer's knowledge of territory, a biologist's expertise in habitats, an ecologist's literacy in ecosystems, and an economist's ability to measure flows and leakage of money and resources. We need new tools to measure where resources come from and identify leaks in local economies, and connected ways of plugging those leaks using local skills and resources.

Various tools and solutions exist, but the most appropriate have to be identified, and selected. This is not a task for designers acting alone – their role is as much connective as it is creative. But in creating objects of shared value – an atlas, a plan, a meeting, a network – the design process is a powerful way to foster collaboration among those various expert geographers, ecologists, economists, planners, social historians, writers, artists, and citizens. And as the process entrains the system emergence it seeks to foster, valuable new learnings emerge.

In the Northwestern United States, a network of universities has developed a Curriculum for the Bioregion⁸⁵ that transforms place-based development. The curriculum is taught across the Puget Sound and Cascadia bioregions. It covers such topics as ecosystem health, water and watersheds, sense of place, biodiversity, food systems and agriculture, ethics and values, cultures and religions, cycles and systems, and civic engagement. An impressive archive⁸⁶ of completed projects is evidence that these are not just academic activities.

Bioregional stewards may be experts in water, soil, agriculture, flora, and fauna. Teaching and learning stewardship is multidisciplinary. In Europe, for example, an online course called Land Stewardship: From Theory to Practice was produced by the LandLife EU program.⁸⁷ Teams of experts have so far evaluated water quality data as indicators of the health of an ecosystem; mapped stream channels in a local watershed; researched the geology, hydrology, soils, and slope stability of a local town; analyzed the environmental costs of metal mining; studied how indigenous peoples used to inhabit their region; and discussed how best to integrate this legacy into today's new models of development. During the course, students presented case studies of land stewardship; designed a stewardship agreement; analyzed collaboration methods and communication experiences; and explored funding opportunities for land stewardship. From a different angle, a Soil Academy is being developed by a group called Common Soil.⁸⁸ The Common Soil Campus⁸⁹ will be a learning center for regenerative agriculture, land restoration, regional food systems, and land stewardship – the idea is equip the next generations of farmers and citizens the skills to become stewards of living soil.

Learning how to help groups work together is just as important as deciding

Guambiano, an Indigenous group living in the Cauca region of Colombia. A plan is designed to serve the future needs of the community as it pursues a path towards what is yet to come, but the standards benchmarking its success are the values of Guambiano elders. As Guambiano representative Alvaro Morales says, "The future is behind us." Bastian Hermission, "Plan de Vida—An Indigenous Initiative for Cultural Survival," *Cultural Survival Quarterly*, December 1999, <https://www.culturalsurvival.org/publications/cultural-survival-quarterly/plan-de-vida-indigenous-initiative-cultural-survival>.

81 Visit http://wiki.fablab.is/wiki/Main_Page for more information.

82 Visit <https://github.com/TechforgoodCAST/awesome-techforgood> for more information.

83 "Bibliometrics," GitHub, accessed January 2, 2019, <https://github.com/weecology/bibliometrics/blob/master/keyword.csv#.UTpZXmbo510.twitter>.

84 Visit <http://www.climatechwiki.org/> for more information.

85 Visit <https://wp.wvu.edu/c4b/> for more information.

86 "Activity Collection," Curriculum for the Bioregion: Fostering an Ethic of Place, accessed January 2, 2019, <https://serc.carleton.edu/bioregion/activities.html>.

87 "LandLife: Project Description," European Commission and Xarxa de Custòdia del Territori, accessed February 10, 2019, http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4138.

88 Visit <https://www.commonsoil.org/> for more information.

89 Pieter Ploeg, Nakyta Grimm, and Lyra Skusa, "Common Soil Campus: A Learning Centre for Regenerative Land Stewardship. Vision Document," Common Soil Campus, accessed February 10, 2019, <https://angelidelsuolo.files.wordpress.com/2016/09/common-soil-campus1.pdf>.

90 Visit <http://artofhosting.ning.com/> for more information.

91 Visit <http://www.fao.org/home/en/> for more information.

92 “Agroecology Knowledge Hub,” Food and Agriculture Organization of the United Nations, accessed January 23, 2019, <http://www.fao.org/agroecology/home/en/>.

93 “Well-Being of Future Generations (Wales) Act 2015,” the Wales Government, last modified August 8, 2016, <http://gov.wales/docs/dsjlg/publications/150623-guide-to-the-fg-act-en.pdf>; visit <http://futuregenerations.wales/about-us/future-generations-act/> for more information.

94 Welsh Government National Health Service, *Statistical Release: NHS Expenditure Programme Budgets, 2016–17 (SFR 29/2018)*, April 2017, 4, available at <https://gov.wales/statistics-and-research/nhs-expenditure-programme-budgets/?lang=en>.

95 “What’s Your Connection with Nature Like?,” *Natural Resources Wales*, accessed February 10, 2019, <https://naturalresources.wales/guidance-and-advice/business-sectors/education-learning-and-skills/whats-your-connection-with-nature-like/?lang=en>.

96 “Scottish GPs to Begin Prescribing Rambling and Birdwatching,” *The Guardian*, October 4, 2018, <https://www.theguardian.com/uk-news/2018/oct/05/scottish-gps-nhs-be-gin-prescribing-rambling-bird-watching>.

97 Annie Proulx, *Barkskins: A Novel* (New York: Scribner/Simon and Schuster, 2016).

what needs to be done, if not more so. It’s not enough simply to proclaim the moral superiority of sharing, for example, and expect everyone to fall in line. Tough questions must be confronted, and not brushed under the carpet. How can we map and name the resources to be shared? How do we determine who is entitled to what? How can we design rules and sanctions, or even how to make the rules? Dealing with difference involves a lot of consensus building, collective participation, and transparent decision making. Nurturing these social practices is a soft activity that lies well outside the comfort zone of most design professionals. But online communities such as The Art of Hosting⁹⁰ can be valuable partners when these soft skills are needed.

The scale and complexity of learning we have to do now is demanding – but it is not unprecedented. The transition from an agricultural to an industrial economy in the nineteenth century also entailed a profound transformation of knowledge and practice. To meet this challenge, numerous support services and regional institutions were invented to equip people with the skills to cope. They gave priority to participatory discovery, and experiential learning.

A surprising number of these institutions still exist, and can be repurposed for today’s transition: Folk High Schools developed in the Nordic countries in the nineteenth century; *Maisons Familiales Regionaux* in France; and community colleges in the US. Other legacy institutions abound: There are more public libraries in the U.S.A. (120,000) than there are McDonalds – and 1,800 YMCAs (now known as Ys). Many regional and specialty museums are looking to redefine their roles. There is also potential for collaboration with friendly and benefit societies: Rotary Clubs, Oddfellows, Lions, Freemasons, and Elks. Thousands of post offices and local shops already act as place-based meeting points; we can use them, too, as hubs for learning networks.

A focus on the local does not mean abandonment of collaboration at a national, regional, European, or continental scale. Most governments focus too much on technology start-ups, it’s true, but below the radar, a growing part of the research ecosystem is advancing with a different set of priorities. Dozens of projects and research networks around the world are looking at land repair, agroecology, food systems, biodiversity, and ecosystem stewardship. Signals of change are also evident in global research ecosystems. Once a remorseless enabler of industrial agriculture, the UN Food and Agriculture Organization (FAO)⁹¹ has evolved remarkably in recent times. It now hosts a variety of agroecology programs based on applying ecological principles to interactions between plants, animals, humans, and the environment, while taking into social justice into account.⁹²

The most significant transformations are emerging where governments are linking the health of human populations to the health of nature. Wales, for example, has passed a Well-being of Future Generations Act⁹³ that requires public bodies to think more about the long term, work better with people and communities and each other, and look to prevent problems with a more communal approach. With mental health costs at over seven billion pounds per year,⁹⁴ Natural Resources Wales has introduced a Connection with Nature Program⁹⁵ that provides doctors and care workers with practical guidelines for “prescribing nature” as an alternative to prescribing drugs.⁹⁶

Further Reading

*Annie Proulx: Barkskins*⁹⁷

Or: how we first got the idea that the earth’s resources are limitless. Proulx’s story begins with the arrival in “New France” – the vast tract of North America and Canada colonized by the French between the 16th and 18th centuries. Two young

men set out to earn their freedom by clearing an area of forest; they are soon awe-struck by the imposing, often impenetrable and seemingly limitless extent of the forest.

Simone Weil on the Need for Roots

“Rootedness in a place is the most important and least recognized need of the human soul. It is one of the hardest to define. A human being has roots by virtue of his real, active and natural participation in the life of a community which preserves in living shape certain particular treasures of the past and certain particular expectations for the future.”⁹⁸

Pamela Mang on Storying of Place

“What makes a shift to true sustainability possible is the power of the connection between people and place. Place is a doorway into caring. Love of place unleashes the personal and political will needed to make profound change. It can also unite people across diverse ideological spectra because place is what we all share: it is the commons that allows people to call themselves a community. In every place, geology and nature interweave over time with human history and culture to create a place’s recognizable character and nature – its essence. The Story of Place process begins with a journey of collective discovery aimed at revealing the ongoing and distinctive core patterns that shape the complex web that makes place, the patterns that determine the dynamics of a given place and influence the complex relationships that result in its activities, growth, and evolution. Understanding these patterns helps reveal new possibilities for how to live in partnership with place, growing a future of greater abundance and creativity for all life.”⁹⁹

Jane Memmott on Ecosystem Interactions

“All organisms are linked to at least one other species in a variety of critical ways – for example, as predators or prey, or as pollinators or seed dispersers – with the result that each species is embedded in a complex network of interactions. The sciences of the mid-20th-century, rooted in units and relations, have a hard time with three key biological domains: embryology and development, symbiosis and collaborative entanglements, and the vast worlds of microbes.”¹⁰⁰

Margaret Wheatley on Emergence

“Rather than worry about critical mass, our work is to foster critical connections. We don’t need to convince large numbers of people to change; instead, we need to connect with kindred spirits.”¹⁰¹ Through these relationships, we will develop the new knowledge, practices, courage, and commitment that lead to broad-based change.

Molly Scott Cato on Gaian Economics

“The heart of our problem lies not in the actions which destroy the environment, but in the economic system which causes them. The business of economics is about creating abstractions, imbuing them with power, and then using them to acquire resources. An understanding of the spiritual value of life and the ability to mediate between humans and the natural world are far more useful qualities for an economist than complex maths.”¹⁰²

Juliet Schor on Connected Communities

“A ‘new economy’ conversation has emerged that focuses on visions of resilience and sustainability where stronger, more connected communities become the social fabric for an ecologically balanced economy of extra-market and new-market

98 Simone Weil, *The Need for Roots: Prelude towards a Declaration of Duties towards Mankind* (1952; London: Routledge, 2003), 43.

99 Pamela Mang, “Revealing the Story of Place: Why Falling in Love with Where We Are Is Key to Lasting Transformation,” *Schumacher College* (blog), March 3, 2016, <https://www.schumachercollege.org.uk/blog/revealing-the-story-of-place>.

100 Jane Memmott et al., “The Conservation of Ecological Interactions”; also visit <http://www.bristol.ac.uk/biology/people/jane-memmott/index.html> for more related readings.

101 Nenad Maljković, “Systemic Change: Emergence,” *Medium.com*, September 3, 2016, <https://medium.com/virtual-teams-for-systemic-change/systemic-change-emergence-bf1fd46818ab>; Margaret Wheatley and Deborah Frieze, “Using Emergence to Take Social Innovations to Scale,” *MargaretWheatley.com*, 2006, accessed February 9, 2019, <https://www.margaretwheatley.com/articles/emergence.html>.

102 Molly Scott Cato, *Gaian Economics* (blog), accessed February 17, 2019, <http://gaianeconomics.blogspot.com/>; also see Molly Scott Cato, *Green Economics: An Introduction to Theory, Policy and Practice* (London: Earthscan, 2009).

103 “Sociology Faculty Directory: Juliet Schor, Professor,” Boston College Morrissey College of Arts and Sciences, accessed February 10, 2019, <https://www.bc.edu/content/bc-web/schools/mcas/departments/sociology/people/faculty-directory/juliet-schor.html>.

104 Olivier De Schutter and Gaëtan Vanloqueren, “The New Green Revolution: How Twenty-First-Century Science Can Feed the World,” *Solutions Journal* 2, no. 4 (2011): 6–7, available at <http://hdl.handle.net/10535/7482>, also available at http://p2pfoundation.net/Six_Proposed_Policy_Principles_for_Scaling_Up_Agroecology.

105 Ina Praetorius, *The Care-Centered Economy: Rediscovering what has been Taken for Granted*, ed. Heinrich Böll Foundation (Cologne: Heinrich Böll Foundation, 2015), 1–84, available at http://us.boell.org/sites/default/files/the_care-centered_economy.pdf.

106 Paul Stamets, “Earth’s Natural Internet,” *Whole Earth Catalog*, fall 1999, <http://www.wholeearth.com/issue/2098/article/86/earth's.natural.internet>; also see Richard Coniff, “Microbiomes at the Roots: A New Look at Forest Ecology,” *Yale Environment* 360, October 7, 2013, https://e360.yale.edu/features/microbiomes_at_the_roots_a_new_look_at_forest_ecology.

107 Anne Whiston Spirn, “Ecological Urbanism: A Framework for the Design of Resilient Cities,” in *The Ecological Design and Planning Reader* (Washington, DC: Island Press, 2014), 557–71, DOI: https://doi.org/10.5822/978-1-61091-491-8_50.

enterprises. The new economy initiatives are oriented to high satisfaction, egalitarian outcomes, low eco-footprints, and enhanced levels of learning. Connected consumption is one part of these visions of resilience and sustainability.”¹⁰³

Agroecology, by P2P Foundation

Agroecological practices require public goods such as extension services, storage facilities, rural infrastructure (roads, electricity, and information and communication technologies), access to regional and local markets, credit and insurance against weather-related risks, agricultural research and development, education, and support to farmers’ organizations and cooperatives.¹⁰⁴

Ina Praetorius on the Notion of a Care-Centered Economy

German writer Ina Praetorius revisits the feminist theme of care work, re-casting it onto a much larger philosophical canvas. Rediscovering what has been taken for granted suggests how the idea of “care” could be used to imagine new structural terms for the entire economy.¹⁰⁵

Nature’s Internet

In an old-growth forest, a handful of soil also contains millions of super-delicate mycorrhizal fungi. Linked together with the roots of plants, mycorrhiza form vast subsoil networks – “nature’s internet” – where mind-bogglingly complex interactions support the flora and food webs we all rely on for our existence. This vast, invisible web does more than ferry water and nutrients; it also enables long distance communication between plants.¹⁰⁶

Anne Whiston Spirn on Ecological Urbanism

“Humans’ survival as a species depends upon adapting ourselves and our ... settlements in new, life-sustaining ways, shaping contexts that acknowledge connections to air, earth, water, life, and to each other, and that help us feel and understand these connections, landscapes that are functional, sustainable, meaningful, and artful’ (Spirn 1998, 26). Ecological urbanism aims to advance this goal. It weaves the theory and practice of city design and planning, as a means of adaptation, with the insights of ecology – the study of the relationships between living organisms and their environment and the processes that shape both – and other environmental disciplines, such as climatology, hydrology, geography, psychology, history, and art.”¹⁰⁷