BioRegional Development Group

Ecological Design Redux

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Beddington Zero Energy Development, is a carbon-neutral, mixed-use community in the UK, that focuses on producing at least as much energy from renewable sources as it consumes.

Ecological Design was first published 12 years ago. It was one of the first efforts to simply and clearly articulate five basic principles of ecological design:

- Solutions Grow from Place
- Ecological Accounting
- Design with Nature
- Everyone is a Designer
- Making Nature Visible

The approaches explored in the book have been widely embraced and expanded upon over the last twelve years, which is heartening, but the challenges have multiplied much more quickly.

The first principle, "Solutions Grow from Place," states that solutions grow from the unique cultural and physical characteristics of place, which are so often ignored by standardized designs. The globalized, highly mobile economy works against knowledge of and protection of place. All over the world, local groups are fighting to protect their cultural and natural heritage. The ecological, material, and human character of place is always the context of design even as the mechanical world is busy creating what James Howard Kunstler calls the "geography of nowhere."

"Ecological Accounting" is becoming a major force in architecture and construction through the United State Green Building Council's remarkably successful voluntary rating system called Leadership in Energy and Environmental Design (LEED™). This system explicitly allows environmental and social factors, including site, water, energy, materials, and indoor air quality, to be weighed side by side with financial metrics in the design process.

"Design with Nature" has found multiple expressions in the last ten years, ranging from Janine Benyus' groundbreaking *Biomimicry: Innovation Inspired by Nature* to Robert Frenay's *Pulse: The Coming Age of Systems and Machines Inspired by Living Things*. Living systems have become an extremely popular metaphor, model, and measure for the built environment, technologies, and even social institutions. Despite this, entrenched practices in design and engineering continue to keep people from seeing and applying the obvious, such as designing building orientation and shape to reflect the movement of the sun.

"Everyone is a Designer" is increasingly being applied by a new breed of designers who place collaboration with all the stakeholders at the center of their design process.


Roofscapes,inc.

The Life Expressions Center, a chiropractic center in Pennsylvania designed a decade ago, was planted with 6,000 sedum plants that help reduce summer heat radiation and storm water runoff.

It also captures the underlying impulse of the open source movement, which allows an entire community of users to collectively design software, co-author a document ("wiki"), or design a product.

Finally, "Making Nature Visible," which is linked to the concept of biophilia developed by E.O. Wilson and Steven Kellert, is beginning to be taken seriously by building operators and architects. Each building and site becomes a pedagogical opportunity for the exploration of water, energy, food, materials, waste, and biodiversity. In an increasingly urbanized world, it is critical to make natural systems and processes visible and accessible for both children and adults. Buildings like Oberlin College's Adam Joseph Lewis Center and parks like Betsy Damon's Living Water Garden in Chengdu, China offer multiple levels of interaction with both ecological processes and the resources that sustain us.

In retrospect, perhaps the most compelling theme of *Ecological Design* is the search for a unified approach to the design of sustainable systems that integrates scales ranging from the molecular to global. How can industrial design, architecture, city and regional planning, and infrastructure development be woven together with the capacities and needs of specific bioregions in the service of a world that works for all? How can we design in a way that responds to nature, which is continuously exchanging energy and materials and supporting self-organizing forms across a dizzying range of scales?

The last ten years have seen extraordinary theoretical and technical advances in the field of ecological design. Yet the challenges facing the planet have only accelerated, ranging from the loss of biodiversity to the rapidly increasing impacts of global climate change. The Millennium Ecosystem Assessment, conducted by over a thousand leading scientists over several years, provides a recent authoritative and chilling overview of the declining condition of dozens of ecosystem services, including provision of fresh water, climate stability, soil health, and many others[1].

There is a growing consensus that we have approximately one generation to make the transition from fossil fuels, ecological overshoot, and devastating social inequity to renewable energy, stable ecosystem services, and the ability to meet fundamental human needs. This will require unwavering political will, massive economic, social, and values transformation, and a huge reservoir of ecological design metrics, tools, case studies, and practitioners.

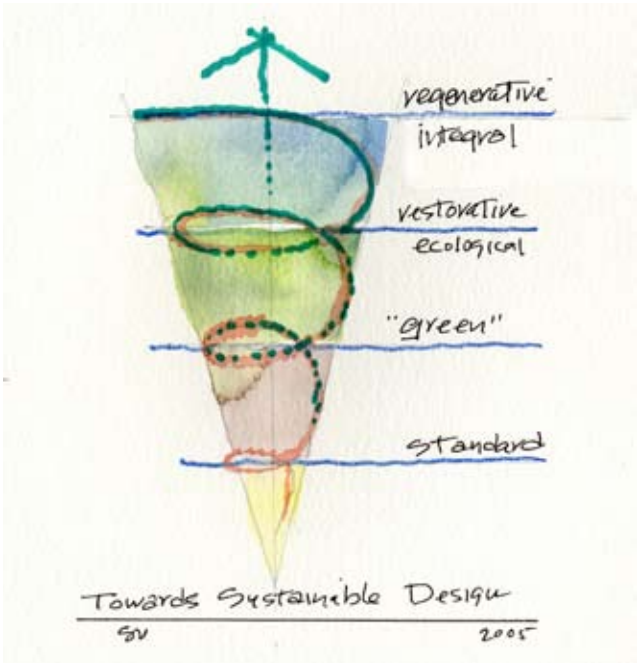
When we first published *Ecological Design*, we reported on early efforts to undertake large-scale land-use planning that systematically conserves biodiversity. In the years since then, landscape ecology, landscape architecture, regional planning, and conservation have shown a promising convergence towards a spatial vocabulary—patch, edge, core, buffer, corridor, matrix—and supporting design principles that protect biodiversity at all levels of scale.

The Nature Conservancy is now undertaking ecoregional planning in its efforts to protect representative samples of key ecosystem types and ensure habitat connectivity. Over the last ten years, the non-profit Wildlands Project has assisted dozens of ecoregional efforts to create effective and linked conservation reserve systems, and now promotes efforts to reconnect habitat at the continental scale, including an effort to create vast linkages along the Rocky Mountains from Yellowstone to Yukon. The Y2Y initiative "is a vision of hope—of a place on the planet that will persevere in its full high-mountain richness forever, while continuing to provide a wonderful place for people to live, work and raise our families. Y2Y works relentlessly to strengthen relationships between conservationists, industry and business leaders, government agencies and educational institutions with the view of working towards achieving a balanced approach to preserving our unique continental treasure."[2]

In a very different bioregional planning context, the Goa 2100 project provides an extraordinary long-term strategy integrating land-use planning, water, energy, economic development, and poverty alleviation for a global biodiversity hotspot

[1] See *Ecosystem and Human Well-Being: General Synthesis*, Island Press, 2005 and also comprehensive resources at http://www.maweb.org.
[2] See The Wildlands Project website, see http://www.twp.org.

located on India's western coast. Prepared in response to an international competition for sustainable urban regions, the project proposes a "dynamic fractal morphology" including a cellular structure of nuclei, cores, spines, and skins; hierarchical networks adapting to topography; algorithmically determined densities which optimize human and resource security; and contiguity and linkage with ambient biodiversity corridors. [3] The project also includes a detailed and economically viable transition to renewable energy systems, zero-waste manufacturing strategies, and ecological restoration. The project team has since been invited to work at the state and national scale in India to extend this strategies.



At the urban scale, the World Wildlife Fund and London-based Bioregional Development Group are currently launching the One Planet Living initiative, which promotes dense communities that allow residents to decrease their ecological footprint (land area required to sustainably provide for consumption) from over twenty acres in the United States and twelve acres in Europe to the globally available average of four acres per capita. Such "One Planet Living Communities" utilize ten guiding principles: zero carbon (no fossil fuel emissions); zero waste; sustainable transport; local and sustainable materials; local and sustainable food; sustainable water; natural habitats and wildlife; culture and heritage; equity and fair trade; and health and happiness.[4] The flagship project is Beddington Zero Energy Development (BedZED), completed in 2003, which features one hundred, three-story, superglazed, attached row houses on a four-acre former wastewater treatment plant in a London suburb. BedZED is powered exclusively by solar energy and biomass, treats all wastewater on site with a living machine, and offers a range of lifestyle amenities allowing residents to gracefully reach the four acre global per capita footprint, demonstrating that everyone on the planet could live in BedZED fashion.[5]

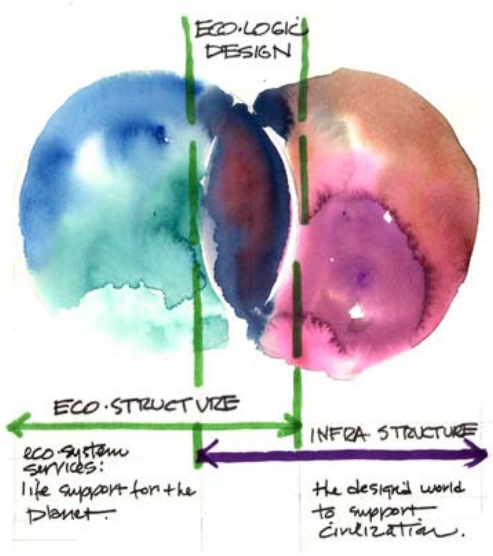
During the last twelve years, product design and industrial design have embraced the concept of cradle-to-cradle design. As William McDonough and Michael Braungart demonstrate in their landmark 2002 book *Cradle to Cradle: Remaking the Way We Make Things*, it is possible to design products that contain only "biological nutrients" that can reenter ecosystems without harm and "technical nutrients" that can be reclaimed and recirculate inside closed-loop industrial cycles. The "Ecological Accounting" chapter discusses an earlier version of this approach, the "Intelligent Products System," which has moved from abstract proposal to mainstream practice within some of the world's largest manufacturing companies in a remarkably short time thanks to exceptional leadership from McDonough and Braungart.

These recent examples from the fields of bioregional planning, urban design, and product design show that sustainability stands at a tipping point of historic dimensions. The design DNA for sustainability is becoming ubiquitous and mutating in response to local need. The scientific foundations for sustainability are rigorous. Policy support at the local, regional, national, and international levels continues to grow. Despite this trend, tens of trillions of dollars of capital remains locked in investments that do not offer sufficient social and environmental returns. This trapped capital greatly limits the possibility of ecological design approaches reaching sufficient scale within the brief transitional generation remaining to us.

Prices do not reflect true social and ecological costs, creating a "sustainability gap" (price differential) for ecological design innovations. However, during the last ten years green buildings, renewable energy, sustainable infrastructure systems, and many areas have made significant progress towards cost neutrality even within the narrowest comparison criteria. Systems approaches that connect project costs and benefits across multiple space and time scales, disciplines, departments, and budgets can further demonstrate the economic viability of ecological design. For instance, based on comprehensive accounting, many municipalities have recently turned to watershed restoration as a cheaper form of flood control and water purification than engineering river channels and installing new treatment equipment.

When a sustainability gap remains, the solution is to recognize that sustainability is a new kind of value proposition, not a mission to be worn on one's sleeve. According to the path-breaking research of Jed Emerson[6], sustainability creates

[3] For a discussion of this project, see Alan Atkission "… " in *The Natural Advantage of Nations*
[4] One Planet Living website, see http://www.oneplanetliving.org.
[5] BedZED/Bioregional Development Group websites, http://www.bioregional.com/programme_projects/ecohous_prog/bedzed/bedzed_hpg.htm
[6] Jed Emerson, see http://www.blendedvalue.org.



blended value (economic, social, environmental). Investors seeking social and environmental returns are drawn to the optimal blended value produced by sustainable enterprises and projects. It is possible to precisely document social and environmental returns—just as financial returns are rigorously analyzed—and provide them to investors seeking such returns. The result is a combination of market-rate and socially or environmentally responsible capital that solves the sustainability gap by replacing unsupportable levels of financial return with supportable blended financial, social and environmental returns.

By optimizing and enhancing social returns (like living wage job creation) and environmental returns (like reduced greenhouse emissions), enterprises become eligible for lower cost, more flexible sources of capital. Such capital may be offered in a wide variety of forms, including loans with more favorable terms, equity investments, grants, bonds, and tax credits. Major sources of living capital include foundations and non-profits (increasingly using their endowments to support their missions); pension funds; community development banks, credit unions, and revolving loan funds; faith organizations; university endowments; local, state, and federal governments; venture capital funds; real estate investment trusts; and businesses. By connecting these vast pools of living capital with worthy sustainability projects, the current sustainability gap, which is probably between 5% and 15% on an economy-wide basis, can be completely closed in a matter of one generation.

Jared Diamond makes the case in his monumental book *Collapse* that past empires collapsed because their political, physical, and cosmological structures ignored the limitations imposed by nature's linked scales. Many current structures in our modern financial, military, and industrial empire cannot be made truly sustainable because their very structure ignores "Design with Nature." We can increase the material and energetic efficiency of such systems, but without a radical restructuring, they can never become sustainable. The most typical example is the living pattern we have been building over the last fifty years: single home suburbs linked by massive freeways to clusters of office and industrial parks and massive shopping malls. You can "green" the houses, you can give the commuters hybrid fuel efficient cars, but you will never achieve sustainability because the basic structure cannot accommodate it.

This brings us to the larger question of recreating community. In David Korten's compelling new book *The Great Turning: From Empire to Earth Community*, he cogently explains the problem: "If we were to apply living-system principles to organizing the relations of daily life within our modern context, we would create locally rooted, self organizing, compact communities that bring work, shopping and recreation nearer to our residences —thus saving energy and commuting time, reducing CO_2 emissions and dependence on oil, and freeing time for family and community activities … With family life, work life, and community life more geographically proximate and people in more regular and natural contact, our lives would be less fragmented and more coherent, the bonds of community denser, stronger and more trusting…"[7]

Sustainability means connecting the flows and structures between the natural world and the built environment at every level of scale. It means transforming the mechanical into the organic, the layer of large grids into ecosystems. We may always have global economies, but they should serve merely to supplement economic activity occurring at the smallest viable scale.

Sim Van der Ryn *is a visionary, author, educator, public leader, and internationally distinguished pioneer in ecological design. Sim has been at the forefront of integrating ecological principles into the built environment, creating multi-scale solutions driven by nature's intelligence. He has served as California's first energy-conscious State Architect, authored seven influential books, and won numerous honors and awards for his leadership and innovation in architecture and planning, including the Congress of New Urbanism's Athena Award for his lifetime achievement.*

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[7] David C. Korten, The Great Turning: From Empire to Earth Community, Berrett-Koehler Publishers, 2006