

Sustainable Development Goals Series  
Industry, Innovation and Infrastructure



Phillip B. Roös

# Regenerative-Adaptive Design for Sustainable Development

A Pattern Language Approach

# **Sustainable Development Goals Series**

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A Pattern Language Approach

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*To the Living Earth  
For my dearest wife Pam and my  
children Arno, Ryan, Shalanda and  
Gemma*

# New Patterns for a Healthy Planet

I discovered Christopher Alexander's important idea of a Pattern Language more than 40 ago, when I was a young graduate student at the University of Oregon. It was a chance discovery as I was working part-time for a local planning consultant under contract to prepare a series of housing studies for the Warm Spring Consolidated Tribe, a Native American community located in the eastern part of the state. I had been tasked to prepare a housing options report and in the process of research found Alexander's books. Multiple volumes, beginning with *The Timeless Way of Building* and *A Pattern Language*, were like none I had ever read – more like sacred design scriptures, it seemed, than a typical book. The third volume in this remarkable sequence was one specifically applying these ideas to the University of Oregon (called *The Oregon Experiment*), where I was studying, and so to me it made the idea of patterns even more relevant and impactful (this document is apparently still the official master plan for the campus). To me the notion of timeless and ancient building and townscape patterns made considerable sense. Surely, we had learned much as a species over the several hundred thousand years of our evolutionary life (and out of 10,000 years of living in place in villages and settlements) about what we needed to build and about the physical and social relationships needed to flourish. Why reinvent what ancient builders and planners had known for millennia? The essential insight was an epiphany – that there were tested and timeless place-building patterns that could be tapped to guide our future design and planning work.

In the last few years there seems to have been an encouraging renaissance and rediscovery of the power of Alexander's pattern language idea and belief in the need to refresh and expand the repertoire of patterns. These efforts have included the *14 Patterns of Biophilic Design*, written by Bill Browning and his colleagues at Terrapin Bright Green; Michael Mehaffy's *A New Pattern Language for Growing Regions: Places, Networks, Processes*; and Phillip Tabb's work on biophilic patterns derived from the inspiring biophilic community of Serenbe, among others.<sup>1</sup>

Peter Kahn has argued for the need to collect and re-invigorate new patterns of nature experiences.<sup>2</sup> He believes – and rightly so, I think – that we have forgotten many of the ways we as a species have historically utilised, enjoyed, celebrated and closely experienced nature in our lives. We have even forgotten what we have lost: Kahn believes we suffer from a pernicious form of “shifting baselines,” as fewer and fewer of us remember the many wondrous and life-affirming ways we tended to interact with nature in the past.

Against this backdrop of climate crisis, global biodiversity loss, and an unravelling of our planetary ecosystems, Roös's book adds immeasurably to a sense of what is possible and needed. Urban design

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<sup>1</sup>E.g. see “14 Patterns of Biophilic Design,” found here: <https://www.terrapinbrightgreen.com/reports/14-patterns/>; Mehaffy, et al, *A New Pattern Language for Growing Regions: Places, Networks, Processes*, found here: <https://patterns.architecture.net/doc/az-cf-193137>; Phillip Tabb, *Serene Urbanism: A biophilic theory and practice of sustainable placemaking*, found here: <https://www.taylorfrancis.com/books/e/9781315608433>

<sup>2</sup>Peter Kahn, et al. “A Nature Language: An Agenda to Catalog, Save, and Recover Patterns of Human–Nature Interaction,” *Ecopsychology*, 2010, found here: [https://depts.washington.edu/hints/publications/A%20Nature%20Language%20\(published\).pdf](https://depts.washington.edu/hints/publications/A%20Nature%20Language%20(published).pdf)

patterns – regenerative and biophilic – are more important than ever, and we need an even more ambitious system of new patterns, commensurate with the extraordinary challenges we face. The need to move beyond modest adjustments and small design tinkering is undeniable, and Roös's new patterns for regenerative-adaptive design are essential. They build on the new-found power of patterns but extend and expand their scope and ambition to fit the dire circumstances we are facing today. As this book shows, everything we build and design must be deeply biophilic; it must work in significant ways to repair and restore these lost connections, at the same time that species, landscapes and eco-systems are restored and regenerated.

What is evident here is a growing sense that our patterns of living and building must acknowledge the deep interconnectedness of our world. Modern cities source much of their food, materials, water and energy from distant hinterlands with little concern for, or transparency about, the long-term impacts, while externalising the waste and pollutants generated there. We don't care where the outputs go, as long as they go *away*. The good news is there is a growing movement which understands that we must make room for nature where we live and work and that we need and want nature around us – an especially important (finally) recognition that being truly healthy, happy, and human requires close contact with nature. Many of the patterns described in this book aim directly at bringing about these closer urban-nature connections. And there is also a growing sense that designing just to be a little less damaging or consumptive of resources and energy can't be enough – we need projects, neighbourhoods, and cities that are regenerative and adaptive, and that help to restore and repair a planet that is already heavily damaged.

We will want to take Roös's regenerative-adaptive patterns and find ways to amplify and accelerate their application. Part of this task will require us to re-think the design fields and what we are teaching in schools of architecture and design. How can the owners, occupants, users of buildings and spaces in our cities care about their regenerative qualities when architects and designers who work to create them don't have the passion, commitment and tools to aspire to higher goals themselves? I have been discouraged to see what we teach, or more importantly what we don't teach, in schools of architecture. There is not much about sharing space with other life, about building and living modestly, about the need to design spaces and places that restore and repair rather than destroy and deplete.

As we tell this story of profound interconnectedness we will need better and more effective methods of storytelling in an era of text messaging and short attention spans. The mystery and magic of nature will need to be part of the answer. I recently participated in a medicine walk in the forests of High Park in downtown Toronto that offers some hope. Led by Irish-Canadian forest ecologist and medical botanist Diana Beresford-Kroeger, it was a vivid and visceral demonstration of this principle of interconnection, but delivered with fun, beauty, and wonder. She explained how essential trees and forests were to human health and the source of a majority of our drugs. She spoke of even deeper connections, telling the group of rapt fellow walkers how terrestrial trees and forests sustained marine ecosystems, fallen leaves providing iron to support microorganisms at the bottom of the marine food chain.

Beresford-Kroeger's work (and she is not alone) reflects the critical power of awe and importance of love. At several points during the walk that day she lovingly embraced the trees she was discussing. The regenerative design responses we need and that are advocated in this book will require a merging of a deep understanding of interconnection with an even deeper sense of love and kinship with all other forms of life.

An appreciation for the value of this kind of ancient knowledge is gaining ground, which is encouraging and reflected strongly in Roös's work here. My brief experience in Oregon also reminds me of the essential role that native cultures can play in helping all of us renew our relationships to nature. They have, after all, managed to live wisely and sustainably for millennia and offer hopeful direction out of the climate and ecological disaster Western societies and economies have precipitated in.

I am especially excited to see in this book an attempt to learn from Indigenous cultures. Australian Aboriginals have lived sustainably on the land for more than 60,000 years, an astounding length of



time. Some research conveyed the idea that this culture was mostly nomadic, with few efforts or innovations at creating settlements or actively managing their environments. New research and new books have shown this to be false. There are few silver linings to the horrific bushfires of the Australian summer, but in the emptiness of the devastation they did in many places show the lines and evidence of long-standing and ancient improvements on the land. Extensive and continuous land management, something careful scholars have known, was made evident in the aftermath of the bushfires when an ancient and elaborate system of aquaculture was discovered.

Hopeful as well are the ways that Indigenous cultures are merging ancient wisdom and modern legal tools, such as the efforts to attach legal and legally defensible rights to nature and natural systems. Ironically an idea expressed in the 1970s by another Christopher (Stone, not Alexander) in the important book *Should Trees Have Standing?*<sup>3</sup>, it was the Maori of New Zealand who applied and tested this idea, notably through the Te Urewera Act of 2014, declaring this large ancient forest a legal person and as such entitled to rights of protection and the ability (through a special governance board) when threatened to sue in the courts.<sup>4</sup> More recently the idea is gaining hold and being applied in a variety of settings, including in ecosystems near cities (such as in the city of Toledo, Ohio, through the Lake Erie Bill of Rights<sup>5</sup>). The lessons may also include the need to shift our Western thinking more in the direction the Maori call “Mauri,” or the spirit or life force that can be found in every element in nature, from fish to trees to rocks. This moves us closer to the notion of their inherent moral worth, and also to a sense of their pervasive and all-encompassing nature – it is all around us, even in cities, calling for acknowledgement and respect.

Several years ago I had the chance to participate in filming the story of how a group of citizens of Perth, Western Australia, organised to defeat a proposed highway expansion (the Row 8 highway) that was slated to destroy an ancient banksia forest and rare wetland. These areas are highly sacred to the *Noongar* people, and during one on-camera interview with *Noongar* Elder Noel Nannup, I learned more about how deeply embedded in nature these ancient Aboriginal societies saw themselves. The larger non-Indigenous world is not likely to embrace this worldview completely, but there are clear lessons to be learned and patterns (some contained here in this book) that can be followed. Most impressively, Nannup talked about the sense of unity between Aboriginals and nature, a totemic culture. Nannup described how at a young age every child is assigned one (or more) totems in the natural world. His was the Bronzewing Pigeon. He spoke eloquently and with remarkable detail about this bird and its biology. It was a creature that he was both clearly fascinated by and that he loved deeply. It was his totem and as such he always carried with him the duty to stand up for the pigeon.

This is just one example of the wonderful traditions that offer compelling lessons for how we cultivate the love, respect and active care for nature we need today. It is easy to succumb to despair, as official reports and projections come piling in and images of burning forests and the deadening of nature bombard us daily. The book before you is one positive response to the challenge of ecological grief experienced by many of us today. It is hard not to fall into a morass of hopelessness and despair, especially when contemplating the diminished world we are leaving the young. But books like this one offer a dose of hope that we might develop the tools and methods and framework to address these challenges and to find (hopefully) a more restorative path and future.

Philosophers sometimes challenge us to consider the ultimate meaning of life: is it primarily about seeking pleasure or happiness, or is it also (or primarily) about purpose and meaning? The rekindling

<sup>3</sup> Christopher Stone, *Should Trees Have Standing? Law, Morality and the Environment*, Oxford University Press, 1972.

<sup>4</sup> See “Te Urewera Act,” Environment Guide, found here: <http://www.environmentguide.org.nz/regional/te-urewera-act/>

<sup>5</sup> E.g. See Tom Henry, “More at stake than water with Lake Erie Bill of Rights court decision,”

*The Blade*, January 25, 2020, found here: <https://www.toledoblade.com/local/environment/2020/01/25/more-at-stake-than-water-with-lake-erie-bill-of-rights-court-decision-toledo/stories/20200124136>

of connections with nature and the natural world provides, I believe, at least some of what makes up meaning and purpose, and some of the antidote to rising levels of anxiety and depression. Perhaps even more essential to purpose and meaning is the renewed commitment at personal and collective levels to begin to tackle the daunting challenges we face. That may be the most important role of the book to follow: as a reservoir of compelling, inspiring and immensely usable patterns that we must all begin to advocate and apply in our work. To follow are at least some of the seeds of hope and the antidotes to despair.

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Timothy Beatley

# The Made Order and the Given Order, Unfolding

You are about to read a radical and visionary work of immanent practicality. The author gets straight to the point: The critical issues we face as a global society require “a new manner of thinking if humanity wants to survive.”

Sometimes it seems that when it comes to academic writing, the smaller the idea, the more one gets support for publishing in ever narrower journals and conferences. The successful scholar becomes adept at navigating the strict limitations of length, scope and methods insisted upon by peer reviewers who have built their own careers on tweaking small increments of an idea inside an existing paradigm. This is decidedly not that sort of book! It is, instead, a book of big ideas.

In a theoretical landscape of increasing fragmentation, a political and social realm of increasing polarisation and an economic terrain of widening income disparity, Phillip Roös takes a reconstructive integrating view. Nothing in academia or in professional practice rewards grand integrated thinking. If we live in an era when many promote the end of truth and facts, the end result is a depressing nihilism where nothing means anything and the only truth allowed by a pathological postmodernism is that there can be no metanarratives. Of course, that in itself *is* a metanarrative, as philosopher Ken Wilber has pointed out. Wholeness does not exist to the postmodern deconstruction-obsessed consciousness. Yet, wholeness *is* what is required, and Roös begins with the idea of *wholeness*, an unbroken vision of the potential for a synthesis of nature and culture in which “humans and nature work together in a developmental process that improves the value of the whole.” Wholeness is both a quality one can feel and a structure of systems and relationships that can be mapped and ordered.

The problems Roös wants to address – ecological degradation and collapse, the threats to water-fronts, loss of indigenous knowledge, climate change, how design creates the feeling of life, the regeneration of industrial wastelands, the nature deficiency of cities – are not solved by the elimination of big ideas, knowledge systems or overarching narratives. Instead they require new stories of the Earth and better explanations for how individual design patterns fit together to build complex multiscalar settlements. To enter this realm takes a particular kind of courage combined with the humility of an integral eye and mind.

Behind the deep solutions offered in this book is the author’s willingness to authentically see the world, to trust his own experience and those of others *as real* in the face of so many apologists for the failures of modern and postmodern architecture and urban design. Architects love to critique the work of other architects but also to defend the value of their profession. As a discipline, we live in our heads and tend to distance ourselves from the truths the whole human self, body included, has to teach us. Few of us navigate a contemporary city in Australia or in America and exclaim about how life-affirming the experience is. Instead, as Roös puts it, the built environment is “almost un-imaginably bad and unacceptable.” The ideals and principles taught in design schools simply don’t produce the quality products as claimed. Even in terms of sustainable development, we are “still grasping at straws, striving to achieve sustainable goals,” he says.

The theoretical part of this book defines a series of “fundamental” patterns for a “regenerative-adaptive pattern language.” These fundamental patterns are not spatial solutions but “idea patterns”

that link together in an intellectual network an ecology of ideas. To unpack the plethora of new terms requires reading the book. I encourage the reader to dive deep and immerse yourself in this journey, as this is not another typical work of speculative design theory, most of which can hardly be called theories at all. A real design theory has to explain what good form is and how it comes into being; it needs its injunctions and its methods. It is the application of these tools in practice from which the paradigm emerges and not the other way around. Following the designation of the text, in the discussion that follows, these fundamental patterns are shown in small caps, such as *THE WHOLE*.

What thinking can support the generation of the wholeness described in the pattern, *THE WHOLE*? In addition to getting out of our heads (at least partly) and leaving behind cherished but dysfunctional precepts, the unworkability of contemporary paradigms (including sustainability), we also need the mind, a higher mind that is. To access the abstract nature of climate change as an invisible, complex-systems phenomenon that is progressive and statistically evolving requires an integral cognition. It requires trans-rational and trans-critical thought. Ecological design itself is a post-postmodern cognitive task, what Harvard's Robert Kegan calls 5<sup>th</sup> order consciousness, the "self-transforming mind" of the "inter-individual self." Taking such an integral prospect, an altitude if we may, it becomes apparent that the multiple perspectives of experiences, technology, ecology and cultures each have something powerful to offer a sustainable future, as articulated in an *INTEGRAL SUSTAINABLE WORLDVIEW*.

Any informed person knows that climate change is one of the grand challenges of our century. From the integral perspective, culture depends on human minds, which depend on life itself, which depends on base matter. Culture is built on nature, and therefore nature is in fact more fundamental, while culture includes nature in its depth. In this holarchic sense, nature is a part of culture. It is like a building where nature is the foundation. No building can stand when its foundation collapses. Any workable responses to curb or adapt to climate change call us to pay deep attention to both the success of the human species, but also to the diversity of species and ecosystems that support life on the planet. Roës therefore calls for *CLIMATE CHANGE CO-ADAPTATION*.

The example study area is a coastal town in Southern Australia. Embedded somewhere deep in the archetypal psyche is an innate *AFFINITY TO WATER* that humans seem to have. Perversely, our desire to settle near water, to look at it from our homes, to access it in our cars (and to use it as our sewer), ends up degrading the real degree of life in the very coastal places we seek out. It is a tension found from the California coast to the Aegean Islands to the shores of Victoria. In Christopher Alexander's thinking, a good pattern is the order of space that resolves the tensions inherent in a particular kind of recurring design situation. Tensions between human biophilic attraction to water and coastal ecological conservation, between a riparian diversity and the relative monoculture of human settlement, form the context of this critical pattern.

One of the characteristics of any integral theory is its embrace of the empirical realities revealed by developmental studies of individuals, cultures, socio-economic systems, etc. Wilber coined the phrase "transcend and include" to acknowledge that each new stage of human developmental awareness has the capacity to both include the workable aspects of a previous stage (its dignities) and to simultaneously transcend what is unworkable (its disasters). Modern thinkers, especially in the design fields, tend to ignore knowledge from traditional societies as primitive and undeveloped, while postmodernists tend to romanticise traditional people as noble Edenic non-modern ecologists. This book takes a more nuanced approach to *ADVANCED INDIGENOUS KNOWLEDGE* as a way to access, for design purposes, a deep knowledge of the land and how people have adapted to live with the rhythms of the days and seasons. In true integral fashion, the author practices taking the perspective of the land's Indigenous custodians for what it reveals about the place, knowledge that from other viewpoints may be occluded.

I have argued in other essays and books that the human experience of nature is as important as designing for how nature works. Giving people rich human experiences of nature and natural forces presents the opportunity to develop relationships with the natural world, and meaningful relationships beget care. Connecting people to nature is obviously a critical aspect of any design-with-nature approach. "Biophilic design" is the term of the day, although much of the current literature on the

topic fails to distinguish “philia” as an interior human experience from the physiological, cognitive and health impacts and correlations of encounters with “bio.” In integral terms, such writers collapse the subjective into the objective. In fact, there is a dearth of concrete biophilic design patterns with useful spatial guidance for designers to create such deep and affiliative experiences of nature. Thus, the LOVE FOR NATURE pattern and its consequent “nature language” – connecting patterns of space with patterns of ecopsychological experience – is well-timed.

A regenerative design approach will look to nature for its inspiration and model. Inevitably, one arrives at the question of how human systems can be ordered in ways analogous to and integrated with the order of nature’s systems. The structure, processes and distribution of ecosystems have evolved over four billion years and constitute what works in the long term on Spaceship Earth. NATURE’S DESIGN helps us locate development in places with the resources and absorptive capacity for human life and also in places where sensitive and eco-productive systems are not harmed.

While nature can be a model for human design, biomimicry is far from enough to sustain regenerative design. John Lyle spoke of “human ecosystems” in which human activity and natural process are always happening co-spatially. We are short on language that transcends the dualistic terms of nature/culture, human/natural and design/nature. REGENERATIVE ECOSYSTEMS is such a transcending pattern that recognises all living systems as a manifestation of their underlying processes and flows of energy, information, materials and organisms. Such new order, arising from the integration of all the species, including humans and their processes, will give rise to authentic and novel form languages that are sophisticated enough to handle their underlying regenerative patterns.

If you ask a restoration ecologist how to go about recreating the pre-settlement diversity of a site, for example a degraded stream corridor, she will tell you that the sequence in which plants, animals, resources and landscape structures, such as bank grading or dechannelising, are introduced is critical to how the ecosystem develops and even what it ultimately becomes. The unfolding of the wholeness at a later stage has to be embedded in the patterns of process and structure at each earlier stage. Architects and urban planners mostly have no consciousness of this principle. Yet how can we expect a rich, diverse and healthy urban human ecosystem without the TRANSFORMATIONS OF WHOLENESS found even in a simple seed? This is fertile intellectual ground for the designer and connects the design patterns to design processes and methods. Roös here is recognising that wholeness is an unfolding incremental process, a necessary and, I will note here, difficult agenda.

Regeneration suggests the healing of places beyond the homeostasis implied by sustainability. It has a vector to return settled landscapes to the richness, diversity and complexity – the aliveness – that was present in earlier times when humans had little or no impact on ecosystem health. Yet, there is no singular end climax state in nature. Thus, the design patterns that catalyse regeneration also have to adapt to changes in the dynamic forces of nature and culture. Species evolve, weather systems change and new technologies are invented. From the integral perspective, these changes might be lateral-horizontal, such as changes of a relatively temporary “state” in a system, for instance the rhythm of seasons or the normal cycles of the economy. Changes can also be vertical-developmental in individuals, cultures and ecologies, as they move from one more or less stable “stage” to another, typically increasing in complexity as they do. The NOTION OF REGENERATIVE-ADAPTIVE PATTERNS represents a conceptual leap forward from all the major urban design and planning approaches, none of which are equipped to deal with adaptation to significant change.

As a real theory needs testing, the book also provides a detailed application of its concepts, tools and methods. The EVOLUTIONARY ADAPTATION pattern more directly addresses ideas such as ecological and settlement succession or development in complexity as the collective actions of residents over time towards continuous improvement and self-transcendence.

Humans are now “the architects of the environment” in this Anthropocene epoch, as biologist E. O. Wilson put it. The book’s final chapter questions whether or not humans can achieve a symbiosis with Gaia. If so, will our responsive actions be the result of GAIA’S REVENGE, that is, rebalancing itself to adjust for the pesky species causing the inflammation? In that event, perhaps the pain of

enduring the consequences of climate change and the social, health and psychological impacts of our degenerative forms of development will become greater than the price of organising to force-evolve a regenerative-adaptive culture in order to survive. Alternatively, Roös invites us to a celebration of Gaia and the planetary rules of design required of all living systems. Will we choose to endure the revenge and survive in a less diverse and less hospitable future or celebrate the good news of our aligning ourselves with THE WHOLE for long-term thriving?

What a great question! What a great time to be alive and engaged in the production of the built environment! It is perhaps, given the overwhelming influence that buildings and towns have on climate change, the most interesting generation for design in the short history of our species. It is certainly the most consequential. As Wendell Berry wrote in his poem *Healing*, “Seeing the work that is to be done, who can help wanting to be the one to do it?” A regenerative-adaptive pattern language offers designers and planners the mind tools for the work of making a new order that “seeks the given order and finds its place in it.” Such a work cannot be done alone; it is a difficult work – without rest – that requires a learning community of practice. It is, however, the work that is to be done.

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