COMPLEX SUSTAINABILITY

A CROSS-DISCIPLINARY APPROACH TO DESIGN

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This article explores the shared principles and ideas between Simon Guy and Graham Farmer's "Reinterpreting Sustainable Architecture: The Place for Technology" and James J. Kay, Nina-Marie E. Lister and David Waltner-Toews's The Ecosystem Approach: Complexity, Uncertainty, and Managing for Sustainability*. It explores what it means to be a practicing architect and planner in modern society through the synthesis of these two perspectives. Honing in on the concept of sustainable architecture and design, we can begin to view our goal as a complex system. Within this complex system of sustainability, we can productively and creatively find new ways to design our built environment without making harmful or irreversible mistakes.*

The ambiguous task of designing for a world that is at risk of environmental failure is constantly examined, questioned, and misunderstood. Several authors within the field of sustainable building, James J. Kay, Nina-Marie E. Lister, and David Waltner-Toews; Simon Guy; and Graham Farmer, propose solutions for how architects and planners can attempt to undertake this overwhelming mission. Each author holds an academic background in architecture and urban planning with an emphasis on the environment. There is a vague understanding that planners and builders cannot progress if they do not reach outside of their immediate studies. Not only is the process important, comprehending the systematic and organizational qualities of the world is essential to successfully designing for potential environmental collapse. Kay et al. discusses these qualities as complex systems. Complex systems can be described as the integrated and interdependent networks within the organic realm. This is evidenced in the symbiotic relationships between human, animal, and nature; complex systems self-balance and respond to changes in their surroundings in order to survive. Understanding how these systems work and how the built environment affects them will continue to aid architects and planners in producing responsive and progressive design.

A SYSTEMS APPROACH

In *The Ecosystem Approach: Complexity, Uncertainty, and Managing for Sustainability*, Kay et al. examine how thinking in terms of complex systems can improve the way we understand the problem of sustainability. To better explain complex systems, they contrast current systems thinking with that of the Newtonian worldview—the traditional scientific way of thinking. The Newton-based format of researching an environmental problem is to take the individual elements that are affected, study them separately, and conjure an applicable solution (Kay et al., 2008). It is similar to studying one fish to understand the patterns of a school of fish. Kay et al. explain that this approach is flawed because complex systems can only be understood through the relationships between their parts, and how those relationships form patterns that develop over time (Kay et al., 2008). Kay et al. argue that one must research how individual fish swim together in order to comprehend the school as a whole. It is not about the individual parts, such as a fish; it is about the relationships between all of the fish that characterize this complex system. These ideas can be applied to all disciplines and all areas of sustainable building.

Kay et al.'s perspective can be supported by Fritjof Capra's article "Systems Theory and the New Paradigm." Capra employs the concept of shifting from part to whole as an example of the current paradigm shift in the larger social arena (Capra, 1998). The metaphor of knowledge is shifting from a building to a network — a network being a system with codependent parts. This network is the equivalent of a complex system. If architects and planners can begin to view their work in this perspective of co-dependency, they can produce more interactive, flexible, and cohesive designs that positively impact the environment.

Without thinking of design through complex systems, humans can have devastating effects on the environment when they intervene in a biological or environmental system whose interrelations they do not understand. For example, humans are consistently trying to put out forest fires. They react to one individual piece of the forest instead of viewing it through a larger lens. The fires produce nutrients which rejuvenate the forest and keep fuel levels down. When humans interfere by putting out forest fires they are disrupting the equilibrium within the system, which makes the forest less healthy and prone to larger, more destructive fires (Kay et al., 2008). Humans unintentionally harm the environment and believe they are protecting it. There are moments when putting out forest fires will do more good than bad, but understanding that it has the potential to do both is key. People interact with nature in a selfish way, but if a forest fire does not have the potential to harm humans, intervention is not necessary. Humans need to alter their problem-solving techniques by taking a step back from the urge to act immediately, and instead consider the systemic chain reaction the intervention might create. Comprehending complex systems will give designers the tools to solve problems in sustainability without being inadvertently harmful.

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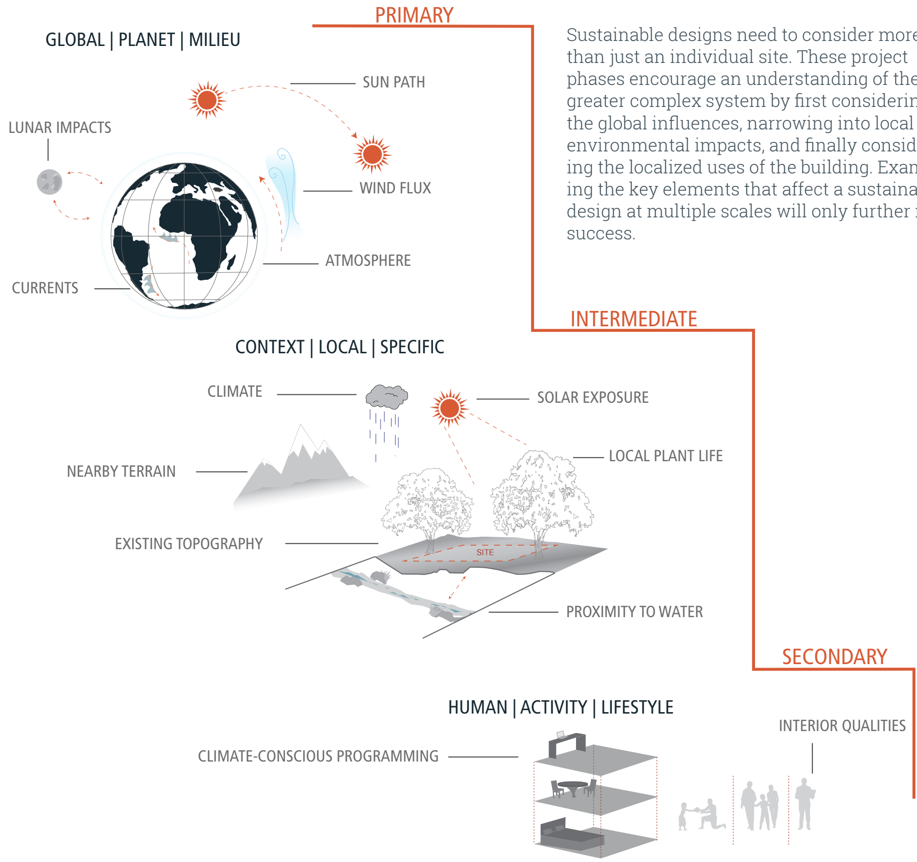
CROSS-DISCIPLINARY DESIGN

In their article, "Reinterpreting Sustainable Architecture: The Place for Technology," Guy and Farmer explain that there is no definitive description of what it means to build sustainable architecture. They illustrate this by analyzing six different ways to categorize sustainable architecture (Simon & Farmer, 2001). These logics (eco-centric, eco-cultural, eco-technic, eco-aesthetic, eco-medical, and eco-social) focus on the driving forces of sustainable design whether they are technological, are culturally responsive, prioritize human health and welfare, or highlight localized materials. Each logic is unique in how it addresses sustainable architecture and planning. The main argument is that varied perspectives and priorities are legitimate in their origins and solutions, and each set of values should be considered when designing architecture. All six logics solve different yet equally important problems within sustainability. It would be naïve to design without contemplating numerous potential resolutions (Simon & Farmer, 2001). Instead of solely designing the most technological and energy-efficient building, incorporating elements that interact with the local culture and environment should be essential.

Sanford Kwinter, a professor of theory in architecture at the Pratt Institute, and Cynthia Davidson, director of Anyone Corporation and Co-Curator of the U.S. Pavilion for the 15th Annual Venice Biennale, further explain this concept of inclusiveness in their piece "Wildness": "The design does not come from the whole and trickle down to the parts, but rather travels up in the opposite direction" (Kwinter & Davidson, 2007, p. 189). This observation reinforces the concept that successful design benefits from numerous disciplines, and that multiple perspectives will help design an urban landscape that is appropriate for its environment. Having multiple perspectives will



Sustainable designs need to consider more than just an individual site. These project phases encourage an understanding of the greater complex system by first considering the global influences, narrowing into local environmental impacts, and finally considering the localized uses of the building. Examining the key elements that affect a sustainable design at multiple scales will only further its success.

FIGURE 1
MACKENZIE LEHON | STEPS TO A SUSTAINABLE FUTURE

continue to provide clarity into the complex systems involved in sustainable design. These proposals view humans not only as one of the primary elements that are affected by the built environment, but also as the means to sustainable architecture. The University of California Berkeley Architecture Building was designed by four professors, each with different perspectives and views on architecture, and demonstrates how Guy and Farmer's proposal can be put into action (Miller & Thun, 2015). The building, Wurster Hall, was intended to house the architecture program. The architects chosen to design the building were faculty from the program, each with a unique background. If successful, this project conveys that in the process of design and planning, consulting professionals in numerous disciplines with varying degrees of knowledge can aid planners to produce resilient buildings for the future. Planners should work with architects, who should work with environmental engineers, who should consult biological scientists, who should collaborate with anthropologists, and so on.

THE COMPREHENSIVE DESIGNER

Kay, Guy, and Farmer each express that no one perspective of sustainability is correct. Instead, a diverse array of perspectives is required to understand a problem holistically. Throughout urban planning history there have been instances where authority disregarded the idea of complex systems, and projects ultimately were not successful. In Jane Jacob's book *The Death and Life of Great American Cities*, she illustrates how Ebenezer Howard's Garden City viewed the problems of a city as solely its ratio of population to open natural space (Jacobs, 1961). The 19th-century Garden City Movement proposed the ideal urban environment as a utopian community, divided based upon type of activity and with equal amounts of built and natural space. Similarly to Corbusier's Tower in the Park, when cities built housing projects by building superblocks adjacent to concrete paths, crime rates rapidly increased (Jacobs, 1961). This case shows it is necessary to view the organizational qualities of an urban environment as that of a complex system. If the Garden City plan had considered the various factors of a city and how they relate to each other as a system, the plan would have produced a different project. Had Ebenezer Howard contemplated Guy and Farmer's eco-social logic - focused on building with connection to the community - Garden City would have addressed the unique cultural qualities of an area and its future inhabitants, possibly preventing corruption.

Guy and Farmer's varying perspectives to improve sustainable architecture are an example of how to interpret complex systems. Their articles can be seen in conjunction with each other. The subtle differences are in the approach to their respective viewpoints. Kay et al.'s essay examines complex systems on a cross-disciplinary platform, whereas Guy and Farmer dissect a specific complex system, the system of sustainability and architecture. Both readings conclude that it is far more beneficial to understand sustainability as a complex system, with its parts and varying perspectives being essential to its success as a whole. What Ebenezer Howard failed to see was the interconnectivity of a successful urban scene. Jane Jacobs properly describes this interdependent web of the city street as a ballet (Jacobs, 1961). The general concept is that organic systems, human interaction and nature being one, do not have clear answers to their problems. Separating the community by districts and adding immense areas of open-air "nature" may improve the lack of access to the environment, but it creates other problems in the process. Surely there is a solution and a middle ground that would prove to be successful, but it can only be found through collaboration with others outside of the field. In today's society, architecture firms are becoming more diverse. International firms such as Gensler, AECOM, and Stantec Inc. all incorporate

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architecture, engineering, contracting, planning, and landscape architecture to some extent. These large companies have produced some of the most notable projects in sustainable design in this century, and continue to do so because of their diversity of disciplines.

The perspectives of these articles tend to place the burden on designers regarding the scope of understanding required in their processes. Designers must work in a range of scales with the ability to incorporate local and global visions, they must incorporate technology while remaining conscious of its effect on the environment, and they will need to accomplish this in a manner appropriate for each particular project. This kind of person can be compared to the "Comprehensive Designer" detailed in Buckminster Fuller's article in World Review "Comprehensive Designing." The comprehensive designer he describes incorporates fundamental knowledge from all disciplines into his work. Fuller even compares the comprehensive designer of the 1950's to the architect of feudal society. He is the human agent of society that continues its fluidity of production (Fuller, 1950). However, this diverse knowledge is rarely obtained by one person in today's society as current technology and innovation have surpassed this point of necessity. Instead of one individual expert, projects can involve a cross-disciplinary team in order to achieve the same inclusive result. Leadership in Energy and Environmental Design (LEED) certified buildings have begun to explore the benefits of collaboration between fields. When a project makes the decision to aim for LEED certification, the first step is to have a LEED Charette. This meeting requires people from all areas of the project to come together and discuss their goals in an integrative approach. Following this charette they have an incentive to work together to complete the project, thus encouraging communication and teamwork.

We have made vast progress in the field of sustainable architecture, and technological developments have significantly decreased the negative effects buildings have on the environment. James Kay, Simon Guy, and Graham Farmer believe our future problems can be better understood and reconciled by recognizing sustainable architecture and sustainability as complex systems. Designers will then become more conscious of how their actions impact their surroundings, taking into account the interdependency of ecological environments. It is only through these methods, connections, and integrations that designers can create an architecture that is responsive, cohesive, and ecologically and socially considerate. ▪

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