



Design with Nature: Ian McHarg's ecological wisdom as actionable and practical knowledge



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HIGHLIGHTS

- Ian McHarg's ecological wisdom applied in The Woodlands yields real and permanent good.
- A comprehensive design process leads to the expression and execution of Ian McHarg's ecological wisdom.
- Ian McHarg's ecological wisdom has immense relevance to contemporary design practices and urban resilience.

ARTICLE INFO

Article history:

Received 14 December 2014
Received in revised form 27 June 2015
Accepted 25 April 2016
Available online 21 August 2016

Keywords:

Ecosystem services
Ecological planning
Landscape performance
Green infrastructure
Design process
Urban resilience

ABSTRACT

Ian McHarg's influential book *Design with Nature* (1969) synthesizes and generalizes his ecological wisdom in informing landscape planning and design. In this paper, we suggest that his design process leads to the expression and application of his ecological wisdom as actionable and practical knowledge. Key features of his design process include: (1) multidiscipline integration to provide holistic design strategies, (2) ability to tackle wicked design problems residing in a wide range of scales, and (3) targeting landscape performance in a quantitative manner. We review the development of McHarg's ecological wisdom in the context of his education, teaching, and practice, as well as the influence from scientific theories of Charles Darwin and Lawrence Henderson. Then, we illustrate McHarg's design process using The Woodlands, Texas, a 117-km² town development that McHarg considered to be the most ecologically based in the United States in the 1970s. Four decades of empirical examinations reveal the outstanding performance of The Woodlands, highlighting the credibility of McHarg's ecological wisdom. Compared with adjacent Houston communities, The Woodlands shows significantly less stormwater runoff during 100-year storms, substantially lower pollutant loadings (e.g., NO₃-N, NH₃-N, and TP), lower levels of forest fragmentation, an average of 2 °C lower land surface temperature, and higher walkability and pedestrian access to open space. We conclude that McHarg's design process fosters the application of his ecological wisdom in an actionable and practical manner in The Woodlands case.

Published by Elsevier B.V.

1. Introduction

In the history of landscape architecture, planning, and urban design, there is no lack of examples that are prominent with respect to doing real and permanent good for the human and nonhuman inhabitants, such as the Dujiangyan irrigation system in Sichuan, China (256 BCE, by Li Bing), Central Park in New York City, United States (1857, by Frederick Law Olmsted and Calvert Vaux), and the Emscher Landscape Park in Ruhr, Germany (1988, primarily through the International Building Exhibition). Designers of these projects tackled unique planning and design challenges in their time, with a common thread being the adaptive strategies

they developed that fit the site's ecological processes and cultural practices. The ecological wisdom and ingenious solutions they presented are still relevant to today's practitioners.

However, designers of these early projects may be overwhelmed by current, increasingly complex sustainability problems (Xiang, 2014). Today, landscape architects and planners face imposing challenges, such as providing resilient landscapes for a changing climate, addressing rapid urbanization, planning adaptations for natural disasters, and performing ecological restoration of degraded urban areas (Jorgensen, 2014; Nassauer, Wu, & Xiang, 2014; Steiner, 2014). An important question remains unanswered: How would the ecological wisdom residing in early projects help link knowledge to action and inform contemporary design and implementation?

This question can be answered through revisiting these prominent projects, with respect to their ideas, strategies, and successes

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and lessons learned. Landscape architects and urban planners benefit from the accumulation of wisdom from precedents, and case study presents a powerful way to inform best practices (Deming & Swaffield, 2011; Francis, 2001; Steiner, 2014; Xiang, 2014). The beauty of ecological wisdom lies in its endurance over time, efficacy in practice, and ability to predict project performance decades, if not centuries, in advance (Martin, Roy, Diemont, & Ferguson, 2010). In landscape architecture and planning, one of the most impactful body of ecological wisdom was put forth by Ian Lennox McHarg (1920–2001), in his seminar book *Design with Nature* (McHarg, 1969), in which he synthesized and generalized his experience. As the book title suggests, following nature's lead in planning and design is the wisdom of achieving sustainability. Anthropogenic uses or interventions shall become an integral part of the natural processes.

This paper focuses on three themes proposed in Xiang's (2014) editorial: Theme 2 ecological wisdom as actionable and practical knowledge; Theme 3 ecological wisdom as benchmark; and Theme 4 ecological wisdom as secret of sustained achievement (Xiang, 2014, pp. 67–68). We propose that McHarg's design process leads to the expression and application of his ecological wisdom as actionable and practical knowledge (Theme 2). Key features of his design process include: (1) multidiscipline integration to provide holistic design strategies, (2) ability to tackle wicked design problems residing in a wide range of scales, and (3) targeting landscape performance in a quantitative manner. These key features of design process help establish landscape performance benchmarks (Theme 3), and show how the processes of McHarg can result in real and permanent good, while not all processes do so (Theme 4). We highlight McHarg's nature-led design in a 117-km² town development, The Woodlands, Texas, whose town plan McHarg considered to be the most ecologically based plan in the United States in the 1970s.

2. McHarg's ecological wisdom in context

In more than ninety projects, as elaborated in *Design with Nature* (e.g., chapter 10, "Processes as Values"), McHarg seeks the intrinsic carrying capacity of land through a design process that respects, integrates, and facilitates multiple ecosystem processes, functions, and services. McHarg's ecological wisdom of "following nature's lead in design," however, does not emerge in vacuum. His education at Harvard University, teaching at the University of Pennsylvania, and 18 years of practice at Wallace McHarg Roberts and Todd (WMRT) culminated in the peak phase of his legendary career.

McHarg pursued joint degrees in landscape architecture and city planning at Harvard in the 1940s. At that time, there was continual separation between the two programs. Most landscape architecture faculty remained focused on small-scale garden and park design, whereas city planning faculty were interested in broad social and environmental issues. McHarg's passion and training in both programs allowed him to embrace diverse planning and design scales when developing his own ecological planning theory and practice, something that most landscape architects at that time were not able to do (McHarg, 1996; Spirn, 2000).

McHarg continued to bridge the separation through his teaching at the University of Pennsylvania. He integrated regional planning and landscape architecture, particularly through his incorporation of environmentalism into studio teaching to achieve a more holistic pedagogical approach (Spirn, 2000). Emphasis was placed on understanding the natural processes. In McHarg's first studio project (Cape Hatteras) in 1956, for instance, students examined the processes of beach formation and erosion, the development of plant communities and animal habitats, and the interactions among them (McHarg, 1996; Spirn, 2000). A number of other case studies were examined in *Design with Nature*, included the Delaware River

Basin Study, Interstate 95 in New Jersey, Staten Island Project, and Plan for the Valleys. The case studies demonstrated the imperative of interdisciplinary collaboration, in order to incorporate natural processes (biophysical attributes) and social and cultural issues in the design process (McHarg, 1996; Toth, R., personal communication, July 20, 2014).

Furthermore, McHarg used his department chair position at Penn to hire many natural scientists and social scientists, as well as leading designers on the faculty, to promote interdisciplinary collaboration in design studios, such as Laurie Olin, Robert Hanna, Sir Peter Faulkner Shephard, Carol Franklin, A.E. Bye, Karl Linn, and others. In 1962, McHarg hired a forester and resource economist, Dr. Nicholas Muhlenberg. Since then, "the biome, the physiographical region, and the river basin provide an indispensable context for the curriculum at Penn" (Spirn, 2000, p. 104).

McHarg taught another noteworthy course, Man and Environment, throughout the 1960s and 1970s, and some of the most distinguished scholars in the environmental era were invited to lecture (McHarg, 2006a), such as Lewis Mumford, who wrote the Introduction to *Design with Nature*, and Eugene Pleasants Odum and Howard Thomas Odum, who heavily influenced McHarg's knowledge of ecosystem ecology. In 1963, eight of the lecturers were Nobel Prize winners (Spirn, 2000). Based on this course, McHarg hosted a CBS television series (*The House We Live In*) from 1960 through 1961, and invited leading scientists of the time (e.g., Margaret Mead, Loren Eiseley, and Luna Bergere Leopold). The course and the CBS television series facilitated the development of McHarg's theoretical framework and scientific ideas for his book *Design with Nature* and his wisdom in ecological planning and design (McHarg, 1996; Spirn, 2000).

After the CBS television series, McHarg began to gain national recognitions outside the landscape architecture field. Particularly after 1962, McHarg played an increasingly important role in developing the intellectual base and methodological framework for the National Environmental Policy Act (NEPA) (McHarg and Steiner, 1998). McHarg's interdisciplinary approach to ecological planning and his systematic evaluation of the plan formed a standard practice in NEPA, and this is particularly reflected in the Environmental Impact Statement (EIS) (Bass, Herson, & Bogdan, 2001).

In 1962, McHarg began to test his ecological planning methods on real clients and projects. Subsequently, his studio at Penn became a place in which to experiment with theories, and McHarg's firm, WMRT, provided a means to test the theories. The types of clients and projects with which McHarg (WMRT) worked were influenced by several federal acts enacted during the environmental era (Table 1). The evaluation and mitigation of environmental consequences due to suburban and exurban growth constituted the majority of McHarg's professional work in the 1960s and 1970s (Spirn, 2000; Steiner, 2011). By 1969, Penn's Department of Landscape Architecture and WMRT enjoyed worldwide reputations as a leading landscape architecture program and firm, respectively (McHarg, 1996; Spirn, 2000).

In addition to a successful practitioner, McHarg was a theorist. He developed his own theory of "creative fitting," which explained and validated his nature-led design approach (Herrington, 2010; McHarg, 1996). The inspirations were attributed to the scientific theories of Charles Darwin's *The Origin of Species* (Darwin, 1859), which suggests that "the surviving organism is fit for the environment" (McHarg, 2007, p. 23), and Lawrence Henderson's *The Fitness of the Environment* (Henderson, 1913), which indicates that "the actual environment, the actual world, constitutes the fittest possible abode for life . . . this fitting then is essential to survival" (McHarg, 2007, pp. 23–24). In addition to Darwin, Henderson, and the Odums, McHarg's ecological ideas were also influenced by Patrick Geddes, Loren Eiseley, Robert MacArthur, John Phillips, and Jack McCormick, among others.

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