

Healing the Earth: The Relevance of Ian McHarg's Work for the Future¹

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Figure 1: Ian McHarg

Source: Ian and Carol McHarg Collection, The Architectural Archives, University of Pennsylvania.

Ian McHarg opened a new way for us to see the world. His approach for interpreting the play between natural and cultural systems has become the dominant visualization tool of our time and provides a roadmap for applying ecological information to how we interpret, plan, and shape our surroundings. The use of ecology in design and planning became his quest and his principal contribution.

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Nature's design

Ian Lennox McHarg (1920–2001) was a child of the Great Depression in industrial Glasgow, Scotland. He experienced the transition between adolescence and manhood as a soldier in the Second World War. He entered military service as a lanky teenage private and left as a confident major in command of one of Britain's most elite combat units. After the war, McHarg, "the major" as he was called then, marinated in modernism at Harvard.

McHarg finished three degrees in landscape architecture and city planning at Harvard and returned to Scotland to help rebuild his war-ravaged homeland by working on housing and new town programs. He experienced a near-fatal bout of tuberculosis before Dean G. Holmes Perkins enticed him to build a new graduate program in landscape architecture at the University of Pennsylvania. There, McHarg fused his desire to practice with a new-found love for teaching.

His most important contributions derived from this reflective academic practice. At first, this practice was grounded in the modernist principles McHarg had learned at Harvard. Influenced by his mentor, Lewis Mumford, McHarg began to move away from the aesthetic dogma of the international style. He grew highly skeptical of the one-size-fits-all stylistic palette of modernism, but remained committed to its ideals. Specifically, he believed knowledge should guide action. Further, this action would result in better housing, more open space, more efficient transportation systems, and, in the end, healthier and safer communities.

McHarg explored these ideals through the design studios at Penn as well as through his growing professional practice, Wallace, McHarg, Roberts, and Todd. Both in his academic department and at his firm, McHarg engaged in action research advancing several disciplines and professions. This work represented a meaningful dialogue between the academy and his professional practice, and it is a synthesis of this dialogue that is provided in *Design with Nature* (McHarg, 1969). This clarion call-to-arms presents insightful case studies and advances a new theory for design and a new mandate for public policy.

What are the origins of McHarg's ecologically based theory? Again, it came from both within the academy and from experience. From the early 1960s, McHarg became a public personality. He hosted his own high-profile CBS talk show and later narrated a popular PBS documentary. He served on several important commissions and panels, including the influential 1965 White House Conference on Natural Beauty. For a series of 26 Sundays in 1960 and 1961, McHarg invited the leading theologians and scientists of the day to discuss our place in the world on the CBS television show *The House We Live In*. He had initiated this format in his "Man and Environment" course at Penn in 1959. Leading scholars were invited to discuss

values and ethics, as well as entropy, the universe, evolution, and plate tectonics in the classroom and on television. McHarg's razor wit, intelligence, and relevance attracted students and television viewers alike.

Through the 1960s and into the 1970s, "Man and Environment" was the most popular course on the Penn campus and it alone changed many lives. For instance, I had a colleague who was a Wharton Business School undergraduate when he took "Man and Environment." He promptly transferred from finance to hydrology, eventually earning a PhD and becoming a significant environmental planner. During Earth Week in April 1970, I was the co-chair of the student-led Earth Day events at the University of Cincinnati. Our activities included a book fair. Compared to the present, there were relatively few environmental books then. The one with the word "Design" on the front cover and the whole Earth from space on the back stood out to those of us studying landscape architecture, architecture, planning, and design. Over the next couple of decades, many of us flocked to Penn. Many more read *Design with Nature*.

Nothing is as practical as a good theory. The dictum "design with nature" not only changed design and planning, but influenced fields as diverse as geography and engineering, forestry and environmental ethics, and soil science and ecology. The evidence is ubiquitous: almost every geographic information systems (GIS) presentation begins with a depiction of what McHarg called a "layer cake." He used the metaphor to describe how maps of various components of the biophysical and sociocultural environment in a specific place can be stacked, like a layer cake, to reveal how landscapes function. However, contemporary GIS applications rarely credit McHarg. They also lack his eloquence or insight into how the data should be collected and analyzed. Environmental impact assessment, new community development, coastal zone management, brownfields restoration, zoo design, river corridor planning, and ideas about sustainability and regenerative design all display the influence of *Design with Nature*.

However, McHarg's theoretical and practical contributions extend beyond this important book. Two other topics occupied much of his considerable energy in the decades after the initial Earth Day. First, he sought to advance the understanding of the ecology of our own species. Second, he advocated the extension of his theoretical framework to the national and global scales. We relate with one another as well as with our physical and biological environments. Like other organisms, our species is part of the web of life. The challenge is to see ourselves as part of that web.

McHarg recognized the need for us to understand the medium we inhabit as well as how we shape it and it us. He sought support from the National Institute of Mental Health (NIMH) to address this topic, writing "My colleagues and I had concluded that geomorphology synthesized physical processes and that ecology synthesized both physical and biological processes. How could we extend this model to include people?" (McHarg, 1996, p. 269).

He turned to anthropology and human ecology for the answer. As he had recruited geologists and ecologists to his department beginning in the 1960s, he added anthropologists and ethnographers in the 1970s. These individuals taught us that culture is our most important instrument of adaptation. Further, our ability to evolve our culture distinguishes us from other species. Design and planning can then be viewed as adaptive mechanisms; that is, tools for resilience. Adaptation and resilience are related to our health, which has been defined by the World Health Organization as the ability to recover from disease, injury, and/or insult.

McHarg generated big ideas. As he witnessed the growing application of those ideas through GIS and other visualization techniques, he realized that they could be used at the national and even global scales. In the early 1990s, McHarg and several colleagues produced a prototype database for a national ecological inventory. Then US Environmental Protection Agency (EPA) administrator (and McHarg admirer) Bill Reilly commissioned the study and the prototype was submitted to the EPA in 1993.

McHarg and his team proposed an extensive inventory at three scales—national, regional, and local—including information about the physical oceanography (where applicable), geology, geomorphology, physiography, hydrology, soils, vegetation, limnology, marine biology, wildlife, and land use. They urged that chronology be employed as “the unifying rubric” (McHarg, 1996). In his autobiography, *A Quest for Life*, McHarg (1996) stated, “We observed that the greatest problem lies not with data, but with integration” (p. 363). Two decades later, integration remains the greatest problem.

In the final decade of his life, McHarg advocated a national ecological inventory for the US and other nations, and also believed the approach could and should be expanded to the planet. This global view was deeply rooted in McHarg’s philosophy. As early as 1968, he wrote: “We must see nature as a process within which man exists, splendidly equipped to become the manager of the biosphere” (McHarg, 1998a, p. 71). He called this global responsibility our “greatest role.” If we agree, then how do we fulfill this role?

Drivers of landscape change

Change does not just happen. A variety of economic, social, and technological forces drive it. Let us look at some global drivers of landscape change and the consequences of those changes to illustrate the continued urgency of McHarg’s vision. A few probable drivers include:

1. population dynamics and consumption
2. urbanization
3. global and regional environmental processes.

Population growth and migration include those factors that will change the demographic structure of the planet. At the beginning of the twentieth century, there were 2 billion people in the world. Now, over 7.6 billion people inhabit the planet. The United Nations projects the world's population to plateau at 9.4 billion by the year 2050 then creep up to 10.4 billion by 2100 (Barrett & Odum, 2000). This translates into some 12.6 billion more folks joining us over the next century (Brand, 1999). We live in the first urban century. For the first time in human history, more than half the world's population lives in metropolitan regions. In the future, even more people will move to cities. Global urban populations are expected to double by 2030. By 2050, two-thirds of the people in the world will be living in urban regions (World Resources Institute, 2000).

Population growth drives change because everyone requires water, food, shelter, clothing, and energy. Our desires to consume the basics and amenities of life affect the level of resources necessary to fulfill those demands, our ecological footprints, as well as the character of the living landscapes that serve as the sources and sinks for those resources.

Population changes—such as growth and migration—and consumption are related to urbanization. The movement of people to metropolitan regions involves the transformation of spaces from rural and natural to urban and suburban, the urbanization of the wild, the abandonment of the rural, and the recovery of the core city and older suburban neighborhoods. Here are some key questions related to both population growth and urbanization:

1. Why do people choose to live where they do?
2. What policies direct and affect growth and development?
3. What are the long-term impacts of these policies?
4. What knowledge is necessary to inform interventions designed to mitigate those impacts?

Global environmental processes also drive landscape changes and adaptations. Global warming trends are well known (Harrison & Pearce, 2000). These changes already influence the life cycles of many species. For example, polar bears in the Arctic normally spend much of the year on the ice bulking up on enough fish to allow them to survive winter hibernation. As the winter seasons shrink and the bears are forced to spend more time on land, they have less time to build their body weight. The health of the species becomes threatened when smaller cubs are born to mothers who have less time to look after their young because of their need for food.

Additional environmental drivers of change influencing the global commons and, to varying degrees of possibility, specific regions and landscapes, include natural disasters (which create more refugees than wars), water quality and quantity, the nitrogen cycle, and energy uses and greenhouse effects. As we learn more about these drivers, we can connect them to change occurring in urban, rural, and wilderness landscapes.

The consequences of landscape change

The consequences of landscape change are all around us. A few changes evident in our daily lives include suburban sprawl, the conversion of prime farmlands to other uses, the decline of biodiversity and cultural diversity, social inequity, urban heat island effects and global climate change, and our health.

Suburban sprawl is dispersed, automobile-dependent development outside compact urban and town centers, along highways, and in the rural countryside. Such development consumes more land, water, and energy than do more traditional settlement patterns. Sprawl fragments open space and tend to be homogenous in appearance.

Sprawl consumes around 365 acres (147.7 hectares) of American countryside every hour. Across the nation, the amount of developed land is growing faster than the population. For example, between 1960 and 1990, the metropolitan population grew by 50 percent while the acreage of developed land increased by 100 percent. The Chicago metropolitan region now covers over 3,800 square miles (9,842 square kilometers). Between 1990 and 2000, the population of the region grew only 4 percent, but land occupied by housing increased by 46 percent and by commercial uses by 74 percent (US Secretary of Agriculture, 2001). Meadows and forests are converted to strip malls and subdivisions that serve cars better than people.

Suburban sprawl consumes significant amounts of prime farmland. According to the US Department of Agriculture's National Resources Inventory, an average of 105 acres (42.5 hectares) of farmland was converted to non-agricultural use every hour of each year between 1982 and 1992. In California's Central Valley region alone, 15,000 acres (6,070 hectares) of farmland are developed each year. That area produces 10 percent of the value of US farm output on less than 1 percent of the nation's farmland (US Secretary of Agriculture, 2001).

Farmlands produce more than food; farms also contribute to our quality of life. Agricultural land uses create a diversity of landscapes, which are aesthetically pleasing to urban and rural neighbors. They add to the culture and traditions of places that provide character for metropolitan regions. Agriculture creates social opportunities because farm families have historically provided pools of civic leadership for many communities. Roughly one-fifth of the US's 250 million acres (101 million hectares) of prime agricultural land can be considered at risk of development because it is within 50 miles of the 100 largest cities in the nation (US Secretary of Agriculture, 2001). We depend on that land for much of our food and clothing.

Our current growth patterns also affect other species. Biodiversity refers to the variety of life and its processes, which includes the abundance of living organisms, their genetic diversity, and the communities and ecosystems in which they occur.

Ill-planned development, poor land-use decisions, and bad land management policies are often incompatible with existing natural habitats (Environmental Law Institute, 2003). Farm and forest lands, threatened by suburban sprawl, can contribute to biodiversity by providing habitat for a variety of wildlife, including rare and endangered species. Large, unfragmented tracts of farm and forest lands and forest corridors allow interaction and crossbreeding among population groups of the same species, which increases population health and genetic viability (US Secretary of Agriculture, 2001).

According to the Environmental Law Institute (2003), the “primary cause of biodiversity loss in the United States is habitat destruction and degradation, followed by competition with or predation by non-native invasive species” (p. 3). Further, the Environmental Law Institute identified the main causes of habitat destruction and fragmentation as “land conversion for development, road building, water development, outdoor recreation, agriculture, and resource extraction or harvest (e.g., mining and logging)” (p. 3). Intervention in natural processes, such as forest fires and flooding, can also negatively influence biodiversity. Such activities and processes are best understood through the landscape perspective pioneered by McHarg.

Current patterns of suburban sprawl exacerbate social inequities in the US. As growth and prosperity occur at the fringes of metropolitan regions, central cities and inner, older suburbs experience a declining tax base and increasingly concentrated poverty. For example, residents of inner-city neighborhoods are more than twice as likely to live in poverty as are their suburban counterparts in the US (PolicyLink, 2002). Poverty is especially pronounced in minority communities, since African-Americans and Latinos have poverty rates nearly three times as high as white Americans (Institute on Race and Policy, 2002).

As metropolitan regions grow, the local climate changes because of the urban heat island, or heat archipelago, effect. This effect involves the additional heating of the air over urban settlements as a result of the replacement of naturally vegetated surfaces with those composed of asphalt, concrete, rooftops, and other human-made materials. For example, between 1970 and 1990, summer night-time average temperatures in the Phoenix metropolitan region increased by 2.2°C, and by 6°C between rural desert and inner urban locations (Brazel et al., 2000).

Sea level rise projected by future global climate change will also affect human settlements, especially vulnerable populations such as the young and the elderly, the poor and the disabled, and racial minorities. A sea level rise of 0.9 meters (3 feet) “places a land area projected to house 4.2 million people [in the continental US] at risk of inundation, whereas 1.8 [meters, 5.9 feet] affects 13.1 million people [in the continental US]” (Hauer et al., 2016, p. 691).

As cities and suburbs and our planet become hotter, we grow fatter. According to the Centers for Disease Control and Prevention (CDC), some 60 percent of Americans are overweight and at least 18 percent are obese. The lack of walking opportunities and the easy access to fast food are two contributing factors. Thus, the design and planning of our surroundings, our landscapes, is a public health issue. In most American cities, there is a lack of safe and accessible sidewalks, crosswalks, and bike paths. Transportation alternatives are limited, with little pedestrian access to buses and transit systems. Parks and recreation facilities are unsafe, ugly, and inaccessible. Shopping and services cannot be accessed without automobiles (Frumkin, 2002).

We need to see the connection between obesity and our health in general and the design of our built environments. As Dr. Richard Joseph Jackson (2001), formerly of the CDC and now with UCLA, observed in an article titled “What Olmsted Knew”:

Even though the United States spends one of every seven dollars on medical care, we will not significantly improve health and the quality of life unless we pay more attention to how we design our living environments. Healthy living environments include not just a clean and heated kitchen, bath, or bedroom, but also the landscape around us. Health for all, especially for the young, aging, poor and disabled, requires that we design healthfulness into our environments as well. (p. 12)

To summarize, just as other species' habitats are disappearing, we are losing our best farmland. The gap between rich and poor is widening, urban and suburban places are heating up, and our waistlines are expanding.

Toward a science and an art of landscape intervention

Each of these consequences of ill-conceived landscape change can be addressed through the design and planning interventions championed by McHarg. In 1967, McHarg initiated a scientific approach for landscape intervention grounded in design after obtaining funding from the Ford Foundation to recruit a faculty of natural scientists into his department at Penn to “integrate their perceptions into a holistic discipline applied to the solution of contemporary problems” (McHarg, 1996, p. 192). As previously noted, he broadened this approach to encompass human ecology because of NIMH support in the 1970s. The notion that one can practice landscape architecture, planning, and architecture by integrating the views of soil scientists, hydrologists, ecologists, climatologists, ethnographers, and other scientists echoes the multi-layered view of geography that McHarg did much to popularize with his *Design with Nature*, and has been important in the building of many environmental programs.

McHarg grounded his approach for landscape intervention in ecology. He argued that ecology, including human ecology, should inform the schemes of designers and planners by helping them to understand interactions among natural phenomena and landscape patterns. His approach is based on collecting data in a chronological order; that is, regional climate helps shape the geology of a place, which in turn affects other abiotic processes such as physiography and hydrology, which influence the specific soils and microclimates of the place. These abiotic processes come together in combinations that provide niches for plant and animal communities. McHarg (1969, 1996) suggested that information about these processes could be mapped and overlaid in what he called a “layer cake” model, which could then be used to determine opportunities and constraints for potential land uses. In this way, the suitability of land uses could be presented to local decision-makers.

The multi-layered model with which McHarg experimented, initially using transparent overlays, has evolved through GIS technology. GIS and other new technologies provide us with the ability to intervene in landscapes to address the pressing issues facing communities and regions. For instance, to ameliorate urban heat island effects, the amount of black asphalt should be reduced in streets and parking lots, more shade should be created, and more trees and other plants should be added to urban environments. GIS and visualization programs present tools for planning where such interventions would have the most positive effects. GIS can also enable designers and planners to locate and reconfigure transportation systems according to need. Visualization technologies, such as geodesign, help architects, landscape architects, and planners to show how these changes will look in neighborhoods and shopping areas (Steiner & Shearer, 2016; Steinitz, 2012).

We need to focus on the nature of cities—our most significant human ecosystem (Steiner et al., 2016). Landscapes provide an ideal framework for urban intervention because they represent a synthesis of natural and cultural features. Each landscape is distinguished from others because of its unique combination of natural and cultural characteristics.

We know more about our planet now than at any time in our history. We can watch hurricanes move through the Caribbean in real time on CNN. NASA offers its own station with endless Earth views. We are connected to one another and to vast amounts of information through the Internet. Science continues to advance our understanding of land and sea. We have created an informational central nervous system for the planet, but the system lacks a brain. What good is all this information if we cannot use it to improve our planet for future generations? The challenges we face require that we pursue and advance the vision McHarg provided.

Through the dual lens of nature and culture, we can begin to use our increased knowledge about our surroundings to take the actions necessary to halt suburban sprawl, to protect prime farmlands and environmentally sensitive areas, to redirect development and investment to existing cities, and to green those cities and reduce the urban heat island in the process. We need to design with nature to heal the Earth.

As McHarg (1998b) observed, “Let us plan to save lives, to protect the environment, to achieve savings from appropriate ecological planning, to improve prediction and placement, and to improve the human condition” (p. 83).

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