

Rethinking Houses as Living Systems for All Life

BY TIM WATSON

This is a vision for how human habitations can be seen as regenerative life sustaining systems for Earth.

In the United States buildings and homes use 70% of utility produced electricity and produce 38% of our carbon emissions. We stand on the threshold of shifting to carbon-free energies to heat, cool, and light our way to renewed habitats that enrich life for people, plants, and animals.

Global Context

There is a planetary shift of consciousness at hand. It has to do with how humans are recalling their connection to all life on Earth. This is not a new idea. Countless cultures of antiquity lived this wisdom. In this spirit of understanding the Western world finds itself rethinking how to design and build houses that integrate consideration of human well-being with the well-being of non-human life forms.

Concurrently, we are reawakening to honoring the needs of life forms that invariably populate the land around the houses we build.

Concepts of “green building”, or “sustainable use” practice are finally taking center stage in Western society. These ideas acknowledge the need for humans to live more lightly on the Earth. Evidence of the degradation of our biosphere finds humans awakening to risking not only our own survival, but the survival of a great proportion of other life forms struggling to co-exist with us. We are seeing the challenge of meeting the most basic human needs as having an enormous influence on the quality of life impacting all “those” who are to inherit the Earth.

The word “those” as it is being used here, infers an important distinction. It not only refers to human populations, it confers attention to all the myriad life forms that populate Earth’s biosphere.

Recent history of human intervention into the biosphere’s natural processes has led such visionaries as architect William McDonough

to reconsider how humans are affecting Earth’s natural systems when constructing buildings. Among many related topics, his thinking encompasses the concept of “embodied energy.” Assessment of a building’s embodied energy considers the life cycle of a material from the beginning of its use to its reuse. This way of analyzing “cradle to cradle” dynamics helps designers assess the environmental impact of their work. Significantly, McDonough champions “regenerative” concepts. As will be explained, this concept ranges beyond today’s mainstream sustainable use policy thinking, and is central to rethinking how we design houses.

How we build our homes, both in their design, use of materials, their relationship with surrounding biota, as well as our dwelling use patterns, will fundamentally determine the fate of our shared future with those who co-inhabit the Earth with us. Enhancement or regeneration of life forms a key to how we are rethinking these processes. Regenerative systems design goes beyond maintaining current balances with Earth’s life communities. Regenerative system thinking’s central focus is to enhance future probabilities of Earth’s natural systems. Related “seventh generation” concepts serve to enhance existing natural ecosystems ability to regain their former long-term balance within Earth’s grand design. These concepts contrast with sustainable use thinking, which tends to focus on maintenance of current natural resources as we find them today. If we consider the

ongoing diminution of natural ecosystems, sustainable use polices seem to fall short of helping previously compromised natural systems regain their former healthy equilibrium.

With great clarity, Buckminster Fuller acknowledged “We rape the Earth each time we build!” When such understanding is seriously entertained, we find ourselves taking a fresh look at how we can reconstitute and enhance the well-being of non-human life forms affected each time we build or reshape human habitat. Correspondingly, intelligent application of contemporary agrarian earth sciences can be seen to complement human habitat design. Prior to the industrial revolution, applications of ancient agrarian practices equitably served the needs of humans, plants, and animals around the world for countless generations. Exponential increases in human populations and their use patterns rendered this past legacy unable to adequately deal with the challenges of our biosphere’s accelerating disequilibrium. Would it then seem we should include emerging agrarian-based bio-intensive earth sciences in order to formulate regenerative life-enhancing designs?

If we are to succeed with such efforts to help rebalance the Earth’s natural systems, we must re-envision what we do in each one of our houses, and in each backyard. The visualization of houses that are seen as “Whole Integrated Living Systems” is upon us. Such systems entail the design of space, walls, roofs, water flows, gardens, trees, etc. in ways that tie all these components into an interrelated, regenerative, synergistic system. One might think of this idea as “Whole Garden Home” design.

Human Context for the Whole Garden Home Design

The word “garden” serves as an ancient metaphor to help us visualize a common idea that powerfully conveys the essence of this regenerative concept. Here we come full circle with antiquity itself, freshly drawing our attention to the wisdom epitomized by the gardens our ancestors depended upon for their survival. Here we are with the tools of our technology and agrarian earth sciences, empowered to bring to bear the means by

which it is possible to structure the flow of energy for the benefit of all life forms affected by buildings, including people. And we now can do so with reduced dependence on the extractive processes which have characterized the industrial revolution over the past 250 years. Here we are able to conceive of a continuum whereby our nourishment of the Earth’s soil returns full circle to nourish us.

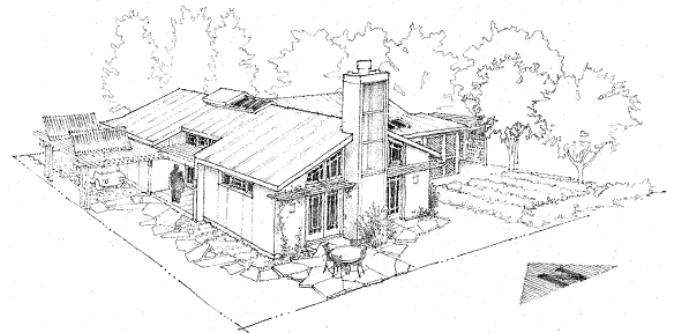
New possibilities are on the horizon for those of us who hunger for a place to nurture themselves

and the hidden world of neighboring organisms

around us. At a primordial level, we yearn for a

place to feel comfortably safe and at the same time reconnected with the natural world surrounding us. Imagine a place where one can better associate with life in all its myriad forms without interruption, throughout the year. Think of creating places crafted to rest and rejuvenate the human soul as well as the very soil beneath our feet, while enhancing the health of all creatures, great and small. Think of this as an opportunity to proactively participate in the global “green movement” by virtue of living in dwellings that consume no more energy than they produce, and homes that are designed to engender biodiversity. These ideas form the source, spirit, and inspiration for the Whole Garden Home design.

Due to rising construction costs, traditional housing options for Americans are narrowing. This is being exacerbated by increasing land and energy costs—all contributing to the diminution of future housing options for the majority of people living in Western societies. In response to the narrowing market for custom and tract-built housing, designers must rethink how to provide affordable alternatives for a broadening range of people seeking home ownership. For example, new solutions are



needed for the millions of “baby boomers” who are entering their retirement years on very moderate fixed incomes, and who often find themselves living alone—geographically isolated from their children, former spouses, and families. These are people who no longer have the guarantee of family-provided assistance earlier generations of Americans often had. These are people who are faced with the prospect of limited physical mobility issues warranting handicapped accessibility as well as “aging in place” amenities within their home and community environments. These are people who aspire to enjoy the dignity of occupying and managing their own home environment on their own terms, if only they can afford to do so. Such are the primary social and economic issues now instigating new approaches to home building design’s connections with Earth’s processes.

Because of affordability concerns for future housing consumers, including those of aging populations, there is an immediate need to rethink how we construct, use, and occupy our homes. We must rethink the lifestyle choices we heretofore have adopted and taken for granted. These challenges are destined to engender smaller sized homes requiring less land area than is customary for today’s typical single family dwelling. The issue of climate change is championing further consideration of homes that consume less energy and fewer resources.

There is also an urgent need to rethink how we manage the flow of heat energy within the very foundations of buildings. And most profoundly, there is a need to integrate these concerns into a holistic design practicum which better assures the survival of indigenous life forms inhabiting the surrounding bioregional ecosystems we all occupy.

“Believe it to be perfectly possible for an individual to adopt the way of life of the future . . . without having to wait for others to do so. And if an individual can observe a certain rule of conduct, cannot a group of individuals do the same? Cannot whole nations? No one need wait for anyone else to adopt a humane and enlightened course of action.”

M. K. Gandhi

Application of Agrarian Earth Sciences

Cuba is setting the stage for helping people visualize how it is possible to transition from fossil fuel-based economies to those centered on the use of bio-dynamic farming. In Brazil, application of permaculture earth sciences is being shared with indigenous communities with the Cerrado Biome. In India, the quantification of natural resource productivity found expression through the practice of “Natueco Culture”—a practical and elegantly simple concept developed by Professor S. A. Dabholkar. Over thirty years ago in Australia, Bill Mollison introduced the concept of permaculture, as it is being applied today in many parts of the globe. Permaculture is a concept whereby people and nature are both preserved and enhanced in concert with one another. These and many other so-called agrarian earth science technologies are globally helping people reestablish a symbiotic working relationship between human habitat and the natural world around them. This melding of the science of building technology, and home-grown agrarian earth sciences, lives at the heart of the Whole Garden Home idea. This fresh way of conceiving the design and site orientation of buildings needs to be further integrated into teaching curriculums within the academic community throughout the United States. Most of these new agrarian technologies are based on just a few fundamental tools.

Whole Garden Home Design Tools

The application of agrarian Earth sciences is based on the use of four principle design tools. These tools have been known to humankind long before written history. As in our ancient past, they form the basic elements with which it is possible to shape man-made environments that both sustain and regenerate life processes ranging from rainforest bioregions to the frigid reaches of the South Pole.

Water

A fundamental concept underpinning the “Whole Garden Home” concept has to do with on-site water flows. Contemporary housing design concepts regard water flow environs outside of building wall perimeters

to be primarily the prerogative of the building owner's personal agenda, so long as they comply with local water management regulations. As a service to building owners, surrounding land spaces are seen by designers as opportunities to complement a building's aesthetic design and functional purposes. Even now, during the early years of the 21st century, the Western world continues to send rainwater in concentrated flows away from the environs of buildings. This precious resource is then collected into extensive storm drainage infrastructures sometimes yielding outflow concentrations that wreak havoc in streams and estuaries. In America, these design concepts continue to be exacerbated by replacing misdirected rainwater with imported and chemically processed potable water supplied from distant off-site waste water treatment facilities. Where could we find similar examples in the natural world that would even remotely mirror such folly?

Instead of sending this precious resource away, and then replacing rainwater with chemically treated water derived from treatment plants, our option seems clear: capture and hold natural rainwater flows generated by impervious surfaces like the roofs of houses. This provides the first step for optimizing intelligent rainwater use first by the containment, and then careful redistribution of on-site water flows. Herein is the central concept driving the on-site water management idea. On-site water management can be seen as the collection, containment, and redistribution of rainwater and water reuse resources that occur within the geographical area of a building or home site land area.

All buildings and site improvements with impervious surfaces create concentrated water flows that differ from existing indigenous rainwater flow patterns occurring prior to their construction. When managed without the application of appropriate earth science technology, the resulting concentrated water flows are often misused and wasted. For centuries humans have known habitat ranges of flora and fauna are largely defined by the presence of water. By managing the graduated release of water flows being generated by the presence of building roofs and other

impervious surfaces, it is possible to engender new site-specific habitat ranges which encourage the proliferation of a greater range of biota. This concept thereby engenders biodiversity. Additionally, on-site management and retention of water flows yields the added benefit of ameliorating extreme off-site flooding hazards, as well as mitigating the effects of periodic drought conditions.

"What will it take for us to once again become indigenous?"

William McDonough

In the near future, nineteenth-century-designed water distribution infrastructures will be seen to be obsolescent. Reuse strategies highlighted by so called "grey water" flows (which are now prohibited or restricted in most jurisdictions within the United States) are also destined to become mainstream technologies. In fact, the issue of water conservation and reuse is no longer exclusive to communities located in dry climates. Areas averaging over 40 inches of rainfall per year are currently being reevaluated for unprecedented water conservation restrictions. Proper utilization of concentrated water flows, and their storage, must be a centerpiece for how we will interface with local biological systems. An intelligent interface of site-specific rainwater harvesting, storage, reuse, and management design is fundamental to the Whole Garden Home concept.

Sun

Indigenous cultures have for millennia understood the significance of our life-giving star, the sun. They knew without its radiant energy there would be no life—no movement of water or pressure differentials to drive the wind. They knew the dynamics of streams, rivers, and heat would be powerless without the sun. And so it should be within the realm of human habitation design today.

As previously acknowledged, one of the key elements that characterize the Whole Garden Home concept is what is known as "net zero" energy flow. This has to do with designing houses that are conceived as energy harvesters producing at least as much energy as they consume. The primary resource for this objective

has to do with intelligent management of sun-generated energy flows within buildings. One can conceive heat flows as being conveyed in ways similar to water flows. If the radiant energy from the sun is directed to flow into a building in a prescribed fashion, it is possible to store heat in that building, or deflect that same heat energy away as needed. The use of captured rainwater and “earth sheltering” combined as dynamic thermal mass storage elements can be central to the concept of retaining and releasing heat energy flows in a controlled manner.

Other proven technologies exist which are representative of this concept. Such technologies can be related to both passive and active solar systems. “Trombe” walls and water heating solar panels are examples that utilize the greenhouse effect of trapped air and/or water being heated by the sun. Inherent in these technologies is a tremendous resource for heat generation and disbursement.

Latent Heat and Earth’s Soil

Humans and many life forms have successfully participated in the evolution of life on Earth thanks to the steady-state habitat created by the sun’s warming the surface of the Earth, and its attendant global green house storage of heat energy. The stored energy of the sun’s radiant heat has persisted enough to attain immense latent heat energy reserves in the earth, thereby maintaining ground surface temperatures which can be tolerated from nightfall to daybreak, and from winter to summer.

We have only to raise latent soil temperatures of the earth about 20 degrees Fahrenheit to create comfortable air temperatures for humans. If the heating and the amelioration of heat is conceived to draw upon this tremendous energy resource which lurks beneath every land habitation on Earth, very achievable active solar energy inputs can be derived. Relative to temperature variations typically found in non-tropical environments, the temperature of soil and related geological structures is a steady-state heat resource that can always be harvested. In temperate climates, one has only to dig little more than four feet into the earth to access the steady-state temperatures found there. Geothermal

heat pump technology is most representative of drawing from or depositing heat energy into Earth’s immense heat sink. Thanks to concepts known as “earth sheltering” there are economically feasible ways to harvest the Earth’s latent heat energy thereby reducing the need for human-made energy inputs.

Sealed crawl spaces are gaining acceptance in the United States. These enclosures are changing the way designers can improve the thermal performance of houses. Yet more is to be gained with this concept. The foundations we are designing today often sadly miss the opportunity to harvest the latent heat energy held captive by Earth’s crust. By carefully determining the excavation depth of open plenum crawl space designs, it is possible to bring steady-state temperatures to the lower structure of any building, and then capitalize on these universally available heating and cooling inputs.

When based on use of agrarian earth technology, soil quality management is an essential component towards achieving the design objectives of the Whole Garden Home concept. Along with the presence of water and climatic air temperature, the nature of soil, and the variation of its characteristics largely determines the range and successful propagation of biota. Indigenous soil’s life-supporting capability is inevitably diminished whenever humans endeavor to create shelter for themselves. However it is quite feasible to reconstitute the initial damage done when we build. The reintroduction of select plants, animals, and microbial organisms into soils compromised by construction activity can be seen as fundamental to the “regenerative” process William McDonough promotes. In other words, the restoration of soil and the life systems it supports is fundamental to not only restoring and sustaining, but enhancing the regenerative capacity of buildings to support neighboring life forms.

Plants and Microbiotic Life Forms

Landscaping continues to be assigned the primary purpose of adding ornamental interest to the visual composition of buildings and their surrounding land spaces. As an adjunct to this way of thinking, designers must add a

further element to these purposes. They need to include the introduction and establishment of an expanded variety of indigenous life forms, primarily microbiotic organisms, edible plants, and xeriscaping designs that enrich local community habitats, thereby encouraging biodiversity.

If the designs of our future habitations are meant to serve this simple concept, the implications are clear. We must see the environs of a building's exterior environment to be as much a part of human support system design as the interior of buildings. That is to say, when we create habitable space, the architecture of that space is comprised of both buildings, and the life forms they engender beyond their physical peripheries. Buildings and houses can no longer be conceived as somehow separate from the natural life processes surrounding them. Instead they must be conceived in a way that is similar to man-made artificial reefs in the ocean. Appropriately constructed reefs create havens of life-enhancing habitat. They serve as islands of refuge capable of supporting greater densities and varieties of indigenous life forms as compared to surrounding ocean bottom habitat. Like coral reefs in the ocean, houses can be conceived as "Garden Reefs" offering havens for rich diversities of life forms. The application of agrarian earth sciences provides a gateway to this end.

Off-Site Fabrication Technologies

Panelized and modular prefabricated building technologies are the wave of the future. New material fabrications comprised of "locally" derived, recycled, and lower "embodied energy" materials are exponentially expanding the potential to build the Whole Garden Home concept. Designers are now able to conceive highly energy efficient building envelopes, both above and below the surface of Earth. Current use of panelized concrete foundation design is gaining acceptance. Another example is the use of structurally integrated panels possessing outstanding thermal-control characteristics for walls and roofs. At the heart of using these prefabricated components is the advantage of their being assembled on-site within a few days, thus sig-

nificantly lowering relevant on-site labor costs and energy consumption.

As we draw upon new prefabrication technologies, it is important to include consideration for locally derived materials and services. Use of construction materials indigenous to the building site locale characterizes how our ancestors built their habitations. This previously addressed "embodied energy" concept deals with consumption of energy and resources required to extract, transport, fabricate, construct, maintain, and recycle a given building component or material, from cradle to cradle as William McDonough has explained. A key contemporary application of the embodied energy concept includes consideration for the recycling and reuse of products and materials used in building construction. Here we yet again find a direct corollary to the wisdom of mimicking the life cycle processes nature has evolved over several billions of years. Everything in nature is recycled. Each time we drink a glass of water the liquid contained within it has sustained the lives of countless life forms that co-existed long before our presence on Earth today. Being in touch with this life process helps us understand how we are all connected, and how it is we all are of the same source.

"Whatever befalls the Earth, befalls the sons and daughters of the Earth. This we know. All things are connected like the blood which unites one family. All things are connected."

Chief Seattle

The rising cost to produce conventionally conceived buildings is creating a need to find fresh alternatives. If one analyzes all energy uses on a construction site, one of the largest energy consumers involves the repeated transportation of construction crews and materials to and from building sites. This amounts to roughly 25% of the total energy needed to construct a building. In response, we are witnessing a trend towards the application of newer modular and "panelized" technologies that promise lower cost advantages. Prefabrication utilizes labor and material resources that are concentrated at one pre-assembly facility, thereby reducing the amount of labor and materials otherwise dis-

bursed to distant building sites. As proof of this, the economic advantage to modular home construction is reflected in the proliferation of mobile homes, recreational trailers, and the like. For decades prefabricated homes have been the mainstay alternative for people who cannot afford to live in conventionally built houses. With the exception of highway construction, houses are the greatest consumers of embodied energy. We can no longer afford to sustain the economic costs of such wasteful practices, or the environmental consequences they generate.

Whole Garden Home Design Objectives

The preceding ideas set the stage for rethinking the way we build, and the way we live. If we were to conceive of a house as being a ship at sea, we could not imagine that ship maintaining land based connections to water lines and fossil fuel supplied power lines. The time is upon us to envision houses and buildings as sailing ships of yore, each supporting and protecting ALL their precious passengers while capturing the sun-generated forces of wind. Such houses are destined to harvest the power of the sun, while nurturing all “those” traveling along with them.

The prefabricated “Whole Garden Home” idea centers on six key objectives:

1. **Affordability** by using locally derived, prefabricated building products which are seen as more durable, as well as aesthetically and functionally superior in design.
2. **Enhancement of both human and planetary health** by adopting LEED (Leadership in Energy and Environmental Design) and related “green-build” standards which serve to minimize energy and resource consumption.
3. **On-site water use management** engendering “regenerative” natural processes, and which can also serve to augment appropriate heat energy and water usage flows.
4. **Solar-based technologies** whereby “net zero” energy consumption patterns can be achieved as a basic requirement and even exceeded wherever opportunities are available
5. **Integration of the human waste stream** into the natural processes found in nature whereby both black and grey water flows, along with biodegradable material streams, are components of on-site designs healthy for humans, and regenerative for the biota living near them.
6. **Engenderment of synergistic connections with nature and the human psyche** via integration of beautiful interior and exterior environments such connections form a backdrop combining landscaping/gardening, interior spaces, water flows, and energy flows . . . all contributing towards the rejuvenation of people who are witnessing and experiencing their active contribution to the welfare of Mother Earth.

The time of anthropocentrically designed buildings must come to an end. In our immediate future we must envision buildings and homes that serve both humankind, and the communities of life forms they impact.

*“One must touch this Earth lightly.”
Ancient Australian Aboriginal saying*