

# Natural Phenomena and the Built Environment

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While humanity is physically pathetic and weak, we excel at adaptability and ingenuity. We build shelters that protect us from the elements and coax food out of the ground. Where groups were able to secure consistent high yield food sources, they developed skills and arts that would catapult them into the lofty heights of civilization. Despite modernity's exponential progress within all realms of our lives, it seems that we evoke equal amounts of dangerous predicaments. What role does the built environment possess in mediating our relationship with nature and its nourishing ecologies?

The great Aztec empire of Mesoamerica is often marveled at for its pyramids and archeological history. Much less celebrated but worthy of further investigation was the Aztec method of agriculture which was used to feed a population of over two hundred thousand people.

Chinampas, meaning *upon reed baskets*, was a broad system of interconnected man-made islands suitable for large-scale urban agriculture built upon the lake surface surrounding the Aztec capital of Tenochtitlan. These islands were created by first driving posts into the lake bottom, then between these posts building an enclosure with branches and reeds from the lake and local marsh area. Fertile soils scooped up from the lake bottom were piled atop and within the woven reed beds to create what would become the planting surface. The root systems of maize, bean, and tomato crops would further reinforce the soil beds to prevent erosion from the lake waters that nurtured them. On the corners of each bed a willow tree was planted so that its strong roots would anchor the chinampa to the lakebed. The consolidation of these chinampas eventually created a matrix of arable land rigid enough to even support huts that the farmers and their family lived in [1].

Aside from being a successful agricultural model, chinampas also provided a myriad of urban solutions. Proper sanitation is vital for any sedentary society. The Aztecs incorporated their sanitation system into their agricultural system. Human excrement was used as a compost ingredient by being mixed with organic matter creating something analogous to cow manure: humanure. The dual benefit of this was a constant supply of soil-building elements for use in food production while also freeing the villages from diseases caused by poor sanitation. As far as urban planning is concerned, the Aztecs were truly an ecologically

intelligent people whose civilization evolved in alliance with the environment that sustained them.

The colonizing civilization that replaced the Aztecs differed greatly from them. The Spanish settlers did not care much for the chinampa method of agriculture, despite its ecological brilliance. Opting instead for the mono-cultural cropping conventions of Europe, they devised schemes to drain Lake Texcoco's entire lake basin under the rationale of accessing its fertile lakebed soils. Short-term productivity quickly led to the sterilization of the former Lake Texcoco due to the aggressive agricultural practices of the ill-advised Spaniards [1].

The ecological legacy of the Aztec empire is nowhere to be found in modern day Mexico City. Quality of life has degraded to the point that it is said that the residents of Mexico City inhale fecal dust blowing off during the hot dry season near what is still called Lake Texcoco, causing a panorama of diseases like typhoid and hepatitis [2].

With a population of twenty million people sprawling over the entire Mexico Valley, the fate of this region to sustain itself has been, and remains, in question. Mexico City is not alone in the dilemma resulting from interfacing their built environment with the squandering of life-supporting ecological equity; much of the world's developing nations are faced with this paradox of progress.

Thomas Malthus, 18th-century economist, proclaimed, "humanity is multiplying its population at a geometrical rate while increasing its life-support systems (food, shelter, water) only at an arithmetic rate" [3]. Embracing the Darwinian dictum of *survival of the fittest*, Malthus professed that the majority of humans are designed to suffer and die far short of their potential life span, and thus tolerate death by disease and starvation [3]. Buckminster Fuller, visionary architect and engineer, on the other hand, was convinced that 20th-century man now possessed the potential to grant every person on earth adequate housing, food, and water. Invoking the increasingly efficient materials and technologies developed in the industrial revolution, Fuller made it his life's work to design and build sustainable infrastructure while preserving the ecological wealth of the planet.

Facing the doomsday tabloids of climate change, we've seen that a large push for the greening of our built environment seems to have taken hold in the conversation over the future of human civilization on the planet. Adapting a chinampa-like method of urban design to house and feed the world's cities may seem idealistic, but American architect Michael Reynolds has been building houses that follow the chinampa logic for the past forty years. He calls them Earthships.

Earthships are a form of self-sustainable houses that generate all of their energy, food, and water by tapping what Reynolds calls the natural phenomena of the sun, wind, and rain [4]. Reynolds brings forth a new paradigm in architecture and our relationship with the environment. Much as the Aztecs utilized organic wastes for the foundation of their successful chinampas, Earthships make use of industrial waste by regarding used car and truck tires as building materials indigenous to every developing region of the world. By ramming dirt in the tires

and stacking them nine levels high, an indestructible wall is created which carries a high degree of thermal insulation properties. Solar panels generate energy for the energy-efficient appliances of the interior. The roof collects rainwater from the sky and funnels it into cisterns that provide water for drinking and cleaning. Grey water and black water are treated by the food-producing indoor garden, and what is left is directed to the outdoor planters.

Earthships provide a viable solution that is ecologically intelligent. They move away from the extractive method of sustenance by designing an alliance with the natural environment, all the while supporting our primordial and modern needs. Hundreds of Earthships have been successfully built across the globe. We humans are inextricably linked to both the ecological and our own built environment. We must regard them in tandem as we continue to evolve on a planet that also undergoes drastic changes. Adaptability and ingenuity are perhaps the hallmarks of our species; they will be the source of our sustainable endeavors as we propel towards the clouds of uncertainty in our future.

#### References

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