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Sustainable Building versus Ecological Building

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Background and Context

"Evidence is mounting that humankind, and the environment that shapes its existence, are in the midst of an epoch of converging fundamentals which place us at the start of a new era in the flow of human history and the planet in which we live. History, however, is not shaped merely by a single or even a string of cataclysmic events, as doomsayers would have us believe. It is mostly shaped by processes that, although they often cause traumatic disruptions, leave enough room for mankind to adapt and survive" (Coetzer 2010). So begins the first in a series of articles in *Leadership Intelligence Bulletin* aimed at unpacking some of this evidence and identifying some of the processes at work in the present epoch – with "epoch" being defined as an instant in time chosen as the origin of a particular era in history – and the processes presently at work.

At the centre of this enquiry lies the concept of sustainability. The emphasis on sustainable development – meeting the needs of the present without compromising the ability of future generations to meet their own needs – has become a theme within international organisations, national governments and civil society. It influences investment destinations and consumer decisions. Over the past decade, the focus of sustainable development programmes has shifted from a green-centred approach to a people-centred agenda, largely in response to alleviating global poverty.

The built environment, as a people-centred domain, has only recently received the same consideration as the green-centred agenda. Construction activities consume raw materials and cause monumental waste: the product which they deliver requires resources such as energy and water to operate over its entire life-cycle, a period measured in decades, and often in centuries. Throughout this process, construction activities often result in environmental degradation and social dislocation. Construction industry participants must therefore take their role as potential agents of change, whose decisions can constrain, alter, guide or enhance the future decisions of others.

The economic performance of construction products has traditionally been perceived as the initial cost of the development and its return over a fixed period. Current thinking, however, includes other costs and opportunities, such as the potential for SME development, minimising life-cycle costs, reducing material consumption rates, minimising energy consumption and waste generation together with the disposal costs, factoring in transportation costs and impacts, and measuring efficiency.

Social well-being assessment criteria include respect for local culture and tradition, the health of the inhabitants, the quality of the indoor environment, and the security offered by the facility.

Environmental stewardship assessment criteria include the protection of the atmosphere, the reduction of global warming gases, protecting the ozone layer, improving air quality, conserving biodiversity, protecting fresh water and groundwater sources, limiting the consumption of land (especially food-producing land), planting trees and reinstating indigenous landscapes, reducing the extent of hard landscaping, encouraging the reuse of brown-field sites, prohibiting the leaching of pollutants, and controlling and harvesting storm water.

Thus buildings and infrastructure can no longer be assessed within the narrow definition of Gross Fixed Capital Formation (GFCF): their impacts extend into the depth of our social fabric and breadth of the earth's limited natural resources.

Green building

What is green building? The Office of the federal Environmental Executive in the US defines green building as "the practice of 1) increasing efficiency with which buildings and their sites use energy, water, and materials, and 2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal – the complete building life cycle" (OFEE 2003).

The International Code Council (ICC 2007) defines green building as building with a conscious effort to minimise the negative impacts and encourage positive impacts of buildings on both the indoor and outdoor environments. The practice of green building typically includes attention to the following primary concepts and systems:

- Sustainable/durable/low maintenance building design and operation
- Energy efficiency and conservation
- Site/land management, sustainability, reclamation and conservation
- Water efficiency, management and conservation
- Indoor Air Quality
- Outdoor Air Quality
- Material and resource management, recycling and conservation (including the reuse of building materials and products)
- Innovation

Each of the above primary concepts can be further expanded into many and detailed components.

'Green Building', it can be argued, is now a universally accepted principle that promotes the construction of environmentally friendly buildings. Green Building can be defined as building that minimizes its impact on the environment while improving its indoor environmental quality.

It can be argued that green building is in reality a sub-set of sustainable development as green building essentially restricts its area of influence to minimizing environmental impacts. Thus, of the three legs of sustainability i.e., economic feasibility, social well-being, and environmental stewardship, the environment is its key objective with limited attention paid to economic feasibility and almost no reference to social well being with the possible exception of a healthier indoor environment.

Globally considerations of sustainable development within the context of the construction and property industries is also limited to environmental considerations, and in some instances, further limited to energy-related considerations. This response is, in part, to a global security crisis around peak oil, and to the implications of global warming and climate change on the environment and the human population.

More current thinking on the issue of sustainable building reflects a growing recognition of the relationship between development and ecology. The following definition as provided in the Sustainable Mobility Project 2030 of the World Business Council for Sustainable development (WBCSD) reflects this new thinking, i.e., "the ability to meet the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human and ecological values today and in the future." This definition identifies the benefactors as society at large, describes the scope of need albeit within the context of transportation, and establishes an oversight doctrine based on human and ecological values. This expanded definition thus constitutes a useful context for establishing ecology as the foundation of sustainable development.

Zero-energy building

The goal of green building and sustainable architecture is to use resources more efficiently and reduce a building's negative impact on the environment. Zero-energy buildings achieve one key green-building goal of completely or very significantly reducing energy use and greenhouse gas emissions for the life of the building. Zero-energy buildings may or may not be considered 'green' in all areas, such as reducing waste, using recycled building materials, etc. However, zero-energy or net-zero buildings do tend to have a much lower ecological impact over the life of the building compared with other green buildings that require imported energy and/or fossil fuel to be habitable and meet the needs of occupants.

Because of the design challenges and sensitivity to a site that are required to efficiently meet the energy needs of a building and occupants with renewable energy (solar, wind, geothermal, etc), designers must apply holistic design principles and take advantage of the free, naturally occurring assets available, such as passive solar orientation, natural ventilation, daylighting, thermal mass and night time cooling.

Green building certifications do not require a building to have net zero energy use, only to reduce energy use a few percentage points below the minimum required by law. And, many green building certification programs (such as the Leadership in Energy and Environmental Design developed by the U.S. Green Building Council and Green Globes), all involve evolving check lists that are measurement tools, not design tools. Inexperienced designers or architects may cherry-pick points to meet a target certification level, even though those points may not be the best design choices for a specific building or climate.

Ecological building

Urban structures, functions, and processes are investigated on different spatial scales, e.g. on districts, urban regions, and regional levels, considering the consequences of domestic and international developments. In this approach, people and their interactions in society, economy, and politics are considered as actors in decision-making, as well as those affected by them. The effects of urban land use on environmental and ecological quality are in many cases directly, as well as indirectly linked to the social and economic components of the entire urban system. In order to improve quality of life and environmental quality, sustainable urban development must take into consideration ina a comprehensive manner, the society-environment-interrelationships as bases for planning, decision-making, and management.

Charles Kibert and Kevin Grosskopf (undated) argue that the ideal green building should have five major features.

Integration with local ecosystems – ecosystems have the potential to assist with the heating and cooling of buildings, storing stormwater, providing wastewater treatment, and providing environmental amenity.

Closed loop materials systems – this means designing buildings that enable the materials used to be deconstructed and re-assembled and/or reused in its existing or new forms.

Maximum use of passive design and renewable energy – this means that buildings are designed to be climate responsive, i.e., taking full advantage of local renewable energy sinks and sources, including solar, wind, rain, groundwater, and the earth in the vicinity of the building.

Optimised building hydrologic cycles – this means making use of natural systems to process waste water through the use of ecosystems, trees and other biomass uptakes, and green roofs.

Full implementation of Indoor Environmental Quality measures – this means a developing a fully integrated approach to IEQ including acoustics, air quality, noise, lighting, vibration, external views, temperature and humidity.

Kibert and Grosskopf posit that in the future three basic contemporary approaches will be synthesised into an integrated process and that ecological design will become a part of a

new design process. The three contemporary processes are: vernacular design, the technological approach, and the biomimetic approach.

Vernacular architecture is the embodiment of cultural wisdom, memory, tradition and intimate knowledge of place into the design and operation of buildings. Vernacular architecture speaks directly to the human ethos.

The technological approach is predicated on the belief that all problems can, in time, be solved by the development and implementation of technology. While there is much evidence to support this, an underlying challenge presented by this view is that no attempt is made to avoiding problems in the first place. Thus when things go wrong, significant (and sometimes irreversible) damage can occur while solutions are being found.

The biomimetic approach is based on mimicking the manner in which nature sustains itself, including the conversion and use of energy, self-repair, reuse, self-regulation, and self-cleaning.

Conclusion

Ecological building is building in a manner that integrates the ecological, cultural, economic and political elements of social-ecological systems in an effort to define sustainability in a rapidly changing world. Ecological building is forward-looking, focusing on opportunities to shape the future by building resilience and seeking opportunities for favourable transformations in the built environment. Much of the emerging effort addresses the grounding of resilience concepts in practical actions that foster sustainability of desired system attributes. Fundamentally ecological building is conceptually founded in planetary stewardship that seeks to the reorient the relationship between society and the biosphere.

References

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