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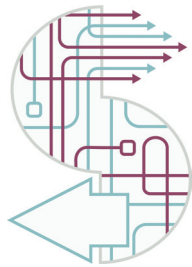

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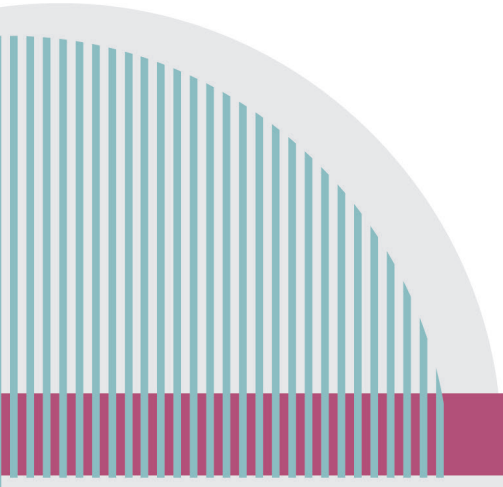

sustainable approach

Adrian MOLEAVIN

INTRODUCTION

Sustainability (< En. sustainable) fem. n. Attribute of a human activity of being conducted without exhausting the available resources or destroying the environment, thus without compromising the possibilities of satisfying the needs of future generations. (https://dexonline.ro/definitie/sustenabilitate)

The architects' preoccupation with ecology, durability and sustainability originates in the 70s, more precisely during the years of the oil crisis, which imposed a reconsideration of energy consumption in using buildings, with direct implications for architecture.

Unfortunately, the problem of reducing energy consumption in buildings has been regarded more as a technical and less as an architectural one, a misconception which affects environmentally sustainable architecture to this day.

The reasons for this state of affairs are psychological and supported by a limited understanding of our existential universe, namely the materialist-mechanistic cosmology that still dominates human society. This vision proclaims the self-world dichotomy as a fundamental principle and materialism as the essential reality of the universe. This scientific vision was developed before the discovery of the quantum levels of reality, of chaos theory or of complexity science and before the redefinition of humanity's position as an integral part of the ecosystem, i.e. before gaining the knowledge which has fundamentally changed the scientific cosmological paradigm, yet in the sphere of everyday life we are still influenced by mentalities and living patterns based on a limited vision of ourselves and of our living environment.

Over decades, this way of thinking and acting has led both investors and designers to avoid, at almost any cost, the application of sustainability principles in the construction sector because: 1. Such buildings would require a larger investment, which contradicts the principles of capitalist economy and 2. The architecture would have to obey a set of principles that would redefine the aesthetics and functionality of the buildings in a manner that would oppose *starchitecture*. For a long time, without truly researching the problem, architects have considered ecoarchitecture to be... ugly and too limiting.

Although science has moved beyond the materialist-mechanistic vision, human society still unaccountably bases its living (production, work, residing, building, etc.) patterns on this limited mode of understanding the reality we inhabit.

Any objective look at global events, in any direction, shows that human society is undergoing a period of profound *transformations*. Yet, as we know from the field of psychology, any transformation is prompted by the type of event called crisis. And recent history tells us that crises multiply and deepen.

The first global economic crisis, known as The Great Depression, began in 1929 with the Wall Street crash. Almost 50 years later, in 1973, the oil crisis occurred. Then, only around 25 years later, in the year 2000, there was an economic recession that mainly affected the developed countries while 2008, a mere 8 years later, was the start of a financial crisis that reverberated to 2014. In 2020, after an interval of only 6 years, we are dealing with a new financial crisis, this time combined with a health crisis.

We are obviously dealing with the shortening of stable periods and multiplication of the moments of economic crisis. Furthermore, we are dealing with a demographic, political, cultural and, perhaps most important of all, an ecological crisis, with the emphasis on pollution, and with climate crisis.

The fact that these crises reoccur and intensify shows that our way of living requires transformation, a change that has yet to take place.

Yet from the very fact that these crises occur and especially from the fact that we cannot manage to redress the balance in our favour, we know that we cannot regard human society as separate from its living environment. Given that the construction sector, from the production of materials to the moment of demolition and including the pollution produced in the building process, represents the greatest energy consumer, the role of architecture becomes crucial.

Nevertheless, the problem of an unsustainable way of living can be traced back to our oldest ancestors. According to the findings of the well-known historian Yuval Noah Harrari, in his book *Sapiens A Brief History of Humankind*, human society has been unsustainable from the emergence of the first Homo Sapiens. The migration of Homo Sapiens populations has always been followed by the disappearance of large animals.

Yet if until the end of the 20th century unsustainable living patterns did not jeopardize the very existence of human beings on this planet, at present the threats of the Anthropocene are well-known to all of us. It suffices to mention the fact that Jakarta, the capital of Indonesia, is in a process of relocation due to global warming, specifically the rising sea level.

The need for new buildings increases more rapidly than our capacity to build (due to population growth). The artificial built environment is the greatest polluter of the planet.

The equation is obvious and for the result to be a positive one, the unknown must answer the question: how do I build, use and recycle buildings without pollution?

In conclusion, ecological, sustainable and durable architecture does not only represent the answer to current problems regarding pollution or climate

change, but also the spatial-constructive and aesthetic expression of a new scientific cosmology that views human beings and society as an integral part of a planetary ecosystem.

More than a necessity of survival, the sustainability of the built environment realises one of the highest human aspirations: harmony (Edwards, 2005).

RELATION TO LEARNING AND TEACHING OBJECTIVES

The sustainability dimension of the built environment is integrated to an increasing extent into the objectives of the design themes. If in the themes of study years 1-3, sustainability and durability appear only as topics for reflection without actually becoming generating factors, in years 4-5, a series of clearly defined objectives emerges.

The year 4, semester 1 (7) project themes list the objective of "Understanding, assimilating, applying and developing technological principles adapted to the programme and related to environmental impact". Fulfilling these desiderata requires understanding the impact of buildings on the environment, i.e. of the relationship between energy consumption and pollution, the role of technology in reducing energy consumption and in harvesting and using renewable forms of energy. The strong technological development of the 20th century and the even more rapid one of the 21st century has created the impression that today's technologies can solve any problem. Yet we must bear in mind that while technology has, for example, the ability to harvest and use renewable forms of energy, the efficiency of these technologies is still very low and the pollution resulting from the production process of the technological systems outweighs the benefits of their use. Technology must be seen as a supporting, mitigating factor and not as a universal panacea.

Another objective, featured in the year 4, semester 2 (8) general themes is "Project development starting from the understanding of sustainability features that can be integrated into the project". This requirement should have certainly preceded the study of technological aids since it entails understanding the connections between built environment - human being - natural environment - pollution. Above all, it is necessary to understand the architecture/building as part of an extended context: on the one hand spatial, as part of a natural-artificial ecosystem and, on the other, temporal, for its entire lifecycle, from concept to recycling. It is interesting to study and search for the benefits, the added value that the architecture/building can bring to the natural-artificial ecosystem through its very presence and/or use, thereby improving the quality of life of direct or indirect users.

In year 5, semesters 1 and 2 (9 and 10), the focus is on "Understanding and applying architectural and related principles linked to the reduction or control of energy consumption of buildings and the incorporation of sustainability elements at all scales of intervention". Any architectural project develops an interdependent relationship with its surroundings. This relationship is translated into a series of principles that determine how the building behaves. Stated already at the concept stage of the project, they influence the architecture of the building, independent of the scale at which we read it. Regardless of whether they concern volumetric composition, materiality or a mere technical detail, the incorporated sustainability principles must retain their validity and functionality.

RESEARCH – CRITERIA AND CONCEPTS

> If we are seeking a new world, to find it we must sail past the edge of the map, past our existing beliefs and worldview. (Beth Carruthers, member of the jury of the Land Art Generator competition, qtd. in Koh & Wong, 2012, p. 27)

PASSIVE APPROACH – Architecture that responds in a passive manner to local weather conditions, without the contribution of (active) mechanical systems.

Bioclimatic architecture (Lebedev & Jurov, 1985; Olgyay, 2015) deals with adapting the architecture of buildings to local conditions (microclimate) and landscape [protection against the cold and the heat, bad weather protection, adaptation to the topography of the area, building orientation, choice (nature) of building materials, design and positioning of openings, etc.], as well as to the cultural and historical context, being influenced by the residents' occupations, traditions (patterns) of living, user needs, local artistic traditions or historical influences.

To control the interior microclimate of buildings, bioclimatic architecture uses natural physical processes and no other form of energy consumption. The architecture/building actively and continuously interacts with its environment, becoming an integral part of it and thus fulfilling not only the function of protecting users but also that of an interface/permeable membrane of an osmotic nature between the natural environment and human beings.

ACTIVE APPROACH – Any other type of architecture/building, which uses mechanical installation systems to adapt and maintain the interior climate.

Passive House (passivehouse.com) is a building standard conceived to simultaneously ensure conditions of energetic efficiency and of comfort and economic efficiency. Although it uses installation systems, it is called Passive House because emphasis lies on passive bioclimatic design. Certification conditions for the Passive House standard are the same regardless of the geographical location (climate, landscape, etc.) of the future building.

Ecoarchitecture (Roaf et al., 2007). In addition to the Passive House system, ecoarchitecture pays far greater attention to the ecological footprint of the future buildings.

The ecological footprint is a means of measuring sustainability. It is measured in hectares of productive agricultural land, the surface required to sustain a particular lifestyle. The ecological footprint can be calculated for the entire human society, for different populations, countries, regions, cities, buildings, or even for a single person (Bastianoni, Galli, Niccolucci & Pulselli, 2006; Lim, 2018; www.footprintcalculator.org).

Ecoarchitecture emphasizes the idea that the built environment is part of the planetary ecosystem. In other words, buildings must enter a systemic relationship with the living environment in a natural, ecological and sustainable fashion.

***The Cradle to Cradle concept* – C2C or Regenerative architecture** (Braungart & McDonough, 2009) represents a new mode of viewing the relation of human society to its living environment, which aims at the transformation of linear processes into circular ones. In linear processes, the natural environment

is sacrificed with a view to collecting raw material; enormous quantities of energy are consumed to produce objects, including buildings, which are discarded or burnt after use, with huge quantities of garbage and toxins (pollution) being generated throughout this process. In circular processes, resources and materials are assimilated to nutrients that circulate between different systems of the natural ecosystem in a healthy, ecological manner, without producing waste and pollution. Within this system, any product must have the capacity of being continuously recycled, in other words, what is waste to human society must become nutrient for nature, this being the only way of ensuring continuous and sustainable consumption growth.

Living Architecture is defined as the architecture that uses the resources, strengths and possibilities of the natural environment and its organisms to build efficiently and sustainably. Although the concept is frequently associated with the process of using the strengths of living plants or trees to create structures that are useful to humans, there are complementary approaches which interpret natural systems in a new, scientific, creative key, in order to achieve the same result.

Bionic architecture (Cogdell, 2018; livingarchitecture-h2020.eu) is defined as a contemporary architectural movement which studies the adaptation of systems or biological mechanisms from the physiological, behavioural or structural point of view, as a source of inspiration for the design and construction of buildings. If we add the ecological desideratum to this line of thought, the direction is very close to the idea of a sustainable built environment. We mention only three representatives: Buckminster Fuller (www.bfi.org), Maria Rosa Cervera (Cervera & Pioz, 2015) and Neri Oxman (oxman.com).

IMPACT

The American architect and professor John Lobell (n.d.) states that architecture must be "in and of its era" and must fulfil four requirements to accomplish this:

> • It is built into the space and time of its era
> • It is built of the materials and methods of construction of its era
> • It is built out of the structures of consciousness of the people of its era
> • It is built in the socio-culture context of its era. (Lobell, n.d.)

Any architectural project must fulfil these requirements. A sustainable approach can generate an architecture with multiple effects:

> _improvement of environmental quality through energy saving, reducing pollution, the use of renewable energy resources, of natural materials and of non-polluting building techniques; quality of the indoor environment by ensuring optimal values of the interior microclimate [*Have I used contemporary materials and methods? What are the methods and technologies of the future*?];
>
> _redefinition of the relationships between human beings - built environment - natural environment by systemic understanding, wherein the three factors are not separate entities but parts of an integrated natural-artificial ecosystem [*Do I respond through my proposal to the structures of consciousness of the people of today*?];

_redefinition of living/usage patterns of buildings, redefinition of functional schemes, emergence of new functions [*Does the proposed architecture fit into the socio-cultural context of the present? And how will this context look in the future?*]

EXAMPLES

The proposed examples are not specific projects but categories that provide some indications of the possibilities of the present and invite to personally meaningful research that goes beyond the technical dimension of sustainable building, leading to the creation of conceptual innovations beyond successful design.

The Hyperbody group, Delft University of Technology (www.hyperbody.nl)

The Hyperbody group, set up at TU Delft, the Netherlands, focuses on using technology and advanced design methods to generate interactive, non-standard architecture.

The Advanced Architecture Group (AAG), Barcelona (iaac.net/research-departments/advanced-architecture-group)

The Advanced Architecture Group (AAG) is an interdisciplinary research group that uses emergent informational, interactive and production technologies to design and transform cities, buildings and public spaces.

The Venus Project, Florida (Araya, 2020)

The Venus Project represents a different vision of the future, a vision which shows the profound transformative implications that assuming ecological consciousness, an ethical and moral way of thinking and acting, has on human living patterns.

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The book presents outstanding sustainable architecture projects as well as various initiatives that place equal emphasis on creativity, scientific knowledge and innovation, thus highlighting the importance of active social involvement and responsibility as prerequisites for dealing successfully with the challenges of the contemporary world.

Gadanho, P. (Ed.). (2018). *Eco-Visionaries. Art, Architecture and New Media After the Anthropocene*. Hatje Cantz Verlag.

Eco-Visionaries tackles the problem of sustainability from an artistic perspective, shedding a new light on environmental problems and the ways in which they are examined and solved or at least imagined.

Koh, R. & Wong, S. (Eds.). (2012). *The Time is Now. Public Art of the Sustainable City*. Land Art Generator Initiative. UAE. Page One Publishing.

Taking the understanding of sustainability to a different level, this book presents buildings which can be regarded as infrastructure and public art installations at the same time. As energy generators, they push the limits of technological knowledge and give a different meaning to the social role of such artefacts.

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