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THOUGHTS AND IDEAS ON ECOLOGICAL SUSTAINABILITY AND THE REFLECTIONS ON ARCHITECTURE

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ABSTRACT

Sustainability concept that particularly mentions a "futurity" is defined as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” in “Our Common Future” (Brundtland Report) in 1987. [1] Concept of ecology was and still is being evaluated with the change of environmental problems, political, economic and social attitudes. Before the industrialization, for the societies living within the nature, environmental consciousness was within the daily life. Environmentalism emerged being against to mechanization and focused on nature-centered view instead of human-centered view after industrialization.
If the action of architecture is interpreted as "to build", from the deep ecologists’ perspective to interfere to the earth (to build) is an anti-ecological action. On this paper, based on the intersection of ecological sustainability and architecture, basically the circumstances that are merged when the concept of ecological sustainability

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encounters with the discipline of architecture which is defined as an anti-ecologic activity by deep-ecologists' point of view will be discussed; the transformation of the concept of ecology throughout years will be summarized and the evolution of ecologic architecture will be displayed. The reflections of ecological discourse on the architecture which is defined as an anti-ecological act and the architectural approaches developed by ecological objectives will be discussed.

Key words: Sustainability, Ecology, Ecologic Architecture, Anti-Ecology.

Introduction

Subjects about environment and environment consciousness have always been on human agenda. The first environmental consciousness appears as a way of living showing its spiritual side. For societies living nested in nature before the machine age, environmental consciousness is a part of daily life. By the emergence of mechanistic view human beings started to grow apart from the idea of nature. This rupture is criticized by certain circles and caused the nature-centered idea instead of human-centered one and there has been born the "environmentalist" approach. After defining "sustainability", environmentalism which has conciliated with the economical order, it paved the way to some serious debates caused by global warming and climate change. In summary, the concept of ecology has been evolved and continuing to evolve in parallel with the development of environmental problems and changes on political, economic and social attitude.

Within this paper, the transformation of the concept of ecology throughout years will be summarized and the evolution of ecological architecture will be displayed without being out of the scientific line. The reflections of ecological discourse on the architecture which is defined as an anti-ecological act and the architectural approaches developed by ecological objectives will be discussed.

Ecology in Relation with Scientific and Philosophical Developments

Until the mechanistic-approach which caused a significant breaking point in science history, human beings had no intent to subordinate the nature. The concept of nature was one in which human beings did not separate themselves from it. The modern concept of nature was a result of modern science developed by Galileo, Descartes, Newton and Darwin during 1600's to 1700's. With the mechanistic philosophical worldview of modern science defined by two interrelated philosophical positions, positivism and determinism, nature started to be discussed as a machine not an organism. This mechanistic approach determined as reductivism, mechanism, and materialism by many authors continues to influence the paradigm of design just as in several other fields.

The development of science under the light of Cartesian thought created the industrial revolution. Within 100 years approximately after the industrial revolution, with the excess of mechanization, the effect of industrialization over nature has become

evident. 100 years after the invention of the steam engine, Haeckel has defined “the science of ecology” in 1869 as a new sub-branch of biology concerned with the relationship between living organisms and their surroundings. Later in 1935, British ecologist Arthur Tansley defined the term “ecosystem” with a holistic viewpoint. [2]
In the meantime there was an important activation in scientific meaning. Especially since 1960s there were many emergent sciences: chaos theory, complexity theory, fractals, nonlinear dynamics [3]
The holistic view of ecologists such as Tansley and the post-modern science of complexity atmosphere helped another theory to develop in the name of ecology. Working on a method about research on the existence of life on Mars for NASA in 1972, James Lovelock developed the GAIA hypothesis. It “proposes that all organisms and their inorganic surroundings on Earth are closely integrated to form a single and self-regulating complex system”. [4]
These developments summarized above have triggered several international organizations to form. They discussed ecology not only on scientific level but on social, economic and moral level too. In 1972 The United Nations has organized “Conference on the Human Environment” in Stockholm. [5]
Sustainable life-style has begun to emerge with these developments on natural and social sciences, Gaia hypothesis, social essence formed in the 1960s and the complexity theory. In 1987 “Brundtland Report” also known as “Our Common Future”, has been published by United Nations World Commission on Environment and Development (WCED). [1] In this report ‘sustainable development’ is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Actually, the concept of “sustainability” was not a new concept at that time. It was being used since the early 1970s. Similarly, the term “sustainable development” was being used since the early '80s, but was popularized by Brundtland Report of 1987.
The Brundtland Report has paved the way the UN Conference on Environment and Development (Earth Summit) to be organized in Rio de Janeiro in 1992 and the adoption of Agenda 21 [6], the Rio Declaration and to the establishment of the Commission on Sustainable Development. In Agenda 21, sustainability has been described within its three different dimensions: ecological, economical and social sustainability.

Reflections of Ecological Science on Design

In many ways, the environmental crisis is a design crisis. It is a consequence of how things are made, buildings are constructed, and landscapes are used. [7]
The concept of ecology discussed above in its historical development, has certainly important consequences on design and architecture too. In this section, the changes on concepts accentuating the ecological point of view in design will be emphasized briefly.

Today the terms “ecological design, sustainable design, green design, green architecture, eco-effective, holistic and environmentally friendly design” have almost similar meanings. Beside the fact that all these terms are used altogether usually, the dominance of use has changed in time. According to Madge, the transition of intensity of use of the terms from "green" to "eco-" to "sustainable" represents “a steady broadening of scope in theory and practice…”. [8]

As public awareness of environmental problems spread, with the influence of green parties and the advertising sector, “Green” became more prominent especially in the mid to late 1980s. By mid-80s "light green," as opposed to "dark green," terms were being used to designate different tendencies within the green movement. [8] While dark green was an opposition to the paradigm of modern industrial society; light green was the lighter green idea of modifying existing situations and practices. [6]

Another division of environmentalism into the categories movement still valid today has been suggested by Timothy O'Riordan's as “technocentric” and “ecocentric” mode. While technocentric mode regarded natural environment as neutral stuff from which man could profitably shape his destiny, ecocentric mode saw natural order as primary concern in which the most delicate and perfect balance was maintained up to the point at which man entered with all is ignorance and presumption. [9]

In the 1970s and 1980s, these different views are described as “shallow ecology” and “deep ecology”. While “shallow ecology” was staying close to “light green” and O’Riordan’s [9] “technocentric” point of view, “deep ecology” was similar to “dark green” and “ecocentric” point of view. In the mid-to-late 1980s, descent form of green design represented a light green, technocentric, or shallow ecological approach, beside relatively few dark green implementations. In the next few years, the practice as recognition of a wider frame of reference has started to be recognized as "ecological design” [8].

In their book Sim van der Ryn and Stuart Cowan described the term ecological design as “any form of design that minimizes environmentally destructive impacts by integrating itself with living processes”. It has been introduced as an integrative, ecologically responsible design discipline which has holistic interdisciplinary perspective. By the mid -90s the concept of “sustainability” has been used excessively in design world to describe the ecodesign vision. [10]

Collaboration of Ecology and Architecture

Every agenda formed around ecology and environmentalism has reflections on architecture. During this process, while traditional methods and natural materials were being used after the industrialization with the technological developments forcing industrial production in architecture, anti-technology designs advocating traditional methods have appeared. For a time period, designs with healthy building physics reflecting human centered view formed the main context of ecological and sustainable architecture. Crisis in energy and politics have led the ecological discussion from “healthy buildings” to “autonomous – energy efficient designs” level.

As in many fields, the fact that ecological approach gaining importance in building sector and architecture, has presented a parallelism with institutional developments, different social organizations and media activity. In 1990-1991 "Committee on the Environment" is founded within American Institute of Architects. In 1997 this committee has started "Annual Top Ten Green Project Award Program" which aims to choose ten best architectural projects on both environmental performance and artistic design. In 1993 "the U.S. Green Building Council (USGBC)" is founded: 'organization committed to prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings.'
Media was influenced by all these tendencies. While some publications entirely specific to this subject have come to the scene, on the other hand, many established publications have started to print regular articles or to reserve a whole issue on this subject. All kind of activities were emphasizing the green approach as a mainstream in architecture.
To apply sustainable design principles in design and architecture became not only a necessity but a fashion in a way. As institutions, organizations, architecture competitions focused on "sustainable/ environmental/green design", ever growing "sustainable/environmental/green design" examples have become very effective factors emphasizing the power of this discourse. In parallel to these developments many architects, including very well-known ones, have started to produce "sustainable/green design". Thus this became a mutual impact.

Ecologic architecture: Criteria, Principles

With the aim to settle the concept of ecological sustainability in architecture, many authors, intellectuals and architects are suggesting principles, on the other hand institutional actions have started to be taken. The former one is mostly related to the qualitative aspects of architecture, while the latter is mostly quantity oriented. Thus the ecologic architecture has became related to some principles triggering for creation a new formal language in a way.
The former one discussed below is about the methods for evaluating the environmental performance of buildings which came into the picture with the growing movement towards sustainable construction from the second half of 1980s. BRE Environmental Assessment Method (BREEAM) is a building certification system, first used in Britain in 1990, then embraced in many countries all over the world. LEED (Leadership in Energy and Environmental Design) launched by U.S. Green Building Council (USGBC) suggested 'helping the designer with a structure of designated points in several broad categories including energy, water, materials, indoor environmental quality and site design'. GBTool (Green Building Tool; then named SBTool) is an international evaluation tool formed in 1998 by developed countries. CASBEE is elaborated in 2001 considering the sustainability principles not only in Japan but in all Asian countries. In Turkey, Turkish Green Building Council (TGBC) established in 2007 has attempts to prepare a National Green Building

Certification. The certification system has positive contribution for energy conservation. These methods have attracted interest around the world.

All these establishments conducting standardization and certification tasks are granting certificates to the buildings abiding the green building standards. The certificated buildings, entitled "green building", also gain prestige. This situation has created an economy and developed an advertising factor.

While these certification methods were leading architecture to a quantitative evaluation, many authors, architects, philosophers who analyzed the qualitative values, have produced manifestos and principles for the ecological viewpoint to be reflected into the architecture.

For example in 1991 Brenda and Robert Vale have proposed six principles which all together could build a "green architecture". This is practically a recipe: Principle 1: conserving energy; Principle 2: working with climate; Principle 3: minimizing new resources; Principle 4: respect for users; Principle 5: respect for site; Principle 6: holism, all the green principles need to be embodied in a holistic approach to the built environment. [11]

In 1996 van der Ryn and Cowan, long time advocates of ecological design, have set up principles for sustainable design: Principle 1: solutions grow from place; Principle 2: ecological accounting informs design; Principle 3: design with nature; Principle 4: everyone is a designer; Principle 5: make nature visible. [12] One of the most important emphasis of van der Ryn and Cowan is the multidisciplinary perspective interlinking conventional science and design disciplines: "they can be solved only if industrial designers talk to biochemists, sanitation engineers to wetland biologists, architects to physicists, and farmers to ecologists."

Six governing principles proposed by McLennan are: Respect for wisdom of natural systems-the biomimicry principle; respect for people-the human vitality principle; respect for place-the ecosystem principle; respect for the cycle of life- the "seven generations" principle; respect for energy and natural resources-the conservation principle; respect for process-the holistic thinking principle. [7]

Guy and Farmer connoted six approaches within sustainable architecture based on related architects and material and technology choice [13]: The eco-technic logic – building and global place: The main issue is energy efficiency. Buckminster Fuller has been described as one of the pioneers of this approach. Guy and Farmer name some architects known for their use of high-technology like as Norman Foster, Richard Rogers, Nicholas Grimshaw and Michael Hopkins, Renzo Piano, Thomas Herzog, Ken Yeang for this category.

The eco-centric logic – buildings and place of nature: This is an approach close to deep-ecology. "The assumption is that "the challenge of sustainable design is too big, too complex, and too uncertain to deal with as a technical problem…" It considers to built is an anti-ecological action in any way.

The eco-aesthetic logic – buildings and the new age place: The aim of this logic in building design is "how to represent the epoch shift of the new millennium and the transition to a holistic ecological worldview..." This perspective related to new post-modern paradigm is associated with sciences of complexity. It is argued that this has

produced a new architectural language. Authors name architects and groups such as Gehry, Santiago Calatrava, and Future Systems, Arato Isosaki, SITE as example.
The eco-cultural logic – buildings and the authentic place: This approach has authencity concept as basis. It claims that "truly sustainable buildings need to more fully relate to the concept of locality and place". For this approach Glenn Murcutt in Australia, Charles Correa in India, Geoffrey Bawa in Sri Lanka, and Hassan Fathy in Egypt is cited by the authors.
The eco-medical logic – buildings and the healthy place: Its discourse is: "a new relationship of human beings to the environment has been legitimated through an understanding that the health of individuals is conditioned by the external environment."
The eco-social logic – buildings and the community place: This participatory architecture, addresses democracy as the key to an ecological society: "The aim throughout is to construct appropriate, flexible, and participatory buildings that serve the needs of occupiers without impacting on the environment unnecessarily by using renewable natural, recycled, and wherever possible, local materials like in Arcosanti in Arizona/USA."

Conclusion

Environmentalist approaches summarized briefly above introduce a complex process. This concept is considerably relative and open to constant change all along. Beside the fact that different approaches are still pronouncing, ecologic architecture moves around two mainstreams: high-tech architecture products realized with high-tech gadgets impossible to obtain in current situation of budgetary restraints [Table 1-A,B,C] (philosophy: eco-technic; shallow ecology...) or architecture products, often related to not so sophisticated existence models [Table 1-D] (philosophy: eco-centric; deep ecology...)
Ecologic architecture approaches based on technological perspective are most apparent among these today. Of course all these approaches inevitably affects architectural language in some way in different scales: from building parts to building form itself. As a result of this today there are several elements creeping into mainstream architecture, especially in technological-oriented architecture [Table 1-A,B,C]. There are also examples in which sustainability is seen equal to nature and green architecture becomes an aesthetisized interpretation of nature. Even though consciousness about sustainable design / green architecture is increased compare to the past, these concepts can still have different meanings for everyone. Today we live in such an epoch that almost every architecture and engineering firm advocate that they practice "sustainable design" and "green architecture" to a certain extent and use these terms as a label. Doubtless to say, the degree of sustainability of most of the buildings advertised to be sustainable / green / ecological is a disputable subject: "sustainability exists at level of connotation as signs and symbols attached to various features." [14]

Whatever reason is the current state of the world in one hand and the fact that ecologic sustainability becoming a marketing tool in the other, the concept has gained directly an important spot in architectural agenda. Beside the fact that this concept's superficial usage is criticized, this pluralist milieu is inevitable and can be causing the society to become conscious in some way. But in an ideal way: "Beyond measureable results, Green (-architecture) is political responsibility, equal rights, equal treatment. We need to have the bigger picture in mind. It's not just about saving energy." [15] Sustainable architecture has to have some properties but for sure but it is not a prescription. It's an approach, an attitude. "It shouldn't really even have a label. It should just be architecture." [13] It is a philosophy "that simply asks 'what is the most we can do on a given project to enhance the quality of the built environment while minimizing or eliminating the impact to the natural environment." [7]

TABLE 1. Reflection to architectural language of technologic and vernacular viewpoints

A-VANCOUVER CONVENTION CENTRE WEST // Architects: LMN**,** DA Architects & Planners / **Location:** Vancouver-Canada **Project Year:** 2009 http://www.archdaily.com/130373/vancouver-convention-centre-west-lmn-da-with-mcm/		
 : LEED Canada Platinum certification : COTE 2011 Top Ten Green Project Award.	> living roof	>> thermal insulation >> stormwater utilization >> extended green/extention of the existing topography >> providing a new habitat
	> clear structural glass skin	>> natural lighting
	> operable windows	>> natural ventilation
	> underwater habitat skirt/artificial reef	>> integration with the waterfront landscape ecosystem; providing new one
B-MEYDAN RETAIL COMPLEX & MULTIPLEX // Architects: FOA Foreign Office Architects / **Location:** Istanbul, Turkey **Project Year:** 2007 http://www.archdaily.com/3338/meydan-umraniye-retail-complex-multiplex-foa/		
 : MIPIM architectural review Future project awards	> living roof	>> thermal insulation >> utilizing geothermal energy (in-ground building) >> extended green/extension of the existing topography
	> automatically operable skylights	>> natural lighting >> natural ventilation
C-CALIFORNIA ACADEMY OF SCIENCE // Architects: Renzo Piano Building Workshop / **Location:** San-Francisco –USA **Project Year:** 2007 http://www.greenroofs.com/projects/pview.php?id=509		
	> living roof	>> thermal insulation >> decreasing urban heat island effect >> stormwater utilization >> giving the nature back cut from it.. >> providing a new habitat
	> photovoltaic cells	>> creating alternative energy (solar power) >> preventing the release of greenhouse gas emition
	> expansive floor-to-	>> natural lighting

 : LEED Platinum Green Museum : North American winner of the silver Holcim Award for Sustainable Construction, 2005,	ceiling walls of glass	
	> automatically operable skylights	>> natural lighting >> natural ventilation
	> operable windows	>> natural ventilation
	> exterior sunshades	>> thermal insulation /energy conservation
D-THE GREEN SCHOOL PT BAMBU // Architects: PT Bambu / **Location:** Badung, Bali, Indonesia **Project Year:** 2007 http://www.archdaily.com/81585/the-green-school-pt-bambu/		
	> traditional construction technique	>> cultural archetype that already exist >> cultural continuity
	> use of local material	>> thermal insulation (response to climatic condition) >> cultural continuity
	> hydro-powered vortex generator	>> creating alternative energy
	> solar panels	>> creating alternative energy (solar power)

In summary; according to the deep ecological discourse, to build is an anti-ecological action itself. An all ecological approach can only be possible by dematerialization suggested by Mitchell in his book E-topia [16]. But today, the main function of architecture is materialization. There is no escape from building action; so at this point consciousness and responsibilities take action. Climate change and global warming are harsh truths stated expressively with all consequences. The profession of architecture has qualities which can provide contribution to a "sustainable world" idea without doubt. And architects have to have holistic and trans-discipliner viewpoints to the architecture through technological perspective as well as philosophical one. Under all circumstances, 'The Architecture' created by this viewpoint will be "sustainable".

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