SUSTAINABILITY IN ARCHITECTURE AND THE LIMITATIONS OF ENVIRONMENTAL ASSESSMENT TOOLS

IŞIL RUHİ SİPAHİOĞLU[1]

ABSTRACT

The methods to achieve sustainability in architecture have continuously entered the architectural scene with different conceptualizations of the tie between the elements of the 'tripolar model:' Society, environment, and economics. Although the roots of this model are first delineated in Brundtland report (1987) and concretized at the Rio Conference (1992), there is actually no consensus on how to conceptualize its framework. The model acts as a discourse, but it hasn't yet reached such a status to define a Khunian paradigm that might lead to a universal way of interpreting the elements of the model. Despite the lack of a generally accepted paradigm, the field is in the search of defining "best practices." Current researches on building environmental assessment tools best illustrate this trend. The paper aligns itself with researches that aim to take benefit from multiple perspectives of designing sustainably to enable the making of "green knowledge." In order to pave the way for this multiplicity, the paper discusses the influence of environmental assessment methods on design process, through three case study methods: BRE Environmental Assessment Method (BREEAM), la Démarche Haute Qualité Environnementale (HQE) and Deutschen Gesellschaft für Nachhaltiges Bauen (DGNB) certification system. While underlining the aspects of design process that is torn between objective and subjective decisions, the paper discusses the role of assessment methods in framing these decisions. The paper first delves into the epistemological and theoretical point of views that have prepared these methods. This examination bases on the design epistemology of Nigel Cross, that is, the study of "designerly ways of knowing." The paper, then criticizes these tools as to their positivist approach to design problems and their influence on limiting the design alternatives. This discussion is essential because due to the appeal of these assessment tools in marketing the projects, they would become the mainstream practice.

Keywords: Building environmental assessment tool, sustainability, BREEAM, DGNB certification system, the Procedure HQE

[1] Ph.D.Student, Department of Building Environment Science & Technology (BEST), Politecnico di Milano, Italy; Research Assistant, TOBB University of Economics and Technology, Ankara, Turkey

1. INTRODUCTION

Ever since its introduction into the design discourse conceptualizing sustainability in architecture has gained paramount significance in designing and the term 'sustainable architecture' has acquired various meanings. Here I say meanings, because even though the aim of sustainable architecture remains the same, its definitions change contingent on suggested methods to achieve sustainability. These methods have continuously entered the architectural scene with different conceptualizations of the tie between the elements of the 'tripolar model:' Society, environment, and economics. Even though the roots of this model are first delineated in Brundtland report (1987) and concretized at the Rio Conference (1992), there is actually no consensus on how to conceptualize its framework (Findeli 2008).

This model, usually represented with the shape of a triangle (Fig.1), has become a commonplace in architectural researches. However, one can observe that it hasn't yet reached such a status to define a Khunian paradigm. That is not to overlook its role in shaping the discourse, but it still lacks the needed tools that define and that guide a paradigm. Even though in the past, designing sustainably was in our agenda, implicitly most of the time, nowadays there is a call for precise methods or tools for attaining sustainability in architecture. The paper aligns itself with researches (Cole 2005, Guy and Moore 2007) that aim to take benefit from multiple perspectives of designing sustainably, thus those multiple meanings in order to "make green knowledge." This knowledge could possibly enable us to define a sustainable paradigm. To this end, paper focuses on one of the major tools for sustainability, that is, the building environmental assessment tools. The aim is to examine their possible role in limiting the design alternatives. This examination bases on the design epistemology of Nigel Cross (1982, 2001), so called "designerly ways of knowing" in regard to its appropriateness for such a research.

The paper first discusses the diverse meanings of sustainable architecture, and then continues with a brief account on the role of paradigm in sciences and in design. After explaining the suitable design epistemology for this inquiry, it surveys the following tools: BRE Environmental Assessment Method (BREEAM), the Procedure HQE (La Démarche Haute Qualité Environnementale) and Deutschen Gesellschaft für Nachhaltiges Bauen (DGNB) certification system. The paper finds it essential to discuss the role of assessment tools, because due to the appeal of these tools in marketing the projects, they would become the mainstream practice.

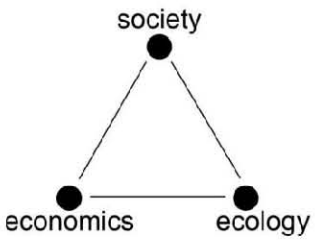

Figure1. The tripolar model (Findeli 2008, p.305)

2. MEANINGS OF SUSTAINABLE ARCHITECTURE

Canizaro and Tanzer (2007), through their analysis of the field, inform us about five competing definitions of sustainable architecture.

1. Buildings and environments that help to establish an integrated relationship with nature.
2. Buildings and environments that preserve and/or improve local ecosystems and which focus on long-term planning and a wider geography.
3. Buildings and environments that result from civic action in which environmental quality, understood both physically and socially, is essential.
4. Buildings that satisfy a series of benchmarks (i.e., LEED) defined by experts, interested parties, and politicians.
5. Buildings and environments that save and/or conserve energy and satisfy our real and perceived needs (Canizaro and Tanzer, 2007, p. 4).

It is observed that each definition foresees the problem from different lenses, and thus reframes the solutions from different point of views. But obviously their reference is the same, as defined by Findeli (2008), the tripolar model, which is first accumulated in the Brundtland report (1987) and concretized at the Rio Conference (1992). Most of the definitions converge on defining frameworks that establish the relationship between the three poles, referred also as forces or goals of sustainability: Economics, environment, Society. Herein lies two problems. The first stems from how these poles conceive sustainability. They belong to different research contexts, and interpret the problems through their proper tactics and strategies that depend on diverse parameters. For example, an economist reflects upon the environmental and social issues depending on his/her "economical theoretical and conceptual framework," (Findeli 2008, p. 306) and this goes without saying that the same process of argumentation for sustainability accounts for an environmentalist or a sociologist. Their solutions to be implemented into projects drive from their own point of view and this situation prepares the ground for the second problem, which is bound to the complexity of attaining such a balance between the solutions of these poles. Besides, each project is specific to its context, which represents different economic, social and environmental problems. The correlation among these problems is therefore dynamic, that might be handled only through a systemic logic (Findeli 2008).

So far there is no consensus on how to handle this complex relationship. In an architectural project, handling the tripolar model, despite its problems, is left to a designer, whose strategies and tactics of analyzing design problems are completely different from those of the economists and sociologists.

2.1. Sustainability as a discourse

Michel Foucault in his book *L'Archéologie du Savoir (The Archeology of Knowledge)* (1972), defines discourse as "regularity (an order, correlations, positions and functionings, transformations)" between a numbers of statements, events or

objects, appearing in a specific time. This regularity conveys a "*discursive formation*" (1972, p. 38). As pointed out by Foucault

> [t]he conditions to which the elements of this division (objects, modes of statement, concepts, thematic choices) are subjected we shall call the *rules of formation*. The rules of formation are conditions of existence (but also of coexistence, maintenance, and disappearance) in a given discursive division (1972, p. 38).

While dealing with a definition or statement, discourse is actually active on "its existence and the rules that govern its appearance" (Foucault 1972, p. 30). From this point of view, the tripolar model implicitly merges into the statements. The introduction of this discourse is not a coincidence, as indicated by Foucault, the emergence of discursive rules is not random; there are several conditions preparing the background of a discourse. Just to name a few, environmental movements of 1960s, energy crisis of 1970s, and aftereffects of climate change are seen to have underpinned this model. As a consequence, its sudden emergence has a specific time and space which has its own social, economic, geographical identities (Foucault 1972). The multiplicity of these identities therefore reflects onto the diversity in the interpretations of the tripolar model. Besides, institutions, in our case architectural firms, ecologists, researchers are essential on the formation of the discourse as well as its appropriation with the knowledge and the powers they carry (Foucault 1972). Even though this tripolar model does not lead to a single interpretation of ways of living with nature, it somehow defines a system of rules, and controls the formation of sustainable discourse. It can be considered as a judge formed of special communities who ensure the rationality of the answers, exemplified with spreading of many building assessment tools. The significance of such a discourse is that it helps to maintain the focus of designers on specific parameters.

2.2. Sustainability as a paradigm

In his book *The Structure of Scientific Revolutions* (1962), Thomas Kuhn (1922-1996) states that an accepted paradigm has its own defined rules, can influence the way –in his case, the scientific area– we perceive the world and it has the opportunity to impose a way of thinking. The rules of a paradigm are not accepted by the whole scientific world, but their perspective on the events influence traditions and practices (Kuhn 1996). The formation of a paradigm, like a discourse, is a process accompanied with effective events, ideas, and traditions (Kuhn 1996). Herein, the paper underlines the important role of paradigms in revealing available tools, because a discourse does not equip the researchers with tools or methods of investigation. Kuhn compares the paradigm to a vehicle for a scientific theory, since it puts forth invaluable information about how, in his case natural sciences, nature behaves and what it does and does not contain. These explanations, acting as a map, enable the researchers to delve into complex details. He states that

> since nature is too complex and varied to be explored at random, that map is as essential as observation and experiment to science's continuing development… paradigms provide […] also with some of the directions essential for map-making. In learning a paradigm the scientist acquires theory, methods, and standards together… Therefore, when paradigms change, there

> are usually significant shifts in the criteria determining the legimacy both of problems and of proposed solutions (Kuhn 1996, p. 109).

As suggested above, the tripolar model acts as a discourse, it does not define a paradigm. Thus the perception of the designers is guided by a loosely gestalt. There is no direction to teach someone to develop a paradigm, but ways to convert this discourse into a paradigm. A group sharing a paradigm will have a consensus on beliefs and values that might lead to a universally distributed across the world, however locally sensitive way of interpreting the elements of the model. This does not mean that a paradigm shall dictate a universal definition, but it should guide the designers to deal with the poles.

2.3. The epistemology of design suitable to address the problems of sustainability

Acquiring knowledge in the design field necessitates an epistemology of design suitable to make researches on problems of sustainability. Researches in sciences – here I refer to sciences such as, physics, biology, and chemistry,– even though depending on diverse epistemologies, have so far established various criteria to justify their quality of knowledge. In contrast to scientists, whose aim is to define the components of existing structures, designers "try to shape the components of new structures" (Alexander cited in Cross 2006, p. 97). Designs are the outcome of objective and subjective decisions.[2] This duality reflects also on the dichotomy of sets of epistemological perspectives of the researches on design processes: Positivism and constructivism. Positivist approach draws possible inferences from the scientific methods for a rational way of treating creative design problems. Positivist approach holds that by processing the sensory data, which are gained from an objective world, through a priori categories enables the subject to know the object (Dorst 2004). The constructivist one deals with making that knowledge by investigating design-based practice, in this sense it also involves a phenomenological perspective as it conceives the environment and history of the subject (Dorst 2004).

One objection to the positivist approach is related to the nature of design problems. Researches in the field converge on the impossibility to define design problems, since they are ill-defined and in Rittel's words they are actually "wicked problems" (1972). They are not amenable to decomposition, thus to a positivist and inductive approach. To overcome this problem, one of the main pioneers of constructivist approach, Donald Schön proposes an epistemology based on the investigation of practice, because practice is "implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict" (2006, p. 99). That is what he calls "reflective practice." In line with Schön, Nigel Cross states that an appropriate paradigm for design research is still building and the design epistemology lies in the study of "designerly ways of knowing" (Cross 2006). He identifies five aspects of "designerly ways of knowing:"

[2] Bartneck (2008), for example, points to the overlaps between the quality criteria of science and design, but they are inefficient in enhancing the formation of a proper epistemology.

- Designers tackle 'ill-defined' problems.
- Their mode of problem-solving is 'solution-focused'.
- Their mode of thinking is 'constructive'.
- They use 'codes' that translate abstract requirements into concrete objects.
- They use these codes to both 'read' and 'write' in 'object languages' (2006, p.12).

If the designer uses this epistemology in designing, then the design research should follow this path. In a similar vein Gadamer points out that "the basic operation in the acquisition of knowledge" is interpretation, which is formed of two activities: Objective interpretation and subjective interpretation. While objective refers to "what the thing itself already points to," the interpretative one questions the "attribution of value to something" (Dorst 2004). While referring to design processes, Dorst states that "the type of interpretation that is dominant varies through the phases of design activity, and across design situations" (2004). Therefore, an epistemology suitable for the design process and consequently for the researches on design processes should conceive ways of knowing the interaction between the subjective and objective decisions.

In line with this understanding, we should refer to Guy and Moore's (2007) call for a pluralist approach to sustainable architecture that may flourish the "making of green-knowledge" (2007, p. 16). Released from all the epistemic communities, they suggest that we should not limit ourselves with labeling best practices,[3] but instead we should look for diverse examples, which are produced in different contexts with different ways of seeing and practicing sustainable architecture. At first look their approach seems to be pragmatic, but it is possible to argue that a constructivist epistemology underlies in their researches. Dealing with diverse objective and subjective interpretations of designers could enable the researchers in generating a paradigm.

3. DESIGNING WITH "METHODS"

Despite the lack of a generally accepted paradigm, the field is in the search of defining "best practices" to enable the growth of the "green-making knowledge." Current researches on building environmental assessment tools best illustrate this trend. In regard to ambiguous meanings sustainable architecture and the discussion above on "making of green knowledge," the paper aligns itself with Moore and Guy's approach. This approach is best explained in Cole's words:

> A clear difficulty is the existence of a multiplicity of views of what form a sustainable future may take and each is capable of generating a wide range of approaches to building design and construction. Moreover, given the uncertainties of climate change and associated social, economic and political consequences, there will be no single or easy path to a sustainable future (Cole 2005, p.460).

With the intention to pave the way for this multiplicity that enriches our knowledge on sustainable design, the paper discusses the influence of building environmental assessment tools on design process, through three case study assessment tools:

[3] Actually we do not know whether this label is attributed properly.

BREEAM, the Procedure HQE, and DGNB certification system.[4] First, it delves into the epistemological and theoretical point of views that have prepared these tools and secondly reveals the possible impact of the use of these tools on limiting the design outcome.

3.1. From theory to methods

How do the building environmental tools limit the designerly ways of knowing of the architect? How "the designerly ways of knowing" is integrated into these assessment tools? How these tools influence the designers' interpretation of design problems? In order to answer these questions, the paper refers to a graphic illustration (Fig.2).[5]

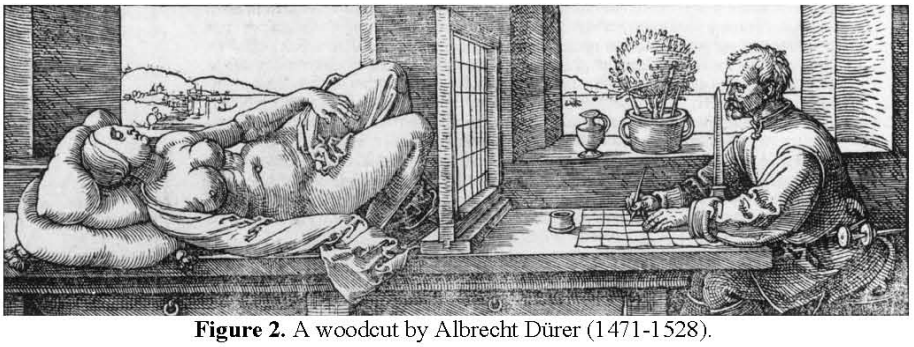

Figure 2. A woodcut by Albrecht Dürer (1471-1528).

In Dürer's woodcut, the artist does not only contemplate on the object but he also draws it according to prescribed method. He views the object through a grid, which acts as a measurement element. The artist trust the data gained from the grid. Groat and Wang states that

> [i]t is that he accepts certain presuppositions about the empirical universe, to wit, that the objects that make it up can be understood by certain geometric relationships that hold constant. What he assumes is theoretical. What he does based upon those assumptions is methodological (2002, p.74).

This illustration is given to better explain the role of assessment tools, because even though these tools are not originally generated as design guidelines, in the absence of better alternatives, they have become as such. Consequently, researches in the field discuss the use of these tools as guidelines during the design and construction process (Crawley and Aho 1999; Ding 2005; Ding 2008).

3.2. Building environmental assessment tools

By evaluating and making public the sustainable qualities of buildings, environmental assessment methods aim at reducing the detrimental effects of

[4] This paper is limited to the BREEAM-Offices, HQE–bâtiments/enseignement, and DGNB certification system –New Construction of Office and Administration Buildings.
[5] This illustation is used to explain the relationship between theory and method by Linda N. Groat and David Wang (2002, pp. 73-74).

construction practices on natural environment. The following table summarizes the major characteristics of each assessment tool.

Table 1. Table explaining the characteristics of building assessment tools

	Modes of qualification	Modes of certification	Definition of sustainable (green) building	Implicit epistemology
BREEAM	After Design stage (DS) and Post-construction stage (PCS)	Checklist	Efficient use of resources + maximizing the use renewable energy + quantitative evaluation of social aspects (indirectly)	Positivist
The procedure HQE	After the program, the design process, and after the construction	Checklist + a system that evaluates the working systems of the design professionals	Efficient use of Resources + Economy + quantitative evaluation of social aspects (indirectly)	Positivist in evaluation + Constructivist owing to its working check system
DGNB Certification system	After Design stage and Post-construction stage	Checklist	Efficient use of Resources + Economy + quantitative and qualitative evaluation of social aspects (directly and indirectly)	Positivist

Evaluation schemes act in a checklist manner to demonstrate whether a building meets certain qualitative and quantitative criteria, and the final performance is the sum of the points gained from the constituent environmental credits. The performance credits are independent so as to avoid double-counting; they are thus isolated from each other (Cole 2003). All these methods exhibit a positivist approach in evaluating a building. They entail that evaluation can be made by decomposing the design problem. However in regard to the discourse on sustainability, designing requires the optimization, hence the interaction of parameters of the tripolar model.

In the tools, criteria are composed of both quantitative and qualitative performances. Although quantitative ones, such as annual energy, water consumption, and green gas emissions, can easily be represented, the qualitative ones, such as, impact on ecological land, and impact on local wind, can only be evaluated on a feature specific basis, where the points or credits are given in case the project has or has not the needed features. Ding underlines that it is these qualitative criteria that become decisive in environmental issues (2008). Therefore the knowledge gained from these best practices could not be justified.

The definition of sustainable building differs among these tools, which exhibit different tactics and strategies to define the relationship between the elements of the

tripolar model. Then it does not mean that a project labeled as "best practice" with a method will receive the same label when assessed with another one. The relationship between poles is established with different weightings and credits of criteria. A possibility of subjective decision on the relationship of the poles is lost. Besides given the lack of intense prerequisite criteria that a project must comply with, in BREEAM and DGNB certification system it is possible obtain a significant label if the design process focuses only on particular categories. A low score obtained from one category can be compensated by a higher score in other categories to certify the building as environmentally sensitive. A good or a very good label does not mean that the building pushes the edge towards an environmental project. The evaluation of HQE is more convenient in regard to its evaluation method, since in order to obtain the certificate, the integrated design process is controlled by the Système de Management de l'Opération (Management system of the operations, SMO). Despite a positivist in the evaluation process, its control system enables to build knowledge.

3.3. Building environmental assessment tools as a "grid"

How can a designer trust these methods or "grids" in gaining data? In regard to their characteristics, the paper illustrates the problem for BREEAM and DGNB certifications system with reference to the Dürer's woodcut (Fig.3-4).

There is no such true way of attaining sustainability, but these tools define methods, which base on the sustainable definition of the tool, thus the problem especially stems when these tools are used as design guide. Designing is a top-down system, and these tools starts from a bottom-up direction, that is, from technical details of a system. Focusing on these details would possibly hinder subjective interpretations, thus variety. They are not suitable for "designerly ways of knowing," as their evaluation bases on an epistemology suitable for researches in natural sciences. They suggest a way to tackle ill-defined problems through a pre-defined path and frame the interpretation of the designer. In case several of these tools gain significance in the field, their "grid" would disseminate in the market and would fuse into the design process of new projects. Consequently, multiple solutions would be lost to the field, and thus the formation of a generally accepted paradigm in the future.

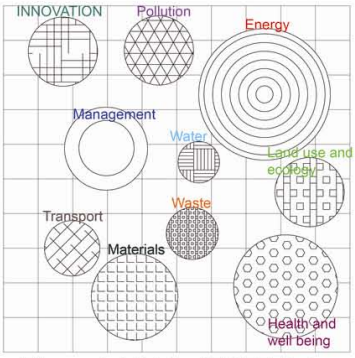

Figure 3. 'Grid' of BREEAM

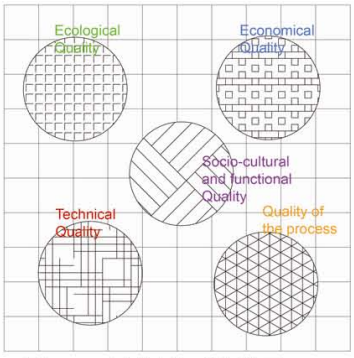

Figure 4. 'Grid' of DGNB

4. CONCLUSION

Starting with the discussion on multiple views on sustainable architecture, the paper aimed to put forth the role of the tripolar model in shaping the discourse on living with the nature. It is observed that even though there are diverse interpretations on how the model should be conceived, so far a paradigm, which reveals proper tools to deal with issues on sustainability, has not been yet founded. To this end, it might be possible to call this situation in Kuhn's words, a "pre-paradigm" period or maybe there is no possibility to talk about a paradigm for sustainable design. In order to arrive at such a conclusion, the paper suggested to uptake multiple perspectives that have generated architectural projects.

In order to make "make green knowledge," the paper suggested pursuing suitable epistemologies for design and referred to Nigel Cross's design epistemology. While underlining the aspects of design process that is torn between objective and subjective decisions, the paper aimed to discuss the role of assessment tools in framing these decisions. This intention is bound to the current use of these tools as design guidelines.

The paper argued that the tools, due to their positivist method, do not suit to the epistemology of design. Or put differently, their evaluation questions, I may say, do not stem from a suitable epistemology to know the sustainability of the project at stake. More importantly, their methods and tactics bases on frameworks, which are not prepared according to a general consensus. The paper concludes that the limitations put onto design processes could possibly obstruct to attain diverse, or maybe, more efficient, and optimized design solutions. Currently, the effectiveness of these assessment tools in defining best practices is ambiguous, but accompanied with marketing tactics, and extensive use of these assessment tools might lead the society to conceive their definition of sustainable design and their methods as a reality.[6]

REFERENCES

Bartneck, C. 2008. What is good?: a comparison between the quality criteria used in design and science. In CHI '08 extended abstracts on Human factors in computing systems. ACM, New York, 2485-2492.

Berger, P. L. and Luckmann, T. 1966. The Social Construction of Reality: A treatise in the sociology of knowledge. Doubleday & Company, New York.

Cole, R. J. 2005. Building environmental assessment methods: Redefining intentions and roles. Building Research and Information 33, no.5, pp. 455- 467.

Cole, R. J. 2003. Building environmental assessment methods: a measure of success. Special issue article in: The Future of Sustainable Construction.

[6] In their book Berger and Luckmann (1966) discuss that a reality is socially constructed. It is not within the scope of this paper, but extensive use and reference to these assessment tools might lead to their appreciation as a representative of sustainable design.

Crawley, D. and Aho, I. 1999. Building environmental assessment methods: Applications and development trends. Building Research & Information 27, no. 4-5, pp. 300-308.

Cross, N. 2006. Designerly Ways of Knowing. Springer-Verlag, London.

Ding, G. K. C. 2005. Developing a multicriteria approach for the measurement of sustainable performance. Building Research & Information 33, no.1, pp. 3-16.

Ding, G. K. C. 2008. Sustainable construction-the role of environmental assessment tools. Journal of Environmental Management 86, no.3, pp. 451-464.

Dorst, K. 2004. The Problem of Design Problems-Problem solving and design expertise. Journal of Design Research 4, no. 2.

Foucault, M. 1972. The Archeology of Knowledge and the Discourse on Language, translated from French by A. M. Sheridan Smith, originally published in French in 1969. Pantheon Books, New York.

Groat, L. N. and Wang, D. 2002. Architectural research methods. Wiley & Sons, New York.

Guy, S. and Moore, S. 2007. Sustainable architecture and the pluralist imagination. Journal of Architectural Education 60, no. 4, pp. 15-23.

Kuhn, T. S. 1996. The Structure of Scientific Revolutions. 3rd ed. The University of Chicago Press, Chicago. First published 1962 by The University of Chicago Press.

Rittel, H. 1972. On the Planning Crisis: Systems Analysis of the First and Second Generations. Bedriftsokonomen, no. 8, pp. 390-396.