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FACES OF SUSTAINABLE HOUSING

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ABSTRACT

The past few decades several attempts have been made to get a better understanding of the diversity in appearance and expression of sustainable architecture. This paper will investigate different recent approaches to classification of sustainable residential design. Two recent student projects focusing on the contemporary context in The Netherlands will be presented to illustrate these classification approaches.

First a brief summary of relevant publications dealing with recent attempts to classify the aesthetic dimension of sustainable architecture will be presented. These various taxonomy endeavors show both the variety and similarities particularly in the applied vocabulary.

Led by these selected contemporary publications two recent case studies will be presented: a design project by 24 master students at the Eindhoven University of Technology (TU/e) and a research project involving 14 master TU/e-students.

In the design studio the assignment was to design a housing complex for 36 students located in Rotterdam. Key issue in the project was the explicit instruction to investigate the possibilities of replacing building services and devices by passive architectural and spatial solutions. Analyzing the results afterwards the designs can be related to the vocabulary derived from the classification approaches in the selected references.

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In the research project students investigated a self-compiled best-practice anthology of 21 recent Dutch autarkic and/or sustainable housing projects. They had the publications [1], [2], [3] to their disposal. Besides documenting the projects, part of the research were interviews with both the architect and the occupants to come to a proper understanding of autarkic and sustainability aspects of each housing project. They also compiled a method to measure autarky- and sustainability-indices for comparison.

The paper concludes with investigating the correlation between scores on autarky and sustainability scales, and the position in the aesthetic spectrum as proposed in the student's research project.

Key words: aesthetic dimension, sustainable housing, classification, student designs, taxonomy

Introduction

The main objective of this paper is to investigate different approaches of classifying the aesthetic dimension of sustainable architecture, and moreover the (non)sense of such a classification. Two case studies, both involving master students in Architecture at the Eindhoven University of Technology, will be used to discuss and illustrate the summarized anthology of contemporary literature on the subject.

Towards a Taxonomy for Sustainable Architecture

Sustainability as a concept never had a clearly outlined representation. As several authors over the past decade have observed (e.g. [1], [2], [3]) there is no consistent or coherent image of sustainability. That conclusion is probably closely related to the problem of defining sustainability itself since a wide range of aspects, emphases and parameters are involved. It seems logic that a different specific focus (e.g. energy consumption, materialization, waste management, adaptability) results in an entirely different design approach and a distinct architectural language.

Six Environmental Logics

One of the more early serious classification attempts is presented in a 2001 paper by Simon Guy and Graham Farmer Reinterpreting Sustainable Architecture: The Place of Technology. [6] They introduce 'six competing environmental logics' to classify sustainable architecture: *Eco-technic, Eco-centric, Eco-aesthetic, Eco-cultural, Eco-medical* and *Eco-social.*

Each one is carefully explained, characterized and exemplified with the work of specific architects. All six have their roots in a distinct conception of environmentalism. As Brennan observes a decade later, Guy & Farmer privilege the position of technology (despite the somehow misleading designation of the six labels), leaving 'little room for the sensibilities of culture and place.' [4]

Nature, History and the Machine

In one of the concluding essays in the major 2004 publication Dat is architectuur (That is Architecture) [5], Hilde Heynen describes the paradigm shift at the end of the 19th century. Prior to that era she observes two distinct role models for architecture: nature and history. With the development of industrialisation a third paradigm was being introduced: the machine became a new mind-set for the aesthetic expression of buildings. Though she does not link it to sustainable architecture these three paradigms can be applied as a way of categorizing sustainable housing designs.

Contemporary Trends

As Ursula Seibold-Bultmann states in the introduction of her essay [1] there has never been an unambiguous image of sustainability. She illustrates this with the exemplary absence of an allegory for sustainability in the history of iconology. Seibold-Bultmann subsequently tries to classify the diversity in sustainable architecture into three main contemporary trends regarding its appearance. In short these approaches are 'quantifiable rather than qualitative aspects' (resulting in legislations, and computation models such as BREEAM and 'leaving beauty largely out of the picture'), 'familiar and traditional shapes' and 'technological appearance'. She immediately puts this categorisation into perspective with her comment (referring to statements of the architects Sauerbruch & Hutton) that those three trends 'fail to satisfy aesthetically and hence socially'. [1]

Constant Themes

In Steele's book Ecological Architecture: A Critical History [2], Part 1 is dedicated to the search for Constant Determinants of an Ecological Aesthetic. Steele derives three constant themes or leitmotifs: 'tradition, technology, and urbanism, each a vital consideration in shaping our conception of ecological architecture'. The first two appear similar to the trends observed by Seibold-Bultmann. A closer look reveals however that they are subtly divergent. Where Seibold-Bultmann links tradition to nostalgia, for Steele it represents accumulated knowledge and links it to rituals related to nature. Both authors consider technology strongly related to progress, but furthermore Steele also observes a historical connection and even 'a symbiotic relationship between tradition and technology'.

Pluralism

In a more recent article [3] Simon Guy (one of the authors of [6]) and Steven Moore seem to have elaborated the aforementioned ideas on sustainable architecture. In fact the previous intention of classification [6] is abandoned all together in their 2007 paper. They believe in a 'deeper engagement with sustainable architecture' involving 'broader sociological and philosophical questions' rather than simple categorization. The authors now observe a similar pluralism as Seibold-Bultmann did. However, they no longer see any plausible need or sense for classification but rather celebrate the diversity as a necessary fuel for the scientific discourse on sustainability. They propose 'a research agenda for architecture of reflective engagement that is sympathetic to the pragmatist tradition' and are not particularly interested in 'objective or universal goals'.

'Three decades of debate about sustainable architecture and a search for some form of consensus around universal best environmental practice appear to have failed. As Hagan puts it, "environmental architecture, in other words, is environmental architectures, a plurality of approaches with some emphasizing performance over appearance, and some performance over appearance.' [3]

'... any attempt to neatly categorize or 'essentialize' forms of environmentalism along a scale of light and dark, or deep and shallow, as some authors have attempted, seems fatally flawed.' [3]

Critique on their points of view could include that attempts to classify the aesthetic appearance of sustainable architecture must not be mistaken for a search for 'objective or universal goals'. Accepting the obscure polymorphism of sustainable architecture does not exclude the quest for taxonomy. In his pioneering work on taxonomy for the polymorphic world's flora and fauna Linnaeus was merely interested in, and succeeded in achieving, a method of describing, communicating and understanding its diversity. Contrary to Guy & Moore (quoting Schlosberg; 'plurality is not a phenomenon to be categorized') it was because of its plurality it needed to be categorized. For the same reason the variety in the aesthetics of sustainable architecture itself is the license to seek for taxonomy. The main challenge however is finding the adequate taxa.

Qualitative and Quantitative Traditions

John Brennan's contribution in Sang Lee's book Aesthetics of Sustainable Architecture [4] is criticizing the ideas of Guy & Farmer and favours Susannah Hagan: 'Following the work of Hagan, the quantitative traditions in architecture can mediate design with the goals of sustainability, without necessarily dominating design through the use of technology.' Brennan quotes the three typologies used by Hagan to articulate architectural expressions: symbiosis, differentiation and visibility.

'Symbiosis describes an environmentally responsive architecture through existing forms of representation. Differentiation refers to the development of form that reflects natural processes more overtly [...] visibility suggests the possibility of new forms, or the yoking of certain existing formal experiments to environmental modes of operation.'

Two Case Studies

During the academic year 2013 – 2014 two master projects have been (co-)tutored and supervised by the author. The only but relevant similarity between the two projects was that both had a strong emphasis on the aesthetic dimension of sustainability. The results of both projects are interesting to evaluate, and to relate them to the aforementioned briefly outlined references.

Master Design Studio

From September 2013 to January 2014 24 master students attended the master design studio Uninstalling. The assignment was to design a student housing complex for 36 students including collective facilities as well as a club for miscellaneous events. Provided was a quantified program of requirements, an overall planning for the 16 project weeks, and a site. The chosen location was an empty plot on the North bank of the river Maas in Rotterdam, adjacent to a kind of rural oasis nonetheless in close vicinity of the city centre. No literature on the subject of the aesthetic dimension of sustainable architecture was provided. The main goal of the project was to investigate the possibilities of avoiding energy consuming additive building services like heating, cooling, lighting and ventilation devices, in a design for a residential complex through privileging a smart spatial lay-out and passive architectural solutions. The site offers a lot of options that could be implemented in the design, for example by using the water of the river for generating or storing energy, or cooling purposes. The site faces south to south-west so there were plenty of opportunities for daylight orientation and wind application.

Master Design Studio – Results

Despite the strict program and site limitations the results were remarkably divergent. It confirms the ideas of Guy & Moore, and others, on pluralism. The final designs were surprisingly heterogeneous (figure 1 and 2). Where student Joeri Bollen based his design on the archetype of the village (Steele's 'urban' or even Seibold-Bultmann's 'familiar and traditional shapes'), Michael Maminski's design is shaped around a shrine of technology (Steele's 'technology', Heynen's 'machine', Seibold-Bultmann's 'technological appearance', Guy & Farmer's 'eco-technic logic'), and the design of Geert-Jan Stoop resembles the typology of a traditional fortress (Seibold-Bultmann's 'familiar and traditional shapes', Steele's 'tradition). Other concepts were

blending with local peculiarities and physical conditions or even pretend to be hidden or invisible, and are harder to categorize as the design of Julie Bosch (though it appears to be reminiscent of Guy & Farmer's 'eco-cultural logic').

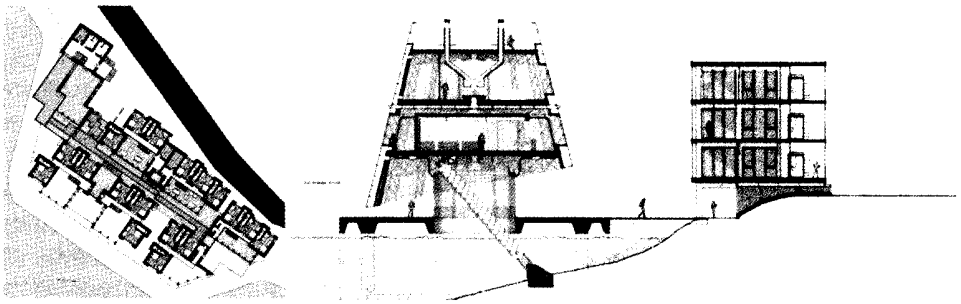

Figure 1 : Student designs by Joeri Bollen (left) and Michael Maminski (right).

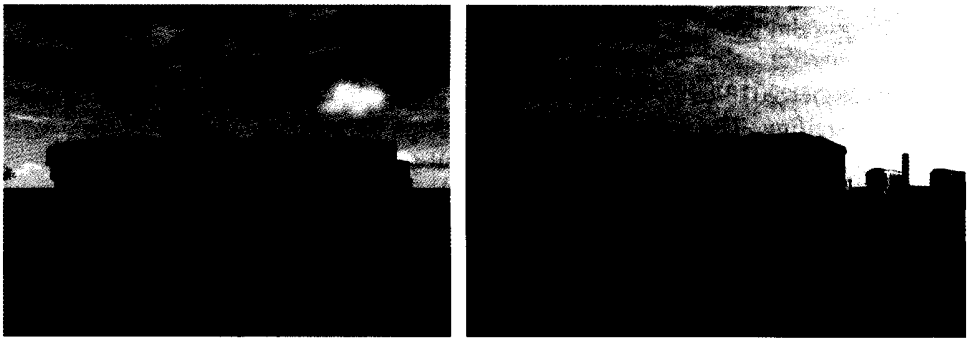

Figure 2 : Student designs by Geert-Jan Stoop (left) and Julie Bosch (right)

Research Master Project

From April to June 2014 14 master students took part in an 8 week research project, supervised and tutored by the author, called Faces of Autarky. At the start of the project the main goal was to compile an anthology of contemporary autarkic Dutch housing. A shortlist with about ten best practices was provided as a start, as well as the literature references [1], [2] and [3]. Students were given a substantial degree of liberty to flesh out and elaborate their collective ideas on approach, structure and the way of presenting their results in their final collective report. Students worked in couples, each couple dealing with three housing projects. Besides visiting the projects, documenting them in drawings and photographs, also interviews with the architect and the occupant were strongly recommended to come to a detailed understanding of a wide range of autarkic and sustainable aspects.

In a very early stage the students decided that the scope of the project should not be limited to merely autarkic dwellings. The reason behind that is the fact that on the scale of a single house, or even a small compound, true autarky is very difficult to

achieve and therefor almost non-existent. A second explanation is the progressive understanding that autarky and sustainability are closely related, though not synonymous, and particularly a comparison of the two could be interesting.

Students formulated a list of nine aspects which all have a significant impact on the degree of sustainability and/or autarky of a dwelling: Building process, Electricity, Flexibility, Materialization, Maintenance, Food, Heating strategy, Waste, Water. Each of these aspects was described, detailed and quantified.

Each of the selected 21 Dutch (one was in Belgium) housing projects in the final list was graded on all nine aspects, each resulting in a score on a scale of 0 to 5. The arithmetic average of the nine grades was the final general score. This procedure was executed twice for each house; for autarky and for sustainability resulting in two different final scores. For example: a house with its own diesel-generator scores high on autarky but poor on sustainability in the Electricity section.

The selection of the 21 housing projects was largely based on the pursuit to achieve diversity in visual appearance as wide as possible. That of course is rather arbitrary and hence determining the final selection has been the main topic of discussion in the first half of the project. Subsequently the projects were arranged from 'low-tech/traditionalist' to high-tech/modernist' which again was subject of discussion. The main overall educational achievement of the project itself was in fact those numerous and passionate discussions among the students. Though the final selection, arrangement and grading are arbitrary to a certain extent, it can be defended and explained. Since the selection was wide and the amount substantial, another selection probably would have had the same concluding overall results.

Research Master Project – Results

Of the 21 dwellings that were investigated the final scores varied between 2.3 and 4.3 on sustainability and between 1.4 and 4.4 on autarky. Though the highest and poorest scoring houses were the same in both categories (Figure 4), all others varied considerably. (E.g.: the number 2 in sustainability is the number 6 in autarky, number 13 in sustainability is number 5 in autarky). The highest scoring project was not a single house but a compound of eventually 23 dwellings. That emphasizes the notion that size does matter in the construction of sustainable and autarkic housing. (Figure 4)

The most salient conclusion from the exercise was the absence of a clear correlation between the architectural language or appearance of a dwelling and its score on both autarky and sustainability. The high and low scores seem to be spread equally over the 'low-tech - high-tech' arrangement of the report without an articulated preference for any of the architectural languages.

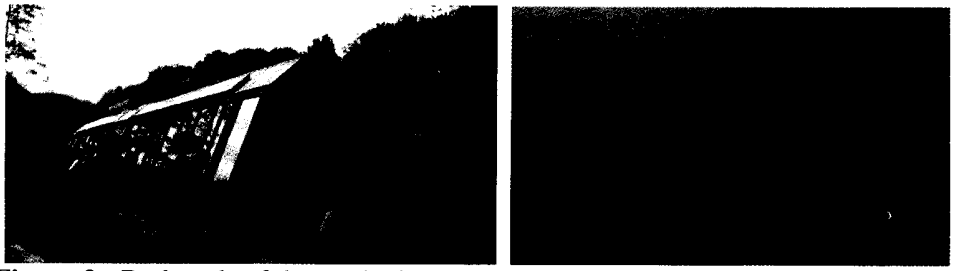

Figure 3 : Both ends of the aesthetic spectrum as presented in the final report of the research project: the low-tech Earthship Zwolle (left) and high-tech Villa Kogelhof by arch. Paul de Ruiter (right)

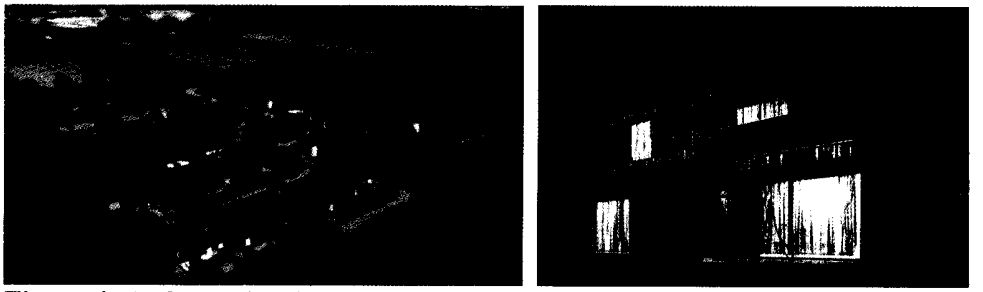

Figure 4 : Left: Aardehuizen (earth houses) in Olst. DIY project designed and built (yet to be completed) mainly by the occupants themselves eventually resulting in 23 single family houses. It ended up as highest scoring project, both in sustainability and in autarky. Right: Villa Welpeloo in Enschede by Superuse Studios 2009. It was the poorest scoring project, both in sustainability and in autarky. The project merely focused on harvesting recycled materials in the immediate vicinity of the construction site.

Conclusions

- The various classification attempts in recent literature show a certain superficial similarity but, on a more detailed level, the diversity is remarkable. In particular the interpretation of the ideas of tradition and technology vary significantly.

- A more detailed investigation of the exercises in taxonomy presented, and probably a wider selection, deserves further research and more advanced approaches with various taxa.

- Classification of design approaches resulting in taxonomy of sustainable architecture can be useful for descriptive purposes and a better understanding of the development and evolving variety in sustainable architecture.

- Classification and pluralism in the aesthetics of sustainable architecture can co-exist and essentially justify one another.

- The architectural language of a dwelling is a very poor indicator for sustainable performance. So far there seems no significant correlation between any of the 'sustainable architectures' and the score on a wide range of parameters related to sustainability.

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