Exploring the first European residential project receiving the 'outstanding' BREEAM certificate

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ABSTRACT: The importance of demonstration projects in the process towards more sustainable building is endorsed. It is noticed that performances on sustainability of these projects are rarely proven by leading and widely used multi criteria assessment and rating tools. This research focuses on a project for sustainable grouped housing intended to act as a demonstration project and awarded with the BREEAM 'outstanding' certificate.

The main objective of this paper is to explore and position this assessed and rated project between renowned European demonstration and best practice projects. First, implemented design measures are unveiled which led to the 'outstanding' pre-design certificate. Second, detected design measures are compared with prevailing sustainability measures in a 'real-life' cross case confrontation. Third, a SWOT analysis is made concerning innovative, deviant or exceptional measures within the context of Flanders/Europe.

It is concluded that, pending the completion of the construction phase, the assessed and rated project cannot be designated as 'demonstration or best practice project'. Intended and/or actual measures are insufficient regarding the full scope of sustainability.
Keywords: sustainability, grouped housing, design measures

INTRODUCTION

Multiple authors and public organisations endorse the importance of demonstration projects in the process towards more sustainable building [1,2,3]. This impulse is especially promising when demonstration projects cover the field of grouped housing. Due to specific features of this sector, sustainability opportunities both embedded and acquired by some limited deliberate effort, come in sight. All aspects of sustainable development need to be fulfilled in a reasonable limited time span and scope, which makes these projects particularly suitable to study the sustainability quest.

The recognition of the promising combination between the aspects and issues of sustainable development, demonstration projects and grouped housing, is expressed by a multitude of completed projects in Europe during the last 20 years. Parallel to these fostered projects, several others often set themselves up as best practice. Although these sustainable projects receive much attention both in popular media and in scientific literature, their performances on sustainability is rarely proven by leading and widely used multi criteria assessment and rating methods which, with a general growing interest for sustainability tools, could mortgage the recognition of these projects' sustainability value, the reproducibility of up front sustainability measures, and ultimately the realization of a broader base for sustainable building.

This research focuses on a project for sustainable grouped housing assessed and rated using BREEAM, with the intention of acting as a demonstration project. As part of a Flemish new neighbourhood, the ongoing pilot building 'De Balk van Beel' received the BREEAM 'outstanding' certificate, allocated for the first time to a residential project in Europe. The main objective of this paper is to explore and position this assessed project between renowned 'European demonstration and best practice projects'. This positioning allows a preliminary approach of the question: is it plausible that assessed and high rated projects are undeniably worthy being designated as 'demonstration or best practice projects'.

METHODOLOGY

This paper is partially derived from case study research, part of an ongoing doctorate dissertation on sustainability in grouped housing projects. Exemplary practices in Europe are being explored, analyzed and compared in view of both a generic and a specific framework for architects/designers.

The research methodology of this study is based on a cross case confrontation. By focusing on actual sustainable design measures regarding the two most tangible pillars of sustainable building (ecological and social aspects), the research chooses the perspective of the architect designer who often serves as the centre of contemporary project teams. First, the selected assessed

and rated project 'De Balk van Beel' is identified. Second, an overview on the sustainability assessment is provided, supplemented with key design measures leading to the 'outstanding' rating. Third, a comparison is made regarding implemented sustainable design measures of the assessed case with exemplary practices on sustainable grouped housing projects in Europe. Fourth, a SWOT analysis gives insights in the selected assessed project. Finally, a discussion is presented.

The identification of the project, the discussion of the sustainability assessment and the overview of implemented design measures is based on a literature review of published articles and exploring building plans, supplemented by interviews with stakeholders (project developer and general contractor) and finally a visit to the construction site.

The complex and contextual nature of an architectural project can be understood through the study of actual cases. According to Yin [4], case study methodology can be used when a contemporary phenomenon, like e.g. sustainable building, should be investigated. In order to increase the reliability of case study research, multiple demonstration projects are considered in the cross case confrontation. To act and serve as a demonstration project, literature urges that certain conditions are being met: Keating & Peach [5], Buijs & Silvester [3], UN Habitat and Van Hal [2] promote repeated evaluations; Keating & Peach [5] and The United Nations Habitat Program mention the open and public character; The United Nations Habitat Program puts forward the intention of acting as a demonstration project from the beginning, and highlights its special character.

Projects were selected from The Netherlands, United Kingdom, Germany, Finland and Sweden. All cases are connected as one of the main driving factors was based on achieving a 'full sustainable development project', thus meeting aspects regarding 'People', 'Planet', 'Prosperity' and 'Politics'. Information on the presentation of the district was rich and available, both descriptions and illustrations. Other neighbourhoods, a priori interesting to analyze, were identified but were not selected for the research because their information proved to be incomplete. Projects were selected regardless of their urban context (urban – suburban – rural) and whether or not they overlap different scale levels (block – neighbourhood – district). This grants the aim to collect a representative set of design measures in context and scale level in order to make a reliable cross case study.

Sustainable design measures of 'De Balk van Beel' are compared in twofold. First with generic prevailing design measures regardless typology aspects of the different projects, and second, with measures of projects with some typological similarities. Typological comparisons were made with two projects (figure 1): a project in a new residential district called 'Kronsberg' on the outskirts of Hannover (Germany), and 'One Brigthon' in Brighton (United Kingdom). Both projects show similarities on aspects relating to the context (physical, climatological, urban, ...), amenities (number of dwellings, housing types, density, …), space (general configuration, access and circulation, …) and tectonics (load bearing structure, skin design, …).

Figure 1:Selected projects with some typological similarities: left 'Kronsberg', right 'One Brighton'.

The SWOT analysis is based on empirical observations presented in previous sections supplemented with a theoretical pre-understanding of the field of sustainable grouped housing and the Flemish/European context. This process of abduction [3] can be seen as an iterative process between collection and analysis of empirical material and the study of theory in literature [6].

The analysis and discussion is illustrative and only representative for selected assessed project, thus within the context of Flanders (the building and housing culture), even if the results, discussion and conclusions can be useful for other regions.

IDENTIFICATION OF THE PROJECT

The project 'De Balk van Beel' is the pilot building in the new neighbourhood of 'Tweewaters' [7] situated in the northern part of Leuven, an area rich of industrial heritage of the Leuven brewery past. City developer Ertzberg [8] is the sole owner of the site and is responsible for the design and development of the entire neighbourhood. During the period 2009 – 2020 the former industrial site is being redeveloped into a 11 –acre urban neighbourhood with 1,200 low-energy dwellings, accounting for 5,000 people. Currently, 'Tweewaters' is the largest city-centre development in Flanders and Belgium.

Building and housing in Flanders

Flanders is one of three regions of Belgium. It has a moderate maritime climate with fresh and humid

summers and relatively mild and rainy winters. Due to socio-political incentives, focus was on individual houses for decades. Because of demographic trends, financial economic constraints, urban and environmental issues, interest in grouped housing is climbing. Regarding sustainability aspects in the architecture and building sector, the Flemish government has inter alia set up stringent requirements concerning: energy use, waste (construction, demolition and building's operational-related) and water (waste and storm water).

The neighbourhood of 'Tweewaters'

The urban plan of the abandoned industrial area (figure 2), made up by architects Xavier de Geyter [9] and Stéphane Beel [10], is based on the provision of several individual grouped housing projects, new build and refurbishments, clustered within a reorganized public space.

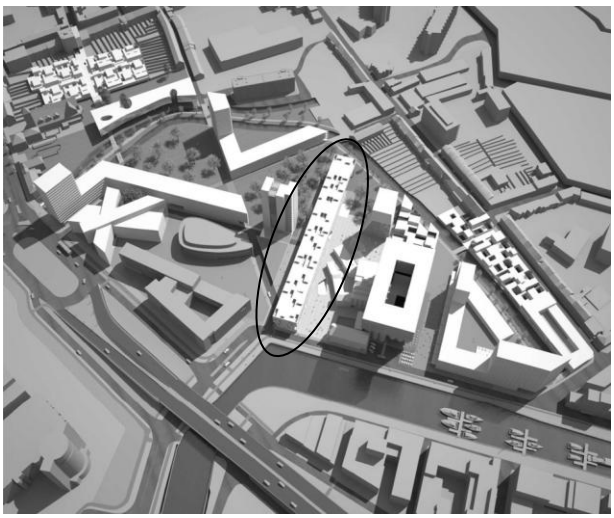

Figure 2: Model of the urban plan of 'tweewaters' indicating the project. (architects Xavier de Geyter and Stéphane Beel)

The keywords for this development are sustainability and innovation. The goal with 'Tweewaters' is to roll out a new way of life by which it wants to position itself as a city part of the 21st century. Ertzberg has written an 'Urban Convenience' vision, which sets out how the site will look in future. This vision is based on the belief that all facets of society are closely interconnected – the use of space, waste, water, energy, materials, services, consumption and so on.

The urban plan deliberately chooses to undevelop 70% of the site and to set up an enhanced public space. A new public park will be provided and the whole area will be car-free. The neighbourhood will use 100% green heat and power, and will even supply the surrounding neighbourhoods which makes it the first CO^2 -negative development in Flanders and Belgium.

The grouped housing project 'De Balk van Beel'

'De Balk van Beel' is very dominant in the master plan of 'Tweewaters' due to its specific position, its exceptional length of 185 meters and a total floor area of 15,000 square meters. Despite these features, the public area remains well fordable thanks to the provision of corridors on the ground floor of the building (figure 3).

Figure 3: Rendered image of 'De Balk van Beel'. (architect Stéphane Beel)

The project, named after its architect Stéphane Beel, comprises 4 upper floors containing 101 different housing units. The ground floor contains shops and services for the neighbourhood and its surroundings, such as a daycare center, a pharmacy, a general medical practice, a local shop and so on. The five storeys are staggered to each other giving the building a strong elegance and pleasant private outdoor spaces for the dwellings. The spacious terraces are conceived as a continuation of the interior spaces and create an expansive view on the surrounding public park.

'OUTSTANDING' AND ITS MEASURES

Sustainability assessment

The British Research Establishment Environmental Assessment Method (BREEAM) [11] was used in the project as a control mechanism to measure the content and the implementation of the formulated vision of the developer and corresponding selected sustainability measures and decisions. It is important to emphasize that BREEAM was not used to support the design team as a design tool. BREEAM distinguishes itself by flexibility of use worldwide, applicability on the community scale and not regarding the financial aspects of the projects.

Upon completion of the design, the sustainability of the project was assessed using the BREEAM version 'International Bespoke 2010', resulting in an 'interim (design) Stage' certification. The design achieved a

score of 87.81% leading to an 'outstanding' BREEAM rating. The highest possible rating with this world leading international assessment method, and allocated for the first time to a residential project in Europe.

The development achieved 100% of the available credits in the Management, Health & Wellbeing and Land Use & Ecology categories and scored over 90% in the Energy and Transport categories. Moreover, three innovation credits were awarded for exemplary level performance.

Sustainable design measures

The basis of the buildings' performance on sustainability consists of measures and decisions, design based as well as building constructive. Table 1 provides a brief overview of key sustainability measures used in 'De Balk van Beel', which as a whole on 'People' and 'Planet' aspects have resulted in the 'outstanding' BREEAM certification. Implemented measures are subdivided into two categories: 'embedded sustainability features' and 'acquired sustainability measures'. The first category covers these features which are to some extent intrinsic to the field of grouped housing (common features in mainstream projects). The second kind of measures are acquired by some (limited) deliberate effort, either on the neighbourhood level or the building level. Because design measures can have benefits on multiple sustainability aspects [12], no subdivisions were made. Measures are listed without any specific order. Within the scope of this article, displayed design measures are illustrative and thus seek by no means to be exhaustive. Listed measures will, amongst others, be discussed and documented in depth during the oral presentation.

CROSS CASE CONFRONTATION

This section provides a comparison on implemented sustainable design measures of 'De Balk van Beel' with exemplary practices in Europe. The first column of table 1 presents generic prevailing design measures regardless typology aspects of the different projects. The last two columns present measures of projects with typological similarities with 'De Balk van Beel'.

	Cross typology	De Balk van Beel	Kronsberg	One Brighton
Embedded sustainability features				
Collective bicycle storage	x	x	x	x
High density	x	x	x	x
Functional diversity	x	x		x
Collective meeting spaces	x		x	x
Extensive range of housing types	x	x	x	x
Extensive range of inhabitants profiles	x			x
Recreation area's	x		x	x
Collective courtyards	x		x	
Acquired sustainability measures				
Neightbourhood level				
Combined heat and power plant		x	x	
District heating network		x	x	
Kitchen gardens		x		x
Cycle & pedestrian friendly routes	x	x	x	
Car free	x	x	x	x
Electric recharching plug in points for cars	x	x		
Storage facility and recycling station	x		x	
Rain water irrigation / re-use system	x	x	x	
Wind turbines			x	
Ecological habitat	x	x	x	
Building level				
Bioclimatic design	x		x	x
Low energy performance level	x	x	x	x
Bio-mass fuelled boiler				x
High efficiency condensing boiler	x			
Mechanical ventilation + heat recovery	x	x	x	x
Solar collectors / pv panels	x			
Micro-climatic spaces	x		x	
Low temperature heating	x	x	x	x
Kitchen gardens				x
Submetering energy use	x	x	x	
Real time energy monitoring		x	x	
Overlooked collective & public spaces	x	x	x	
Ecological responsible building materials	x	x		
Bright collective circulation spaces	x		x	x
Green roof	x	x	x	x
Internal spatial flexibility	x	x		
Home delivery boxes		x		
Storage facility and recycling station		x		x
Presence of a sustainability manager		x		x
Ecological habitat	x		x	x
Water saving measures	x	x	x	x
Car parking restriction	x			x
Transitional zones private-collective-public	x		x	
Electronic butler service		x		
One key access		x		

Table 1: Cross case sustainability design measures.

The cross typology comparison makes clear that some assumed embedded sustainability features are nonexistent in 'De Balk van Beel'. Little or no attention is given to the intermediate scale level, the collective or the semipublic space. The list of acquired measures lacks the starting point of sustainable building: bioclimatic design principles, such as compactness, orientation, passive solar heating, etc. On the other hand, some acquired measures exceed most cross typology projects. Examples are the combined heat and power plant and kitchen gardens for the entire new neighbourhood, real time energy monitoring (electricity, heat and water) and the presence of a sustainability manager. Above all, the placement of home delivery boxes is intended, so residents can have goods delivered or collected, even when not at home. The idea is that it is more efficient to have a single supplier dispatched to the district than to have all residents go to the supplier.

Comparison with both projects with typological similarities confirms the absence of embedded sustainability features and the limited implementation of bioclimatic principles. Further on, both renowned projects distinguishes themselves through bright collective circulation spaces and measures for enhancing the ecological habitat on the building level, both with important social benefits for inhabitants. 'De Balk van Beel' focuses more on technological and innovative measures such as electric recharching plug in points for cars, the home delivery boxes, an electronic butler service 'my james' and a 'one key access' system.

Across all cases, large similarities can be observed in the provision of: collective bicycle storages, low energy performance level housing units together with low temperature heating and mechanical ventilation with heat recovery, green roofs, water saving measures (appliances and taps), and a car free open space.

SWOT ANALYSIS AND ISSUES

To gain insights into the current and possible future positive and negative aspects of the selected assessed project, a SWOT analysis was made concerning innovative, deviant or exceptional sustainability measures. Strengths, weaknesses, opportunities and threats of the project were structured within the framework of BREEAM. The full outcome of the analysis will be discussed during the oral presentation. This article briefly presents some striking SWOT's.

Strengths: On the Land use and Ecology category, the reuse of land that has been previously developed, together with measures for the enhancement of the ecology and biodiversity of the site, are certainly important strengths. Concerning Energy, the provision of a combined heat and power plant exceeds mainstream sustainable projects. Two other strengths are: the presence of a sustainability manager on site and home delivery boxes, both providing high scores in the Innovation category.

Weaknesses: 'De Balk van Beel' lacks collective meeting spaces, recreation spaces on the building level, attractive circulation spaces and qualitative transitional zones between public and private areas. This way, social interactions between inhabitants are not encouraged, causing 'people' aspects of sustainability not being enhanced. In other words, an important deficit on the Health and Wellbeing category.

Opportunities: As the project is part of a whole new neighbourhood development, opportunities for a comprehensive sustainability are multiple. Building zones could be designed better in view of the provision of transitional zones between the public park, the semi public parts of the building and the private dwellings. The absence of stringent planning regulations allows the implementation of ecological responsible materials on the facades. Measures which also could be considered are: extensive use of bioclimatic building design principles, integration of the water canal in the energy and water concept, and so on.

Threats: Preceding ambiguous projects show that during the construction phase some design measures are being deferred or even cancelled. Reasons are multiple: the lack of financial capacity, insufficient technological expertise, etc. The actual implementation of some innovative and even less innovative sustainability measures may be threatened.

DISCUSSION - BALANCE

A series of assessment tools are available, each with their own content, focus points and methods. The outcome of an assessment highly depends on the set of components and indicators of the selected tool. Regarding BREEAM, it is clear that focus is on an environmental assessment ('planet aspects') with only limited attention for a social assessment ('people aspects'). After comparing features and measures of 'De Balk van Beel' with renowned projects, it may be clear that, due to the lack of 'people aspects', mainly on the residential building level, the social sustainability is only limited present. Assessing the project with a tool containing components and indicators with a more social approach of sustainability, or even a better balanced set of components, would result in a totally different sustainability performance. Indicative, the project was assessed using the recently developed Flemish tool 'Vlaamse Maatstaf voor Duurzaam Wonen en Bouwen' (Flemish Criterion for Sustainable Housing and Building) [13]. Although this tool is based on the

BREEAM method, 'De Balk van Beel' only achieved a score of 75% (instead of 87.81%).

Regarding intended measures, two findings can be discussed. First, the nature of most sustainability measures are rather building technological. Besides newly introduced technologies, conventional technologies are optimized, e.g. the heating and ventilation system, acoustic actions, etc. Second, the sustainability performance is largely based on measures on the neighbourhood level, and some intrinsic features of the building site: location, availability of public transport and facilities, former nature on the site, etc.

Pending the finalization of the project, it is relevant to observe the present state of the project and its possible future evolutions. It is noted that certain key measures on the building level have been cancelled on the building level and moved to the neighbourhood level. These measures are in other words shifted to future developments. Example is the initial provision of a dedicated storage facility and recycling station for the building's operational-related waste streams in the basement level. Unfortunately, stakeholders mentioned that this facility will be deferred. Ongoing negotiations with the city to provide this facility on the neighbourhood scale have been unsuccessful so far. Other measures, such as the combined heat and power plant and the home delivery boxes, still appear to be in full development and are, until further notice, deferred. Because the green roof and the rain water irrigation system was only mentioned as 'optional', the threat is conceivable that no water related measures at all will be implemented at the end.

The present state of the project confirms previous formulated weaknesses and threats. The score given by BREEAM at the design phase cannot ensure the final sustainability performance. Outcomes of measures can turn out differently during the construction phase. This finding corresponds with results by Ding [14] and by Abdalla, Maas, Huyghe & Oostra [15]. Final completion of the project mid 2013 will show its true value regarding sustainability. The presentation will include the final implemented sustainability measures and the BREEAM 'post construction' assessment and rating.

CONCLUSION

The exploration based on sustainable design measures shows that the assessed and rated project 'De Balk van Beel' is, in reference with exemplary projects, not worthy being designated as 'demonstration or best practice project'. Intended and/or actual measures are insufficient regarding the full scope of sustainability. Completion of the project will proof this status, although current trends are rather negative.

According to this case study were a project was assessed and rated with a leading method, it cannot be stated that the use of current assessment and rating tools undeniably guarantee full sustainable successes. Tools can facilitate on the condition that incorporated components and indicators cover the full scope of sustainability.

Regardless the use of sustainability tools during or after the design process, demonstration and best practice projects show that essential keys to sustainable successes are knowledge on and implementation of appropriate and integrated design measures, a conceptual approach and architectural solutions.

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