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Evaluating sustainability of building projects in urban planning

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Abstract

If building projects are going to be sustainable in the future, we need to use sustainability as a criterion for choice of concepts. The evaluation of projects needs to address more aspects than just the properties of single buildings. In this paper, the new evaluation model NTNU SBP is presented, for the evaluation of the whole urban planning situation including the neighbourhood and the transport infrastructure. The model has the potential to help practitioners achieve better results in terms of real sustainability in urban planning. The successful use of the NTNU SBP model may lead to more conscious choices in urban planning and a more sustainable community.

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1. Introduction

We are living in a world facing climatic changes at an ever faster pace due to the anthropogenic emission of greenhouse gases. In order to mitigate these climatic changes and reach sustainability, we need to transform our industries towards zero emissions of greenhouse gases. The architecture, engineering and construction (AEC) industry is the key industry in the mitigation of climate change, the industry is alone responsible for 30-40% of the anthropogenic greenhouse gas emissions (UN, 2009).

A large part of the industry's activities is related to the planning and construction of building projects in urban environments. Unlike other consumer products, buildings typically have a functional service life over 100 years. Thus, where and how these buildings are constructed has significant effects on the future sustainability of urban areas.

It is a long time since 1987, when the term "sustainable development" was defined by the Brundtland Report (WCED, 1987): "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" This report and its definition has proved very influential and has been a platform for policy development ever since. However, the definition caused problems by being wage and difficult to translate into measurable metrics. Thus giving rise to a plethora of different frameworks and indicators. Our approach is that we believe that is there is a limited action space for the support of human activities (Meadows et al 1972). Of the many limitation mankind is about to face, we agree with IPCC (2014) and others that global warming is the most immediate threat to a sustainable future. Global warming is caused by a lack of carbon sinks, and thus a limit to our consumption of energy from fossil fuel. In other words, we have a waste handling or "self-pollution" problem.

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However, the identification of global warming as the most immediate threat makes it possible to operationalise sustainable development, also within the Brundtland definition. Further, we have identified the AEC industry as a potential key game changer. Most humans already live in or near cities, and more will do so within the next years (UN, 2014). Thus, Near Zero Building Projects in Urban Planning is a necessity in order to reach sustainability (Høyer & Næss, 2008; Bohne & Solli, 2011).

How can we know if a project is successful? Following the Brundtland definition, a project must be environmental, social and economical in order to be sustainable. This means that not only must a building project be near zero in energy consumption and emission, it must also be socially attractive and economical viable.

Smyth (2013) pointed out that construction majors are compliance driven, rather than proactive developers. This limits the AEC industry's ability to act as game changer. Thus, we assume that the industry needs more knowledge, mature policies and better tools to lead the development onto a sustainable track. We would like to contribute to this.

Traditional assessment tools such as BREEAM and LEED emphasise some of the ambitious ecological targets with regard to climate change. However, such tools focus on energy efficiency gains in compliance with current rules and regulation. They refer but do not emphasise the non-technical dimension of organisational, social and behaviour and do not consider the diversification of stakeholders involved (du Plessis & Cole, 2011; Kallaos & Bohne, 2013; Schweber, 2013; Schweber & Leiringer, 2012). This way of thinking is widespread and follows the old Scandinavian proverb: "Many small creeks make a big river", suggesting that all small contributions will make a difference but this is not necessarily the case. The reality is more like: "If everybody does a little bit, little is done" (Albert Einstein). In the case of climate change, we need a reduction in greenhouse gas emissions of more than 90% within 2100 in order to stay below a 2-degree increase in average global temperature (IPCC, 2014).

So with regards to building projects, what we need is a systematic way of assessing the project's performance and success criteria to evaluate against. In this paper, we propose an evaluation framework that enables a dynamic capabilities approach and addresses some of the gaps left by existing tools. The OECD model for evaluation of development programs and projects called the OECD Integrated Evaluation Model (OECD, 2006) was the starting point of this development. It is based on the five success criteria as follows:

- *Efficiency*: A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
- *Effectiveness*: The extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.
- *Impact*: Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.
- *Relevance*: The extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, needs, priorities and the policies of partners and donors.
- *Sustainability:* The continuation of benefits from a development intervention after major development assistance has been completed.

The OECD model also includes six cross cutting issues which should be considered for each of the five criteria. These are Economic and financial aspects, Institutional aspects, Societal aspects, Technological aspects, Environmental aspects and Policy support measures (Samset, 2010).

The work behind this paper was initiated due to a need for an evaluation model that addresses more aspects than just the properties of single buildings. Thus, the purpose of this work has been to identify strengths and weaknesses of using existing evaluation models for overall sustainability of building projects and suggest an alternative that takes the next step towards more conscious choices in urban planning.

2. Methodology

We started our work with a literature study. Not surprisingly, the literature study revealed an extensive literature on different aspects of evaluation of sustainability. As commented by Hacking and Guthrie (2008:74), '*[a] difficulty when considering assessment and SD [sustainable development] is not the scarcity of literature, but rather the vast quantity'*. There is a plethora of indicators and evaluation frameworks to choose from. Our approach was to simplify the process of evaluating sustainability, by adapting a well proven framework with as few as possible indicators, while at the same time assessing the overall sustainability of complex projects. The model was desk tested against known case-projects and then finally introduced into real life situations.

The authors deliberately chose to start with a wide array of different projects to make sure we address all major practical issues in the use of the model right from the start. Case 1 is a recently completed and known to be outstanding building project in terms of sustainability performance. Case 2 is an established building in operation and assumed to be in sharp contrast to Case 1. Case 3 is an ambitious building project still in the early stages of execution.

All three case studies were completed with document studies, one interview for each of the three cases and finalized through an evaluation report. The document studies were based on documents we got from our interviewees, and were executed in order to find facts about the cases. For the interviews in Case 1, one of the authors met a representative for the project owner in person