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# An Exploration of Stakeholders' Perceptions of Sustainable Construction

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**Abstract:** Recognising the significant footprints of social and environmental development, the construction industry has been viewed as a major contributor to the promotion of sustainable development. However, the extent of implementation of sustainable construction varies greatly from one practice to another, particularly as definitions and principles of sustainable construction are not yet universally agreed and have been widely debated amongst stakeholders. Different stakeholders and professions adopt different definitions and the principles of sustainable development that address their own specific concerns and needs. Since the construction industry integrates people and works across different sectors, it is necessary to define sustainable construction comprehensively in order to avoid overlooking any unique needs of the stakeholders. Hence this paper will explore and discuss the viewpoints of different stakeholders on sustainable construction. Interview is used as a means to collect the opinions on sustainable construction from various stakeholders' standpoints. This paper offers a snapshot on the understanding and the expectations of individual stakeholders in respect of sustainable construction. By grasping a better understanding of the overall development of the concepts of sustainable construction, practitioners can shape their future directions and strategies better and hence push sustainability performance in construction to a higher level of maturity.

**Key words:** Sustainable construction, stakeholders, understanding

## 1 Introduction

Sustainable development (SD) has initiated a revolutionary movement worldwide, spanning from engineering, manufacturing, marketing, tourism to food areas. Given that public concerns over environmental and social growth have risen in the past decades, the phrase of "sustainable" or "green" can always seize people's attention. As attempts of tracking sustainability performance in business organisations, a variety of measurement indexes have emerged including Dow Jones Sustainability Index (DJSI), Hang Seng Sustainability Index, ISO14001 and Global Reporting Initiatives (GRI) Sustainability Reporting Framework to enable greater transparency and systematic guideline to organizations in their pursuit of sustainable development.

Despite the high popularity of the sustainable development, there is no standardized definition for sustainability or sustainable related terms to date. A wide range of interpretation of sustainability concept is still opened and a number of new thoughts and ideas have evolved over time. Oxford Advanced Learners' dictionary defined "sustainable" as one "involving the use of natural products and energy in a way that does not harm the environment" or one that "can continue or be continued for a long time". On one side, in the Brundtland report published in 1987, United Nations World Commission on Environment and Development (WCED) proposed sustainability as "the ability to meet the present needs without compromising the ability to meet the needs of future generations". The interpretation of WCED has been widely accepted by the people by recognising the interlocking of environmental, economic and social interfaces in the commitment of sustainable development.

### 1.1 Sustainable Development in Construction

The wave of sustainable development has also spread into the construction industry. The construction industry left substantial footprints with a large amount of natural resources exploitation, land use, waste production, energy use, and carbon emission (Chong et al. 2009; Tan et al. 2011). On one side, construction industry has created numerous jobs and has contributed a high percentage to GDP of nations. Viewing the great contributions, both positively and negatively of construction industry has imposed on economical, environmental and social developments, the need for applying sustainable development in construction is hence highly acknowledged in the path towards sustainable development.

The scope and meaning of both sustainable and construction are highly debatable. The integration of these two complex concepts has further complicated the definition dilemma. Irurah (2001) (as cited in Du Plessis, 2007) categorised construction into four levels: as site activity, as the comprehensive project cycle, as everything related to construction business, and as the broader process of human settlement creation. Given the broad extent provided in the sustainable development, it is inappropriate to refer sustainable "construction" to site activity only.

As described by Hill and Bowen (1997), sustainable construction (SC) was initially proposed to describe the responsibility and roles of the construction industry in achieving sustainability, whereby the construction industry is deemed to include civil engineering and building construction. It is also important to avoid viewing sustainable construction as

a site activity or a specific stage in the project life cycle. Apart from the comprehensive cycle of a construction project such as feasibility study, design, construction, operation, decommissioning, demolition and disposal, a broader concern should also be addressed on the process of creating human settlements, which entails planning, design, implementation and management (Du Plessis, 2007).

Presley and Meade (2010) also supported the view by referring to sustainable construction as not only the buildings and spaces but also the process and activity as well as the infrastructure elements such as waste management, transportation, and utility transmission systems. This paper therefore views sustainable construction as the application of sustainable development to the comprehensive construction cycle, from the extraction of raw material, through the planning, design and construction of buildings and infrastructure, until final deconstruction and management of the resultant waste (Tan, Shen and Yao, 2011).

As pointed out by Hill and Bowen (1997), the pursuit of social principle aims to improve the quality of human life, make provision for social self determination and cultural diversity, protect and promote human health, implement skills training and capacity enhancement of disadvantaged people, seek fair distribution of social costs and benefits of construction, and seek intergenerational equity. Economic "pillar" in sustainable construction is to ensure financial affordability for intended beneficiaries, promote employment creation, enhance competitiveness, use full cost accounting and real cost pricing for price and tariff setting, choose environmental responsible supplier and contractor, and invest the proceeds to maintain the capacity to meet future generations' needs (Hill and Bowen, 1997).

## 1.2 Why Exploring Stakeholders' Perception is Important?

Voluntary approaches and initiatives have been used for the promotion of sustainable development in construction over years (Lee and Yik, 2004). Although the promotion of sustainable development has been done, the implementation varies greatly from one practice to another. The performance of construction industry has a close association with the attitude and knowledge of the construction players involved. As described by Lo et al. (2006), building professionals play a major role in decision making process and their attitudes and perception will accordingly have a significant impact in the course of sustainable development. Construction organizations which include clients, contractors and consultants have a great influence in determining the extent of sustainability employed in the projects. An appropriate level of stakeholders' interest can promote sustainable practice significantly. Nonetheless, diverse interests and backgrounds of construction stakeholders complicate the application of sustainable construction, each with their own visions and ideas in performing sustainability (Chong

et al, 2008).

Construction players might perform sustainable practices voluntarily or involuntarily as they sometimes abide by the rules and regulations to achieve sustainability in their practices. Stakeholders are subject to different exposure and pressure in applying sustainability. A lack of understanding on sustainability could change the vision on the intended objectives, which would lay stress in shaping the implementation of sustainability in construction. Understanding the total concept of sustainability is therefore essential to incorporate it into the construction business strategies and practices which in turn can improve the overall performance of the construction industry. Full benefits of sustainable development would be limited if the construction stakeholders are not keen in committing and involving in sustainable development. For instance, if a sustainable building is not operated and managed in its designed way then the performance will be reduced.

## 2 Research Methodology

Interviews can help to obtain firsthand knowledge about people's perceptions while the data's reliability can be improved by gathering supplemental information through observations. Interviews were therefore employed to explore various viewpoints on sustainable construction from different stakeholders. Standardised open ended interviews were employed since they can minimise variations, increase comparability of responses, reduce interviewers' bias, and have a highly focus on the required subjects (Patton, 2002). At the same time, open-ended interview questions can allow more flexibility for interviewees in expressing their views without external restrictions. Interview questions were sent to interviewees prior to the conduct of interview for the interviewees' reference.

Ten face-to-face interviews and one interview administered by email were collected in the study. Purposive sampling was used where all interviewees must possess related exposures to sustainable practices in construction. In purposive sampling, the informants are intensively informative and richer in experiences who can offer large information on subjects or phenomena. Table 1 shows the profile of interviewees. Interviewees included construction stakeholders with diverse background comprising of academics, architect, contractor, engineer and developer. Interviewees possess an average 24.8 years of working experience in the construction field. In the study, interviewees were

asked about their views and impressions on sustainable development or sustainability in construction including the definition and major principles.

**Table 1** The profile of interviewees

No.	Code	Professions	Experience (years)
1	A01	Academic & Engineer	23
2	A02	Academic & Landscape Architect	25
3	C01	Contractor	35.5
4	A03	Academic & Architect	18.5
5	E01	Engineer Consultant	22.5
6	D01	Developer	40
7	C02	Contractor	12
8	C03	Contractor	15
9	U01	Urban Planner	30.5
10	C04	Contractor	35
11	E02	Engineer Consultant	16

### 3 Results and discussion

The recent trend of sustainable development in the Hong Kong construction industry has drawn construction organizations' attention on sustainability issues. Hence, it is not a surprise that a medium to high level of awareness is found among the interviewees on sustainable development in construction. Nonetheless, the fragmentation nature of construction industry has diverged the understanding of construction stakeholders' on sustainability, in addition to the traditionally debatable concepts of sustainable development. Interviewees with different backgrounds held their different beliefs and views in describing sustainable construction. Despite of a variety of viewpoints, there are some grounds of sustainable construction that most or all interviewees have agreed upon.

Most interviewees agree that sustainable construction (SC) contains an idea of long term development and creating a long lasting effect to the future development of construction industry. As described by interviewee A01 and A02, SC is a long term development without leaving any footprint or negative impacts. Interviewee E01 also defined SC as "something that can continue without making negative impacts on stakeholders including construction community, society in neighborhood, and other interested parties". "Sustain" always carries the picture to make something continue and prolong for some time and hence most interviewees embrace long term development in its interpretation.

All interviewees have a consensus on the inclusion of the environmental pillar in their definitions of sustainable construction. As reflected by interviewees, sustainability is always viewed relating to carbon footprint, green resources, material use, resources efficiency, energy consumption, water use and waste management. Interviewee A03 stressed four major savings in SC: material, water, energy and land resources. On one hand, interviewee E03 upheld six factors in applying sustainable construction i.e. sustainable materials, the ultimate energy use, water consumption, waste management, the location of the access to public transport and life cycle cost. In the interviewee E02's opinions, SC should contain minimum environmental impact/pollution, minimum carbon emission, prolonged life cycle, flexibility in building use, renewable energy, less energy and material use, recyclable and reusable materials, indoor environment quality, occupants' comfort and intelligent systems.

The main reason behind sustainable implementation in construction practices is mainly due to the fulfillment of legal requirements as well as the environmental responsibilities, although organizations are aware of the needs and benefits of applying sustainable construction. Fellow and Liu (2008) alleged that the motivation for sustainability certification systems are reinforced iteratively by environmental protection legislation and institutions' influences that both encourage ethical (including environmental protection) behavior and discourage the reverse via social (leading to economic) sanctions. Therefore, it is not a surprise why the construction organizations' perceptions on sustainable development are always inclined to the environmental aspects. The situation becomes even controversial when the current sustainability assessment systems often place greater focus on the environmental dimension, while the other two pillars are often overlooked in the pursuit of sustainable development. Beheiry et al. (2006) advocated that the historical tendency to focus on environmental sustainability has overaligned sustainable development with green movement and alienated business executives. Fellow and Liu also supported this view by asserting that "legislation is piecemeal and addresses greening rather than sustainability".

For the economic pillar of sustainability, most interviewees agreed to embrace life cycle cost in the practice of SC. Interviewee A02 perceived that people should avoid from narrowing their focus of SC to the cost incurred from a particular project stage and

consider true cost instead, which involves the cost commencing from the supply, taking off and bring in to the site, until the disposal of the materials. Interviewee E01 also believed that life cycle costing is critical in improving sustainable performance and that cost effectiveness and payback period should be often given a high priority in the pursuit of sustainability. She felt some sustainable features such as wind mill have low cost effectiveness due to their high initial cost and maintenance cost with the limited benefits generated. The inclusion of life cycle cost in SC practices has the backup from interviewee E03 too. Rather than mere construction cost, interviewee E03 opined that sustainable construction should look at the whole life cycle cost of the building, whereas life cycle entails the whole processes of construction, operation, demolition and maybe even the reuse of the buildings. He also asserted that “achieving life cycle can drive the occurrence of other sustainable factors which can help to drive more sustainability into the buildings, while the emphasis on short term gains will always leads to wrong decisions”. As reflected by interviewee E03, operation cost is typically 80% of the total building life cycle cost, and if a building can be operated at the lower cost, it can produce lower energy consumption, better water usage and lower waste outputs.

On the other hand, the integration of social pillar in SC does not gain much agreement from the interviewees, although some interviewees acknowledge the significance of social concerns in developing sustainability in construction. As an urban planner, interviewee U01 has placed a great emphasis on the development of urban landscape, culture, and human interactions in SC. He felt that current construction has induced a low town bearing and imposed lesser connectivity between people and the place. Interviewee U01 therefore urged more attention to be placed on the natural setting, cultural landscape and community in the efforts towards sustainability. This standpoint is supported by interviewee A02 who also stressed on the balance between culture and community identity.

Nonetheless, in the perspectives of other interest group among the interviewees, the priorities and scales for economical and social development are sometimes far more reduced compared to environmental dimensions. As indicated by interviewee E02, “Social development is more applicable to district area planning rather than building. District planning has more influence and importance in social development. Buildings have limitations because of the overall district exploration in the construction plot.” Interviewee C04 also advocated that “human factor will only be considered beyond the construction areas given that the working environment in the construction site is still

not good”.

The balance to achieve SC is another focus given by the interviewees in picturing SC. As revealed by interviewee D01, it is critical to strike a balance between cost, people and environment in a sensible way in implementing SC. The value of sustainable development would lose if the project fails to achieve one of the triple bottom line. Interviewee A01 also supported this view by examining the entire issues of people, cost and technology in the path towards sustainability. He highlighted the significance to explore life cycle costing in determining the worthwhileness of the sustainable effort because it is impossible to introduce sustainable features which are unacceptable by the people. On one hand, interviewee A03 believed that three pillars of sustainable development have not been developed equally in construction, whereby environmental development is comparatively less emphasis than the other two aspects in the past. He opined that more efforts are currently put on environmental improvement in order to retrieve the balance of SC.

Apart from the traditional triple bottom line, this study found that culture is another important issue for developing sustainable construction. The interviewees highlighted the importance of changing people’s mindsets and society to work towards sustainable development. As expressed by interviewee E03, although smart engineering solutions have been designed for the clients, it still needs the end users or operators to use them in their designed way. He shared his experiences whereby the operators switched the building devices to automatic off, and did the operation manually, which is the way they are used to it. The case has proven how critical of the understanding and commitment of the end users and operators to shift the whole construction society towards sustainable development successfully. It is thus necessary to improve the knowledge and commitments of not only the construction parties but also all involved interested stakeholders in the construction industry for the development of SC.

Interviewee C04 believed that the sustainable development trend will only be changed totally when private developers are willing to pursue sustainability and build good quality buildings without any enforcement of government policy. It is significant to pursue sustainability from a genuine heart but not from either the desire to secure advantage over other firms in the market or the desire to comply the legislation requirements. Meanwhile, interviewee A02 also

asserted that people should change the lifestyles by mapping their real needs before making any decision. Even the smallest development, he affirmed that it would also lead to negative impacts on the environment, human and the planet by changing the original identity and ecology surrounding of a place. As a result, Fellow and Liu (2008) suggested that only a real convergence value shift, supported by strong and enforced legislation to get to grips with the divergence in value judgement of various systems in completing sustainable development framework.

In the absence of a clear definition, concepts, principles and directions in applying SC, construction stakeholders tends to make SC suit to their particular needs and fit to their professions, in which they would be more familiar in their field of practice (Chong et al., 2009). To achieve the wholesome sustainability in construction, the crossover and integration of knowledge between different fields is required (Chong at el., 2009). As a result, more efforts could be done by providing a platform to the diverse interest groups of construction stakeholders to share ideas, communicate and distribute SC information to work towards a common goal in their sustainable construction practices.

#### 4 Conclusions

Sustainable construction helps to drive the implementation of sustainable development significantly. Although definitions and principles of sustainable development and sustainable construction are not yet universally agreed upon and have been widely debated amongst stakeholders, triple bottom line – environment, society and economy is generally adopted as main principles. This paper offers a snapshot on the understanding and the expectations of individual stakeholders in respect to sustainable construction.

Subject to different exposures and interests, construction stakeholders always have different focuses and weightings on their sustainable construction agendas and this can often result in conflicts among the stakeholders. This study found that environmental pillar is always included in the definition of sustainable construction, while cost and social perspectives are not always included in the considerations. Sustainability is always viewed as relating to carbon footprint, green resources, material use, resources efficiency, energy consumption, water use and waste management. The inclusion of economic and social concerns in developing sustainability highly depends on the background and exposures of the stakeholders. Social pillar will often be taken into the considerations by those who have always stressed on the macro development such as urban planner and urban landscape architect.

A better understanding on the interfaces of the triple bottom line of sustainable construction is needed and the understanding can prompt higher commitments of construction stakeholders towards sustainable practices. A gap would be formed in sustainable practices when incompatible goals are set by different interested parties due to their different interests. By grasping a better understanding of the overall development of the concepts of sustainable construction, practitioners can shape their future directions and strategies better and hence push sustainability performance in construction to a higher level of maturity.

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