



**AUTHOR(S):**

**TITLE:**

**YEAR:**

**Publisher citation:**

**OpenAIR citation:**

**Publisher copyright statement:**

This is the \_\_\_\_\_ version of proceedings originally published by \_\_\_\_\_  
and presented at \_\_\_\_\_  
(ISBN \_\_\_\_\_; eISBN \_\_\_\_\_; ISSN \_\_\_\_\_).

**OpenAIR takedown statement:**

Section 6 of the "Repository policy for OpenAIR @ RGU" (available from <http://www.rgu.ac.uk/staff-and-current-students/library/library-policies/repository-policies>) provides guidance on the criteria under which RGU will consider withdrawing material from OpenAIR. If you believe that this item is subject to any of these criteria, or for any other reason should not be held on OpenAIR, then please contact [openair-help@rgu.ac.uk](mailto:openair-help@rgu.ac.uk) with the details of the item and the nature of your complaint.

This publication is distributed under a CC \_\_\_\_\_ license.

\_\_\_\_\_

# Myths of sustainability: an evaluation of their enduring influence on sustainable construction in Singapore

Belle Chua Lee Yin and Richard Laing

The Scott Sutherland School of Architecture and Built Environment

Robert Gordon University, Aberdeen, UK

r.laing@rgu.ac.uk

**Abstract**— Singapore faces specific and immediate risks due to environmental challenges and climate change. To overcome these challenges, the government has been making efforts to implement policies and guidelines on building designs and construction methods in order to achieve sustainable construction to develop an environmental friendly and resource-conserving city. This research provides a review of Singapore’s construction industry’s perception and awareness of sustainable construction and its effort in implementing new practice. An online questionnaire was conducted with the industry’s A1 contractors addressing common myths of sustainability, and whether regulatory compliance and initiatives will affect respondents’ perception, thereby changing their attitudes when practising sustainable construction. A Spearman rank correlation and Kendall’s coefficient tests relating to contractor’s awareness, attitudes and obstacles in practising sustainable construction were also conducted to identify if there is a monotonic relationship between the ordinal variables. The research shows that respondents positively embraced the idea of sustainability and some have adopted initiatives to further enhance their practices. Although a majority of such practices are due to regulatory compliances, however, through driving forces such as public sector taking the lead and government incentive programmes, the Singapore construction industry will be more responsive and thereby can pursue sustainable construction more effectively and efficiently.

**Keywords**- Singapore; sustainable construction; perception; myth; awareness; attitude; obstacles

## I. INTRODUCTION

Set against a backdrop of rapid urbanisation and fast population growth, our cities are experiencing overpopulation and aging infrastructures. Growing environmental and economic urgencies are threats facing tomorrow’s cities and therefore, we need to explore the key challenges and look at innovative design solutions to develop an environmental friendly and resource-conserving city. Over the past four decades, Singapore, a small island city with an increasing population, has been facing challenges on waste management due to rapid industrialisation and economic development. To overcome these challenges, the government has been making

efforts to implement policies and guidelines on building designs and construction methods in order to achieve sustainable construction. Against this background, though, is the danger that aspects of sustainability and sustainable construction are misunderstood by the industry.

### A. Research objective

As predicted by Goodland [1], sustainable practice would differ in each country and sector due to variation in growth, limits, scale and suitability. In the 21<sup>st</sup> century, Morelli, [2] further defined the concept of sustainability within specific disciplinary areas, and in particular ecological sustainability and economic sustainability where we explore its impact on sustainable construction. There are abundant problems and challenges faced by the construction industry everywhere ranging from design, technical issues and management practice. However, the situation is even more complicated for developing countries when socio-economic stress, chronic resource shortages and institutional weaknesses appear alongside the already present challenges [3].

In the region of Southeast Asia, a long-term sustainable development framework was affirmed in 1997 ASEAN Summit [4]. Construction has been included as one of the goals in ASEAN Vision 2020 to envisage “*a clean and green ASEAN with fully established mechanisms for sustainable development to ensure the protection of the region’s environment, the sustainability of its natural resources, and the high quality of life of its peoples.*”

The central objective for this research was to explore connections between awareness within the Singaporean construction industry of the importance of sustainability construction, and to explore how the primary barriers in practicing sustainable construction, as perceived by the industry, may be a combination of knowledge, economic and policy factors. Arguably, some of the obstacles that hinder the implementation and subsequent success of sustainable construction are due to misconception and commonly held beliefs within the industry itself.

### B. Sustainability in the context of construction

A developed and first world country, Singapore has a successful economy and is a financial hub of the Southeast Asia region. Construction is one of the industries that flourishes with the economy, but is one which has contributed to the environmental pollution and exhaustion of resources. Singapore started her green efforts as early as in the 1970s, with the likes of ‘annual tree planting day’ [21]. Besides raising awareness in environmental sustainability and addressing such issues, Singapore’s government professes to aspire to be a leading global city in this sector and therefore has implemented various initiatives and regulations such as the Sustainable Construction Master Plan 2008, Singapore Green Plan 2012 or SGP 2012 (NLB 2016), Green Mark Scheme and environmental management system (EMS) to encourage sustainable construction. The focus is not only on energy efficiency, but a holistic approach to encourage and ensure that environmental quality and comfort are not compromised.

The progress of a nation’s economy and society has a close relationship with the construction industry. This relationship is therefore an important challenge in attaining sustainable development, especially when there has been increasing number of empirical studies demonstrating the importance of sustainable construction when it is one of the largest exploiters of natural resources, both mineral and biological. The continuation and acceleration of such activities has a myriad of environmental implications and will inevitably intensify areas of environmental stress [5, 6]. Therefore, there has been an increasing requirement for adaption to climate change and resource efficiency in the construction industry, specifically sustainable construction in developing countries. It was also noted [7] that the lagging in response to problems of environment is of critical importance and should be emphasize on prevention. It has been evidential that the extent of such problems has become greater and severity over recent years [7]. While recognition of the need for sustainable construction has emerged globally, the demand is still low or even at its infancy due to lack of awareness [4, 7], misconceptions and more importantly, the economic barriers that deter stakeholders and contractors in adopting sustainable construction [7, 8 and 9). Henceforth, it is necessary for further effort to be established on common concepts, principles and techniques relating to sustainable construction; and encouraging enterprises and individual practitioners in making their activities sustainable [10].

### C. Reported myths of sustainability

Across a number of years, Hueting [11], Leal Filho [12] and Rogers [13] discussed various ‘myths’ and misconceptions of sustainability, which involved topics relating to knowledge, population, environmental conservation, costs, policies and technologies. These have been debated within both academic and journalistic publications, with scientific concerns about such myths in the 1990s still prevailing in the popular media in recent years. A consolidated list from Lemonick [14], described numerous (still common) myths and misconceptions of sustainability.

- Myth 1: Nobody knows what sustainability really means.
- Myth 2: Sustainability is all about the environment.
- Myth 3: “Sustainable” is a synonym for “green”.
- Myth 4: It’s all about recycling.
- Myth 5: Sustainability is too expensive.
- Myth 6: Sustainability means lowering our standard of living.
- Myth 7: Consumer choices and grassroots activism, not government intervention, offer the fastest, most efficient routes to sustainability.
- Myth 8: New technology is always the answer.
- Myth 9: Sustainability is ultimately a population problem.
- Myth 10: Once you understand the concept, living sustainably is a breeze to figure out.

From the above, 2, 3, 4 & 5 were the most commonly mentioned and persistent myths identified in previous studies [3, 7, 11, 15 and 22] as barriers, with particular regard to the construction industry. Therefore, these were used to provide an initial driver for exploration of industry attitudes and behavior with regards to sustainability.

Of course, it is worth noting that the term ‘myth’ can be taken to hold a number of related but perhaps conflicting meanings.

*‘An ancient traditional story... one offering an explanation of some fact or phenomenon’*

*‘A commonly held belief that is untrue, or without foundation’*

(Chambers 20<sup>th</sup> Century Dictionary, 1983)

Whilst it is recognised that there is often truth within such myths, it is more often the case that widely held ‘received wisdoms’ may serve to limit understanding. Thus, we perhaps deal more with the second definition than the first, and use this as a basis to explore whether, and how, this affects practice within the industry.

## II. METHODOLOGY

The research employed an online survey questionnaire, with a primary target audience of 104 contractors under the registry category A1 of Building and Construction Authority (BCA). Contractors under this category are companies with unlimited tendering limits and a minimum paid up capital of S\$15 million. The results were analysed to identify Singapore contractors’ general understanding and awareness of sustainable construction, and their current practices. The survey also addressed questions relating to the construction industry’s perception and its effort towards practicing sustainable

construction, and if regulatory compliance and initiatives will affect respondents' perception, thereby changing their attitudes when practicing sustainable construction.

The results were analysed to test two hypotheses:

- The construction industry is aware of the importance of sustainability in construction and its impact on the environment.
- The primary barriers in practicing sustainable construction as perceived by the industry are a combination of knowledge, economics and policy.

A 5-point Likert scale was used to evaluate respondent perceptions (1=strongly disagree, 3=neutral, 5=strongly agree). Secondary data sources were extracted from the firms' archival records of mission statements and published annual reports available from respective respondent's websites. For the second part of the questionnaire, semi-structured questions based on the primary data collection, consisted of three sections: (1) respondents to list their existing practices on sustainable construction and reason for implementation; (2) to determine the driving forces for adopting sustainable construction; (3) to determine respondents' view on enforcement of mandatory policies and voluntary initiatives for sustainable construction.

### III. RESULTS

The survey was distributed via professional social media (LinkedIn), totalling 95 out of the total 104 companies under the BCA A1 contractor listing. In total, the survey received responses from 16 companies, the respondents consisting of senior/executives (42.9%), managers (50%) and directors (7.1%).

The analysis is reported into two parts. The first part is a textual analysis of the demographic data of the respondents, their current practices on green construction and document review using secondary data sources extracted from the firm's archival records of mission statements and published annual reports available from respective respondent's websites. Therefore, for classifying contractors' positive or negative attitudes on implementation of sustainable construction, it is based on the following set of criteria for a positive group:-

- Contractors have obtained ISO 14001 EMS certification; and
- Contractors have implemented more than 5 environmental practices in their construction activities

A nonparametric measurement was used to relate sample group's awareness, attitudes towards implementation of sustainable construction to the potential obstacles in such practices (i.e. hypothesis *H2*). For this purpose, the Spearman

rank correlation coefficient and Kendall's Tau-b coefficient tests will assess the monotonic relationships between the ordinal variables.

#### A. Awareness and attitudes towards sustainability

Since 2011, 36% of the respondents' average annual turnover was more than S\$501 million, 28.6% with S\$201 - S\$300 million, 14% for both turnover of S\$100 - S\$200 million and 7% with S\$ 401 - \$500 million turnover. 71% of projects executed by the respondents consist of both public and private sectors, mainly in residential and commercial, followed by hospitality projects. Although only 85% of the respondents were awarded with a Green Mark Award, however, most of these awards were Gold and above. Another more encouraging fact that reflected the respondents' commitment on sustainable construction is that all have obtained ISO14001 EMS certification. Notwithstanding this, 64% of the respondents have environmental practices in their projects for more than 5 years; 71% of these projects implemented more than 5 such practices, including employment of a Green Mark or sustainability officer 79% in the respondents' company.

An examination of all A1 contractors' corporate websites on their mission statements and environmental-related publications were conducted. Results revealed that 43% of the firms' operations placed emphasis on corporate quality, environmental and resource management, followed by 25% emphasised on Environmental Health and Safety (EHS) policy and practices. Emphasis solely on the corporate quality management was almost a close tie with EHS, and these corporate are either public listed companies or developers as one of their main core business. Firms which publish environmental issues or sustainability reports are majority international corporations; with only 2 out of the 16 corporations local firms. As such, a firm's approach and commitment towards sustainable construction is very distinctive between local and international corporations.

TABLE I. RESPONSES TO COMMON MYTHS

Statements on common myths of sustainability	Mean	SD	Rank
B1 Sustainability is about the environment only	2.57	1.93	4
B2 Sustainability is a synonym for 'Green'	3.14	1.33	2
B3 Practicing sustainability can be more expensive	3.14	1.29	2
B4 Sustainability is about Reduce, Reuse, Recycle only	3.29	1.50	1
B5 Sustainability means lowering our standard of living	1.64	1.72	5
B6 New technology is the only solution to sustainability	2.79	2.48	3
B7 Sustainability is a pollution problem	0.50	2.30	6

In response to bold statements regarding common 'myths', agreement with the 3Rs (Reduce, reuse and recycle) was ranked highest (B4). Similarly, perception that sustainability relates to 'Green' (B2) and higher costs (B3) when these two statements were ranked second place, and perceived that

technology is the only solution to sustainability (B6) as these statements have lower standard deviation values when compared to the other statements. In stark contrast, the myths of sustainability that concern environment (B1), lowering of living standard (B5) and population issue (B7) were with the lowest mean value, which suggests that awareness of sustainability is on the rise.

At the same time, when respondents were asked on their awareness and attitudes towards sustainable construction, it was consensus that a greater success of such practices would only be possible and achievable when there are participation and commitments from stakeholders and consultants, as statements C10 and D9 of Table 4.4 and Table 4.5 has the highest mean scoring; especially if the adoption of such practices are to begin at design stage for maximum performances. Therefore, with the rise in awareness of sustainability among contractors (see statements B2, B5, B6 and B7 of Table 4.3), it is encouraging to see the changes when contractors implement their knowledge into practical adoption, especially majority of the respondents adopted proactive environmental strategies such as waste reduction and prevention of pollutants at source [16].

TABLE II. AWARENESS

	<i>General statement on awareness of sustainable construction and impact on environment</i>	<i>Mean</i>	<i>SD</i>	<i>Rank</i>
C1	Sustainable construction can reduce resources	3.69	1.28	7
C2	Sustainable construction can improve energy efficiency	3.92	1.04	5
C3	Setting minimum standards through legislation	3.85	1.14	6
C4	Recycled on environmentally friendly materials	3.85	0.89	6
C5	Various types of construction waste are available for recycling	4.08	0.76	3
C6	Implementation of ISO 14001 EMS to achieve better environmental performance	3.92	0.86	5
C7	Utilisation of high performance insulation protection, water and energy saving equipment	4.00	0.91	4
C8	There will be a time impact when implementing sustainable construction	3.15	1.09	8
C9	Sustainable construction should begin from the design stage	4.38	1.12	2
C10	Success of sustainable construction will not be possible without the commitment from stakeholders and consultants	4.69	1.11	1
C11	There is a limited selection of environmentally friendly materials	2.85	1.28	9

When faced with a series of more general statements regarding the implementation of sustainable construction, the most positively received statement again highlighted a cross-team adoption and acceptance of the principles and practice.

*“Sustainable construction should not be limited to contractors alone. Greater success will be achieved with participations and commitments from stakeholders and consultants”* (Likert score 4.31/5)

Therefore, with a rise in awareness of sustainability among contractors (with reference to Table I), it is encouraging to see the changes when contractors implement their knowledge into practical adoption, especially majority of the respondents adopted proactive environmental strategies such as waste reduction and prevention of pollutants at source [16].

With this objective, respondents revealed the provision of education on green practices throughout all levels of staff from office to site operating teams. Aiming to increase efficiency and reduction of resources, adherence to ISO 14001 EMS standards, implementing recycling programmes and procuring environmental friendly products appear as basic steps to adopting sustainable practice. Further steps such as using equipment which generate less noise and smoke emission, using less pollute bio-fuel for machineries and proper house-keeping are also implemented to reduce damage to our environment. In spite of 71% of the respondents indicating that capital costs do increase with these green practices, such costs are justified with the economic benefits throughout the construction process, including the extended life cycle of the buildings, (as cited by three respondents). Only 29% of respondents felt that sustainable practices do not incur capital costs in their organisation.

In summary, an increasing awareness of and positive attitudes towards sustainability and green construction were indicated, including additional voluntary initiatives implemented by the firms. Therefore, these results had supported the first hypothesis. The requisites for authority compliances and government’s incentive programmes are also plus points when firms do have these practices in place, creating a win-win situation for all [15].

#### B. Barriers to practicing sustainable construction

The research proceeded to explore whether there were other factors that hinder the implementing of these practices. To that end, respondents were asked to indicate potential obstacles in practicing sustainable construction. The following statements were the most distinct cost-related obstacles, which should be read in tandem with perception on achievement of greater success when stakeholders truly embrace the advantages and benefits of adding green value and extending the building’s life cycle.

*“High cost incurred in green practices and technologies”* (Likert score 3.62/5)

*“Complex building codes and regulations cause difficulties in evaluating cost involved for such compliance. Stakeholders often fail to see convincing benefits behind practice of sustainable construction”* (Likert score 3.85/5)

*“Lack of expressed interest from stakeholders and market demand”* (Likert score 3.85/5)

In the case studies conducted by Williams, and Dair, [19], the most commonly cited barriers to achieving sustainability were (i) where sustainability measurement was not considered by stakeholders; (ii) where sustainability measures cost too much, and (iii) where lack of adequate or reliable sustainable products or equipment were available.

In fact, one of the reasons to explain lack of stakeholder interest could be due to their perception of sustainable construction project risks [17]. A previous study conducted by Shen, et al. [18] also revealed the relevance of incorporating sustainable development principles when conducting project feasibility study. However, the importance of incorporating such principles and insufficient examination of project performance during the project feasibility study was not effectively understood by stakeholders, thereby little attention was given in this aspect which is a common phenomenon in the developing regions.

The next major obstacle as identified by respondents was the important role of *management support* and *time factors* when adopting green practices (mean score 3.54/5). Respondents also highlighted limited certification bodies and materials availability in the Singapore market (3.54/5) which limits the adoption of such green materials and technologies in projects. Therefore, contractors are sceptical about the performance and potential benefits of 'green' materials and equipment. Moreover, when their competitors are using less environmental friendly materials because they are less costly, contractors may feel compelled to follow the same footsteps in order to survive in the competition. Therefore, uncertainty of the performance of green materials or competition leading to the use of cheaper but less environmentally acceptable materials (each bearing a mean score of 3.46/5), may play a deciding consideration when organisations decision to implement sustainable construction. In contrast, respondents deemed the remaining statements were less of an impact or obstacles if organisations were to implement green practices.

Next, when respondents were asked what factor(s) contributed to implementing their current practices, 13 of 14 respondents indicated that these implementations were for regulatory compliance and contractual obligations; and the remainder was solely voluntary basis.

More than 66% of respondents also named parameters including government incentive programmes, attractive tax rebates, economics; social and environmental benefits when considering implementation of environmental practices. Regardless of regulatory compliance or contractual obligations, respondents do agreed that with these practices in place, there is increased efficiency while resources are reduced.

### C. Correlation Tests between Awareness, Attitudes and Obstacles

Spearman rank correlations and Kendall's coefficient tests were conducted among contractor's awareness, attitudes and obstacles in practicing sustainable construction. To illustrate the strength of relations between the sets of variables which were ranked separately, the sum of the square differences will be small [19].

The tests were conducted on four topics of sustainable construction, namely: (i) perspective of implementing green construction as early as design stage; (ii) the selection of specifications; (iii) implementing reduced and recycled of construction waste; (iv) obstacles in practicing green construction.

On the first topic (perspective of implementing green construction), the mean scores for statements of awareness, attitudes and obstacles were 4.38, 4.31 and 3.85 respectively; however, the results in showed positive coefficient of medium strength, but there is no significant statistic correlation (Sig. 2-tailed) between these statements.

On the second topic (material specifications), results not only showed large strength of positive coefficient, but also significant statistic correlations (Sig. 2-tailed) ( $r=.781$  and  $.805$ ,  $p<0.01$ ). Similar results showing high strength of positive coefficient and significant statistic correlations (Sig. 2-tailed) ( $r=.578$  and  $.649$ ,  $P<0.05$ ) for topics on construction waste and obstacles in green constructions ( $r=.702$  and  $.738$ ,  $P<0.01$ ).

These results demonstrate positive coefficients of medium to large strength parameters. It must be recognised, though, that the Sig. 2-tailed statistical correlations were applicable to all, except for perspective of green construction implementation. In other words, the primary barriers in practicing sustainable construction as perceived by the industry are led by economic and policy factors. Therefore, the second hypothesis is partly supported, although a lack of knowledge of sustainable construction is not a prime barrier to implementation.

## IV. CONCLUSIONS

There is an abundance of problems and challenges faced by the construction industry in the implementation of sustainable practice, these ranging from design to technical issues, cost and project management. However, the situation is more complicated for developing countries when socio-economic stress, chronic resource shortages and institutional weaknesses appear alongside other challenges [3].

Success in the implementation of sustainable construction requires commitment and buy-in from participants. Moreover, some of the obstacles that hinder the implementation and subsequent success of sustainable construction are due to misconception regarding the 'myths' previously reported in the literature.

The key findings of this research show that respondents embraced positively the idea of sustainability and that some have adopted initiatives to further enhance the practices. It should be noted that a majority of such practices are due to regulatory compliances, with driving forces such as public sector taking the lead and government incentive programmes. As a result, the Singapore construction industry will be more able to apply sustainable construction practices as a result.

## REFERENCES

- [1] Goodland, R., 1995. The concept of environmental sustainability. Annual review of ecology and systematics, pp.1-24.

- [2] Morelli, J., 2013. Environmental sustainability: A definition for environmental professionals. *Journal of Environmental Sustainability*, 1(1), p.2.
- [3] Ong, K.C.G., Anggadajaja, E. and Soh, S.L.Y., 2009. Sustainable construction strategies: a Singapore perspective. *Lifecycle Design of Buildings, Systems and Materials*, p.8.
- [4] Shafii, F., Ali, Z.A. and Othman, M.Z., 2006, September. Achieving sustainable construction in the developing countries of Southeast Asia. In *Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006)*, Kuala Lumpur, Malaysia (pp. 5-6).
- [5] Ding, G.K., 2008. Sustainable construction—The role of environmental assessment tools. *Journal of environmental management*, 86(3), pp.451-464.
- [6] Spence, R. and Mulligan, H., 1995. Sustainable development and the construction industry. *Habitat international*, 19(3), pp.279-292.
- [7] Ofori, G., 1998. Sustainable construction: principles and a framework for attainment-comment. *Construction Management & Economics*, 16(2), pp.141-145.
- [8] Tan, Y., Shen, L. and Yao, H., 2011. Sustainable construction practice and contractors' competitiveness: A preliminary study. *Habitat International*, 35(2), pp.225-230.
- [9] Hwang, B.G. and Tan, J.S., 2012. Green building project management: obstacles and solutions for sustainable development. *Sustainable Development*, 20(5), pp.335-349.
- [10] Ofori, G., 2000a. Challenges of construction industries in developing countries: Lessons from various countries. In *2nd International Conference on Construction in Developing Countries: Challenges Facing the Construction Industry in Developing Countries*, Gaborone, November (pp. 15-17).
- [11] Hueting, R., 1996. Three persistent myths in the environmental debate. *Ecological Economics*, 18(2), pp.81-88.
- [12] Leal Filho, W., 2000. Dealing with misconceptions on the concept of sustainability. *International journal of sustainability in higher education*, 1(1), pp.9-19.
- [13] Rogers, S., 2016. 5 Myths About Sustainability. Princeton University Press Blog [online]. New Jersey, USA. Available from: <http://blog.press.princeton.edu/2016/04/22/5-myths-about-sustainability/> [Accessed on 4th September 2016]
- [14] Lemonick, M.D., 2009. Top 10 myths about sustainability. *Scientific American*, 19, pp.40-45.
- [15] Oo, B.L. and Lim, B.T., 2011. A review of Singapore contractors' attitudes to environmental sustainability. *Architectural Science Review*, 54(4), pp.335-343.
- [16] Aragon-Correa, J.A. and Rubio-Lopez, E.A., 2007. Proactive corporate environmental strategies: myths and misunderstandings. *Long Range Planning*, 40(3), pp.357-381.
- [17] Rafindadi, A.D.U., Mikić, M., Kovačić, I. and Cekić, Z., 2014. Global Perception of Sustainable Construction Project Risks. *Procedia-Social and Behavioral Sciences*, 119, pp.456-465.
- [18] Shen, L.Y., Tam, V.W., Tam, L. and Ji, Y.B., 2010. Project feasibility study: the key to successful implementation of sustainable and socially responsible construction management practice. *Journal of Cleaner Production*, 18(3), pp.254-259.
- [19] Williams, K. and Dair, C., 2007. What is stopping sustainable building in England? Barriers experienced by stakeholders in delivering sustainable developments. *SUSTAINABLE DEVELOPMENT-BRADFORD*, 15(3), p.135.
- [20] Gautheir, T.D., 2001. Detecting trends using Spearman's rank correlation coefficient. *Environmental forensics*, 2(4), pp.359-362.
- [21] Baker, J.A. (2014) Tree Planting Day in Singapore: 5 things about the 51-year-old tradition, *The Straits Times*, November 13th.
- [22] Zhou, L. and Lowe, D.J., 2003, September. Economic challenges of sustainable construction. In *Proceedings of RICS COBRA Foundation Construction and Building Research Conference* (pp. 1-2).