

GREEN BUILDINGS AND SUSTAINABLE CONSTRUCTION IN THE UNITED ARAB EMIRATES

Mohamed Salama¹ and A R Hana

School of Management and Languages, Heriot Watt University, Edinburgh, EH14 4AS, UK

Sustainable development is a relatively new trend within the construction industry in UAE whereby organizations seek economic development approaches that benefit the local environment and improve the quality of life. This paper aims at exploring the level of awareness of sustainable construction in the UAE meanwhile identifying the main challenges facing the implementation of the green building notion. In a forward looking approach, the paper attempts to provide some recommendations that should facilitate and enhance the implementation of green building in UAE. A questionnaire was distributed to a random sample of 120 practitioners representing clients, consultants, project managers, contractors and suppliers. A total of 68 practitioners completed the survey. The key findings of the statistical analysis indicated that the construction industry in UAE is witnessing a growing awareness of sustainability, which is leading to a notable development in the green construction culture. The results suggested that there are different opinions and perplexity on some of the main issues related to green buildings, primarily cost. Also, despite the growing awareness, the study suggested that the green building concept still needs further enhancement across the various stakeholder groups whereby a change towards the green culture will be necessary to reduce carbon emissions and encourage best practices, industry wide. The study recommended the need for a federal legislation to be enforced by the UAE government to ensure the implementation of green buildings by the construction industry.

Keywords: sustainability, green building, United Arab Emirates.

INTRODUCTION

The UN Summit on Environment and Development in 1972, ‘Agenda 21’ followed by the closing document of the UN ‘Earth Summit’ in 1992 in Rio de Janeiro and many other international and national meetings and conferences indicated the growing concern about protecting the environment for the future generations and hence introducing sustainable development concept. The Kyoto Protocol which was initially adopted on 11 December 1997 in Japan and entered into force on 16 February 2005 addressing the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. As of November 2009, 187 states have signed and ratified the protocol including the United Arab Emirates which has sent its ratification on 26 January 2005 (Al Marashi 2006). In 2005, the Environment Agency – Abu Dhabi (EAD) was nominated as the United Arab Emirates Designated

¹ M.a.salama@hw.ac.uk

National Authority (DNA) for the Clean Development Mechanism (CDM). The CDM that is part of the Kyoto Protocol encourages companies in developing countries to reduce their greenhouse gas – mainly Carbon Dioxide – emissions by offering them a tradable Certified Emission Reduction (CER) or ‘carbon credit’ against every ton of carbon dioxide equivalent reduced (EAD 2008)

Following the same strategic direction, the construction industry in the UAE has recently started setting the stepping stones towards sustainable development. The fairly young industry that has witnessed a remarkable boom in the last two decades is characterized by being heavily dependent on expatriates who come from various backgrounds, experiences and cultures. It is quite common to find that the stakeholders within the same project have a significant variation in culture and meanwhile working within the cultural context of the UAE which amongst other factors affected the performance and also the demand for different types of building (Salama *et al.* 2009).

AIMS AND OBJECTIVES

This study aims at reviewing and investigating the concept of sustainable development in the context of the construction industry in UAE. The study focused on two main objectives:

1. Investigating the level of awareness of the green building concept amongst the various categories within the key stakeholders in the construction industry in UAE.
2. Identifying the main challenges facing sustainable development as perceived by the key stakeholders in the construction industry in UAE.

CONTEXT AND RATIONALE

Reviewing the literature, it was clear that a number of researchers addressed various issues in the context of sustainability and green building. However, it was resolved that still there was a need for laying the foundation in the specific context of the UAE construction industry before embarking on selecting the appropriate and relevant findings of previous research to guide and inform the implementation of sustainable construction in UAE. Hence the rationale in conducting this study was to identify the coordinates of the status quo of the green building initiative; mainly the level of awareness and the key challenges, in the context of the construction industry in the UAE.

SUSTAINABLE DEVELOPMENT IN UAE

Sustainable Development (SD) is a very important concept for the UAE, whereby the heavy reliance on natural gas and the increasing demand for air-conditioning and desalination have made the UAE one of the biggest carbon emitters on a per capita basis.

Hence, it is vitally important to reduce energy consumption and CO₂ emissions from buildings (Wilen 2008).

The construction industry is a major contributor to the UAE’s Gross Domestic Product (GDP) but it is considered one of the prime resource-demanding sectors. Therefore, growing cities such as Dubai and Abu Dhabi need to plan along sustainable lines in order to reduce the negative environmental impacts and the natural resource depletion.

The Emirates Environmental Group (EEG), is a leading non-government organization

(NGO) based in Dubai, established in 1991, and has emerged as one of the most active civil society NGOs in the United Arab Emirates. EEG's vision is to facilitate a green and sustainable UAE. EEG's operations are targeted at building effective outreach among key stakeholders including government, businesses, communities, and civil society groups. EEG was the main driver to form a green building council in the UAE seeking to establish environmental quality standards and transparent rating systems. In 2004, EEG launched the multi-stakeholder Corporate Social Responsibility (CSR) Network in the UAE, bringing together the heads and hands of urban economic development in a single, structured, composite body (Al Marashi 2006).

EEG has been accredited by the Governing Council of the United Nations Environment Program (UNEP), and by the United Nations Convention to Combat Desertification. EEG was the first environmental NGO in the world to earn the prestigious ISO 14001 accreditation for its environmental management systems (Al Marashi 2006).

The Emirates Green Building Council (EGBC) was established in July 2006 and became a member of the World Green Building Council in September 2006 thus making the UAE the 8th country in the world to establish such a council. The aim of the EGBC was to endorse the green building principles and practices to achieve high performance buildings that utilize environmentally friendly technologies, critical for protecting the environment and ensuring sustainability in the UAE. The Emirates Green Building Council is an active platform for discussion and co-operation among professionals from various segments of the construction industry. The council organized work-shops which have been attended by 600–700 professionals since 2007 (Wilén, 2008). Also, EGBC has developed a green building rating system for the United Arab Emirates. Three existing rating systems were tested: LEED, Green Star and BREEAM. EGBC was minded to apply LEED (Leadership in Energy and Environmental Design) as it has some flexibility. Yet, it was regarded as the basis for the new system that required some modifications. For example in water usage UAE moved from a 5 point system to a 12 point system, as water issues are very important in the country. The rating system was set to embrace the local conditions and members of EGBC worked together towards developing a system that can be applied to buildings constructed in the UAE.

LITERATURE REVIEW

Following the Brundtland announcement (Report of the World Commission on Environment and Development 1987), a number of academics and policy makers investigated the core principles of sustainable development. Khalfan (2002) highlighted that sustainable construction is generally used to describe the application of sustainable development to the construction industry.

Historically, many academics interested in sustainable development in the late eighties and early nineties approached the subject from an economics background attempting to price the environment through a framework of fiscal controls and incentives (see Dresner 2002 for a comprehensive discussion). This school argued that the best way to protect the natural environment was to assign it an economic value based on people's willingness to pay. The aim was to internalize all the external costs to the economy in terms of pollution, resource depletion and human health.

In seeking to define sustainable construction, many sources (UNEP Industry and Environment 2003, Carter and Fortune 2007 and others) supported the concept of

sustainable construction as an approach to building which promotes the attainment of goals associated with the triple bottom line:

- Economic sustainability – increasing profitability by making more efficient use of resources, including labour, materials, water and energy.
- Environmental sustainability – preventing harmful and potentially irreversible effects on the environment by careful use of natural resources, minimizing waste, protecting and where possible enhancing the environment.
- Social sustainability – responding to the needs of the people at whatever stage of involvement in the construction process (from commissioning to demolition), providing high customer satisfaction and working closely with clients, suppliers, employees and local communities (Department of Trade and Industry 2002).

Vanegas *et al.* (1996) have drawn attention to this expanded set of belief systems for the construction industry, which was further developed by Huovila and Koskela (1998) A new paradigm for a sustainable construction industry has incorporated these beliefs in both a model of sustainable construction, and a set of technological puzzle solutions. Along the same path, Crowther (2006) presented a model of a new technological paradigm for sustainable construction to guide the implementation of sustainable development with emphasis on the regional contextual view. Adejunti *et al.* (2003) presented a systemic model of the concept, which investigated the interrelationship between the natural, economic and social systems and the importance of each subsystem to the complex suprasystem. They also emphasized the fundamental doctrine of sustainability that the environmental system is pre-conditional to social and economic systems

Keeping and Shiers (1996) discussed the benefits of green building in the refurbishment of commercial property leading to lower energy costs, lower maintenance costs healthier environment that reduces absenteeism. Kibert (2008) described the high-performance green building delivery system, which is a rapidly emerging building delivery system that satisfies the owner while addressing sustainability considerations of economical, environmental and social impact from design stage throughout the building's life cycle. Also, Paumgarten (2003) concluded that the high-performance green building is changing the direction of the construction business towards a healthier environment and a cost effective approach on the longer term basis.

Panagiotakopoulos and Jowitt (2004) suggested that the construction industry should have a sustainability policy in place leading to the balanced consideration of economic, social and environmental aspects in making business decisions. Furthermore, sustainability policy should inform companies seeking to build a hierarchy of performance objectives and possible targets. Carter and Fortune (2007) have highlighted that a sustainable development policy that addressed environment, economy and society, the triple bottom line, in equal measure, was a new funding requirement for social housing projects in the UK.

The Turner Construction Company Green Building Market Barometer survey conducted by Bayer in 2008 focused mainly on executives involved with commercial real estate such as office, retail, and industrial facilities. It surveyed 754 executives on Green building issues in the USA over the period August 12 to September 14, 2008. The executives surveyed represented a broad range of organizations involved with facilities including developers (37%), owners of rental buildings (31%), brokers and

other firms providing real estate services (27%), architectural, engineering and construction firms (22%), and corporate owner-occupants and tenants (10%). The survey asked the respondents about their views of Green buildings with emphasis on the following areas: Benefits of Green buildings to those who own or occupy them; Operating costs; Construction costs; Obstacles to Green construction and the role of the LEED Green Building Rating System. The survey showed that there was a broad consensus among the real estate executives that Green buildings enjoy lower operating costs and improved financial performance, while providing an environment that fosters healthier, more productive workers. Nevertheless, a perception of higher construction costs is posing an important obstacle to additional Green construction. Although 87% of the executives believed that green buildings cost more to construct, around 73% stated that these higher costs would be paid back through lower operating costs with a median estimated payback period of seven years. Also one of the important findings of this survey was that 75% of the executives said that the recent developments in the credit markets might help companies seeking to implement green building concept.

DATA COLLECTION AND ANALYSIS

A survey utilizing a questionnaire distributed to a random sample of 120 practitioners covering the 5 main categories namely; the client; the consultant; the project manager; the consultant and the suppliers. A total of 68 responses were received i.e. nearly 57% response rate. The questionnaire comprised three main sections. The first section sought information about the respondent's profile. The second section included questions primarily addressing the awareness of the sample about the general and higher level concepts and green building updates in the context of the UAE construction industry as shown in Table 1. In the third section, the respondents were asked to rank 9 key challenges identified from the literature on a scale from 1 to 4 where 1 = not applicable; 1 = low importance; 2= medium and 3= high importance as shown in Table 3.

The data collected indicated that the respondents' distribution comprised 7 clients; 36 consultants; 4 project managers; 9 contractors and 12 suppliers where 60% of the respondents had a bachelor degree and 31% had a post graduate degree. The respondents represented companies with various sizes; 54% of the companies had more than 200 employees; 7% had 151-200 employees; 10% had 101-150 employees; 15% had 50-100 employees and 13% had less than 50 employees. A total 60% of the respondents had over 20 years of experience in the construction industry; 19% had 15-20 years of experience; 19% had 10-14 years of experience and 18% had 5-9 years of experience. Almost 60% of the respondents claimed that they were aware of the green building concept while 28% mentioned that they heard of it and only 3% stated that they were not aware of the green building concept. The responses indicated that 40% of the surveyed sample worked for companies that were never involved in green building projects; 34% were involved in 1-3 projects; 15% were involved in 4-6 projects; 6% were involved in 7-10 projects and 6% were involved in more than 10 projects. Hence, it might be reasonable to assume that the sample provided a reasonable representation of the population reflecting on the key variables, namely; the 5 main categories of practitioners; qualification; experience; company size and involvement in green building projects.

The data collected from section 2 indicated a blurred awareness of the suitability concept. Despite that 70% reflected reasonable awareness of the three dimensions of

the sustainable construction concept in response to Q3, only 13% mentioned that they were aware of EEG in response to Q1 and 40% stated that they were aware of the EGBC in response to Q2 in Table 1. The statistical analysis of the responses provided to Q4-Q6 using the mean and the standard deviation indicated a general tendency towards the agree category, however, the standard deviation in Q4 and Q5 particularly amongst the consultants, project managers and suppliers (0.97 – 1.5) as shown in Table 2 suggested a considerable variation, i.e. overall, there was no clear understanding of the green building concept across the various categories. The data collected from section 3 in the questionnaire was analysed using the relative importance index (RII) calculated using the following formula: $RII = \sum W / (A * N)$ Where W is the weight provided by each respondent and it is ranging from 1 to 4; A = 4 (which is fixed for all calculations and represents the highest possible weight), and N is the total number of respondents. The results were listed in Table 3.

Table 1: Extract from the survey questionnaire: section 2 on awareness

Q 1 – EEG – Are you aware of the Dubai-based Emirates Environmental Group (EEG),

- (1) No (2) Heard of it (3) Yes, I know it well

Q 2 – EGBC – Are you aware of the Emirates Green Building Council (EGBC),

- (1)No (2) Heard of it (3) Yes, I know it well

Q 3- SC Concept – Sustainable Construction (SC) approach to building promotes the attainment of goals associated with:

- 1- Environmental sustainability 2-Economic Sustainability 3- Social Sustainability 4- All three

Q 4 – Environmental Performance – Every project is an opportunity to improve the Environmental performance on sites, during its use and afterwards, when demolition or rehabilitation becomes necessary.

- (1) (2) (3) (4) (5)
- Strongly Disagree Disagree Not Decided Agree Strongly Agree

Q 5 – Traditional Construction Performance – Traditional construction approaches adopted within the building industry in UAE is creating societal and environmental problems.

- (1) (2) (3) (4) (5)
- Strongly Disagree Disagree Not Decided Agree Strongly Agree

Q 6 – SD Contribution – Sustainable Development (SD) is a very important concept and principle for the UAE,

- (1) (2) (3) (4) (5)
- Strongly Disagree Disagree Not Decided Agree Strongly Agree
-

The lack of awareness of the benefits emerged as the most significant challenge, followed by the higher construction cost and in the third rank came the short term budget horizon. On the one hand the results indicated the emphasis on the economic dimension which could be justified in light of the findings of previous studies. On the other hand a significant majority of 78% identified the increased operating costs factor as a challenge in contradiction to the basic concept of sustainability. Also, 78% were concerned about the difficulty in quantifying the benefits of green buildings and regarded this challenging factor as of medium – high impact. This finding when coupled with the three factors ranking 1-3 and meanwhile considering the confused view about the operating costs, all put together would suggest the lack of awareness of

the life cycle costing concept and subsequently the relevant tools and techniques essential to implementing the green building concept.

On another dimension, there was almost a common consensus that the lack of federal policy is a significant challenge facing the implementation of green building. It might be reasonable to assume that the establishment of an effective federal policy can act as the driving force towards implementing the green building concept. Hence, key stakeholders would more than likely be seeking to develop the relevant skills and essential mechanisms in this pursuit.

CONCLUSIONS

There was clear evidence based on the secondary data collected about the sustainable development in the UAE that there is a growing awareness and moreover a notable interest in the green building initiative. Both the Emirates Environmental Group (EEG) and the Emirates Green Building Council (EGBC) are actively leading and guiding the construction industry in this shift towards green building. Also, the significant emphasis on the economic dimension was aligned with the findings of previous studies. However, the findings of the analysis of the primary data indicated that the green initiative in the UAE might still be in the infant stage. The results indicated the inconsistency of the responses which reflected a blurred awareness of the key concepts of green building.

Table 2: Level of awareness within each category

Category	Mean SD	Factors		
		Q4 Environmental Performance	Q5 Traditional Construction Performance	Q6 SD Contribution
Clients	Mean	4.29	3.86	4.57
	SD	0.49	0.69	0.53
Project Mgrs	Mean	4.50	3.25	4.50
	SD	0.58	1.50	0.58
Consultants	Mean	4.08	3.86	4.44
	SD	0.97	1.07	0.65
Contractors	Mean	3.44	4.22	4.56
	SD	1.24	0.44	0.53
Suppliers	Mean	4.00	3.92	4.67
	SD	1.04	0.79	0.49

The study concluded that the lack of skills illustrated by confused view about the operating costs besides the relatively high ranks awarded to the factors reflecting on the benefit realization and quantification as being the key challenges should give rise to the need for effective skills development programmes to complement the efforts of EEG and the awareness campaigns conducted by EGBC. The skills enhancement programmes seeking realistic meanwhile reasonably accurate benefit realization and quantification should typically embrace the life cycle costing approach and hence would require the departure from the current position inclined towards the short term planning. The findings suggested the need for an effective federal policy endorsed by a legislative framework to derive and drive the implementation of the green building initiative in the UAE amid the apparent cost sensitivity and the emphasis on the short term effects.

LIMITATIONS AND FURTHER DIRECTIONS

The sample size was skewed towards the consultants claimed to be the driving force towards the implementation of green building. However, the primary concern that consultants might enjoy better awareness of the green building concept did not seem to have distorted the findings of the study. Following the findings of this study, the next step would aim at investigating in further depth the way forward towards the effective implementation of the green building concept in the UAE having identified the coordinates of the current position.

Table 3: Challenges: frequency and relative importance index (RII) for all categories

Factor	Respondent Scoring (%)				RII	Rank
	4	3	2	1		
Lack of awareness of the benefits	62	22	16	0	0.86	1
Higher construction cost	49	41	10	0	0.85	2
Short-term budget horizons	46	40	14	0	0.83	3
Length of required payback period	32	46	19	3	0.77	4
Difficulty in quantifying benefits	31	47	22	0	0.77	5
Lack of clear federal policy	37	33	26	4	0.75	6
Documentation and Cost of certification	24	41	32	3	0.71	7
More complex construction	19	34	41	6	0.67	8
Increased operating costs	15	26	37	22	0.58	9

REFERENCES

- Adejunti, I, Price, A, Fleming, P and Kemp, P (2003) The application of systems thinking to the concept of sustainability. *In: Greenwood, D. J. (Ed.) 19th Annual ARCOM Conference, 3-5 September 2003, University of Brighton. Association of researchers in Construction Management, Vol. 1, 161-70.*
- Al Marashi, H (2006) Facing the Environmental Challenge: Encouraging Sustainable Urban Development in the United Arab Emirates. *Global Urban Development Magazine, Volume 2, Issue 1.*
- Brundtland, GH (1987) *Our common future: report of the World Commission on Environment and Development*, New York.
- Carter, K and Fortune, C (2007) Sustainable development policy perceptions and practice in the UK social housing sector. *Construction Management and Economics, 25*, 399-408.
- Crowther, P (2006) Sustaining a Subtropical Response. In *Proceedings Subtropical Cities 2006, Brisbane, Australia. http://eprints.qut.edu.au/5378/1/5378_1.pdf* [Accessed 8 March 2010]
- Dresner, S (2002) *The principle of sustainability*. London: Earthscan.
- Emirates Environmental Group (EEG) <http://www.eeg-uae.org/> [Accessed 2 March 2010]
- Emirates Group Building Council (EGBC). <http://www.thegreenhouse.ae/tgh/inside.aspx?v=1&nid=513&sec=interview> [Accessed 2 March 2010]
- Environment Agency – Abu Dhabi (2008) *Abu Dhabi Environment Strategy 2008-2012. http://www.ead.ae//tacsoft/filemanager/misc/ead_strategy_eng.pdf* [Accessed 5 March 2010]
- Huovila, P and Koskela, L (1998) Contribution of the Principles of Lean Construction to Meet the Challenges of Sustainable Development. Sixth international conference of the

- International Group for Lean Construction, Guarujá, Brazil, 13-15 August 1998.
<http://www.ce.berkeley.edu/~tommelein/IGLC-6/> [Accessed 3 March 2010]
- Keeping, M and Shiers, D (1996) The “green” refurbishment of commercial property.
Facilities, **14**(3/4), 15-19.
- Khalfan, M (2002) *Sustainable development and sustainable construction: a literature review for C-SanD*. Loughborough University.
- Kibert, Charles J (2008) *Sustainable construction: green building design and delivery*. 2nd ed.
 New Jersey: Wiley.
- Kyoto Protocol (1998) Available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf>
 [Accessed 10 May 2010]
- Panagiotakopoulos, P D and Jowitt, P W (2004) Representing and assessing sustainability in construction. In: Khosrowshahi, F. (Ed.) *20th Annual ARCOM Conference*, 1-3 September 2004, Heriot Watt University. Association of researchers in Construction Management, Vol. 2, 1305-11.
- Paumgarten, P (2003) The business case for high performance green buildings: Sustainability and its financial impact. *Journal of Facilities Management*, **2**(1), 26-34.
- Salama, M, and Habib, A P (2009) Investigating the causes of variation within the construction projects in UAE. In: Dainty, A R J (Ed) *Procs 25th Annual ARCOM Conference*, 7-9 September 2009, Nottingham, UK, Association of Researchers in Construction Management, 949-57.
- Turner Construction Company (2008) Green Building Market Barometer.
<http://www.usgbc.org/ShowFile.aspx?DocumentID=5361> [Accessed 2 May 2010]
- United Nations, General Assembly, Aug (1987) Brundtland Report. Report of the World Commission on Environment and Development. <http://www.kpem.gr/Aiforia/brundtland.pdf> [Accessed 30 April 2010].
- US Green Building Council. LEED Rating System, Version 2.1. November 2002. http://www.usgbc.org/Docs/LEEDdocs/LEED_RS_v2-1.pdf [Accessed 15 April 2010]
- Vanegas, J A, DuBose, J R and Pearce, A R (1996) Sustainable Technologies for the Building Construction Industry. Proceedings of the Symposium on Design for the Global Environment, Atlanta, USA, November 2-4, 1996.
- Wilen, J (2008) United Arab Emirates: Sustainable building and green buildings.
<http://www.finpro.fi/NR/rdonlyres/1B5896B2-4663-4382-A0E4-FE65F0993DD0/9988/UAEsustainablebuildingandGreenBuildings1.pdf> [Accessed 15 March 2010].