

# IMPOSING GREEN BUILDING REGULATIONS IN DUBAI

Mohamed Salama<sup>1</sup> and Tamer AlSaber<sup>2</sup>

<sup>1</sup> School of Management & Languages, Heriot-Watt University, Dubai Academic City P.O. Box: 294345, DIAC, Dubai, UAE

<sup>2</sup> Project Management Department, P.O. Box: 111485, DIP, Dubai, UAE

In 2008, Dubai announced its plan aiming to introduce mandatory green building regulations for all new buildings starting 2014. So far, Dubai has only voluntary rating systems such as LEED and BREEAM. This research aims to investigate the anticipated benefits and implicated challenges from imposing the green building regulations on the construction industry in Dubai; primarily seeking to facilitate the planned move through effective recommendations on how to proactively manage the identified challenges. The literature review aimed to compare and contrast the implementation practices for the mandatory regulations versus the voluntary rating systems, and the implicated challenges from imposing the green building regulations in general, and specifically in Dubai. The study applied a stepwise methodology embracing an online survey utilising a questionnaire sent to 150 professionals in Dubai who are involved in regulating and implementing the green regulations. The second step comprised a set of interviews with experts to discuss the findings of the survey and suggest recommendations to address the identified challenges, proactively. A statistical analysis was applied to the survey dataset whereas a content analysis was applied to the interviews dataset. The key findings of the study indicated that experts within the construction industry are still sceptical about green practices due to the perceived higher costs. This reflected the lack of awareness besides the minimal involvement of private sector in setting the green building regulations, amongst other challenges. Many Professional preferred the voluntary systems due to the perceived rigidity of the intended regulations and the reviewers from the regulatory bodies. The study concluded that the government, in order to can enhance the implementation of the green building regulations in Dubai, needs to introduce effective measures to promote the green building initiative to all categories of stakeholders; both the supply side and the demand side meanwhile increasing the involvement of the private sector in the consultation process leading to the release of the new regulations.

Keywords: Dubai, green building, regulation, sustainability

## INTRODUCTION

Over the period 2005 till 2009, the consumption of electricity in the Gulf Cooperation Council (GCC) countries, witnessed a significant upward trend with a fast rate of 12.5% due to the rapid development in construction activities (Landais, 2009). Gas was not enough to substitute the reliance on Oil. Lands in the GCC countries are basking in solar energy equivalent to 500–600 W/m<sup>2</sup> per year which is equivalent to 1.5 million barrels of crude Oil This triggered the exploration of renewable solutions

---

<sup>1</sup> M.A.Salama@hw.ac.uk

(Alnaser & Alnaser, 2010). Dubai was the first to initiate a serious move toward sustainability with clear regulations based on LEED (Leadership in Energy and Environmental Design) & BREEAM (Building Research Establishment Environmental Assessment Method) voluntary systems but the implementation was significantly limited. In 2009, only six buildings were LEED accredited and 450 structures were still awaiting their accreditation (Landais, 2009).

Despite announced in 2008, the implementation of green building regulations was delayed until 2014. Starting 2013, the real estate market in Dubai has started to show a cautious upward trend. Amid this critical period of economic turbulence and the efforts towards recovery, the impact of imposing new regulations on the real estate market and the building industry in general remains unclear. This paper aims to investigate the impact of imposing the green building regulations on the construction industry in Dubai. Through the critical review of current practises and the benefits as well as the challenges of voluntary system versus the imposed regulations, this study aims to suggest recommendations for the effective implementation of the green building regulations in Dubai construction market.

## **LITERATURE REVIEW**

“Green strategy” is defined as “the approach that developers adopt to improve and gain sustainable competitive advantage by contributing to environment protection, ecological responsiveness and social responsibility” (Zhang, 2010). To stay competitive in the new market, project stakeholders realize the need to adopt new skills, experience and knowledge base. Generally, the lack of clear regulations was recorded as a challenge facing the implementation of green systems in different countries such as in Malaysia (Papargyropoulou, 2012). Stakeholders, particularly project developers, can enhance their competitive positions when adopting the right green strategies. However, the significantly high level of governments’ involvement in the Middle East; 62%, compared to 45% in Africa, 43% in Latin America and 20% in Europe (Iwaro & Mwasha, 2010) raises the question whether this extensive reliance on government might limit the private sector role and can therefore result in less coordination and development. On the one hand, the knowledge about the green building systems is still immature and needs yet to develop and evolve (Korkmaz et. al., 2010). On the other hand, there is lack of experience amongst project stakeholders, particularly the regulatory personnel; compared to the advanced techniques in the market (Beerepoot, 2007). This can be an obstacle to the efficient implementation of the imposed regulations.

Regarding the obstacles facing the green building initiative, project designers identified the lack of education and awareness as the most significant factor that follows the perceived higher initial investments (Chan et. al., 2009). In addition, occupants may lack the necessary experience to utilize and operate the green features. The counter argument builds on Total Life Cycle Costing which supports the view that the savings in utilities and maintenance bills can reach up to 25.6% over 20 years against the premium cost of 7.5% (Kansal & Kadambari, 2010). The project type and size are important factors which support the previous argument. When implementing LEED standards, prestigious projects were found to be less costly than low quality buildings (McAuley, 2008). Mandatory government regulations should embrace incentives for green projects that can reduce the initial cost difference in addition to the tariff charges that can impact the long term savings. The participation of private sector in issuing the rules is vital. “Regulatory process that emphasis stakeholder’s

participation, transparency and predictability will be more credible than one without these features” (Berg, 2000). Collaboration models may not be very common in many countries such as the UAE and the gulf region in general (Vidican et. al., 2012) despite its importance to achieve the government strategy and long term plans. Collaboration through formal partnering agreements between stakeholders includes training programs to share lessons learned and overcome the lack of experience (Morrison-Saunders & Bailey, 2009). Partnering may also include the appointment of third party reviewers with adequate resources to overcome the lack of reviewers’ experience. Injecting voluntary approaches such as third party certification and incentive programs can overcome mandatory challenges by achieving best compromise technically, economically and managerially (Rizzi et. al., 2011). Mixing both voluntary and mandatory systems can help to overcome the challenges for the energy efficiency program implementation as proposed by Peterman et. al., (2012). Injecting voluntary approaches can be done through offering incentives (as shown in figure1) and implementing Cap-and-Trade strategies. Industries may trade their surplus for future reduced prices.

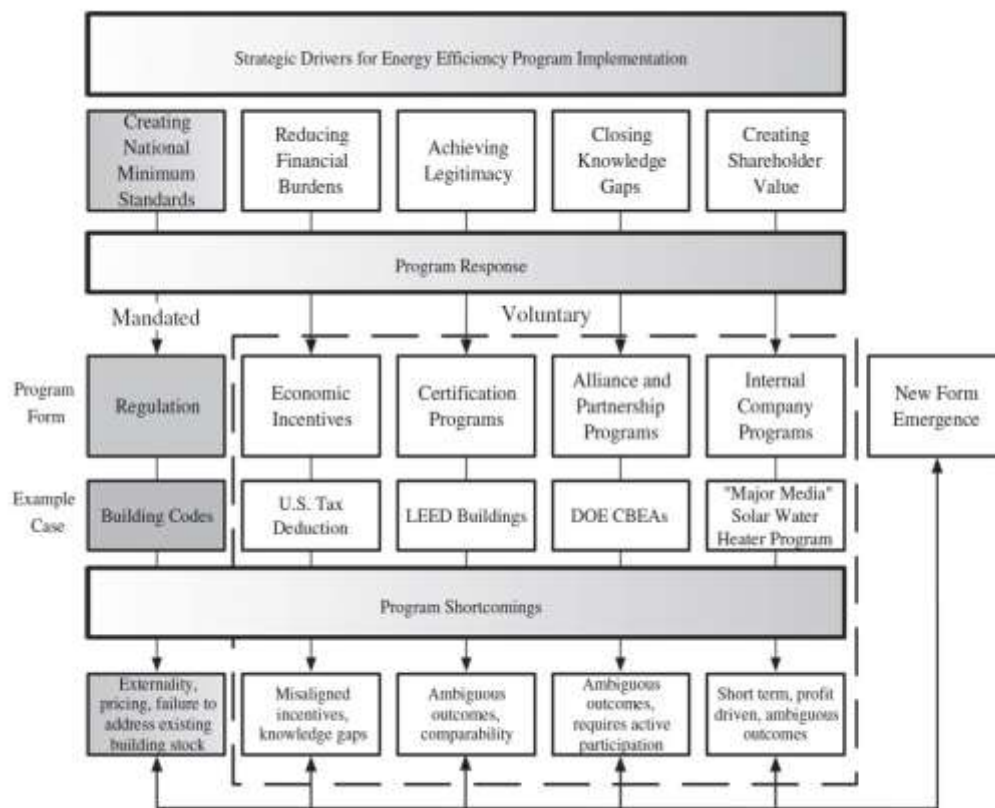


Figure1: A roadmap for voluntary and mandated programs for building energy efficiency. Source: Peterman et. al. (2012)

### Dubai Green Building Regulations

In 2008, the implementation of the green building regulations project was planned to be in phases in coordination of WSP consultant, Dubai Municipality and DEWA (Roberts, 2010). However, the first set of regulations planned to be issued in January 2009 has been delayed by more than four months. There has been a cautious attitude due to the anticipated increase in cost; about 5% compared to the traditional building approach, despite the identified long term savings ranging from 30% to 40% (Remo-

Listana, 2010). Other reasons could be the shortage in renewable energy suppliers in Dubai which are due to the relatively low water and electricity tariffs (Vidican et. al., 2012). In 2011, the decision to enforce the green codes was put on hold until 2014 to avoid disruptions within the still-to-recover construction industry amid the prevalent aftermath of the financial crisis (Tedorova, 2011). In 2012, it was announced that green building regulations which are currently applied to governmental buildings shall be enforced industry wide by 2014. Regulations aim to help existing buildings improve the current electricity and water consumption (CW Staff, 2012).

Comparing the proposed green buildings regulations in Dubai to the LEED system available in UAE the key differences are highlighted in Table 1. On the one hand, LEED is more comprehensive in terms of explaining the measures and providing guidelines for innovation. On the other hand, Dubai regulations portray tailoring the measures to suit Dubai needs in landscaping local types and glazing orientations. In addition, LEED provides standards for verification after occupancy such as IEQ Credit 7.2 for Thermal Comfort whereby buildings must be verified under thermal comfort survey within 6 to 18 months after occupancy. If the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort, corrective actions must be developed. LEED also provides a reference for minimum energy cost savings percentage for each point in new and existing buildings. There is no sign of such a structured approach to verify buildings after occupancy in the new regulations.

## **METHODOLOGY**

This study was conducted over two stages; a survey of a sample of stakeholders followed by a set of interviews with experts. At the outset, the key benefits and main challenges were identified from the literature and secondary sources. Both sets were utilised to construct a questionnaire that was distributed to a random sample of 150 professional in the construction industry in Dubai. In total, 57 responses were collected with a response rate of 38% comprising different stakeholders' groups of consultants, contractors, DEWA, Dubai Municipality, Project Developer, Suppliers and others. The aim of the survey was to verify and furthermore rank the identified benefits and challenges in the context of Dubai construction market. In the following step, the findings of the survey were utilised to conduct semi-structured interviews with experts in green buildings and sustainability in Dubai. A purposive sample of 20 experts who are currently involved in the green building initiative in Dubai was contacted but only 8 interviews were conducted. The interviews primarily addressed the second objective of the study; to suggest effective measures to enhance the implementation of the intended regulations reflecting on the current practice within the public sector meanwhile providing in-depth expert opinion on the findings of the survey.

### **Anticipated Benefits and Identified Challenges**

The data collected from the Survey Monkey website were analyzed using the Statistical Package for the Social Sciences (SPSS version19). A ten point likert scale was used with a neutral middle point of 5. The score 0 represents strongly disagree, 5 neither disagree nor agree and 10 strongly agree. The results were classified into two main categories; the regulations' perceived benefits and the perceived challenges. The relative importance of the factors among the attributes as perceived by stakeholders was tested using mean scoring and Kendall's coefficient of concordance. The latter was used to understand respondents' extent of the agreement with the factors identified in the literature (Lam et.al., 2010 and Ahsan & Gunawan, 2010).

The data collection resulted in 57 responses; the majority of respondents were between the ages of 30 to 49 with an average experience of 10 green building projects. In total, 43 respondents had previous experience in green building out of which 29 have been involved in less than 5 projects. The maximum responses were received from contractors with 22 responses followed by the consultants, developers, regulators and suppliers.

*Table 1: A glimpse Comparison between LEED and Dubai regulations*

	Green Building Regulation	LEED
Applicability	All buildings in Dubai (new, existing, refurbished..etc) but not temporary.	All buildings with regional solutions, while recognizing local realities.
Innovation	Encourage Innovation and alternative methods	Innovation in design, Exemplary Performance and Pilot Credit up to 5 points credit
Parking	Building with more than 20 parking, 5% of total cars to be designated parking for low emitting fuel efficient and carpool vehicles	5% of the total vehicle parking for low-emitting and fuel-efficient vehicles, 3% for alternative-fuel fueling stations , 3% for full-time equivalent (FTE) occupants
Landscaping	25% of total planted area should be adapted to Dubai climate	No specific reference in LEED
Exterior lights	shielded with automatic controls. prevent the lighting of the night sky. Wall washing lights must spill no more than 10% of the lighting past the building façade.	Exterior lighting power densities shall not exceed those specified in ANSI/ASHRAE/IESNA with controls.. maximum initial illuminance value no greater than 0.10 - 0.20 horizontal and vertical foot-candles
Roof	75% of the roof area. minimum SRI * $\geq 29$ for steep sloped roofs and $\geq 78$ for flow and low sloped roofs. Unless 30% of roof is vegetated	75% of the roof surface. Low-sloped roof minimum SRI 78 Steep-sloped roof minimum SRI 29. Unless 50% of roof is vegetated or meets specific criteria
Orientation of glazed façade	50% of glazed façade should be north oriented with 150 degree angle from east to north	provide connection to the outdoors via vision glazing between 30 inches and 90 inches above the finish floor for building occupants in 90% of all regularly occupied areas
Hardscape	50% of hardscape with minimum SRI 29	50% of the site hardscape materials with SRI of at least 29.
Thermal comfort	HVAC must be applicable for 95% of the year dry bulb temperature of 22.5 low to 25.5 high. Relative humidity 30% min to 60% max	(HVAC) systems and the building envelope to meet the requirements of SHRAE or ISO 7730
Acoustical control	follow approved document E 2003 UK	must comply with AHRAE or CEN Standards (part of indoor quality)
Envelop/energy performance	$U = 0.3 \text{ W/m}^2\text{k}$ for roof and $0.57 \text{ W/m}^2\text{k}$ for external wall. $U$ for glazing vary between 1.9 to $2.1 \text{ W/m}^2\text{k}$ if less the 40% glazing. SC between 0.25 to 0.4 max if less the 40% glazing.	building envelope and systems to meet baseline requirements using Whole Building Energy Simulation, Prescriptive Compliance Path: ASHRAE
Timber	25% of used timber for temporary or permanently must be certified.	minimum of 50% must be certified in accordance with the Forest Stewardship Council's principles and criteria, for wood building components
Recycled content	5% of total materials in construction	10% or 20%, based on cost
Regional Materials	building materials available regionally must comprise at least five percent (5%) of the total volume of materials used in the construction of the building	Use in construction between 10% or 20%, based on cost, of the total materials value

The mean scores, as shown in Table 2, are presented in an ascending order for the anticipated benefits as well as the expected challenges upon implementing green building regulations. The average mean scores for benefits vary between 7.36 and 6.13 which indicated that respondents, in general, agree on the listed benefits of imposing building regulations in Dubai. The same was also confirmed by respondents in a direct question regarding their preferences for regulations against voluntary system. The results indicated that 71% were in favour of imposing regulations against 19% who preferred voluntary systems and 10% were neutral. For the challenges, the mean scores indicated that the lack of education followed by the lack of awareness and experience are the most significant challenge as perceived by respondents. This was also observed when respondents were requested to evaluate their understanding of the new regulations. Almost 29% were not aware of the availability of new green building regulations and only 10% indicated clear understanding of the intended changes.

*Table 2: Mean Scores for Identified Benefits and Challenges*

	Benefits	Mean	Standard Deviation	Challenges	Mean	Standard Deviation
1	Sustain Profitability	7.65	2.002	Lack of Education	8.85	1.633
2	Alternative resources	7.57	2.325	Lack of stakeholder Awareness	7.15	2.129
3	Support government and investment plans	7.55	2.120	Balance the needs	7.00	2.106
4	Enhance competitive advantage	7.39	2.103	Premium Cost of green	7.00	2.211
5	Minimize risk	7.37	2.280	Economical conditions	6.77	2.460
6	Improve quality	7.36	2.107	speed of Implementation	6.30	2.216
7	Assure Compliances	6.94	2.809	Low Tariff of utilities	6.00	2.708
8				Project Delays	5.91	2.888
9				Extensive reliance on government	5.89	2.730
10				Extensive reliance on government	5.18	3.099
11				Incorporate Innovation	4.98	3.385
12				Lack of Experience	4.98	2.595

Correlation analysis carried out among different variables indicated significant correlation between experience and understanding the regulations which means that the more stakeholders are experienced in green building, the more they understand the regulation (Zikmund et. al. 2011, p. 510). On the other hand, correlation analysis showed that there was no significant correlation between each of the variables; age; experience and stakeholders' understanding, and the anticipated challenges. A one way analysis of variance (ANOVA) has been carried out to understand the impact of stakeholders' group on the results. Leven's test for homogeneity of variances in scores among the groups was conducted and the results confirmed that there were no

significant differences among the stakeholders' groups regarding the regulations' perceived benefits. However, in the case of the challenges, ANOVA indicated some variations among stakeholder groups particularly regarding the two factors; low tariffs of utilities and speed of implementation. The statistical analysis could not shed more light on the details and causes of this variation. Hence, the interviews aimed to further investigate and clarify this finding.

Out of the 20 experts sampled for semi-structured interviews, only 8 were available and agreed to participate. The findings indicated a general belief among interviewees that regulations are important to implement the green standards. The majority indicated that imposing green building regulations is a good step for Dubai and the construction market. Some experts expressed the benefits as "will cover the demand for electricity and water in the future" while others indicated that the new regulations will facilitate creating "more job opportunities". Comparing the intended regulations to the voluntary systems such as LEED, experts stated that the former has the advantage of being tailored to the specific needs of Dubai. Regardless the category of experts, most of the interviewees believed in the green building ability to sustain profitability. Consultants confirmed the long term cost savings whereas developers indicated "high aspirations for energy and water conservation". Some interviewees believed that suppliers need to work harder to gain competitive advantage in the market following the implementation of the new regulations.

Reflecting on the anticipated challenges, the lack of awareness and education were identified during the interviews as the main challenge. One of the interviewees stated that green building causes "unnecessary variation". The perceived higher cost was identified by almost all interviewees to be a barrier for implementing green building regulations. On the one hand, some interviewees indicated that the higher cost is due to the supply chain with a limited number of suppliers currently specialised in green building materials meanwhile there is an anticipated increase in green building materials prices following the imposition of the green building code. On the other hand, some interviewees justified the perceived higher cost due to the anticipated rise in the fees of consultants and contractors overheads in order to develop the needed competences and practices for the design and execution of the green buildings. Most of the interviewees identified the changes in the economy as a barrier to implementing the regulations. There was a general belief that the transformation into a green market might affect investment opportunities and that the market was not ready for this change. Experts indicated that the private sector role was limited in the development of green building regulations whereby a few experts and a limited number of construction companies were involved.

The identification of the anticipated benefits and expected challenges was achieved over two stages that embraced the analysis of the survey data then was further explained, confirmed and verified by experts in the Dubai construction market. In the third stage, the interviews aimed to investigate the way forward in order to smoothly implement the intended mandatory green building regulations starting 2014. In the following section, the findings of the interviews will be discussed leading to recommendations thought to facilitate the planned change.

### **Towards Effective Implementation of Building Regulations in Dubai**

Five key themes emerged through the interviews that need attention; 1) the current position on the learning curve; 2) the involvement of the private sector; 3) the mechanism for the evaluation and updating of the regulations; 4) including voluntary



regulations and finally 5) the impact on the market which includes three markets; the construction market, the market of building materials and the real estate market in Dubai.

The Dubai construction sector is still in the infant stage with regard to green building practices. Experts believe that there is urgent need for learning and developing skills in order to progress on the learning curve. On the other hand, some stakeholders have gained experiences from working in LEED and ISTEDAMA (Arabic term for sustainability) projects in Abu Dhabi. On the positive side, most of the interviewed consultants have LEED specialist or Sustainability department. Others would refer to a third party as required in some areas like Jebel Ali Free Zone Authority (JAFZA), in Dubai. Most of the interviewees think that education is most needed through degrees courses and workshops and that it will take time to adopt best practices and for people to gain experience.

Due to the perceived pitfalls of the suggested regulations that were highlighted in the comparison provided in Table 1 above, experts expressed their concern about the need to have an evaluation and updating mechanism to review the regulations, periodically, in order to reflect on the lessons learned, consider the changes in the market and ensure continuous improvement. Embracing voluntary systems such as LEED, will complement and further address the pitfalls of the suggested regulations and can provide an incentive and be a driver for innovation over and above the minimum mandatory hurdle set by the regulations.

The delay in the imposition of the regulations since it was first announced in 2008 was primarily due to the ambiguous impact it might have on the market amid the financial crisis which had detrimental consequences on the real estate market and subsequently the construction industry. So far, these concerns prevail despite the cautious upward trend that started to show in the real estate market in Dubai in the first quarter of 2013. The perceived higher initial investments coupled with the lack of awareness of the benefits of green buildings, particularly among consumers, fuels the fears of developers who are trying to recover from the significant losses incurred over the past few years. In addition, there was no clear evidence that the supply chain has started adaptive measures towards an efficient and competitive green building materials market.

## **RECOMMENDATIONS**

In order to facilitate the implementation of the green building regulations in Dubai by 2014, the local authorities need to address the identified concerns. In the following section, the suggested recommendations were derived from the findings of the survey and the interviews with experts meanwhile embracing the findings of previous research on green building in other countries.

Despite the current attempts to promote the green building initiative, those efforts are not clearly recognised by experts. Hence, there is a need for more intensive campaign that would reach out to a wider range of audience from the different categories of stakeholders; consultants, contractors, developers, suppliers and customers. This should be coupled with effective workshops tailored to the needs of the market and professionals in Dubai. In addition, regulators can enforce a minimum level of qualifications for professionals as a pre-requisite for trade licenses issued to contractors and consultants.

Providing incentives and trade-offs is imperative to drive the change toward green building. Trade-offs may include flexibility in allowable floor area, site coverage or height; resulting in more saleable area. Incentive schemes such as priority for loans, help obtaining environmental licenses and quality certificates can attract investors, builders and consumers. Regulators can test the new system within the public sector prior to the release of the intended regulations to the wider domain of the building industry.

The change towards green building needs to be coupled with a move towards a green culture and innovation. Both need an infrastructure that should be provided by the local authorities meanwhile involving the private sector and various categories of stakeholders. Establishing systems and regulations that embrace voluntary systems meanwhile reward green practices and innovation besides promoting the benefits to the general public will help to develop and foster the green building market. For example, LEED is offering grading incentives of innovative designs proposing new measures.

## **CONCLUSIONS**

The real estate market and subsequently the construction market in Dubai have started to show an upward trend during the first quarter of 2013. Meanwhile green building regulations will be mandatory starting 2014. In general, there is lack of awareness among stakeholders about the green building practice. The prevalent perception of the higher initial investment associated with green building and the ambiguity regarding the impact of this factor on the market is a key challenge. There are concerns about the impact of the intended regulations on the recovery of the market. In addition, the results indicated that the market will need time to adapt to the change. There is an urgent need for various categories of stakeholders to join forces in order to facilitate the move towards green building. Indeed, the government has a crucial role in regulating the market, not just by introducing regulations, but also through effective measures that should set the direction for market forces; mainly the demand and the supply. The demand is the driving force in the real estate market which in turn drives the construction market and the building materials market. The government has to promote the green building culture with emphasis on the direct benefits to the consumer meanwhile providing tangible incentives to create demand for green buildings. On the supply side, the government should enhance the learning and development among the supply chain by setting minimum qualifications as pre-requisite for trade licenses. Other measures include integrating a voluntary system as the basis for grading buildings as a differentiating factor to be rewarded. This will help the green building initiative to take off beyond the minimum hurdle set by the mandatory regulations. Developers, contractors and suppliers will be motivated to seek innovative solutions in pursuit of competitive advantage. Once the benefits of green buildings are appreciated by the customer, the demand will rise and the building materials market will start to enjoy economies of scale, thus pushing prices down.

## **REFERENCES**

- Ahsan, k. & Gunawan, I (2010) 'Analysis of cost and schedule performance of international development projects', *International Journal of Project Management*, Vol.28, Issue 1, January, Pages 68-78
- Alnaser, W & Alnaser, N. (2011), 'The status of renewable energy in the GCC countries', *Renewable and Sustainable Energy Reviews*, August, Pp. 3074-3098

- Beerepoot, M. & Beerepoot, N. (2007), 'Government regulation as an impetus for innovation: Evidence from energy performance regulation in the Dutch residential building sector', *Energy Policy*, October, p. 4812-4825.
- Berg, S. (2000), 'Developments in Best-Practice Regulation: Principles, Processes, and Performance', *The Electricity Journal*, 3 July, p.11-18.
- Chan E., Queena K. Qian, Q. , Lam, P. (2009) 'The market for green building in developed Asian cities—the perspectives of building designers' , *Energy Policy*, vol. 37, Issue 8, August, p. 3061-3070.
- CW Staff (2012), Green building to be enforced in Dubai from 2014 [online]. Available from: <http://www.constructionweekonline.com/article-16137-green-building-to-be-enforced-in-dubai-from-2014/> (Accessed 22 Jan 2013)
- DEWA website (2012), Do Good To Planet Earth [online]. Available from: <http://www.dewa.gov.ae/community/conservation/dogood/default.aspx> (Accessed 30 Aug 2012)
- Iwaro, J. & Mwashu, A. (2010), 'A review of building energy regulation and policy for energy conservation in developing countries', *Energy Policy*, vol.38, December, p. 7744-7755.
- Kansal, R. & Kadambari, G. (2010) 'Green Buildings: An Assessment of Life Cycle Cost', *IUP Journal of Infrastructure*, vol. 8, Dec, p50-57.
- Lam, P., Chan, E., Poon, C., Chau, C. & Chun, K. (2010) 'Factors affecting the implementation of green specifications in construction', *Journal of Environmental Management*, vol.91, January–February, p.654-661.
- Landais, E. (2007) 'Dubai to turn green in 2008', *gulfnews* [online], 24 Oct. Available from: <http://gulfnews.com/news/gulf/uae/environment/dubai-to-turn-green-in-2008-1.207817> (Accessed 20 Sep 2012)
- McAuley, T. (2008) 'Understanding Green Building Cost and Value', *AACE International Transactions*, p1-43.
- Morrison-Saunders, A. & Bailey, M. (2009) 'Appraising the role of relationships between regulators and consultants for effective EIA', *Environmental Impact Assessment Review*, vol.29, September, p.284-294.
- Papargyropoulou, E., Padfield, R. Harrison, O. & Preece C. (2012) 'The rise of sustainability services for the built environment in Malaysia', *Sustainable Cities and Society*, vol.5, December 2012, p.44-51.
- Peterman, A., Kourula, A. & Levitt, R. (2012) 'A roadmap for navigating voluntary and mandated programs for building energy efficiency', *Energy Policy*, vol.43, April, p.415-426.
- Remo-Listana, K. (2010) 'Green code for building utilities from April', *emirates247* [online] , 10 March. Available from: <http://staging.emirates247.com/2.277/construction/green-code-for-building-utilities-from-april-2010-03-10-1.67027> (Accessed 22 Jan 2013)
- Rizzi, F. Frey, M & Iraldo, F. (2011) 'Towards an integrated design of voluntary approaches and standardization processes: An analysis of issues and trends in the Italian regulation on ground coupled heat pumps', *Energy Conversion and Management*, vol.52, September, p.3120-3131.
- Roberts, J. (2010) 'Building for the local environment', *MEED: Middle East Economic Digest*, 16 July, p.35-37.
- Rowley, J. (2012) 'Conducting research interviews', *Management Research Review*, 35 (3/4).

- Tedorova, V. (2011), Green code on hold to boost building [online]. Available from: <http://www.thenational.ae/news/uae-news/green-code-on-hold-to-boost-building> (Accessed 05 Jan 2013)
- Vidican, G., McElvaney, L. Samulewicz, D. & Al-Saleh, Y. (2012), 'An empirical examination of the development of a solar innovation system in the United Arab Emirates', *Energy for Sustainable Development*, vol.16, June, p.1-8.
- Zhang, Y. (2010) 'Towards Better Regulatory Governance?', *Public Management Review*, vol. 12, Nov, p873-891.
- Zikmund, W, Babin, B., Carr, J. & Griffin, M. (2010) *Business Research Methodology*, p.61-559, Canada: Cengage Learning