

AN OVERVIEW OF SUSTAINABILITY IN SAUDI ARABIA

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ABSTRACT

The present demand for economically viable construction projects in the Saudi Public Sector is coupled with the need to maximise the efficient use of Saudi Arabian natural resources. The aim of this paper is to investigate sustainability in Saudi Arabia in terms of strategies, policies, barriers and enablers associated with its implementation and as perceived by key decision makers. It also endeavours to define sustainable construction principles as currently being applied in the country. The data used in this study were obtained through a review of related literature, reinforced with information distilled from interviews conducted with people working in or possessing significant experience of the Saudi Public Sector. The findings show that the Saudi government has made significant efforts towards protecting the environment by enacting a number of regulations and policies and by joining a number of global conventions over the past few years. However, the lack of consideration paid to sustainable construction principles during the conceptual phase of design has resulted undesirable consumption rates of materials, water and energy during the construction, operating and maintenance phases of projects. Moreover, there currently appears to be a lack of awareness, regulation, policies, information and leaderships with regard to implementation of sustainable construction. Several relevant principles for sustainable construction in terms of environmental, economic and social have been elaborated upon; and enablers that could accelerate its understanding and implementation in the country have been highlighted.

Keywords: environment, national strategies, Saudi Arabia, sustainability, sustainable construction

1. INTRODUCTION

There has recently been considerable concern regarding the degradation of the environment caused by depletion of natural resources, air pollution, global warming and the lack of consideration paid to the earth's ecosystem. The principles of sustainable construction have thus been widely adopted in a number of countries throughout the world. Sustainability issues are frequently categorized into three major types: economic, environmental and social. Sustainable development was defined by United Nations World Commission on Environment and Development as "development which meets the needs of the present generations without compromising the ability of the future generations to meet their own needs" (Brundtland, 1987). This definition is about realizing a balance between: economic growth and progress; and natural resource conservation and social equality promotion. Sustainable development is thus about minimising the negative impacts whilst improving the environment to ensure a better quality of life for the current and future

generations. It implies using renewable natural resources in a way which does not eradicate or degrade them. It also implies using non-renewable natural resources at a rate slow enough to ensure an orderly societal transition to new alternatives (Langston and Mackley, 1998). Over recent years, Saudi Arabia has experienced considerable economic growth due to strong oil prices and ongoing reforms in the country. This has been also spurred by major government construction activities and development of infrastructure and building projects including; schools, hospitals, accommodation, private construction, as well as rapidly expanding tourism sectors.

The present demand for economic buildings in the Saudi Public Sector needs to be coupled with the need to use the Saudi Arabian natural resources in an efficient manner. In addition, extreme economic development in the countries of the Arabian Peninsula has caused a significant imbalance of water resources and demand. Between 1980 and 1990, demand increased from 9.95m³ billion to 22.6m³ billion of water. If the current situation continues, water demand could reach 35.4m³ billion by 2010 (Abdulrazzak 1995). Moreover, the Saudi Government energy plan calls for the installation of 50,500 MW of additional generating capacity which requires an investment of \$117 billion in the next 20 years (Asharq Alawsat, 2003). Statistics relating to the Saudi population illustrate that 60 per cent of the population are under 25, which means there will be increasing demand for dwellings and infrastructure (Asharq Alawsat, 2003). It is inferred from these statistics that resources are being, and will be continued to be, used at an exceptionally high rate. If this situation continues, future generations may well run out of sufficient natural resources. Moreover, sustainable construction appears not to have been sufficiently considered in Saudi Arabia and there is a lack of awareness and knowledge amongst key decision makers in the Saudi Public Sector (Al-Yami and Price, 2006). In the light of the above, greater consideration needs to be given to sustainability by the Saudi Arabian construction industry whilst at the same time supporting the immediate economic, social and environmental needs of the country. The aim of this paper is to investigate sustainability in Saudi Arabia in terms of strategies, policies, barriers and enablers associated with its implementation and as perceived by key decision makers. It also endeavours to define sustainable construction principles as currently being applied in the country.

2. LITERATURE REVIEW IN SAUDI ARABIA

There is scarcity of literature addressing sustainable development in general and sustainable construction implementation in particular in Saudi Arabia. A few publications highlight environmental policies and their history in the country. Al-Gilani and Filor (1997) reviewed the Saudi government's attempts through policy documents which include the administrative structure and decision making process with regard to environment protection. In a later paper, they also propose improving the current national framework for environmental policies in Saudi Arabia (Al-Gilani and Filor, 1999). The suggested framework comprises four areas: political culture and the public role; environmental decision-making procedures; environmental policies and laws; and new institutional structure (ibid).

Thereafter, Alshuwaikhat and Aina (2004) suggested a framework for achieving sustainability principles in Saudi Arabia at the municipal level. They also proposed developing Strategic Environment Assessment (SEA) to start from the level of the

Ministerial Committee on the Environment (MCE) and the Preparatory Committee for the Ministerial Committee on the Environment (PCMCE). The second level of the framework covers the most important ministries, such as the Ministry of Economy and Planning (MoEP) and Ministry of Municipal and Rural Affairs (MoMRA). The framework at the ministry level should be sectoral except at MoEP and MoMRA where have a mandate for region planning. The final level is the municipal level and the Presidency of Meteorology and Environment (PME) which needs to be more equipped to conduct Environment Impact Assessments (EIA) at the project level in compliance with the SAE process.

Alshuwaikhat and Aina (2005) subsequently appraised the incorporation of environmental assessment into the municipal planning process and planning documents. The study findings were that: the implementation of environmental assessment at the municipal level was minimal; there was lack of experience in the sustainability assessment of planning documents; and sustainability principles have yet to be entirely integrated into the planning process. Al-Yami and Price (2005) explored the conceptual linkages between Value Management and sustainable construction, concluding that Value Management could be an effective vehicle for implementing sustainable construction principles in the country.

3. CURRENT STATUS IN SAUDI ARABIA

Sustainability Agencies in Saudi Arabia

During the last decade, the Saudi government has given significant consideration to protecting the environment, conserving biodiversity and natural resources and providing a better quality of life. It has contributed significantly to sustainable development, through the initiation of a number of regulations, polices and reports by relevant agencies that are playing major roles in achieving sustainability principles in the country. These agencies and their roles are shown in Table 1(MoEP, 2006).

Table 1: Agencies associated with sustainable development in Saudi Arabia

<i>No</i>	<i>Agency</i>	<i>Responsibilities</i>
1.	The Presidency of Meteorology and Environment (PME)	Protecting environment at the national level. The PME and other relevant agencies are jointly accountable for implementing and monitoring sustainable development.
2.	The National Commission for Wildlife Conservation and Development (NCWCD)	Preserving both terrestrial and marine wildlife, along with maintaining ecological balance and biodiversity in addition to conservation of environmental and natural resources
3.	the Ministry of Agriculture (MoA)	Maintaining pasture, forestry, animal resources and fisheries, as well as the establishment of national parks.
4.	The Ministry of Water and Electricity (MoWE),	Managing and sustaining water resources, the sewage system and the generation of power.
5.	the Ministry of Petroleum and Mineral Resources (MoPMR)	Managing and sustaining mineral and oil industries.
6.	The Ministry of Municipal and Rural Affairs (MoMRA)	Providing urban services with respect to environmental health, waste management, cleaning of cities and landscaping.

7.	The Ministry of Health (MoH)	Managing and eliminating medical waste
8.	the Ministry of Interior (MoI)	Checking and inspecting periodically vehicles which enforce measures with respect to air pollution as a result of vehicles exhaust fumes.
9.	The Ministry of Culture and Information (MoCI)	Raising environmental awareness by conducting campaign.
10.	The Saudi Arabian Standards Organization (SASO)	Setting standards and specifications as to environment protection and elimination of pollution
11.	The Royal Commission for Jubail and Yanbu (RCJY)	
12.	King Abdulaziz City for Science and Technology (KACST)	Sharing some specific environmental concerns with other agencies.
13.	Saudi Aramco	
14.	Saudi Arabian Basic Industry Company (SABIC)	

Achievements of Saudi Government in Sustainable Development

The Saudi Government has taken an active role in initiating sustainable development during the Seventh Five-Year Development Plan (2000-2004). Agenda 21 issued at the 1992 Earth Summit in Rio as the international blueprint for sustainable development, was approved by the Saudi Government in December 1994. A number of environmental targets were accomplished such as reducing the level of pollution, controlling desertification, creating environmental information network, adopting coastal management plan and conserving national wildlife.

The General Environmental Regulations were enacted in October 2001 and the executive by-law was enacted in September 2003, which led to the appointment of the Presidency of Meteorology and Environment; the main agency responsible for the enforcement of the environmental regulations in coordination with other appropriate agencies. Moreover, Saudi Arabia joined the following international environment conventions during the Seventh Five-Year Development Plan: the United Nations Framework Convention on Climate Change (UNFCCC); the supplement of Kyoto Protocol which was approved on January 2005; the United Nations Bio-Diversity Convention; and United Nation Desertification Control. The PME coordinates with related agencies which embark on the implementation and follow up of a number of environment conventions associated with their duties. These include: the Basel Convention on the Control of Transboundary Movement of Hazardous Waste; the Vienna Ozone Layer Protection Convention; and the Montreal Protocol on substances that deplete the ozone layer Agreement (Ministry of Economy and Planning, 2006).

The Saudi Government is preparing outline of the National Strategy for Health and Environment, the National Environment Strategy, the National and Action Programme for Desertification Control, the National Strategy for Biodiversity, the National Forestry Strategy and the National Plan for Management of Coastal Regions in terms of the national environment strategies and developing related regulations. The Saudi Government has also enacted: water resource conservation and consumption rationalization; and sewage water recycling regulations. In the meantime, the Ministry of Water and Electricity has been updating its water resources studies as part of formulating the National Water Plan (MoEP, 2006).

The Ministry of Municipal and Rural Affairs has issued a circular in terms of water resources conservation to all its branches and consultants. It informs them that it is mandatory for all new construction and area planning to be designed to use conservative plumbing equipment in line with the new Technical Saudi Standards and Codes, to maximise water-efficient use. Licenses for starting construction will not be issued and all services such as water supply and electricity will not be connected for these projects and areas until the relevant standards and requirements have been met (MoMRA, 2006).

Sustainable Development National Strategy of Saudi Arabia

The Eighth Five-Year Development Plan (2005-2009) has been drawn up, with a broad strategic vision of the economy and development that is geared to accomplishing sustainable development. The main objective is to satisfy the material, cultural and spiritual needs of people in addition to health and quality of life. The objectives of the development strategy are to achieve sustainable development and eliminate any negative impacts on natural resources, the quality of life and public health while protecting the environment against harmful activities and practices. This section highlights the objectives, policies and targets of environmental operations during the Eighth Five-Year Development Plan (MoEP, 2006).

Objectives

- Protecting the environment against pollution.
- Improving the quality of life and public health.
- Achieving sustainable development through a closer harmony between human activities and the protection of natural resources; the conservation of non-renewal natural resources in addition to searching for alternative resources.
- Developing and protecting wildlife to ensure their sustainability.

Policies

- Enhancing the efficiency of protective mechanisms to protect the environment and conserve natural resources.
- Reassessing and updating environmental standards.
- Enhancing databases of the weather, climate and the environment.
- Enhancing the role of the private sector in the protection of the environment, natural resources and wildlife conservation, and especially the adoption of "green" materials and environmentally friendly processes in industry.
- Developing the institutional capacities of the environmental agencies.
- Introducing sustainability awareness issues into the school curricula and the media.

Targets

- Conducting studies on the environmental effects of new factories as part of licensing requirements.
- Updating air, soil, groundwater databases as well as surface and coastal water pollution standards.
- Spreading environmental awareness programmes.
- Stimulate the formation of environmental protection societies in all regions of the country.

- Strengthening inspection of the environmental status of existing industrial establishments to ensure compliance of new industries with environment protection requirements.
- Broadening the meteorological monitoring network to cover the entire Saudi territories.
- Reassessing and modifying the school curricula to cover environmental and awareness issues starting from primary schools.
- Co-ordinating with the ministry of culture and information for preparing shows, programmes and TV serials that focus on environment issues, as well as providing coverage to regional and international environment news and issues.

4. INTERVIEWS ON SUSTAINBLE CONSTRUCTION

Qualitative research is a systematic, empirical strategy for eliciting responses from people in a special social context (Locke, 2000). Qualitative research is often referred to as ‘idealistic’ and is concerned with information about things that are less easily understood by calculation. It seeks to understand how people see and interact with ‘the world’ (Fellows and Liu, 2003). This study intends to: explore; explain; and describe the sustainable construction situation, as well as defining sustainable construction principles in Saudi Arabia.

Conduct of interviews

The data for this research were obtained through semi-structured interviews with twelve experts working in or possessing significant experience of the Saudi Public Sector. The experience in the Saudi Arabian construction industry was on average 14 years. The qualifications of interviewees were: five of them held a PhD; four held an MSc; and three held a BSc. The interviews lasted between 55 minutes and 2:32 hrs. These semi-structured expert interviews were conducted to investigate in-depth sustainable construction in Saudi Arabia as illustrated in below sections.

Interview results

Rationale behind sustainable construction implementation in Saudi Arabia

The implementation of sustainable construction is undoubtedly crucial all over the world, however, each country has its own needs, agenda and circumstances. This section is to identify the reasons behind the consideration of sustainable construction principles in construction projects by asking the interviewees “*Why are sustainable construction principles important to be implemented in the Saudi construction projects?*” Table 2 illustrates important factors that justify the implementation of sustainable construction principles in the country.

Table 2: Reasons behind sustainable construction implementation in Saudi Arabia

<i>Rationale behind sustainable construction implementation</i>		<i>n</i>
1	Elimination of green area; deterioration of environment and scarcity of resources;	3
2	Seventy per cent of energy goes to buildings;	1
3	Sick buildings that includes harmful paints, furniture, ducts, IT, air and materials;	1
4	Forty five per cent of overall waste comes from construction;	1
5	Landfills are quickly filled by waste	3
6	Sea and ground water are being polluted;	3
7	Shortages of dwellings especially in big cities such as Riyadh, Jeddah, Eastern province;	3

8	Shortage of water and energy in addition to high demand;	4
9	Dwellings and land price have dramatically increased over the few past years;	3
10	Demolition of buildings result in negative impacts to environment;	2
11	Distortion of large areas where materials are taken for construction; and	1
12	Neighbours' relationships have increasingly abated.	2

n= Number of interviewees mentioned a reason

Defining sustainable construction dimensions

Sustainable construction issues were identified in Saudi Arabia by asking the interviewees the following question, “*What are the sustainable construction principles that are important to be taken into account in the Saudi building projects?*” Table 3 shows the principles of sustainable construction in Saudi Arabia according to the perception of interviewees.

Table3: Sustainable construction dimensions in Saudi Arabia

<i>Sustainable construction principles</i>		<i>n</i>
1	Environmental	n
	- Recycle and reuse water and materials.	6
	- Maximise efficient use of land.	4
	- Minimise water and energy consumption.	7
	- Maximise efficient use of non-renewable resources.	2
	- Encourage renewable resources use (solar energy).	4
	- Reduce material waste in construction and use.	4
	- Stop desertification.	2
	- Deplete ozone.	1
	- Conserve and develop coastal regains.	1
	- Stop pollution to sea and groundwater, air and land.	4
	- Protect biodiversity, and flora and fauna.	1
	- Satisfy good indoor and outdoor environment.	5
	- Minimize CO2 emission.	1
2	Social	n
	- Provide evacuation area.	1
	- Prevent crime.	2
	- Consider neighbourhood relationships in design.	3
	- Stop smoking inside building and general places.	1
	- Consider earthquake, geotechnical and weather aspects in design.	2
	- Eliminate toxicity and sick buildings.	2
	- Respect culture of people.	4
	- Involve society in decision making.	2
	- Satisfy user's needs and requirements.	3
	- Respect disabled and satisfy their requirements and needs.	5
	- Provide public amenities.	4
	- Satisfy privacy.	
3	Economic	n
	- Apply whole life cost .	5
	- Deliver affordability.	3
	- Ensure durability.	2
	- Enable adaptability.	3
	- Ensure quality.	4
	- Satisfy equity.	5
	- Create jobs.	3

n = Number of interviewees mentioned a factor

Barriers to sustainable construction in Saudi Arabia

This section is to identify the barriers that could hinder the implementation of sustainable construction by asking “*What are the barriers that could impede the implementation of sustainable construction in the Saudi construction industry?*” Table 4 illustrates these challenges to implementing sustainable construction in the country.

Table 4: Barriers to sustainable construction implementation in Saudi Arabia

The barriers		n
1	Lack of information;	4
2	Lack of awareness;	10
3	Lack of government support;	3
4	Lack of regulations and policies in terms of sustainable construction implementation;	5
5	Lack of guidance for sustainable construction to clients, designers and contractors;	3
6	Lack of penalties and inspection to violation works;	2
7	Lack of collaboration and coordination between governmental agencies	2
8	Shortage of sustainable materials, equipment and appliances in the Saudi market;	3
9	Shortages of practitioners, expertise, and knowledge of sustainable construction;	4
10	Misperception of high initial cost to implement sustainable design; and	2
11	Complexity of agencies’ legislation, rules and bureaucracy.	1

n= Number of interviewees mentioned a barrier

Overcoming the barriers to sustainable construction

The interviewees were asked two questions regarding how to overcome existing barriers and implement sustainable construction principles in Saudi construction projects. The first question was, “*What are the enablers and incentives that can/do encourage sustainable construction implementation in Saudi Arabia?*” The second question was, “*What steps should the government or Saudi agencies take to establish or improve sustainable construction performance in Saudi Arabia?*” Table 5 illustrates the enablers that could provide a catalyst for improving the implementation of sustainable construction in the Saudi construction industry.

Table 5: Enablers to sustainable construction implementation in Saudi Arabia

Enablers to implementation		n
1	Demonstration	
	- Achieve sustainable construction principles in governmental projects and demonstrate a good example.	5
	- The Government should strongly advocate sustainable construction implementation to be a leader as major customer and sponsor of the industry.	3
2	Regulations/policies	
	- Enact regulations and policies for sustainable construction implementation.	7
	- Establish guidance of sustainable design, construction, operations and maintenance to clients, contractors and designers.	2
	- Establish Saudi Council of Engineers System.	2
	- Mandate Saudi Building Code and sustainable construction principle implementation in new projects.	3
	- Establish ranking of consultants and designers in Saudi Arabia.	1
		2

	- Certify people who work in sustainable construction.	
3	Incentives	
	- Establish monetary incentives and awards for designers, consultants and contractors who implement sustainable construction principles and give them a priority to obtain new projects.	5
4	Technology	
	- Provide sustainable materials, environmentally friendly, suitable appliances and equipment to conserve energy and water in the Saudi market at an affordable price.	2
5	Awareness	
	- Bring key stakeholders together in one place and introduce them the principles of sustainable construction and its benefits and drivers at early stages of a project.	3
	- Teach people benefits and drivers of sustainable construction and involve them in decision taking.	4
	- Start teaching sustainability principles at schools and institutions.	4
	- Train engineers, architects and labours and raise awareness of top management and affected stakeholders.	2
	- Find sponsor to adopt sustainable construction by introducing its benefits to the society.	
6	Process	
	- Make competitions of sustainable design for designers & consultants;	2
	- Evaluate performance of sustainable construction during design, construction stage and after completion; and	1
	- Work together with relevant agencies (MOMRA, PEM, MWE, MPM , NCWCD) to establish regulations and policies, and assign duties and tasks for each one.	4

n= Number of interviewees mentioned an enabler

5. CONCLUSIONS AND RECOMMENDATIONS

The Saudi government has made significant efforts towards protecting the environment by introducing a number of regulations and policies and by participating in a number of global conventions over the past few years: general environmental regulations and its rules for implementation have been issued and approved; climatic research and reports have been produced; meteorological, environmental and air pollution measurements are being conducted; and the implementation of sustainable development is handled by collaboration between a number of ministries and agencies in the public and private sector. The Saudi government has also signed a number of international environmental protection conventions. Although the Saudi Government has enacted and approved a number of regulations and joined a number of global conventions relating to sustainable development, there is unawareness among the agencies and people regarding sustainable principle implementation, both in the public and private sector in the country.

This study has established sustainable construction issues in Saudi Arabia and explored the most important reasons behind its implementation. Furthermore, it has identified the barriers that could hinder sustainable construction application and introduced enablers that could overcome these obstacles. The identified enablers could help accelerate the understanding and implementation of sustainable construction dimensions in the Saudi Arabian construction industry. On the basis of the findings of

the study and related literature, it is clear that the lack of awareness for sustainable construction principles within the Saudi Arabian construction industry would appear to be a problem across the country. Moreover, most governmental agencies in the Saudi Arabia have a long way to go, before they can effectively implement sustainable construction principles. The result of this study indicate that the most important issues of sustainability were energy and resources conservation as well as land use regulation and urban planning policies which are justified by that fact that energy and resource are of increased concern in Saudi Arabia.

Developing solutions to the aforementioned problems from the perspectives of the interviewees requires further research, which could involve developing two legislative frameworks in initiating the process of entrenching sustainable construction in the Saudi construction industry. These frameworks can be classified into two broad categories connected to general and specific – sustainable construction - framework. They would need to focus on reducing conflict of interests that could happen between the Saudi governmental agencies in addition to determine authorities and duties for each agency. The general framework should focus on sustainable urban development, education and training programmes development. The sustainable construction framework should comprise all sustainable construction principles.

6. REFERENCES

- Abdulrazzak, M. J., (1995) Water supplies versus demand in countries of Arabian Peninsula. *Journal of Water Resources Planning and Management*, **121**(3), pp. 227-234.
- Al-Gilani, A. And Filor, S., (1997) Environmental Policies in Saudi Arabia. *Journal of Environmental Planning and Management*, **40**(6), pp. 775-788.
- Al-Gilani, A. And Filor, S., (1999) Reforming the national framework for environmental policies in Saudi Arabia. *Journal of Environmental Planning and Management*, **42**(2), pp. 169-1999.
- Alshuwaikhat, H.M. and Aina, Y.A., (2004) Sustainable Cities: Implementation of strategic environmental assessment in Saudi Arabia municipalities. *Journal of Environmental Planning and Management*, **47**(2), pp. 303-311.
- Alshuwaikhat, H.M. and Aina, Y.A., (2005) Sustainable planning: the need for strategic environmental assessment-based municipal planning in Saudi Arabia. *Journal of Environmental Assessment Policy and Management*, **7**(3), pp. 387-405.
- Al-Yami, A. and Price, A. D. F., (2006) Assessing the feasibility of using value management to accelerate the implementation of sustainability. In: Delft, *Proceeding of the 6th International Postgraduate Research Conference in the Built and*, 6th-7th April , Research Institute for the Built and Human Environment Vol.1, pp765-774.
- Al-Yami, A. And Price, A.D.F., (2005) Exploring conceptual linkages between value engineering and sustainable construction. In: SOAS, *Proceeding of the 21st annual conference of the association of researchers in construction management (ARCOM)*, 7-9 September, Vol. 1, pp375-384.
- Bnoon, J., (2003) The Saudi construction industry is predicted to increase its value to \$19 billion over the next 3 years *Asharq Al-Awsat*.
- Brundtland G. H., (1987) Our common Future. World Commission on Environment and Development, Oxford Paperbacks.

- Fellows, R. F. And Lui, A., (2003) *Research methods for construction*. 2nd ed. Oxford: Blackwell Science.
- Hussey, J. and Hussey, R., (1997) *Business Research: A Practical Guide to Undergraduate and Postgraduate Students*. Macmillan Press, London, UK.
- Langston, C. and Mackley, C. (1998) *The Role of Environmental Economics in the Cost Management of Projects*, *AACE INTERNATIONAL TRANSACTIONS*.
- Locke, F.L., Spirduso, W.W. And Silverman, S.J., (2000) *Proposals that work: A guide for planning dissertations and grant proposals*. 4 Ed. London: Sage Publications, Inc.
- Ministry of Economy And Planning, 2006-last update, the Eighth Development Plan [Homepage of Saudi Arabia], [Online] Available: <http://webserver.planning.gov.sa/home/Home/English/8Plan/Contents.htm> [May 31, 2006].
- Ministry of Municipal and Rural Affairs, 2006-last update, the Rules [Homepage of MOMRA], [Online]. Available: <http://www.momra.gov.sa/english/index.asp> [May 10, 2006].