

Construction Projects in the GCC: The Opportunity and the Missing Link for a GCC-Based Eco-Innovation.

By Sami Mahroum (INSEAD)

with contributions from Dr. Mazen Omran (ARUP) and Souheir Mahroum (freelancer)

Introduction

The construction sector is a substantial economic sector worldwide. The global construction industry is valued at approximately 4.6 trillion USD annually. Asia is considered to be the fastest growing regional construction market valued at approximately 1.5 trillion USD annually. The World Bank estimates that by 2015 half of the world's building construction will take place in China. Europe is also one of the top regional construction markets with an approximate construction value of 1.4 trillion USD. The USA is considered as the largest single country construction market in the world with an annual value of 1.2 trillion USD. In 2007, the construction sector contribution to the GDP in the OECD area ranged from 12% in Spain to 4% in Germany (OECD, 2009).

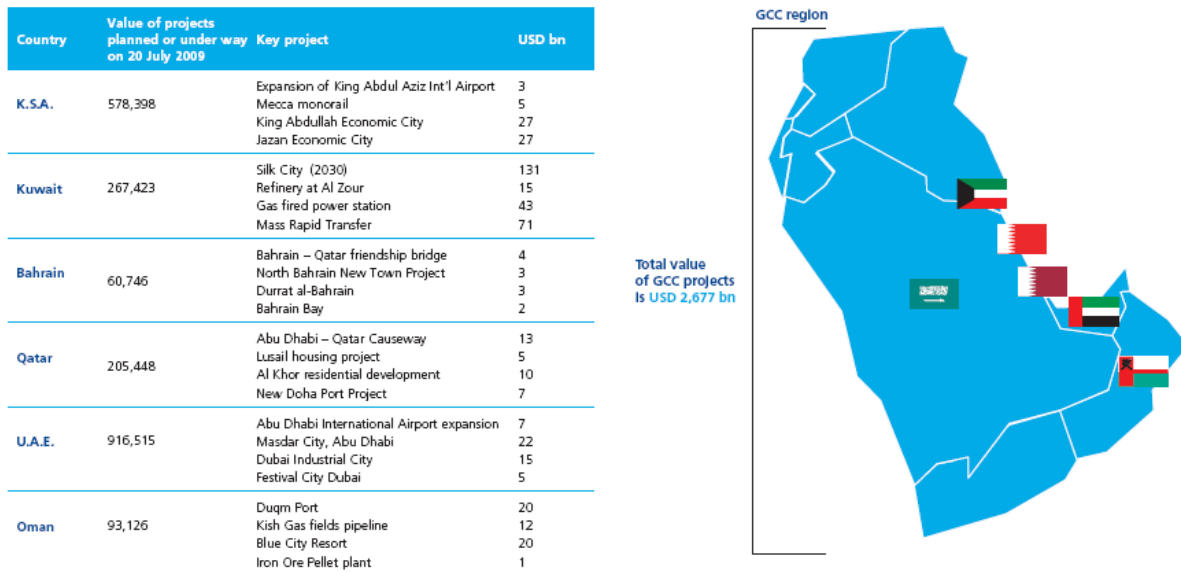
Another major market for construction industry is the Gulf region with approximately 1,400 on-going projects worth an estimated value between USD\$700 and 1300 bn. The share of the construction sector of the GDP is approaching 10% in some countries; without including related business services as such real estate services (which in Abu Dhabi contributes another 8% to the GDP).

The Gulf Cooperation Council (Bahrain, Kuwait, Qatar, Saudi Arabia and United Arab Emirates) governments have begun introducing green building codes to encourage the industry become more energy efficient, but to date the governments of that region have not recognized the potential link between construction, eco-innovation, and techno-economic development. By leveraging on their role in the market as large clients for construction services, governments in the GCC are in a good position to incentivize investors and developers to engage in knowledge development and transfer in the region. The compounded effect of a strong local demand for construction services and a growing global demand for construction in general and green buildings in particular provide a unique opportunity for the GCC region to use the construction sector as a driver of economic development and not only an enabler.

Construction Market in the GCC

In the past 5 to 10 few years, the Gulf region has increasingly become associated with large construction projects taking place in this area. The construction section in the GCC remains promising despite the recent credit crunch. According to a recent study by Deloitte (Chart 1), the Gulf Cooperation Countries (Bahrain, Qatar, Oman, Kuwait, Saudi, and UAE) have a pipeline of construction projects worth around USD 2,677 billions. While the money is expected to come from both the public and private sectors, governments remain the most influential clients and investors.

Chart 1



Source: Deloitte, 2009.

This puts the GCC governments in a unique position to drive and shape the future of eco-innovation globally. Governments, particularly, in the UAE and Saudi Arabia, have the power to leverage on their strong positions in the market to drive not only eco-innovation in this sector, but also to use it as an engine for knowledge transfer and economic diversification. The construction industry can do GCC innovation what the defense industry did to US innovation 60 years ago; become a catalyst and a driver of innovation.

In Saudi Arabia, the construction sector is expected to continue to blossom due to the high demand for affordable housing by the growing population, and due to the efforts of the governments to diversify the economy away from relying on oil as the single commodity. In this regard, Saudi Arabia which is by far the largest GCC country in every aspect has a construction market that is fuelled by real domestic demand as opposed to other GCC countries where much of the growth is based on expected future demand. The residential market is a strong sector in Saudi Arabia. The demand for residential units is expected to increase due to the young growing population and the new mortgage law. This new law will enable home ownership for the majority of population (currently one in every five Saudis is a house owner (Deloitte 2009)).

The government in the United Arab Emirates too is creating opportunities in the construction industry. Abu Dhabi's Economic Vision 2030, which focuses on education, health care, and infrastructure, identifies construction sector as an enabler of development in all these sectors. But most important the Abu Dhabi Economic Vision 2030 envisages a rise in population, both through "immigration" and through natural growth. It is expected that the population will grow from a current 1.5 million to 3.5 million inhabitants in the Emirate. Indeed, already the current supply does not meet the demand for real estates in Abu Dhabi, and thus it is expected that the construction sector will continue be prosperous in the near future.

In Qatar, substantial parts of oil and gas revenues (ca. USD 100 bn) are being re-invested in infrastructure and construction projects. The country's sustainable economic growth has resulted

in a parallel growth in the construction sector (17% in 2009). In addition to residential units, Qatar is experiencing an increase in demand for office spaces. Qatar is expected to continue in experiencing growth due to revenues generated by the rich gas resources. Hence, the funding to the construction sector is expected to carry on.

Against this background, this paper argues that the continuous construction boom in the GCC provides a unique opportunity for GCC countries to specialize in the 'Green Buildings' sector, which is itself experiencing a rapid growth globally.

The Green Buildings Market

Buildings, residential and commercial, are responsible for around 40% of global primary energy use and 12% of the global water consumption (IPCC, 2007). Measures to reduce greenhouse gas (GHG) emissions from buildings fall into one of three categories: reducing energy consumption and embodied energy in buildings, switching to low-carbon fuels including a higher share of renewable energy, or controlling the emissions of non-CO₂ GHG gases (Ibid., 2007). 'Green Buildings' are primarily about improving energy efficiency in new and existing buildings, which encompasses the most diverse, largest and most cost-effective mitigation opportunities in buildings.

Green buildings are typically designed to meet green building code requirements (such as LEED and BREAM), which are set to improve overall building performance and to minimize their life-cycle environmental impact and cost. Green building rating systems in general focus on the following five categories of building design and life cycle performance: Site, Water, Energy, Materials, and Indoor Environment.

For each category, a number of prerequisites and credits with specific design and performance criteria exist to reach the certification status. The practices and technologies adopted in Green Buildings vary from region to region; however some fundamental principles remain applicable, such as efficiency in design, usage of energy, usage of water, and usage of materials.

The United States Green Building Council estimates that green building, on average reduces energy use by 30 percent, carbon emissions by 35 percent, water use by 30 to 50 percent, and generates waste cost savings of 50 to 90 percent. Thus, there is a growing pressure globally on the construction sector to become more energy efficient and environmentally cleaner. A combination of government incentives and regulation frameworks (e.g. through building codes) have generated a widespread interest in the development of Green buildings (Trade Queensland, 2009). Governments are increasingly realizing the need to foster eco-friendly construction techniques in order to:

- Save energy, water and natural resources
- Reduce waste, pollution and environmental degradation
- Implement a healthier and more comfortable living environment

Green Building Sector in the GCC

There are growing signs that the demand for green buildings in the GCC (see box 1) region is rising too, with almost all countries in the region adopting and introducing 'Green Buildings' Codes. This is due to the growing shift towards liberalizing energy prices, the increased global push towards energy efficiency, as well as due to the local water scarcity problem.

Box 1: Major green building projects in the Gulf States

- The Economic Cities, Saudi Arabia: at a cost of more than US\$60B, the Kingdom has planned and begun constructing four economic cities, which are located in Rabigh (King Abdullah Economic City), Hail (Prince AbdulAziz bin Mousaed Economic City), Madinah (Knowledge Economic City) and Jazan (Jazan Economic City).
- World Trade Building, Bahrain: opened in 2008, this is the world's first sky scraper to use wind turbines in its design. The project has received a number of awards including the Arab Construction World for Sustainable Design Award.
- Sabah Al Ahmed International Finance Centre, Kuwait: a 40-storey tower able to generate its own energy from a PV system and roof mounted wind turbines.
- Bawadi, Dubai: to be the world's largest hospitality, shopping and entertainment district resembling Las Vegas, incorporating green and sustainable design throughout the development. The project will incorporate 51 hotels and 60 000 hotel rooms.
- Energy City, Qatar: utilizing the latest green building technology, this will be a modern business and residential facility occupied by a diverse mix of energy-related companies, commercial tenants, customers and suppliers.

Traditionally the region has a poor record when it comes to sustainable development, but things are changing quickly, driven by regulation and leading examples set by government clients. Looking ahead, sustainable design techniques and active technologies, such as renewable and water recycling, are set to become commonplace providing a boost, not just for environmental statistics on construction sites, but also for economic growth in new technologies (MEED, May 19, 2010).

The past three years have seen a significant change in attitude in the Gulf to the importance of minimizing the environmental impact of its construction projects. Over this time, the Dubai Electricity and Water Authority (Dewa) has introduced green building regulations, Abu Dhabi's Urban Planning Council (UPC) has launched its Estidama (sustainability) ratings system and Qatari Diar has established a Sustainable Assessment System.

While developers are free to use any methods they choose to meet the standards laid down in the new regulations, Abu Dhabi developers are encouraged to use the region's first sustainable development rating system, which will see buildings earn 'pearls', depending on their green credentials. Projects to be assessed under the Pearl Rating System fall into three categories – buildings, communities or villas. Each assessment is split into design, construction and

operational phases. The rating system itself is voluntary and falls within the government's wider 'Estidama' development system. However, the Urban Planning Council has also introduced a compulsory element to new developments which all projects will have to satisfy. The Emirates Green Building Council (EmiratesGBC) too has, produced a draft version of such a system which is tailored for the UAE (federal level) environment and its construction market.

In Dubai too, in line with the Dubai Strategic Plan 2015, a new resolution implementing green building specifications and standards in the Emirate of Dubai was issued by the Executive Council. The aim is to turn Dubai into a healthy city that meets the demands of best practices and benchmarks of pollution-free sustainable development, whilst boosting its continuous efforts to promote global endeavors to face environmental changes. The impact of these new regulations is likely to be significant; estimates suggest their application is expected to result in 30 percent building energy savings for cooling and air-conditioning; 9 percent savings for artificial lighting and 6 percent for heating water. At the same time they will also reduce water consumption in buildings by up to 30 percent (Gulf News, 2007).

In Qatar, a similar system has been created, namely, the Qatar Sustainability Assessment System (QSAS). This Sustainability Assessment System is the new 'green building' rating system developed specifically for Qatar. It takes into account the specific requirements of the region, with the aim of aiding Qatari companies, save money; reduce energy costs and in the main protect the environment from the effects of climate change.

In Saudi Arabia, serious efforts are being made to develop a coherent green building strategy. The Saudi Green Building Council was formed in 2009 and is expected to finish its own version of LEED within two to three years. This is important because Saudi Arabia's ecological footprint is estimated at 4.5 global hectares per capita, roughly twice the world average, and the country is ranked among the Top 20 most environmentally challenged countries in the world.

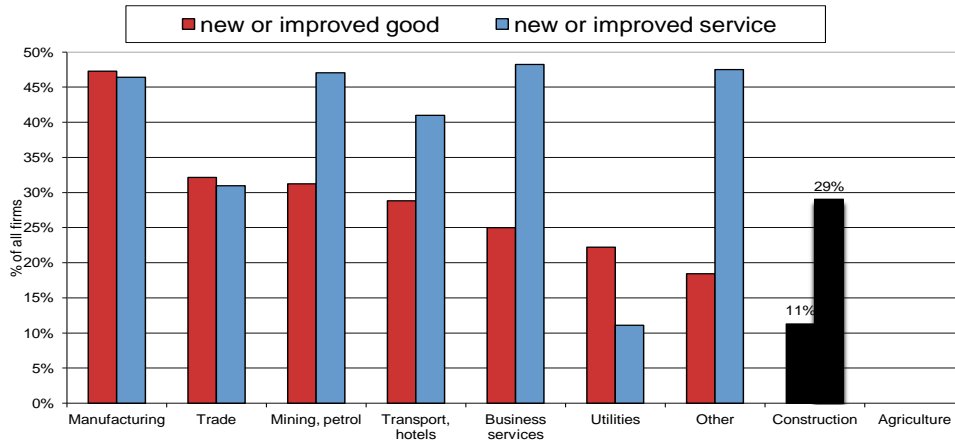
GCC Opportunity and Governments' Role

Since 2003, about \$250 billion worth of major projects have been finished across the GCC; amounting to more than 60 per cent of the region's gross domestic product (GDP) that year (MEED, May 19, 2010). Construction is the second most important economic activity in the GCC. Yet this sector is not regarded as a driver of techno-economic development but merely as an enabler of economic growth through investment but not productivity. There are no coordinated national strategies linking investment in this sector to long term techno-economic development. This is despite the enormous potential of productivity gains that can be achieved through this low productivity but yet sizable economic sector.

A recent study conducted by the author in collaboration with Statistics Centre Abu Dhabi (SCAD) has shown that firms in the construction industry in Abu Dhabi are amongst the least innovative in the emirate (Chart 3). Not only this, but it is also the industry with the smallest market for local innovations despite its sheer size in the local economy. While this is akin to the situation in other countries, the construction industry in the GCC is way more important and strategic to GCC economies.

Chart 3

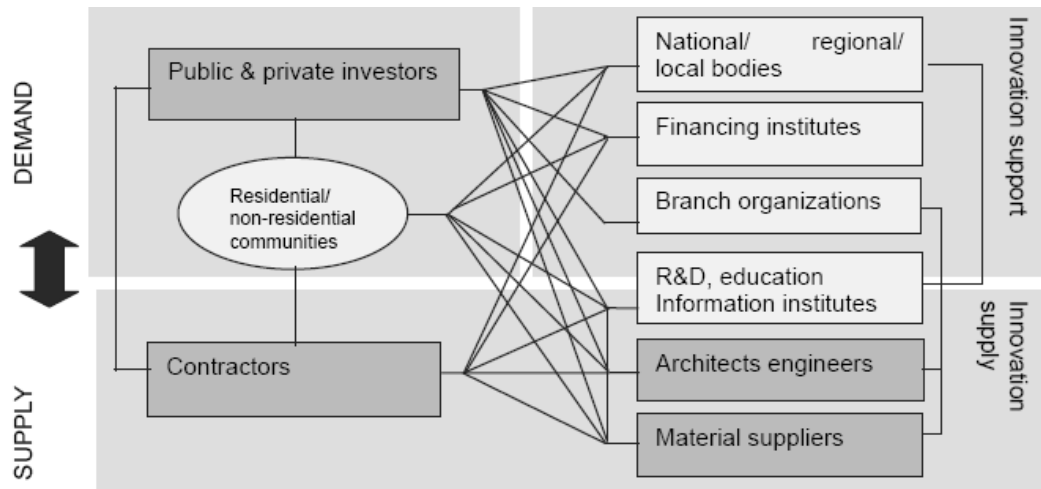
Goods & Services Innovators in Abu Dhabi Across sectors



Source: SCAD CIS 2009 (unpublished).

Traditionally, much of the innovation occurring in the sector tends to be incremental and interactive (OECD, 2009). For example, much innovation occurs on site in the form of logistics, health and safety arrangements, people management or planning, reflecting that many construction projects are unique and require unique solutions. The sector is classified by the OECD *Frascati Manual* as a low tech industry. This is due to its low R&D intensity and low number of persons employed in R&D. But this might be changing with new players joining the construction value chain, especially eco-innovation suppliers. Innovation in the industry is largely through the supply chain, such as building materials, building equipment and machinery, architecture and design, and IT (see chart 2). This is a “supplier-dominated” industry, where firms innovate primarily by acquiring machinery and equipment (Pavitt, 1984).

Chart 2



Source: Van Egmond de Wilde de Ligny (2007).

Due to its relatively large size in the economy, the construction industry acts as an important market for specialized suppliers of capital goods and equipment who work very closely with their customers. GCC governments can capitalize on the characteristics as well as the performance of this sector to increase their overall economic productivity, diversify into a new techno-economic base (which has strong synergies with the oil and gas sector), and potentially increase the ratio of skilled labour in the construction sector.

From an enabler to a driver of economic diversification

The economic impact of the construction industry goes far beyond its statistical representation. By supporting infrastructure, the construction sector acts as an enabler of economic development, primarily through its contribution to improving the delivery of public services such as education, transport or healthcare, and helps improve business productivity, and ultimately a country's standard of living (OECD, 2009). But GCC governments need to view this sector more strategically, particularly as a driver of economic diversification and increased productivity. This can be achieved by specialising in the high-end segment of this sector particularly where there is a growing demand, namely in the 'green building' sector. Subsequently, the GCC governments will need an innovation policy that links environmental policies and economic development policies together. This can be achieved through a number of policy instruments.

Public Procurement

Governments' policies remain lacking in this area, where public procurement of large construction projects does not include knowledge transfer and or domestic sourcing requirements. The opportunities presented by the large portfolio of infrastructure and construction projects in the region means that greater results can be achieved by pursuing demand-led innovation policies centered on the burgeoning construction market. The GCC has the chance of becoming a world leader and a supplier of eco-innovation solutions if the opportunity is seized through a

combination of policy instruments that link demand for construction and efficient energy solutions with the supply of construction services and alternative energy solutions.

Smart Regulations

The introduction of new regulations and rating systems across the GCC is increasing the demand for green buildings; and hence engendering a domestic market for it. An increased in demand via regulation and/or consumer choice will make more innovation in the construction sector possible. An increased in demand for smart building solutions, will inevitably increase the number of skilled workers as well as innovative firms in the construction value chain.

A mix of demand-side policy instruments (i.e. those aimed at changing consumer behaviour and/or market conditions) ranging from public procurement procedures, to legislation, standards, and direct financial incentives can create an environment that is conducive to innovation. A number of international experiences can serve as good sources of learning in this regard. For example, Cyprus has a national action plan for Green Public Procurement (GPP), which uses public procurement to promote market penetration of environmentally friendly products and services, especially in the construction sector (Cunningham, 2009). Public procurement is also one of the main instruments in Spain, Austria, Flanders, Italy, Liechtenstein, Lithuania and Sweden, where a series of guidelines to encourage public procurement aimed fostering eco-innovation in the construction sector have been introduced (Cunningham, 2009).

Standards

Other demand-oriented policy instruments such as a mix of mandatory and voluntarily standard-setting guidelines can be effective policy instruments. The green building codes introduced in the GCC are a good starting point, but so far they give few credits to innovative practices, the weight given to innovation is small, and abiding by the codes remain largely voluntarily. Table 1 below shows the emphasis given to innovation across the three major green building codes adopted in the region.

Table 1: The Three Main Green Building Ranking Schemes

PEARLS		BREEAM		LEED	
Site selection and Natural systems	16%	Site Selection and ecology	20.5%	Site Selection	24.5%
Water	25%	Water	2.5%	Water	5.5%
Energy	25%	Energy	33%	Energy	33%
Materials	16%	Materials	13.5%	Materials	13.5%
Indoor Environmental Quality	20%	Indoor Environmental Quality	13%	Indoor Environmental Quality	14%
Innovation	2%	Innovation	6.5%	Innovation	6.5%
Integrated Design Process	7%	Facility management	12%	Regional Priority	4%

© Carbound.com

Innovation in these schemes refer primarily to new designs, solutions, practices and technologies that contribute to more cost efficiency while achieving desired energy efficiency levels.

Other standards-related instruments such as the Japanese Top Runner Program can be used. This instrument in particular would be very interesting to apply on the construction sector where best achieved commercially viable results by any building become the established standard for all buildings. Other instruments such as Feed-in-Tariffs for energy use provide further incentives to stimulate a local supplying base of eco-innovations adapted for local environment and conditions.

Actions needed on the ‘supply-side’

The supply-side of innovation is the universe of all possible or potentially possible solutions. For example, there are numerous types of technologies that are needed in mitigating climate change, including energy efficiency improvements throughout the energy system; solar, wind, nuclear fission and fusion and geothermal, biomass and clean fossil technologies, including carbon capture and storage; energy from waste; hydrogen production from non-fossil energy sources and fuel cells (IEA, 2006). Some are in their infancy and require public R&D support, while others are more mature and need only market incentives for their deployment and diffusion (IPCC, 2007).

Across the region there is a lack of strong centres of expertise and an R&D base in the domain of eco-innovation in general and eco-construction in particular. Governments should take an active role in increasing the number of players active in this domain, both from a research and practice perspective, and from the perspective of human resource development and competencies. The Abu Dhabi government has teamed up the Massachusetts Institute of Technology to set up MASDAR Institute of Science & Technology to create a centre of excellence in among other things renewable and alternative energy. But it would be long before the region develops the depth and breadth needed to become a global hub for eco-innovation. The booming local construction sector though can accelerate this development.

Construction industry observers, however, say that action is needed in two key areas. The first is in human resource management including recruitment, training, worker accommodation and health and safety, on and off site. The second encompasses the technical elements of the construction supply-chain from conceptual planning to operations and maintenance. The two areas are, of course, connected. World-class project execution is not possible without world-class human resources (MEED, 19 May, 2010).

Conclusion

Without a proactive government strategy to view the construction boom as a springboard to economic diversification and techno-economic specialization, the construction boom of today will fail to yield long term economic benefits to the region. A combination of policy mix is needed to deploy environment regulation with procurement policy to develop a domestic innovation system geared towards eco-innovation. The demand is there, and what is needed is a greater support for the supply side and a stronger link between actors on the demand side and actors on the supply side. This is where government role through regulation and legislation becomes so important.

References¹

- Cunningham, Paul, 2009, Demand-side Innovation Policies PRO-INNO Policy Brief No 1 (2009).
- Deloitte. (2009). GCC powers of construction 2009 – An expert diagnosis. *Deloitte publications*.
- Egmond - de Wilde De Ligny, E.L.C. van, Scheublin, F.J.M. (2007). Drivers and barriers for succesful industrialisation in construction. In G. Girmscheid, F. Scheublin (Eds.), *Innovation and industrialisation in construction*. Zürich: CIB.
- GulfNews October 24, 2007, Dubai to turn green in 2008.
- IEA, 2006: Energy Technology Perspectives: Scenarios and Strategies to 2050. Paris, France.
- IPCC (2007). Climate change 2007 – Mitigation of climate change. *Contribution of working group III to the fourth assessment report of the intergovernmental panel on climate change*.
- Lee, Y.S., Guerin, D.A. (2009). Indoor environmental quality differences between office types in LEED-certified buildings in the US. *Journal of Built Environment*.
- Mao, X., Lu, H., Li, Q. (2009). International conference on management and service science. *Mass 2009*.
- MEED, 19 May, 2010, Turning the construction industry green. (Accessed November 12, 2010).
- MEED, 19 May, 2010, The Gulf Construction challenge. (Accessed November 12, 2010).
- OECD (2009) Responding to the Economic Crisis: Fostering Industrial Restructuring and Renewal. Paris, July, 2009.
- OECD Frascati Manual, 2002. Paris.
- Pavitt, K., 1984. “Sectoral patterns of technical change: towards a taxonomy and a theory”. *Research Policy* 13, pp. 343–373.
- Simpson, J.R. (2002). Improved estimates of tree-shade effects on residential energy use. *Energy and Buildings*, February 2002
- Queensland Clean Technologies Exports. (2009). Green building opportunities: global.

¹ References remain incomplete.