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Green Procurement of Construction Industry in United Arab Emirates

العقود الإنشائية الخضراء في قطاع الإنشاءات في دولة الإمارات العربية
المتحدة

By

70032

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Dissertation Supervisor

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Abstract

The increasing activities of the human being on earth contribute considerably in the extensive depletion of the natural resources and in increasing both the biological and carbon footprint especially in the United Arab Emirates. Construction industry is considered a vital sector in the UAE since it contributes approximately eight per cent (8%) to the country's Gross Domestic Product (GDP) and twelve percent (12%) to the non oil GDP. Therefore, Procurement, processes of construction industry in the UAE, needs to be reconsidered in order to reduce the environmental impact and achieve the sustainable development. This dissertation aimed to examine the current adopted procurement systems in the construction industry against green procurement requirements for transformation. Literature review was conducted in order to understand the current procurement systems. Then, a theoretical frame work was developed in order to transform to green procurement taking into consideration the construction project stakeholders: client, consultant, and contractor in addition to the contract document. Surveys were conducted; interviews with specialists were performed in order to contrast the results with the information gained from the literature. The main conclusions include identification of the global and local driving factors for sustainability, the necessity to include environmental sustainability in the organisation's Corporates Social Responsibility, identification of the obstacles of transformation, and finally, identification of transformation requirements. After that, the major gaps between the current and green procurement were lack of client input and scarcity of the environmental criteria in contract documents. Therefore, client input and control is crucial to guarantee the proper application of green procurement.

Keywords: Construction, procurement, green procurement, environment, sustainability, contract

ملخص

لطالما كانت حماية البيئة تشكل التحدي الأكبر في هذا العصر بسبب النشاط الإنساني المتزايد على سطح هذه البسيطة الذي يؤدي إلى الاستنزاف الحاد للموارد الطبيعية و إلى زيادة البصمة البيولوجية و الكربونية معا. في هذا الخصوص ، تحتل دولة الإمارات العربية المتحدة المركز الأول عالميا في انتاج البصمة البيولوجية و الثاني عالميا ، بعد قطر ، في انتاج البصمة الكربونية نتيجة للتطوير و التنمية المتواصلين و المتمثلتين بازدهار قطاع الإنشاءات في الإمارات العربية المتحدة الذي يشكل ما نسبته ثمانية بالمئة (٨%) من إجمال الناتج المحلي و إثنا عشر بالمائة (١٢%) من إجمال الناتج المحلي غير النفطي كما تشير الدراسات ، لذلك كان لا بد من إعادة دراسة عمليات قطاع الإنشاءات في الامارات العربية المتحدة بما يحقق مفهوم التنمية المستدامة في مجال البيئة . واحدة من هذه العمليات هي العقود الإنشائية ، حيث جاء هذا البحث لمقارنة العقود الإنشائية الحالية و ما تتضمنها من بنود مع متطلبات العقود الخضراء من أجل خلق بيئة خصبة للتحويل . لذلك تمت عملية مراجعة الأبحاث السابقة لمعرفة و فهم محتوى العقود الإنشائية الحالية بما يتعلق بالجانب البيئي و مقارنتها مع متطلبات العقود الخضراء ، مما أدى إلى تطوير خطة نظرية للتحويل من العقود الإنشائية الحالية إلى العقود الخضراء بإشراك الأطراف ذوو العلاقة المباشرة بالمشروع من مطور و استشاري و مقاول رئيسي ، حيث تم إجراء إستبيانات و مقابلات مع الخبراء في هذا المجال من أجل فحص النتائج و مقابلتها مع ما تم التوصل له في الأبحاث السابقة . و أخيرا تم تعيين الثغرات في العقود الإنشائية الحالية و من ثم تم طرح مجموعة من النتائج و التوصيات للتطبيق.

الكلمات المفتاحية: إنشاءات ، العقود ، العقود الخضراء ، البيئة ، الإستدامة ، بنود

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Dedication

Firstly, I dedicate my work to the soul of my father who was the reason why I am here. May Allah bless his soul ...

To my mother who whatever I will do, I will never ever compensate her...

I extend my dedication to ...

My beloved wife Rana...

For her constant moral support, love and encouragement during my studies at the British University in Dubai. I couldn't have made it without her.

My beloved Brother Mohammad, and Sisters Manal and Fatima...

For all the love, support, and continuous inspiration

My supervisor Professor Mohammad Dulaimi...

For being, in addition, my mentor and friend during my journey in BUID and to whose endless patience and advice I credit the success with which I was able to negotiate the rocky path of a novice researcher.

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I would also like to dedicate my work to my friends for just being there for me whenever I needed to unwind...

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Chapter One: Introduction

1.1 Background

Environment, global warming, green house gases, green house effect, carbon footprint and sustainability are being amongst of the state of the art terminologies by which the construction industry is directed nowadays worldwide and locally in the United Arabs Emirates (UAE). The main conclusion of the World Wildlife Fund (WWF) Living Planet Report published in 2010 is that the demand on resources has doubled since 1966 and currently we are using more than one and a half of what the planet can produce. According to the report, UAE has the highest rate of consumption of resources which leads to the highest biological footprint leaving behind countries like United States of America, Kuwait, and Finland. Also it comes in the second place after Qatar in the highest Carbon footprint. Figures1 and 2

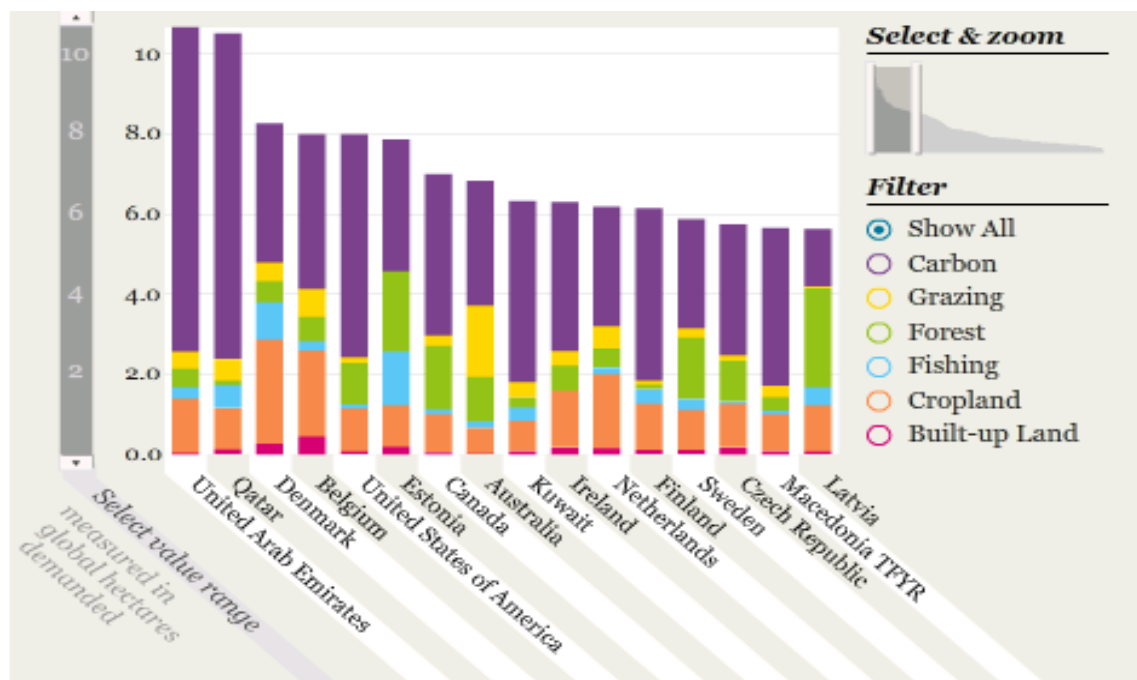


Figure 1 Global ecological footprint ranking. WWF Report, 2010

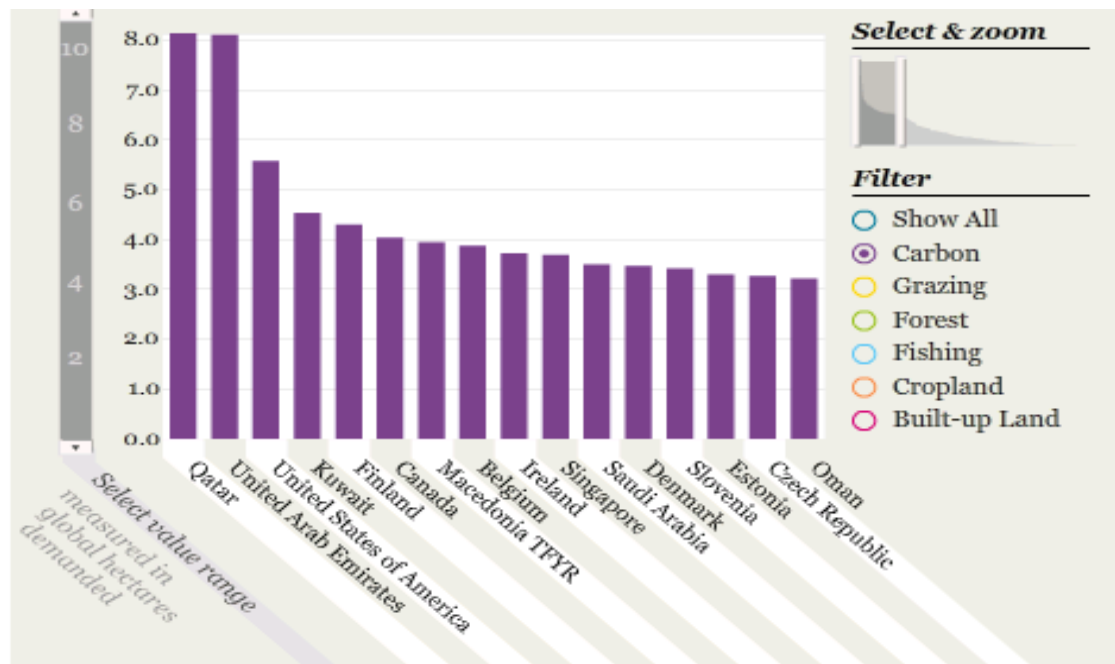


Figure 2 Global carbon footprint ranking. WWF Report, 2010

Oryx Middle East (2010) report provides a deeper exploration of the UAE construction sector highlighting that the report was produced after the global economical crisis occurred. The report reviewed the construction chronology in UAE since it was born in early 1950's with the Dubai Creek improvement project. Ten years later, in 1960's, the exploration of oil started in Abu Dhabi resulting in annual revenue of seventy (70) million US dollars which supported the expansion in infrastructure and construction projects such as building schools, universities, hospitals, housing, and roads. At the end of 1990's the report documented that the construction industry continued to flourish as the economic development prospered. It was till 2005 when the construction industry rocketed in the space of the UAE economy resulting in construction industry output of approximately sixty two (62) billion Dollars in 2006 and since then, the output maintained annually above forty (40) billion Dollars.

Specifically, the construction industry in the UAE market holds a remarkable share of the economic market, according to Research and Market website (2012), the UAE construction market contributed approximately eight per cent (8%) to the country's Gross Domestic Product (GDP) and twelve percent (12%) to the non oil GDP which is considered high with respect to western countries. Hence, the volume of consumed energy in construction sector is massive, which leads to the excessive depletion of the

natural resources. Sev (2009) stated that construction consumes around 50% of raw materials, produces 15 – 50 % of global waste resulting in more carbon production. Additionally, Rwelamila et al. (2000) commented that construction industry affects directly the surrounding environment in terms of sitting, production and delivery, construction, operation, and finally demolition.

As a general view, according to the World Commission on Environment and Development (WCED) report issued in 1987, sustainability is concerned about saving the basic needs of the world poor people to allow a relatively adequate level of life. In addition, it concentrates on the fact that environment resources must be sustained in order to meet the present and the future needs. Hall and Purchase (2006) define sustainability as the bottom line of environmental, economical, and social development. Therefore, construction industry has a direct impact on sustainability since it is exposed to the environment, related to the economy, and affects the social life. Sustainability, according to Wyatt (1994), is about managing the construction project during its lifecycle: construction, operation, eventual demolishing and recycling of the resources in order to reduce the waste resulting from the demolishing process.

One of the tools that lead to a sustainable construction is procurement. Ngowi (1998) stated that inappropriate procurement systems affect adversely construction sustainability since such systems do not fully utilise the available resources, which contradicts with the sustainability concepts. Therefore, green procurement prospects in construction industry in UAE will be examined in this research leading to environmental sustainability.

1.2 Motivation of the Study

After His Highness Sheikh Mohammad Bin Rashed Al Maktoom, Prime Minister and Ruler of Dubai, announced the Green Building directive in 2008, construction industry vendors; authorities, developers, and investors started to review their current adopted polices and reshape them to accommodate the new green requirements. Here, the integrated management system concept arose. The integrated system management

implies the integration of the three components of the construction processes: Health, Safety, and Environment as Griffith (2010) described.

Labuschagne and Brent (2004) stated that sustainable construction has begun to influence construction industry in all aspects of project lifecycle: pre-execution, execution, and post-execution. Therefore, a broader framework is required to assess the sustainability of the projects output throughout all project life cycles. One Aspect of project operations that is directly affected by adoption of green and sustainable policies is procurement.

Ngowi (1998) defined procurement as the project process that is adopted to acquire design, management, and installation inputs. Therefore, the adopted procurement system determines and influences the processes of the project and its effects on the surrounding environment, which requires to be examined in the UAE construction market.

1.3 Research Aim

The main aim of the research is to investigate the adequacy of the procurement processes that are currently adopted by construction industry vendors in the UAE construction market against the recently evolved principle of environmental construction sustainability noting that the environmental pillar of sustainability (others pillars are social and economical) is investigated in the procurement process.

In order to understand the environmental sustainability effect on procurement systems, it is vital to explore firstly the drivers of sustainability actions and the reasons that lie behind their adoption, especially in the construction industry, through presenting the environmental status of the globe generally, and trying to understand the contribution volume of UAE biological activities on global environmental status. Additionally, while exploring the sustainability drivers in UAE, the barriers of application will be highlighted. This contrast will help to identify the deficiency in the adopted processes to respond rapidly to the environment requirements. As a result and since construction procurement is one of the construction industry processes, its capacity to accommodate the environmental requirements will be examined.

1.4 Research Objectives

Green procurement in construction industry has been implemented in many developed countries like United States of America, United Kingdom, and Scandinavian countries of Sweden, Denmark, Norway and Finland. Therefore, it is the perfect time to a rapidly developing country like UAE to implement such policy in its biggest economical sector; construction.

Hence, to achieve the aim of the research, the following objectives are to be examined:

1. Examining the drivers for sustainability in the construction industry.
2. Investigating the impact of embracing sustainability on procurement frameworks.
3. Evaluating current sustainable procurement practices in the UAE and the barriers for implementation.
4. Identifying the gap between the green construction procurement requirements and the traditional procurement systems amongst the construction developers in UAE.

1.5 Dissertation Structure

The dissertation structure will be composed of seven main chapters starting with the “Introduction”. The Introduction chapter spots the light on the development of the construction sector in the UAE, highlights the environmental impact of construction activities, introduces the concept of sustainability and the environmental sustainability, states the motivation of the research, aim, and objectives that are to be achieved.

The second chapter is the literature review which provides a detailed investigation and summarises what was investigated previously. The sustainability concept and its different models are reviewed, and the relationship between construction sustainability and environment is discussed. Then, as a comparison between international and local

motivation for sustainability, sustainability drivers, globally and locally, are discussed. After that, the impact of embracing green measures on the construction procurement frameworks is discussed through firstly, defining construction procurement and its traditional attributes, then defining green procurement concept, deficiencies in the currently procurement systems towards environmental sustainability, and transformation to green procurement requirements are illustrated. Finally, the response of organisation's corporate management to the sustainability requirements through the Corporate Social Responsibility statement is explored.

Chapter Three represents the theoretical framework and the conceptual diagram that the research is based on. The theory is based on the fact that the current procurement strategies must renovate its processes to accommodate the recently evolved environmental requirements despite the existing inertia to change. The adaptation of the procurement strategies pushed through international and local drivers supported by the client's input, contractor's response, and legal support through legitimate contracts. After that, a conceptual diagram is concluded.

Chapter four details the methodology of answering the stated aim and objectives of the research. The qualitative analysis procedure is adopted thorough detailed referenced questionnaire and specific face to face questions directed to specialists in the field of construction procurement in the UAE market.

Chapter five, titled as discussion, includes the presentation of the questionnaires statistics in terms of sample volume, response rate, job description of the questionnaire attendee, analysis of the results obtained from questionnaires and interviews. Also, it will cover the analysis of the results and their correlation with respect to each other.

Chapter six is the conclusions and recommendations where the results obtained from the previous chapter will be translated into conclusions that reflect the current practise in the UAE market, and will spot the light on the recommended required actions, in terms of: by whom, and by what. Also, the limitations of the research and further research opportunities are highlighted.

Chapter Two: Literature Review

The schematic of the upcoming literature review is reflected through defining construction sustainability and its bottom lines. Sustainability drivers, globally and locally, are then investigated. Then, relating construction sustainability to the environmental dimension of sustainability in procurement activities which is known as green procurement. Figure 3

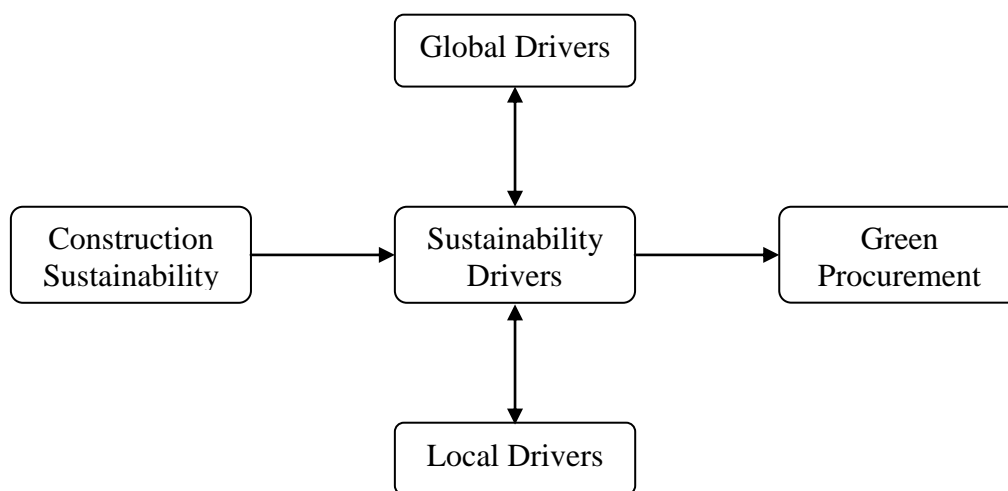


Figure 3 Literature Schematic Diagram

2.1 Sustainability

Ortiz et al 2009 defined sustainability as quality of life in the aspects of a healthier environment that allows for better life conditions socially, economically, and environmentally for present and future generations. This definition illustrates three aspects of sustainability: environmental, social, and economical.

The interest in sustainability and its application arose after the World Commission on Environment and Development (WCED) entitled Our Common Future, which was held in 1987. WCED defined sustainability as the developments that achieve the needs of the present without compromising the ability of the future generations to meet their needs. Also, WCED 1987 added that technology and social organisations are key players in

creating a prosperous economic growth. However, this definition according to [Murray and Cotgrave \(2007\)](#) is vague and may lead to self construal since it does not present the fundamental basis on which developments are generated. Also, it does not provide the framework that transforms the current procedures to sustainable ones.

It was five years later that the concept of sustainability introduced by WCED (1987) was revisited by the United Nations Conference on Environment and Development (UNCED) in Rio Declaration on Environment and Development in 1992. UNCED (1992) considered that sustainable development is all about human beings in order to secure a harmonic life with the surrounding nature. Also, it highlighted that the environmental protection is a key factor in achieving sustainable development. Therefore, sustainable development models which integrate the environmental and human beings aspects of sustainability were generated.

The model of Green Gross National Product (Green GNP) was generated by [Choi \(1994\)](#) in order to defend the hypothesis that the industrial prosperity does not particularly cause environmental decay and more, the environmental decay is more dependent on the source of which the products volume has originated. Green GNP proposes that the economy has two major duties: firstly, is to reimburse the costs of the environmental capital. Secondly, the economy must ensure the environmental protection as an essential part of the production process. Choi (1994) came out with empirical formula that describes the integration between the economy and the environment. The equation is:

Green GNP = conventional GNP + the rents from the environmental capital

Hence, two factors that affect the price of environment capital are identified: firstly, industrial affluence represented by the number of products, and secondly, degree of environmental decay which is the relative price of environmental capital services to other goods within an economy. Choi (1994) speculates that these two factors are relevant to each other and directly affect sustainability. He explained that “With a given level of environmental capital, an increase in the number of products due to the expansion of human and physical capital, or the reduction in fixed costs always makes the relative price of environmental capital services more expensive, while an increase in the number of products due to lower substitutability does not necessarily result in a hike in the relative price of environmental capital services. Therefore, industrial prosperity

does not always cause environmental decay”. This can be a clue for policy makers to consider products substitutability verses and environmental sustainability.

As cited in Hall and Purchase (2006), Office of Government Commerce (2002) set the goals of the sustainable development as ensuring a better quality of life for every one now and for generations to come. That is social progress, protection of the environment, prudent use of the environment, and economic growth, all at the same time. The Department for Environment, Food, and Rural Affairs - defra (2007), highlighted four areas that require immediate actions. These areas are: sustainable consumption and production, natural resources protection and environmental enhancement, building sustainable communities locally and globally, and climate change and energy. Therefore, a five-principle sustainable development framework has been developed for the United Kingdom, Scotland, Wales, and North Ireland. The principles are: living within environmental limits, ensuring a strong, healthy, and just society, achieving a sustainable economy, using sound science responsibility, and promoting good governance. Figure 4 illustrates these factors and their interaction.

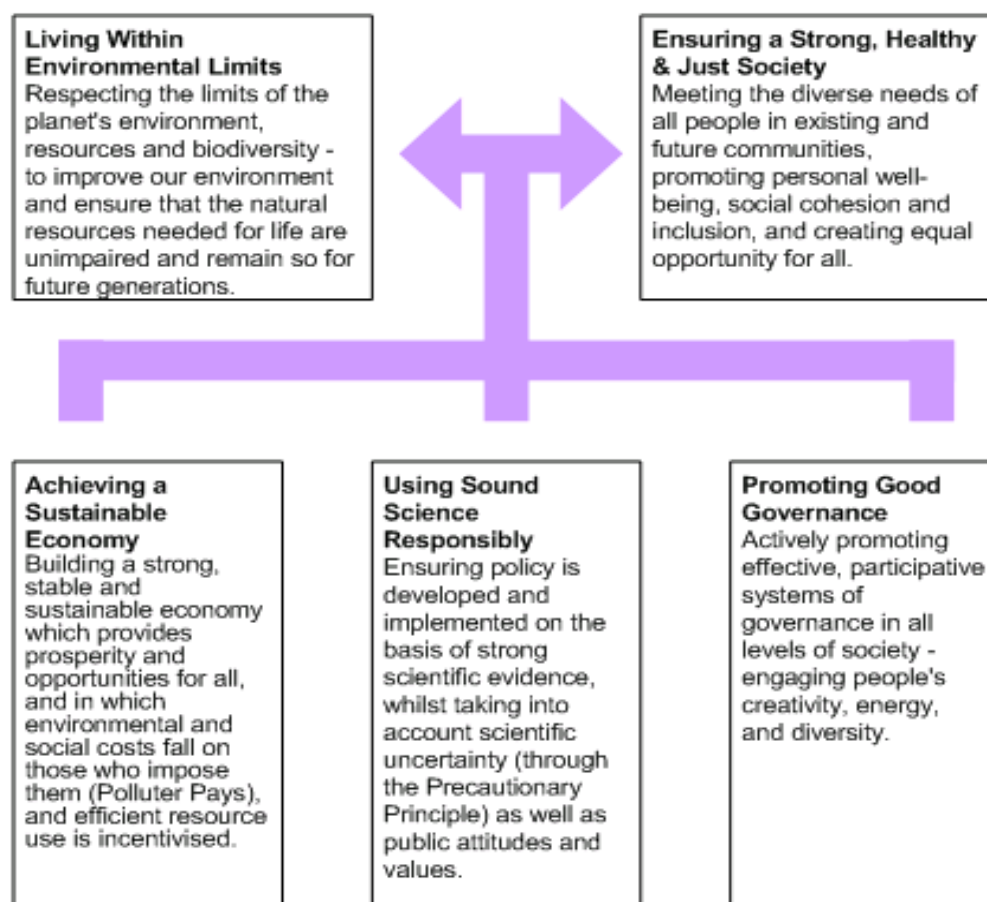


Figure 4 five-principle sustainable development framework, Defra 2007

Todorova and Marinova 2009 outlined five different adopted sustainability models: Pictorial Visualisation Models, Quantitative Models, Physical Models, Conceptual Models, and Standardising Models. These models share the same character of lacking the holistic paradigm of sustainability that implies the interaction between environmental, economical, and social components on the long run. Consequently, Todorova and Marinova (2009) introduced a holistic model, Figure 5, which considers all dimension of sustainability globally, depending on simultaneous integration of economic (E), human (H), and natural environmental (N) components. In order to validate the model, the components must be heterogeneous, equal, and humanity stewardship.

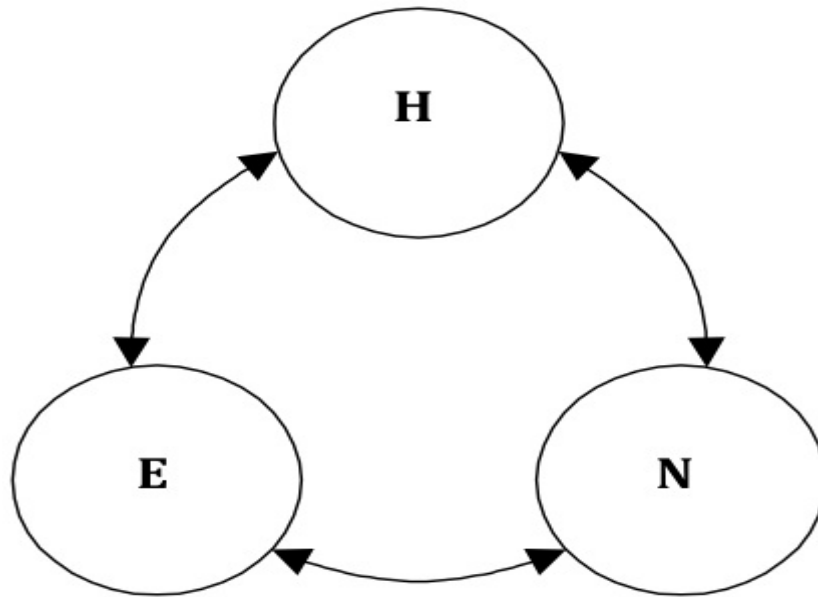


Figure 5 Co-evolutionary sustainability model, Todorova and Marinova 2009

2.2 Construction Sustainability and Environment

Kibert (1994) sustainable construction concept focuses on creating sustainable built environment under six principles: minimizing resource consumption, maximizing resource reuse, utilising renewable or recyclable resources, protecting the natural environment, creating a healthy, non-toxic environment, and pursuing quality in creating the built environment.

Ortiz et al (2009) considered construction industry as one of the biggest economical sectors that directly affect sustainability and in particular environmental sustainability. Also, construction industry share in the global economy equals to one-tenth, resulting in resources consumption of one-sixth to one-half of the world's wood, minerals, water and energy according to Lenssen and Roodman (1995) cited in Ngowi (2000). Additionally, construction industry consumes fifty percent of raw material and produces fifteen to fifty per cent of waste according to Sev (2009) who described environmental impacts of construction industry as: raw material extraction and consumption, land use change, energy and greenhouse effect, indoor and outdoor emissions, water use and waste water generation, increased transport needs, and waste generation. Figure 6 illustrates the interaction of construction industry with the surrounding environment throughout projects lifecycles.

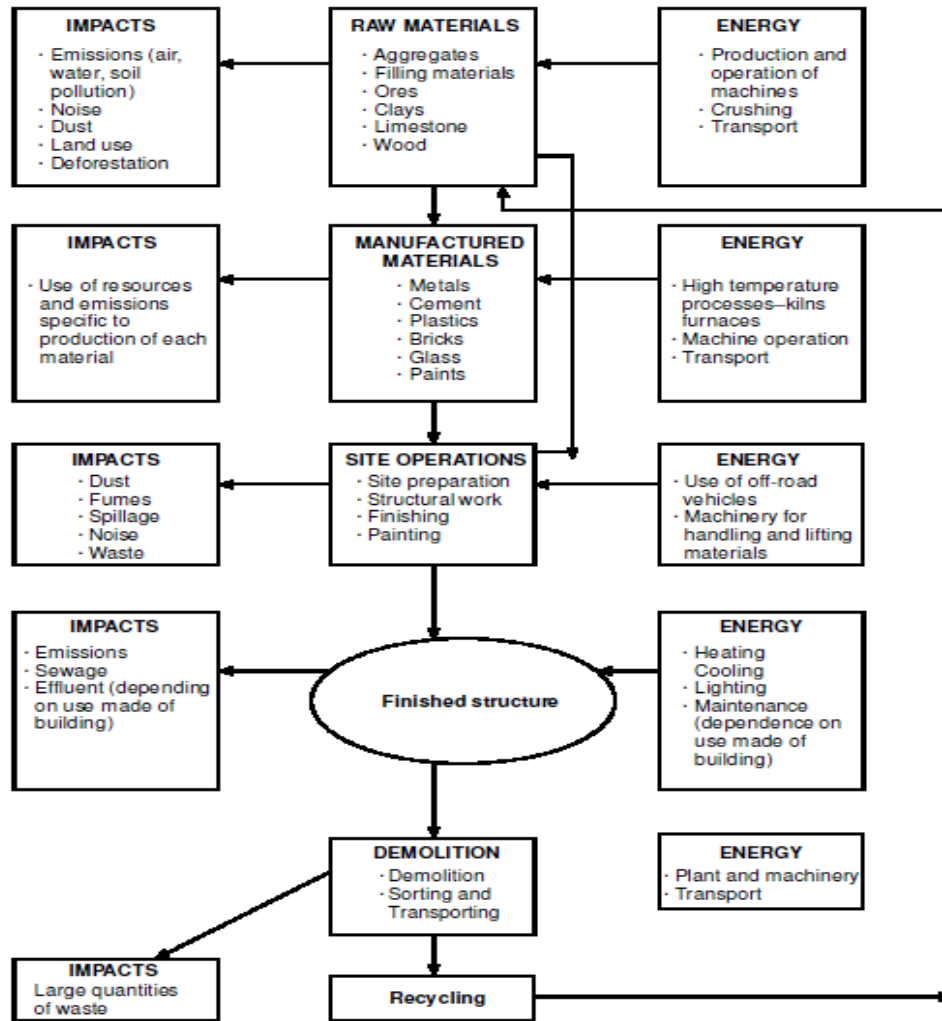


Figure 6 construction process and related environmental impact. Ngowi (1998)

The key objectives of environmental sustainability as stated by OGC (2000) is to reduce harmful effects of human contribution to climate change, and to reduce the impact of negative resources depletion as a result of human consumption patterns and population growth. These goals can be achieved through adopting sustainable operations that include the reduction of carbon emissions, waste reduction, increased recycling, and reduced water consumption, and implementing a sustainable procurement policy that ensures strengthening leadership across organisation, expand the skills and knowledge, and raising standards through mandatory requirements for purchasing goods.

2.3 Drivers for Sustainability in Construction Industry

The previously defined concept of sustainability, which implies main driver for sustainability, is securing today's needs without compromising the future ones globally and locally in all aspects of sustainability: environmental, economical, and social. Also, as previously mentioned, since the share of construction industry is considerable in global economy, it is axiomatic that the contribution of construction industry in sustainable development is critical globally and locally.

2.3.1 Global Sustainability Factors

The most demanding driver for sustainable construction is the policies, laws, and governmental declares, according to Varnas et al. (2009), in addition to the researchers and globe call to protect the environment.

Crotty and Rodgers (2012) examined three factors that drive for sustainability within the Russian business market. These factors are: governmental regulations, stakeholders' pressure, and financial benefits, in other words; Because It Pays. They found that "Because It Pays" factor is the most influential driver in greening within the industrial firms. They added that the government's policy of environmental punishment rather than environmental management, and the poor social environmental awareness paralysed the nongovernmental environmental organisations to influence greening activities.

Mizher (2011) explained five different global factors lead to the adoption of the sustainable construction where the first is Global Warming. The Intergovernmental Panel on Climate Change (IPCC) report cited in Mizher (2011) claimed that the climate change is a consequence of human activities represented in fossil energy consumption which causes the noticeable increase in carbon dioxide emission that forms the most important greenhouse gases. Therefore, the dependency on alternative energy sources is crucial to reduce greenhouse gases emissions considering that the UAE, according to figures 1 and 2, has the highest carbon footprint after Qatar internationally. The second factor is the depletion of the current consumed resources, such as fossil fuel and water

that are essential to the economic growth. Thirdly, the urgency for lifestyle change since the humanity today consumes almost one and a half planet in order to provide the required resources and absorb the waste. This means that the Earth requires one and a half years to reproduce its yearly consumed resources. Population and technology also affect sustainability from environmental perspective. The accelerating population growth exerts more pressure on energy and resources consumption rate which leads to their fast depletion. Finally, the urgency of balancing between economic growth and development with sustainable development is mandatory to achieve sustainability.

Mizher (2011) concludes that the adoption of sustainability urges all the stakeholders to think harder and smarter to create developments that are carbon free, energy efficient, and liveable. The concept of developing requires to be altered in all its stages: developing, designing, building, and operating and maintaining, which results in obtaining green communities that depends on renewable energy, resources recycling and a better quality of life.

Global competence is another driver for sustainability adoption. Tan et al. (2011) explained that there are two global indices that monitor sustainability driven companies. These indices are FTSE4Good and the Dow Jones Global Sustainability Index (DJGSI). FTSE4Good index monitors companies' behaviour towards environment, human rights, and positive relationships amongst stakeholders. While Dow Jones Sustainability Index monitors the financial performance of the sustainability driven companies. According the Sustainable Construction Task Group (2002) cited in Tan et al (2011), the companies listed on the Dow Jones Sustainability Index attained fifteen per cent more than the standard Dow Jones Global Index. This means that the momentum towards sustainability operations is widely accepted and increasingly adopted. Therefore, it is mandatory to construction companies to adopt sustainable operations in order to compete globally. A study by the World Business Council for Sustainable Development cited in Ofori (2000) concluded that sustainable development and better environmental performance supports the organisation's competitive spirit. Moreover, the quality of the organisation's environmental management is one of the considerable indicators of the total quality management that the organisation applies.

Richardson and Lynes (2007) classified sustainable construction motivations into two categories: organisational and financial. Organisational motivations are strong leadership, sustainable targets, coordination and interaction between researchers, designers and facilities management employees. Similarly, financial motivations are: reducing both the direct capital and lifetime operation cost of the building, and the creation of operation structure that provides the building designs with lower energy overheads.

Balkau and Sonnemann (2011) claimed that the driver for sustainability is subject to two reasons: public and governmental environmental movement, and the business itself. They justified that those environmental movements, either public or governmental, underpin the environmental outcomes rather than business benefits despite that the business outcomes are still potential. On the other hand, business driver is advocated as a commercial driver that mandates the business to transform to greener one due to increased social awareness and / or governmental regulation. Therefore, the desired product components and or types may be changed and consequently the product supplier as well.

2.3.2 Local sustainability factors

According to Oryx ME Three Year UAE Construction Industry Forecast report (2008), UAE construction industry contributed eight per cent of the Gross Domestic Product (GDP) in 2007; it is the fourth largest GDP contributor after services (47%), crude oil production (27%) and manufacturing (14%) industries. Also, it is considered to be the key source of the UAE employment. Additionally, the construction industry contribution in the UAE to the environment is considered harmful due to the mass carbon footprint where UAE occupy the second highest after Qatar. Therefore, according to Abu Dhabi Chamber of Commerce and Industry (ADCCI) (2008), the President of UAE His Highness Sheikh Khalifa Bin Zayed Al Nahyan declared the vision of establishing “a confident, secure society and to build a sustainable, open and globally competitive economy”.

In response to His Highness vision, Abu Dhabi Chamber of Commerce and Industry (2008) stated the main local drivers for sustainability which are:

- Global trend towards transparency and accountability reinforced by maintaining and strengthening trust with customers.
- Global recession, cost reduction and efficiency which made the organisations focus on cost cuttings and savings through waste reduction and recycling
- Climate Change and the fact that UAE is classified as the worst environmental footprint per capita exert pressure on establishing green technology to reward low carbon economies.
- Global Shift towards sustainability due to the ignorance of the environmental issues by the global financial systems. Thus, the emerging consensus towards sustainable development has become inevitable.
- Sustainability as the next step in management excellence since sustainability management is viewed as a core to the business. Therefore, business strategy must reflect sustainable strategies through its operations: environmentally, economically, and socially. Hence, sustainable organisations have the ability to outperform their competitors.
- Abu Dhabi leadership in sustainability represented in Masdar project through which Abu Dhabi targets to prove its leadership in renewable energy, sustainable design of cities, and leadership in human resources knowledge.
- Rapid economic growth, resource constraints and infrastructure limitations exert massive pressure on some natural resources. Notably in the Gulf and UAE, the risk of water shortage, high associated infrastructure costs, and timeline limitations that may not be in harmony with growth as stated in Sustainability Report (2009).

As an integrative effort to adopt sustainability, and in implementation of the presidential declare upon sustainability, His Highness Sheikh Mohammad Bin Rashid Al Maktoum, Prime Minister and Ruler of Dubai, declared sustainability as a major item of Dubai Strategic Plan 2015, including all the directives to implement green building specifications on all buildings in Dubai Emirate in order to preserve Dubai as a healthy city according to the highest standards of sustainable development, which results in clean pollution free environment. Therefore, Government of Dubai, Dubai Electricity and Water Authority (DEWA), and Dubai Municipality (DM) issued a combined Green Building and Specifications handbook that aims to:

- Develop buildings performance in Dubai through reducing natural resources consumption, public health improvement, buildings lifecycle enhancement including planning, design, construction, operation, maintenance and demolishing.
- Support the Dubai's Strategic Plan 2015 through providing a sustainable environment and extending the Emirate's infrastructure capability to meet the future developments needs.
- Reduce the harmful effects of the buildings through their life cycles which enhance the built environment performance.

When contrasting the local and the global drivers for sustainability (Table 2.1), it is noted that both the local and the global drivers generally share the same merits: they coincide in the global factors, the fear of resources depletion, the vital life style change, financial and development factors. Conversely, the local drivers deviate from the global ones in the aspect of achieving leadership in sustainability worldwide, and in achieving management excellence in the filed of sustainability. The UAE aims at proving its leadership in sustainability through establishing sustainable infra structure that is capable to provide strata to future sustainable projects. The nucleus of such projects is Masdar City in Abu Dhabi which is aimed to be a zero – carbon producing city. Masdar is now considered as a prototype city for a renewable energy and clean technology industry.

Table 2.1 Contrasts of the global and local sustainability drivers

Global Sustainability Drivers	Local Sustainability Drivers
Governmental regulations, stakeholders' pressure, and financial benefits	Global trend towards transparency and accountability
Global Warming	Climate change
Depletion of the current consumed resources	Rapid economic growth, resource constraints and infrastructure limitations
Urgency for lifestyle change,	UAE is classified as the worst environmental footprint per capita
Urgency of balancing between economic	Ignorance of the environmental issues by

growth and development	the global financial systems
Global competence	Leadership in sustainability
Organisational and financial motivations	Sustainability as the next step in management excellence
Public and governmental environmental movement	Global recession, cost reduction and efficiency
commercial aspects of business	Presidential declare
Population and technology	

2.4 Impact of embracing green measures on construction procurement frameworks

In order to understand the impact of sustainability on procurement frameworks in construction industry, it is significant to visit the concept of construction procurement, types of procurement systems, and the attributes of procurement systems.

2.4.1 Construction Procurement

Ngowi (1998) defined procurement system as the project organisational structure that is an integrated action implemented to acquire the design, management, and installation of inputs. Furthermore, Dalgliesh et al. (1997) described procurement as the process through which client requirements and objectives are formulated smoothly throughout project life cycle. Other view of construction procurement according to Uttam et al. (2012) is seen to be a vital organisational process that comprises the purchase of supplies and services since it sets the proper interaction between clients and contractors.

Luu et al. (2003) stated three constraints of procurement selection procedures. Firstly, client characteristics like experience, type, and financial capability. Secondly, project requirements like project size, type, and project location. Finally, external environment like market's competitiveness, technology feasibility, and materials availability. Table 2.2 illustrates these constraints thoroughly as concluded in Luu et al. (2003) literature. Also they mentioned that the procurement selection attributes which are time certainty,

cost certainty, speed, flexibility, responsibility, complexity, price competition, risk allocation, and quality are not mutually exclusive to all projects and that these parameters may imply sub parameters that are unique to each project. Dulaimi and Kumaraswamy (2001), in a comprehensive study about the current procurement systems, concluded that the construction procurement is on a critical turning point and ready for critical development in order to meet the expandable construction industry requirements.

Accordingly, many types of procurement arose to accommodate the previously mentioned attributes. These types include but not limited to Traditional Procurement, Design and Build, Design construct and maintain, Construction management, Warranted maximum price, Managing Contractor, Alliance, and Public Private Partnership (PPP). Table 2.3 provides a detailed illustration of each type.

Table 2.2 Procurement selection constraints. Luu et al. (2003)

Procurement selection factors	Authors																
	AM	AT	BF	C	CR	F	GI	H	HU	KD	M	MG	N	R	SM	T	W
<i>Client's characteristics and objectives</i>																	
Client's experience	✓						✓					✓		✓			
Client type	✓						✓					✓		✓			
Client's in-house technical capability							✓				✓	✓		✓			
Client's financial capability	✓						✓				✓	✓					
Client's willingness to take risks					✓							✓					✓
Client's willingness to be involved			✓					✓				✓	✓		✓		
Client's trust towards other parties														✓			✓
Client's requirement for highly serviced or technically advanced building			✓								✓		✓		✓		✓
Client's requirement for aesthetic building	✓		✓			✓								✓			
Client's requirement for on-time completion			✓					✓						✓			✓
Client's requirement for within-budget completion								✓						✓			✓
Client's requirement for low maintenance cost	✓		✓														
Client's requirement for low operational cost	✓		✓														
Client's requirement for value for money			✓	✓							✓		✓				
<i>Project characteristics</i>																	
Project size	✓	✓														✓	
Project type	✓	✓														✓	
Building construction type	✓	✓														✓	
Project site location	✓										✓						
Unknown site risk factors			✓														✓
Known site factors likely to cause problems			✓														✓
Usage of pioneering technology											✓				✓		
<i>External environment</i>																	
Market's competitiveness	✓								✓	✓				✓			✓
Technology feasibility	✓								✓					✓			✓
Regulatory feasibility	✓								✓					✓			✓
Materials availability									✓	✓							✓
Experienced contractor availability	✓									✓				✓			✓
Labour productivity									✓	✓				✓			✓
Inclement weather									✓								✓
Natural disasters									✓								✓
Industrial actions									✓					✓			✓
Objection from local lobby groups									✓					✓			✓
Objection from neighbour									✓					✓			✓
Political constraints									✓					✓			✓
Cultural differences									✓					✓			✓

Notes: AM = Alhazmi and McCaffer (2000); AT = Ambrose and Tucker (1999); BF = Bennett and Flanagan (1983); C = CSSC (1988); CR = Chege and Rwelamila (2000); F = Franks (1990); GI = Gibb and Isack (2001); H = Hewitt (1985); HU = Hughes (1989); KD = Kumaraswamy and Dissanayaka (2001); M = Molenaar (1999); MG = Masterman and Gameson (1994); N = NEDO (1985); R = Rowlinson (1999); SM = Skitmore and Marsden (1988); T = Turner (1990); W = Walker (1989)

Table 2.3 Procurement Models. State Government of Vitoria, Australia (2010)

MODEL	DESIGN AND CONSTRUCT	NON CORE SERVICES	RISK ALLOCATION
Traditional Construct only	Design and construction separately procured	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	<ul style="list-style-type: none"> Construction risk transferred The state retains planning, latent conditions and site condition risks
Design and Construct	<ul style="list-style-type: none"> Detailed design and construction procured under one contract Functional brief prepared by the State 	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	<ul style="list-style-type: none"> As for the Construct Only model but with the additional transfer of detailed design risk The contractor provides certain warranties over the design
Design, Construct and Maintain	As for the Design and Construct model but with hard facilities maintenance contract term added (typically 5 - 7 years)	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	As for the Design and Construct model but with the additional facilities maintenance risk transferred
Construction Management	Contractor is engaged to manage the construction works on behalf of the client	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	Client enters directly into contractual arrangements with suppliers - the contractor therefore carries little or no risk (except in relation to its own work)
Warranted Maximum Price	Effectively a cost-plus contract between the Principal and the Contractor, which is subject to an upper limit.	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	Provides a limitation on the cost of the project, provided the works are adequately described as to scope. Allows Contractor to work with the design team.
Managing Contractor	<ul style="list-style-type: none"> Contractor manages the design, documentation and construction on behalf of the State. Lump sum (consisting of the management fee and the cost of the work done under the component sub-contracts) 	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	<ul style="list-style-type: none"> Construction quality and completion risk transferred Risks associated with poor service delivery are difficult to transfer using input specifications compared to output specific model (eg PPP)
Alliance	<ul style="list-style-type: none"> Based on open book approach, where the Contractor is generally paid for direct costs with allowances for corporate overheads and a normal profit margin level. A target cost for the work is established - delivery of the project at a cost lower/higher than the target cost will result in a sharing of the benefits/ costs Typically used in highly complex projects 	<ul style="list-style-type: none"> State / Outsourced Typically outsourced services are based on input specifications 	<ul style="list-style-type: none"> Risks are shared in a relationship culture, which encourages a 'no blame' approach for issues and instead seeks to foster a 'solutions' based culture Risks associated with poor service delivery are difficult to transfer under input specifications
PPP	<ul style="list-style-type: none"> A consortium contracts to build the project, finance it and assume responsibility for facilities maintenance and asset replacement over a defined period (typically around 30 years) The State will pay a fixed fee In Victoria this Delivery Model is subject to the Partnerships Victoria policy and guidelines PPP has real potential to deliver value for money where: <ul style="list-style-type: none"> It is possible to clearly define required outputs The project has complexity and there is significant scope for innovation there are opportunities for the transfer of certain risk to the private sector that it is in a better position to manage and therefore can price lower than the cost to the State if it were to retain the risks. The State's responsibilities for managing the project are very different to all other Procurement Models 		The State becomes a purchaser of facility based services that are paid for based on performance and such as the State frees itself of associated risks, locks in whole of life budgets and quality and frees itself up to the focus on its core business.

As a conclusion, the construction procurement models are selected according to their required performance against the developer prerequisites. It is obvious from Table 2.3 that the procurement models are directly affected by the input specifications that are previously decided by local authorities, developers and consultants.

2.4.2 Green Procurement

Warner and Ryall (2001) suggested that it is the time to expand the notion of traditional procurement (Traditional Procurement System, Design and Build, Fast Track, Construction Management, and Build Operate and Transfer) that concentrates on services' efficiency and quality to a wider concept of environmental requirements, and aims at protecting the ecological system, preserving biodiversity, adoption of renewable resources, and reducing the non-renewable resources diminution as stated by Holmes (1994) cited in Ofori (2000).

Lacroix (2008) integrated the concepts of Green Procurement and Life Cycle Impact (LCA) of the purchased services in his definition of environment friendly procurement which is “the purchasing of products or services which have a lower impact on the environment over their whole life cycle than the standard equivalent” integrating the environmental requirements with the traditional requirements of price, quality, and performance. Lacroix (2008) described the green procurement process components as:

- Recycled content products
- Energy Efficient products and energy efficient standby power devices
- Alternative fuel vehicles, alternative fuels, and fuel efficient vehicles
- Bio-based products
- Non-ozone depleting substances
- Alternative fuels and fuel efficient vehicles
- Environmental Protection Priority Chemicals

On the other hand, LCA concept implies close monitoring of the serviced products starting from the extraction of raw material, passing through distribution, operation and disposal. The urgency of this process is reflected through the avoidance of the adverse effects of the products or services.

Dawson and Probert (2007) defined green procurement, quoted from Welsh Assembly Government (2004), as the reflection of procurement on environmental factors that affect the delivered services through highlighting the prospective target groups that are capable to promote green procurement. These groups of individual consumers, private sector organisations, and public sector organisations are able to form a driving force power towards green procurement through their power in their active society. The driving force was translated in European Union and the United Kingdom government through issuing local and global green procurement guidelines. On the other hand, Ofori (2000) stated that environmental procurement is the consideration of reduction, reuse, and recycling of materials in the procurement activities.

Additionally, Palmujoki et al. (2010) described green public procurement as formalising environmental criteria that fulfil the legal principles of the free movement of goods, transparency, and equal treatment of bidders. Also, they defined “green contract” as the contract that includes one or more clauses stating that the contractor must exceed the least prevailing environmental standards.

Menard (2009) considered that green procurement leads to sustainability as it is involved in cost saving which is one of the three targets of sustainable strategy: cost saving, adding and retaining customers, and complying with legal requirements. Therefore, Menard (2009) considers that green procurement does not add cost to the purchasing strategy illustrating that Total Quality Management and Six – Sigma quality tools were perceived as adding expenses tools. However, they are now considered as the most value adding and cost saving tools.

Accordingly, green procurement or environmental sustainable procurement is concerned with the environmental aspect of the construction industry as a part of the bottom lines of sustainability: environmental, social, and economic.

2.4.3 Deficiencies of currently practised procurement systems against green requirements

In his study of the currently applied procurement systems, Ngowi (1998) found that the these systems of Traditional Procurement System, Design and Build, Fast Track, Construction Management, and Build Operate and Transfer are inadequate to contain the environmental attributes. He clarified that Traditional Procurement Systems do not support the integration of knowledge between the organisation and the project's team. Also, it does contribute to the depletion of resources during the project execution. Additionally, Design and Build system provides limitations to the process represented in limiting the creativity of the procurement team since Design and Build system considers the client vision as the benchmark. Hence, the creative considerations, such as sustainability and environment, are overtaken at the preliminary stage of the project, which is the most significant. Finally, procurement systems such as: Fast Track, Construction Management, and Build Operate Transfer do not provide full integration of all the disciplines of the construction industry on the project level. Accordingly, resources depletion is hardly avoided which contradicts with sustainability principles.

Uttam et al. (2012) criticised the disability of the traditional procurement systems to satisfy the environmental requirements of the clients. He added that the detailed design documents and the appointing of the lowest bidder concept lead to the divorce between the construction and the design which is reflected in adversarial relationship between client and contractor, especially when the project is complex and large.

Mazet and Dontenwill (2012) stressed on the urgency of altering the current procurement practices through monitoring more merits like employee security, pollution and resources waste, activities impact on the community, the negative image of current activities on the organisations in addition to the financial monitoring. Furthermore, the traditional adopted supplier management systems, like supplier portfolio model, are often incapable to detect sustainability since it lacks the adaptability concept to the continuously changing environment. Also, the confidentiality issues hinder the clients' access to suppliers' information which limits the cooperation and improvement based on knowledge sharing.

2.4.4 Transformation to environmental sustainable procurement

After exploring the consideration of environmental aspects in procurement procedures, Sterner (2002) found that most of the construction clients basically specify particular material that is environment friendly without considering the operational or energy consumption. Therefore, Sterner (2002) recommended expanding the environmental aspects of procurement application to more operational and tender evaluation since the most environmental attributes are separation of wastes and contractor's environmental policy. However, the inadequacy of the evaluation models does not support such expansion.

Since environmental consideration is becoming a basic social requirement and transforming to be one of its main norms, the organisations tend to adopt environmental orientation externally through the suppliers, and internally through policy and strategy adaptation. Mazet and Dontenwill (2012) viewed the effect of greening the procurement process on the organisation in two methods: through changing the supply network structures and relationships since new actors enter the network and reform the existing relationships including resources recombination and reforming the execution of current activities, and through redefining the organisation's legitimacy which is the social acceptance and perception of the organisation's actions against the society's existing norms, morals and beliefs. The consequences of adopting such policies on the suppliers as explained by Mazet and Dontenwill (2012) were difficulties represented in: the shortage of comparable product's data, lack in sustainable knowledge, the insufficiency of sustainable products, and the emerging ethical dilemmas since the new environmental requirements are beyond their accustomed responsibility. To resolve such problems, Mazet and Dontenwill (2012) suggested increasing the coordination with other experts in the same field such as non-profit-making organisations. Also, enhancing the knowledge sharing between other sustainable oriented suppliers is essential in order to develop sustainable methods away from the traditional ones.

Meehan and Bryde (2011) founded that transformation from currently adopted procurement systems to sustainable ones is confronted by the inertia of the organisations to change, and the fact that sustainability is only environmentally adopted neglecting the other social and economical bottom line components. Also, Ngowi (1998) explained that the inertia of the organisation to change and the absence of a

reliable alternative procurement system confront such adoption. In order to overcome these obstacles Meehan and Bryde (2011) recommended to benefit from other areas, like innovation management related to the inter-organisational relationship, to develop sustainable indicators for procurement, to prove the social and economical dimensions of the environmental procurement practises, and to create sustainable culture amongst the procurement staff rather than concentrating on the sustainability drivers.

In a study aims to explore the opportunity of applying sustainable construction procurement systems in construction projects in South Africa, Rwelamila et al. (2000) introduced the application of the project management tools of Environmental Assessment (EA) and Environmental Management System (EMS). Rwelamila et al. (2000) concluded that the excessive use of traditional procurement systems hinder these tools. Therefore, sustainable construction procurement can not be achieved on project or organisational level. However, individual efforts can be exerted to drive the project sustainably, but these efforts are considered to be limited and inefficient. Finally, Rwelamila et al. (2000) stressed on the role of the client in formalising polices of the procurements according to local requirements and his expectations under the emphasis that clients and project managers must enrol in continuous development programs that provide the required level of knowledge and expertise.

Moreover, Ofori (2000) specified a four-step environmental procurement strategy starting firstly by specifying products standards that are either environmentally friendly labelled or they possess environmental attributes such as recyclable and biodegradable. Then, stating the behaviour standards of services' suppliers through: disclosing information about their environmental practices, auditing the suppliers' environmental performance, obligating the suppliers to have environmental management system throughout their organisations, requesting the suppliers to have their environmental management system to be certified against a recognised standard such as ISO 14001. Thirdly, collaboration between the client and the supplier is important to assist them reducing the environmental impacts through changes in product design and material use. Finally, offering training and development of the suppliers to increase their environmental knowledge and to update them with the latest technological developments throughout their operations.

Contractually, Palmujoki et al. (2010) detailed the conditions that govern the green procurement procedure which include: stating the environmental obligations clearly in the contract terms, implementation of the contractual liquidated damages concept to protect the environmental obligations in case of contractor's contract breach, attaining the right of random and selective inspections of the processes to ensure avoidance of contract breach, ensuring the contractor's environmental prequalified criteria is included in the contractor's offer, stating the required environmental specifications of the required services without which they will be rejected; like material selection, chemical content, and characteristics of products, providing the contractor's environmental management systems, and quality systems such as ISO 14001, Attaining the right to exclude the contractor whose contract was terminated earlier because of environmental contract breach, and finally, providing additional clauses that guarantee the application of the green contract.

Since construction specifications control the relationship between project's stakeholders, Lam et al. (2010) defined green specifications as the full set of construction specifications within which environmental requirements are aligned. They concluded that green specifications generation is dependent on the following factors stated in a descending order from the most important to the least; stakeholder involvement, technology and techniques, reliability and quality, leadership and responsibility, and guide and benchmarking systems.

Varnas et al. (2009) argued that the integration of the environmental management system and the environmental impact assessments supports the execution of the green criteria, described by the client, at the tendering phase of the project. They explained that the environment management system monitor the contractor behaviour, while the environmental impact assessment reflects the effects of the contractor's operations and the environmental impact of the used materials. Varnas et al. (2009) stipulated the articles that must be included in the tender documents in order to nominate the contractors who are capable to comply with the green requirements:

- Measures and parameters that are to be reported to the client periodically
- Contractor's feedback procedure to the client
- Client to contractor instruction procedure

- Availability of project plan, environmental policy, and overall environmental objectives
- The contractor has to produce a unique environmental management system that encloses all the performed activities by the contractor and the subcontractor complying with an internationally management system such as ISO 14001
- Descriptions of the environmental mandatory requirements and environmental appraisal criteria detailing the directions about the standards to comply with and the methods to plan contractor's work

Hill et al. (1994) outlined the requirements of establishing an environmental procurement strategy. These requirements are: determining an environmental strategy, providing an organisational structure that specifies the roles and responsibilities of the concerned personnel, environmental management scheme development, and performing periodic environmental performance audits throughout all operations.

The organisation for Economic Co-operation and Development (OECD), headquartered in Paris, France, with thirty four member countries around the world, OECD mission is to promote policies that will improve the economic and social well-being of people around the world. Amongst these improvements, environmental improvements are considered critical for their affect on the sustainable development and its bottom lines: economical, social. Therefore, OECD contributed in protecting the environment by promoting the green procurement concept through urging the governments to create policy frameworks that support the transformation to green public procurement. Also, creating appropriate procedures for recognising green products, providing training and technical support to simplify the operation, and developing key performance indicators to monitor and evaluate the policies.

Table 2.4 provides aspects of transforming to green procurement in construction industry in terms of current obstacles and transformation requirements as concluded from literature.

Table 2.4 Green procurement transformation requirements

Current Procurement Obstacle	Transformation Requirements	Reference
<ul style="list-style-type: none"> • shortage of comparable product's data • lack in sustainable knowledge • insufficiency of sustainable products • ethical dilemmas 	<ul style="list-style-type: none"> • Coordination with experts • knowledge sharing with partners 	Mazet and Dontenwill (2012)
<ul style="list-style-type: none"> • Inertia to change • Lack of comprehensive sustainability concept 	<ul style="list-style-type: none"> • Innovation management • Sustainable culture creation • Develop sustainable indicators 	Meehan and Bryde (2011) OECD (2012)
<ul style="list-style-type: none"> • Excessive application of traditional procurement systems 	<ul style="list-style-type: none"> • Client input • Development programmes for project managers 	Rwelamila et al. (2000) OECD (2012)
	<ul style="list-style-type: none"> • Specifying environmental products standard • Specifying behaviour standards of the suppliers • Client and supplier collaboration • Suppliers training and development 	Ofori (2000) OECD (2012)
	<ul style="list-style-type: none"> • Detailing the environmental conditions • Implementation of liquidated damages concept • Random and selective inspections • Contractor's prequalification • The right to terminate the contract in case of breach. 	Palmujoki et al. (2010)
Lack of green specification	<ul style="list-style-type: none"> • Generation of green specification 	Lam et al. (2010)
	<ul style="list-style-type: none"> • Listed tender requirements mainly are EMS and EIA 	Varnas et al. (2009) Hill et al. (1994)
	<ul style="list-style-type: none"> • Government policy frameworks 	OECD (2012)

2.5 Corporate social responsibility and green procurement

2.5.1 Corporate social responsibility (CSR)

The social contribution of organisations is vital in order to merge with the community activities. Therefore, organisations must have a corporate social responsibility (CSR) statement. According to Carroll (1991), the hierarchy of CSR consists of four layers: discretionary, ethical, legal, and economic responsibilities illustrated in Figure 7.



Figure 7 Corporate social responsibility hierarchy. Carroll 1991

World Business Council for the Sustainable Development (1999) cited in Castka et al. (2004) defined CSR as “ the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large”. According to Castka et al. (2004), CSR dimensions are:

- External environment features the social responsibility and new opportunities, community relations, consumer relations, supplier relations, natural environment, shareholders relations.
- Internal Environment reflects physical environment, working conditions, minorities and diversities, organisational structure and management style, communication and transparency, industrial relations, and education and training.

- Holistic approach aspects are ethics awareness represented in improving the ethical aspects of a business or an organisation through training and development, and enhanced communication procedures. Also, the involvement of the employees in generating the ethical codes and codes of behaviour.

Caska et al. (2004) presented an innovative broader model of CSR parallel to ISO management standard that is applicable to all organisations' types. They redefined CSR as "a concept to run profitably yet in a social and environmentally responsible way in order to achieve business sustainability and stakeholder satisfaction.

Integrally, and as an obligation from governments and financial institution, organisations are requested to have a CSR statement according to Balkau and Sonnemann (2011). They emphasised the importance of a formal management system that drives the organisation all together harmonically. This arrangement is represented by a CSR supported by a management system like ISO 14000 and ISO 26000. The sustainability targets are usually articulated or phrased briefly within the CSR statement. Balkau and Sonnemann (2011) argued that, on operational levels, companies are requested to have environmental management systems to provide broad monitoring to their activities and to reply to the CSR statement of the head organisations.

Robert Menard (2011) related CSR to organisation's procurement structure through including ethnic, social, gender, and economically deprived procurements' entities. Additionally, CSR boundaries include imposing compliance with decrees involving types and sources of labours, wage levels, ethical relationship amongst suppliers, funding of social activities. While procurement CSR objectives are: honest, equitable and ethical treatment towards all suppliers, appraisal of supplier performance, and granting nearly failing suppliers the opportunity to modify their performance. The environmental dimension of CSR, according to Robert Menard (2011), is concerned about preservation the natural resources of earth through direct stewardship of all the resources such as fuels, raw materials, and water in addition to green house gases diminution.

One of the lead construction organisations in the UAE commitment is to be "a good corporate citizen of the world". Therefore, the four components of the CSR: legal,

ethical, moral, and sustainability are adopted throughout its operation towards employees, clients, business partners, and communities. Additionally, the organisation considers the employees as its best asset, which coincides with the United Nations Global Compact.

United Nations Global Compact, according to United Nations web site, is “a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption.”

Chapter Three: Theoretical Framework

3.1 Introduction

Theoretical framework is the foundation on which the entire research is based through providing a solid background reflected in the literature review conducted in the previous chapter, which leads to develop a conceptual framework. Sulaiman (2009) defined five components of the theoretical framework: highlighting the variables mentioned in the study, explaining the inter relationship between variables, discussing the direction, significance, and strength of the relationships, explaining the belief of having such relationships, and generating a schematic diagram of the theoretical framework that can visualise the theoretical relationships.

3.2 Study Motivation

The study motivation arose from the global trend in greening its operations. Also, since the researcher background is based on construction in the United Arab Emirates market, it is logical to focus on construction industry processes. The researcher believes that procurement processes have a considerable effect on the projects outcomes, which one of them is the environmental.

The research here is intending to explore the gaps that already exist in the currently adopted procurement processes, which will provide the opportunity to introduce the green procurement attributes to present a green procurement practice.

3.3 Study Components

3.3.1 Current Procurement Practice

This component discusses the procurement attributes that are being adopted without considering the environmental traits. According to the literature, the traits selection is affected by: client characteristics including experience, type and financial capabilities. Also, project requirements, and finally, external environment like market

competitiveness, technology feasibility, and materials availability. It is emphasised, through literature, that the current procurement procedures are critically ready to develop in order to meet currently evolved requirements such as environmental sustainability. Figure 8 illustrates the current procurement process and its driving attributes.

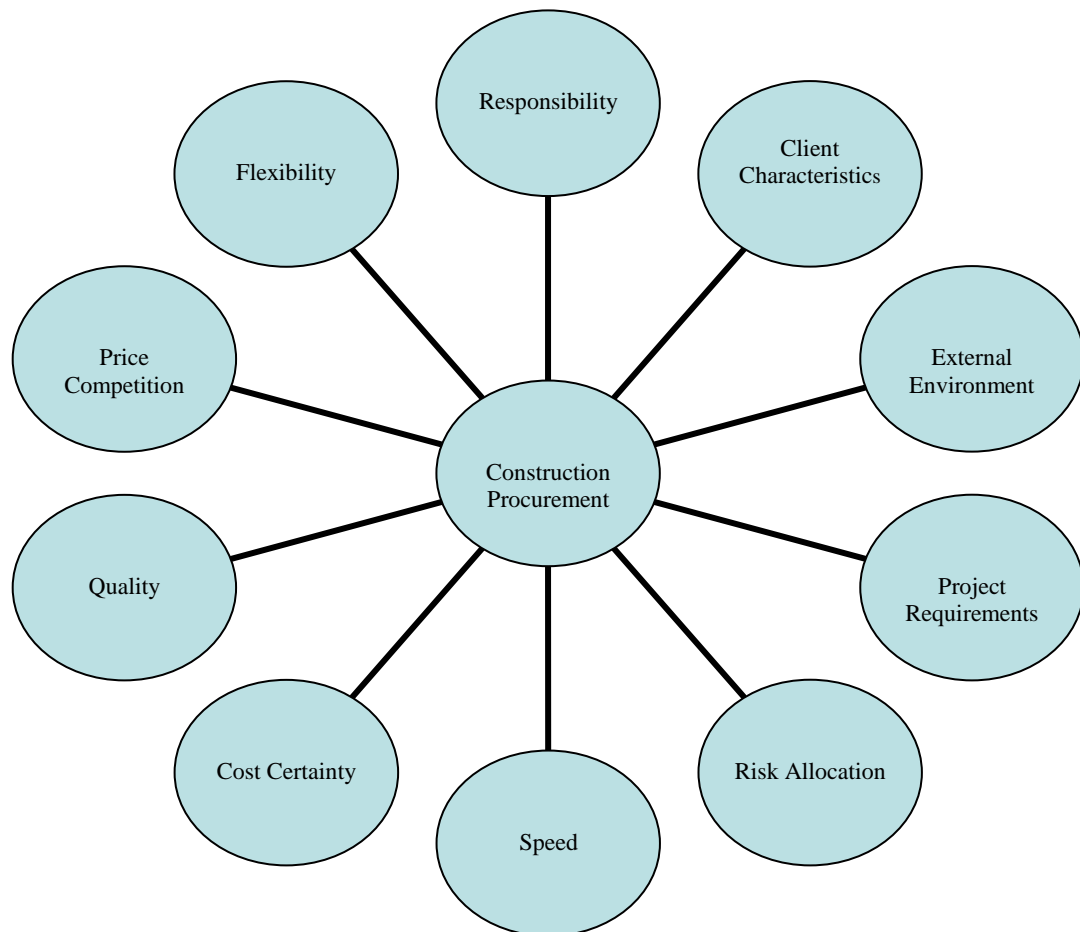


Figure 8 Current Procurement attributes

3.3.2 Environmental Sustainability and Sustainability Drivers

It is concluded, from the literature review, that the international and local sustainability drivers exerted a considerable pressure on the current procurement processes to transform to more environmental sustainable ones. This transformation would not occur unless it is supported by an official governmental declaration, which is the case in the local UAE construction market. The presidential declaration came in 2008 to emphasise on building a sustainable economy, which was translated in all the emirates. As a major part of the economy, construction industry in all its processes is to be reconsidered to

transform to sustainability, especially environmental sustainability. In application of such transformation, the construction procurement process is reviewed against environmental sustainability in order to conclude a green construction procurement process. Figure 9 introduces the transformation process drivers.

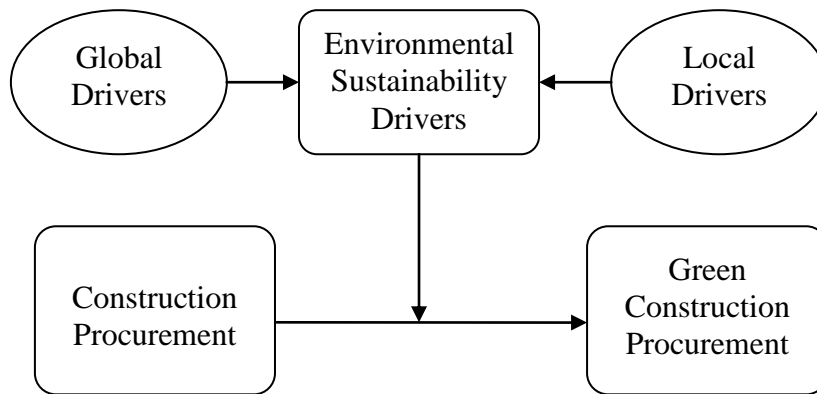


Figure 9 Drivers of construction procurement transformation to green procurement

3.3.3 Effect of Environmental Sustainability on Current Procurement Procedures

The literature proved the deficiency of the current procurement procedures in meeting the evolving environmental requirements in terms of obstacles represented in: shortage of comparable product's data, lack in sustainable knowledge, insufficiency of sustainable products, ethical dilemmas, inertia to change, lack of comprehensive sustainability concept, excessive application of traditional procurement systems, and lack of green specification.

Additionally, the literature provided a series of actions that are to fulfil the scarcity of the current procurement systems and to overcome the previous mentioned barriers. These actions include: coordination with experts, knowledge sharing with partners, innovation management, sustainable culture creation, sustainable indicators development, introducing government policy frameworks, client input, introducing development programmes for project managers, specifying environmental products standard, specifying behaviour standards of the suppliers, client and supplier collaboration, suppliers training and development, contractor's prequalification, detailing the environmental conditions, implementation of liquidated damages concept,

the right to terminate the contract in case of breach, random and selective inspections, generation of green specification, and listing tender requirements mainly are EMS and EIA. These attributes are applied through three different aspects: clients and consultants, suppliers or contractors, and contract documents.

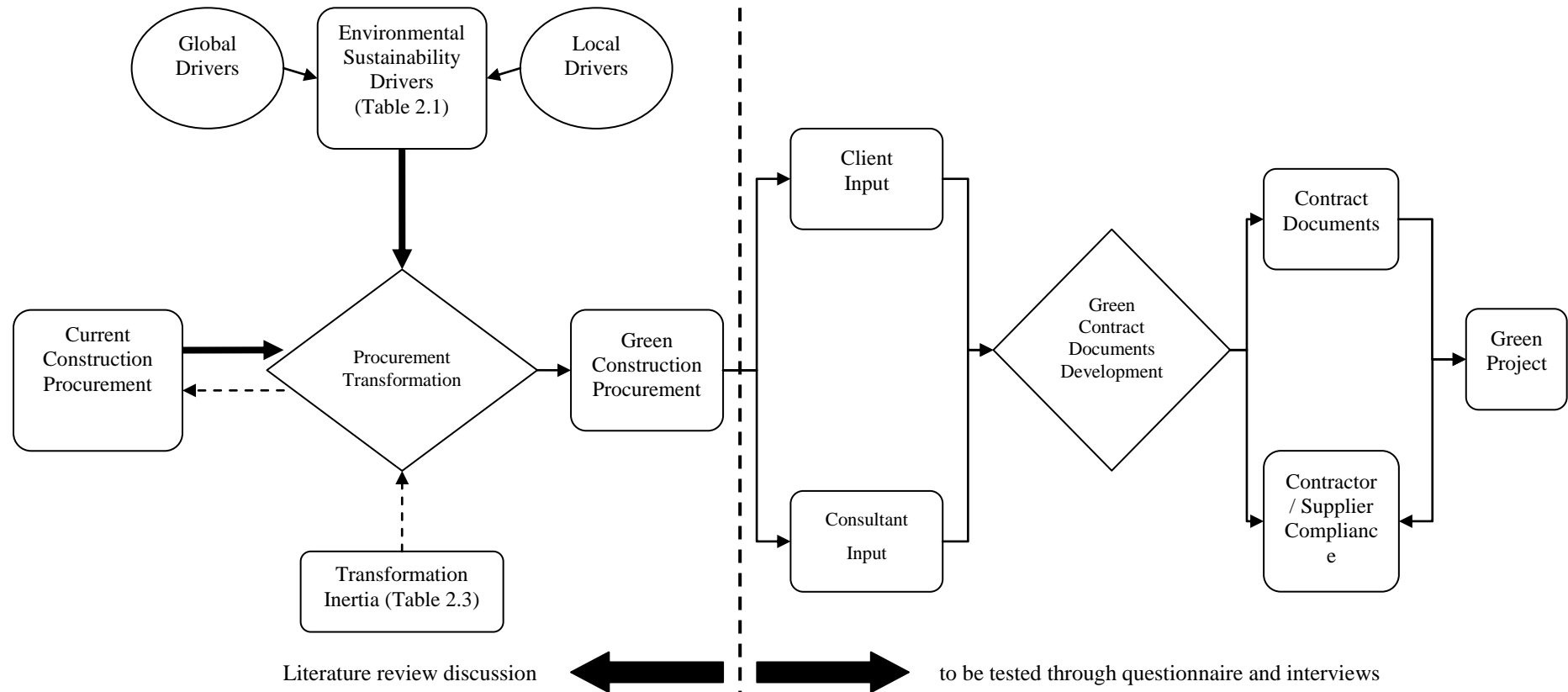
3.3.4 Corporate Social Responsibility and Green Procurement

Corporate social responsibility represents the code of conduct of the organisation that is committed to the governmental declares and reflects the organisation image towards the society and the world. The components of the corporate social responsibility, as illustrated earlier, are: legal, ethical, and economic on all aspects: external environment, internal organisational environment, and ethical aspect of the organisation operations. Recently, and in response to the world wide governmental calls and declares regarding environmental sustainability, organisations considering themselves as “good citizens of the world” responded to the global call for environmental sustainability through their corporate social responsibility attached with environmental management system such as ISO 14000. Hence, organisations’ operations are reviewed, enhanced, applied, and monitored through a quality system such as environmental management system (EMS)

3.4 Theoretical Framework and Conceptual Diagram

The derived theoretical framework is based on the previous overview of the study core, which is greening the construction procurement process. The argument here is that current construction procurement procedures are susceptible to evolve in order to accommodate the recent requirement of environmental sustainability. The components of the study were determined in terms of construction procurement and its attributes, sustainability drivers and its influence on construction procurement, green procurement requirements, and the reflection of corporate social responsibility on the procurement processes. Hence, such development is reflected on the clients’ decisions, consultants’ involvement, contracts’ documents, and accordingly, contractors / suppliers compliance. Hereby, It is important to highlight that the contractors / suppliers role in the procurement process is formulated as executers of the project based on the contract documents that are produced by the client and the assigned consultant. However, the

test of the argument is conducted through a detailed questionnaire and an interview directed to construction procurement professionals, contract managers, project managers of main contractors of different projects. Figure 10 illustrates the conceptual framework.



- Client Input** Client Sustainability Requirement
- Consultant Input** Consultant requirement monitoring and feedback
- Contract Documents** Containment of environmental procurement obligations
- Contractor/Supplier** Contractor/Supplier compliance

Figure 10 Research’s Theoretical Framework

Chapter Four: Research Methodology

4.1 Introduction

This chapter introduces the adopted methodology to prove the research aim and objectives which are briefly to investigate the adequacy of the procurement processes that are currently adopted by construction industry vendors in the UAE construction market against the recently evolved principle of green construction sustainability through examining the drivers for sustainability, investigating the impact of sustainability on procurement frameworks, evaluating current procurement practices in the UAE local market, and identifying the gap between the green construction procurement and the traditional procurement systems amongst the construction developers in UAE. It is important to highlight that the green construction procurement is still an evolving process in the UAE local market and yet to be mandatory in critical projects.

4.2 Research Methodology

This research is intended to be exploratory answering the “What” question types. Therefore, the research is, according to Sulaiman (2009), descriptive (what was), interpretive (what is the effect of what was), and process oriented (what happened over time), which coincides with the research questions illustrated above in terms of what the procurement procedures were, what green requirements are, and what needs to be modified in the current procurement processes. Hence, the qualitative research methodology is implemented.

The qualitative research procedure as described by Fellows and Liu (1997) starts with gathering qualitative data obtained from questionnaires and interviews followed by data analysis and testing. After that, results are obtained forming patterns and relationships. Then, these relationships are contrasted versus the theoretical framework obtained from literature review. Finally, conclusions and recommendations extracted and stated. Figure 11 illustrates the qualitative research procedure.

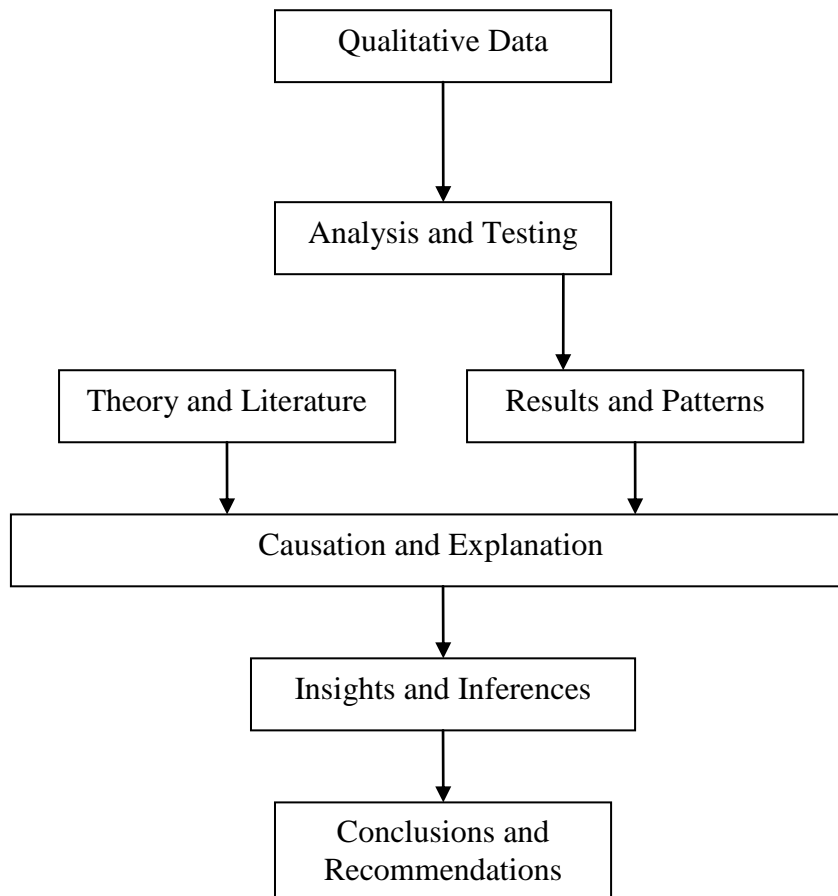


Figure 11 Qualitative Research Procedure. Fellows and Liu (1997)

4.3 Data collection

The data obtained in this research are based on questionnaire replies and interviews. Varnas et al. (2009) considered that questionnaires provide overall picture of the application of the involvement of the environmental attributes in construction procurement. They also recognised interviews as tools that provide in depth examination of the green procurement since such interviews are provide the chance to more explanatory answers of what is required from the suppliers, what is the role of the clients in application, and what are the followed monitoring methods.

4.3.1 Questionnaires

The questionnaire structure and content is based on two separate studies concerning the application of green procurement in construction industry conducted by Ofori (2000), and Palmujoki et al. (2010). The questionnaire is divided into four parts: General Information, client / consultant role, contract content, and contractor / supplier compliance. The parts concerning consultant input, and contractor / supplier compliance were concluded from Ofori (2000) study regarding greening the supply chain in construction industry. While contract content part is concluded from Palmujoki et al. (2010) paper regarding the application of environmental criteria in contracts.

- **Questionnaire Structure**

The questionnaire structure is composed of four parts: the first part consists of classification questions discovering the correspondent role in the project, project type contract type, client type (public or private), and project cost.

the second part includes four questions exploring whether clients: audit contractors / suppliers to evaluate their environmental performance, work with contractors / suppliers to help them reduce environmental impacts through changes in product design and materials use, institute training programmes for contractors / suppliers to increase their knowledge of environmental implications of the company's and their own activities, and inform contractors / suppliers of technological developments relating to their operations.

The third part of the questionnaire consists of six questions examining whether the signed contract: the concept of contractual liquidated damages is implemented to protect the environmental obligations, attains the right of random and selective inspections of the processes to ensure avoidance of contract breach, States environmental prequalification criteria, states the required environmental technical specifications of the required services without which they will be rejected; like material selection, chemical content, and characteristics of products, attains the right to exclude the contractor whose contract was terminated earlier because of environmental contract breach, contains additional clauses that guarantee the application of the green contract.

Finally, the fourth part includes three questions investigating whether the clients request contractors / suppliers to: disclose information about their environmental practices and pollution discharges, implement and maintain environmental management systems, and

to obtain certification of their environmental management systems to a recognized standard such as ISO 14001.

4.3.2 Interviews

Interviews involve face to face contact with respondents and asking them a series of questions when the required answer is more than “Yes/NO” answer and the researched seeks an explanatory answers, personal contact is needed to explain the asked questions, and that the interviewed sample shares the same characteristics; i.e. homogenous. Interview questions may vary from being factual, knowledge, and opinion or can be mixed.

Fellow and Liu (1997) defined a successful interview as if the interviewer can access the required information, the interviewed can understand thoroughly the asked questions, and if the interviewer can motivate the respondents to answer. Therefore, the success of the interview is the critical responsibility of the interviewer.

The interview questions will explore thoroughly the three input elements of the green procurement model: client, consultant, and contract documents. As the research is a project based, hence, minimum three persons from these categories will be interviewed project wise. The interview will be based on semi structured questions allowing to more but bounded explanations.

The themes of the interview questions will be:

- Whether the current procurement processes include environmental criteria
- The inertia forces of implementing green procurement
- The role of the clients in implementing the green procurement
- The contractor response and his willingness to comply with the green procurement requirements
- The adequacy of the current contract documents and clauses to contain the green requirements and what is required to be done.

4.3.3 Population of the study

The questionnaire and interview is directed to construction projects main contractors represented in well reputed construction contracting companies. The targeted

designations are General Managers, Chief Executive Officers, Procurement Managers, Project Managers, Construction Managers, and Design Managers. According to the researcher experience in construction industry, it is guaranteed that these designations can provide a deep view about the current practices adopted in the procurement of construction projects in the United Arab Emirates market.

The questionnaires will be provided to the population for feedback, and interviews will be conducted with chosen sample in order to provide further explanations for the asked questions in the questionnaires.

Chapter Five: Data Results, Analysis, and Interpretations

5.1 Introduction

The analysis process passes through distillation, classification, identification and communication processes as described by Lancaster (2005). Collecting of Information for the research purpose was achieved through two sources of information: survey questionnaire, and professional interviews. The questionnaire was to discover the real application in the market, and interviews for broader information and impression from experts.

The obtained results from the questionnaires and interviews will be demonstrated consecutively in this chapter. The detailed results for each statement of the survey questionnaire are attached in Appendix B.

5.2 Survey questionnaire response

As described earlier, the questionnaire is divided into four parts: General Information, Client/Consultant Role, Contract Content, and Contractor/Supplier Compliance. Accordingly, the questionnaire was web based and distributed through e-mail to a hundred and sixty (160) experts in construction industry in relative to their respective projects. The web based questionnaire mechanism has the ability to track the behaviour of the receivers in terms of viewing, starting, completing, or dropping the questionnaire after starting. Accordingly, the responses came as described in Figure 12. The questionnaire was viewed by eighty two (82) persons out of a hundred and sixty (160), started by thirty nine (39) persons, completed by thirty two (32) persons and seven (7) persons dropped out after starting; resulting in completion rate of twenty percent (20 %) of the receivers (160). Therefore, based on the twenty per cent (20 %) reply, which equals thirty two (32) respondents, data analysis was performed.

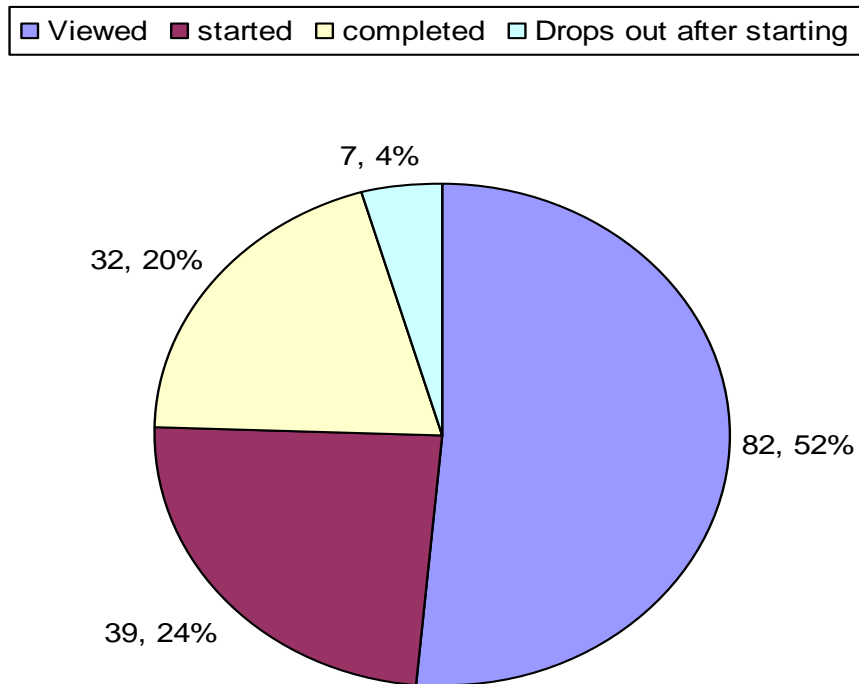


Figure 12 Sample response statistics

5.2.1 General Information

A - Respondents' Project Role

The respondents' role in their respective projects was dominantly Project Manager 27.27 % of the respondents. Other roles were Project Director (9.09 %), Commercial / Contract Manager (12.12 %), Procurement Manager (15.15 %), Construction Manager (9.09%), and 27.27 % distributed evenly between Senior Quality Assurance Engineer, Sustainability Consultant, Project Engineer, Process and Proposal Manager, Quality Health and Safety Director, Sustainability Manager, Senior Project Coordinator, Senior Architect, and Senior Sustainability Engineer as illustrated in Figure 13.



Figure 13 Respondents' Role in Project

B- Project Type

Regarding project type, Figure 14 demonstrates that the majority (81.25 %) of the surveyed projects were buildings, and 6.25 % evenly distributed for engineering services and plants consecutively. The group, others, includes infra structure and buildings projects type.

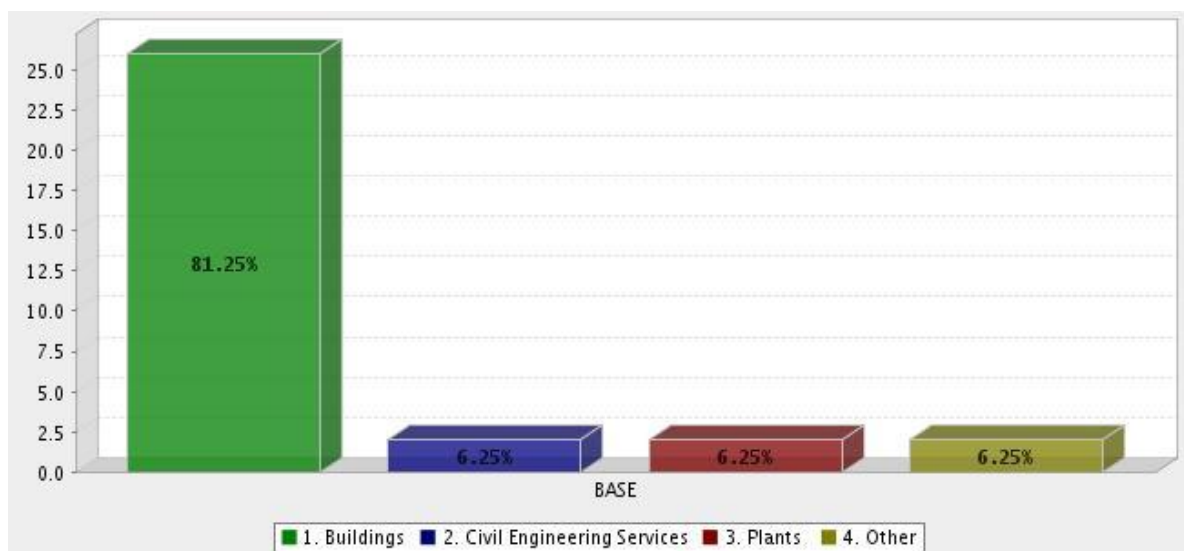


Figure 14 Project Type

C- Client Type

Client type distribution varied from 65.62 % for private clients, and 31.25% for public clients. The balance percentage; 3.13 % represents mixed client type: public and private.

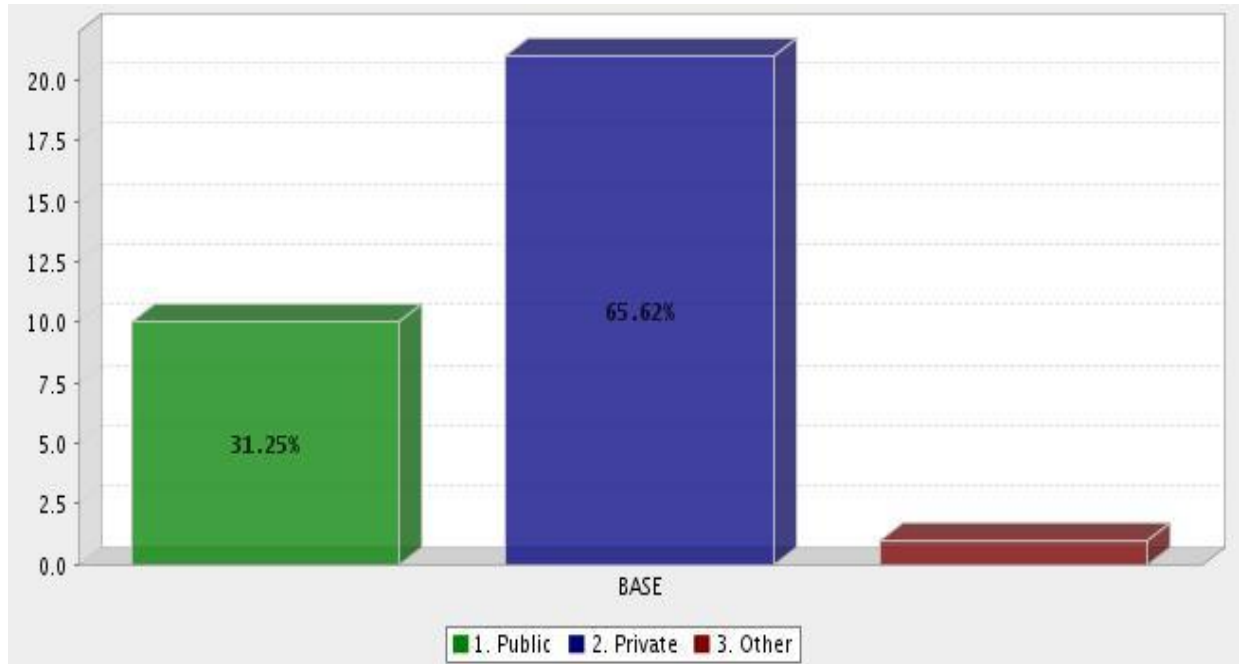


Figure 15 Client Type

D- Contract Type

Figure 16 reflects that fifty percent (50 %) of the signed projects contracts are Lump Sum contracts, twenty eight percent (28 %) are Design and Build, six percent (6%) are Turn Key, and fifteen percent (15 %) are distributed between Design and Site Supervision, Unit Price, re-measured, and Facilities Management.

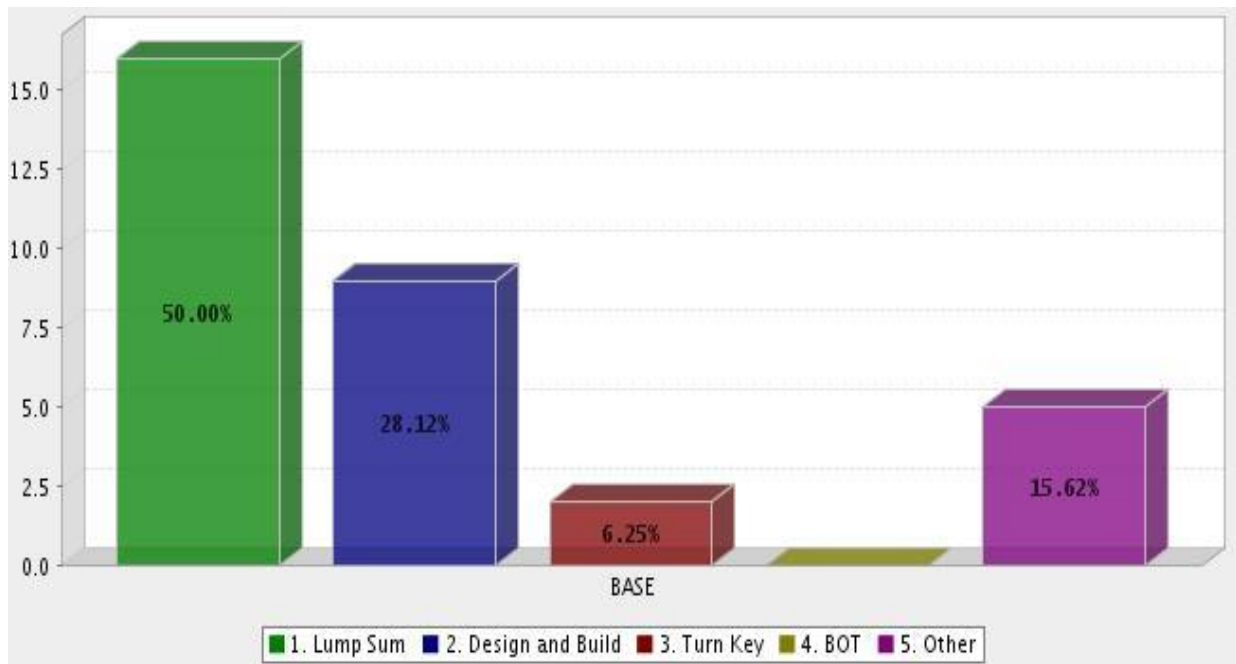


Figure 16 Contract Type

E- Project Cost

Project cost indicator is a vital one since it implies the size of the project, reflects its impact on the surrounding development, and spots the light on the construction process. The surveyed project costs were divided into four categories: less than one hundred million UAE dirham, one hundred to less than five hundred million dirham, five hundred million dirham to less than one billion dirham, and one billion dirham and above. An approximately evenly distributed result came along each category as shown in Figure 17. It illustrates that 28.12 % of the projects' cost is less than one hundred million dirham, 25 % of the projects' cost is between one hundred million dirham and five hundred million dirham, 25 % of the projects' cost varies between one hundred to less than five hundred million dirham, and finally 28.12 % of the projects' cost is more than one billion dirham.

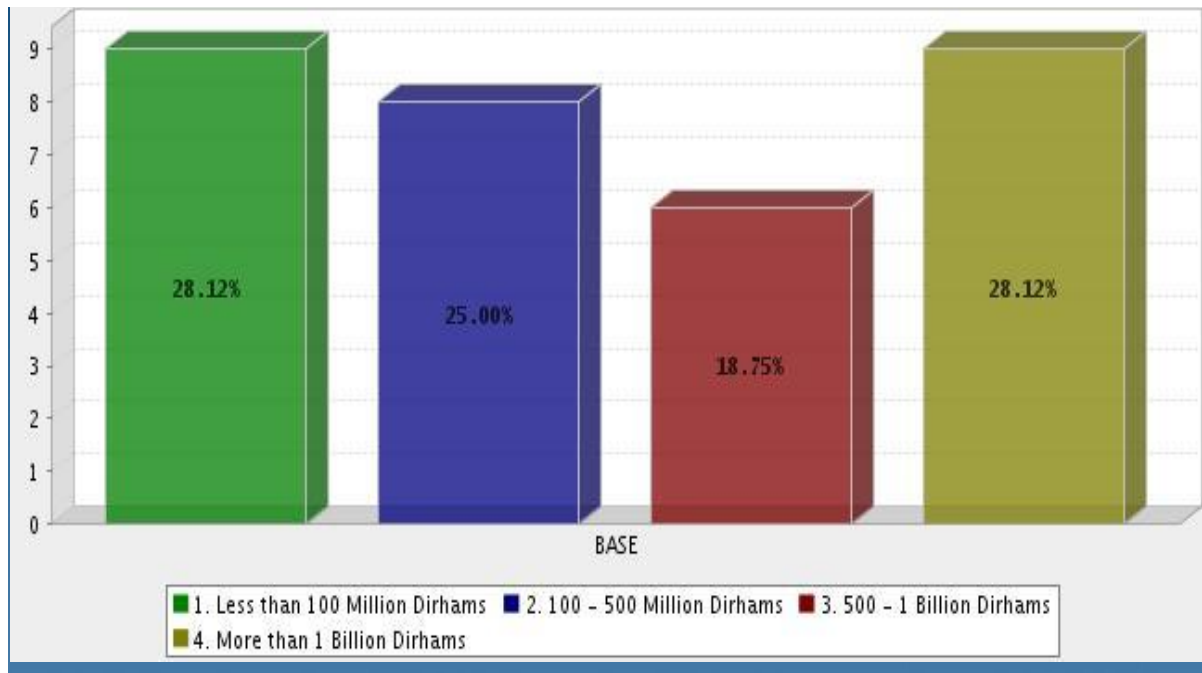


Figure 17 Project Cost

5.2.2 Client / Consultant Input

This section included five questions exploring the contribution of clients / consultants input towards green procurement in terms of: clear indication of the environmental requirement, auditing contractors / suppliers for their environmental performance, client cooperation with contractors / suppliers, providing institutional training programmes, and informing the contractors / suppliers of the latest technological developments related to their operations.

As illustrated in Figure 18, the results identified that clients / consultants tend clearly to indicate their environmental criteria, audit the contractors / suppliers against their environmental performance, and to cooperate with them to help them reduce their environmental impacts. However, clients / consultants achieved low grades concerning providing institutional training and informing the contractors / suppliers of the latest technological development.

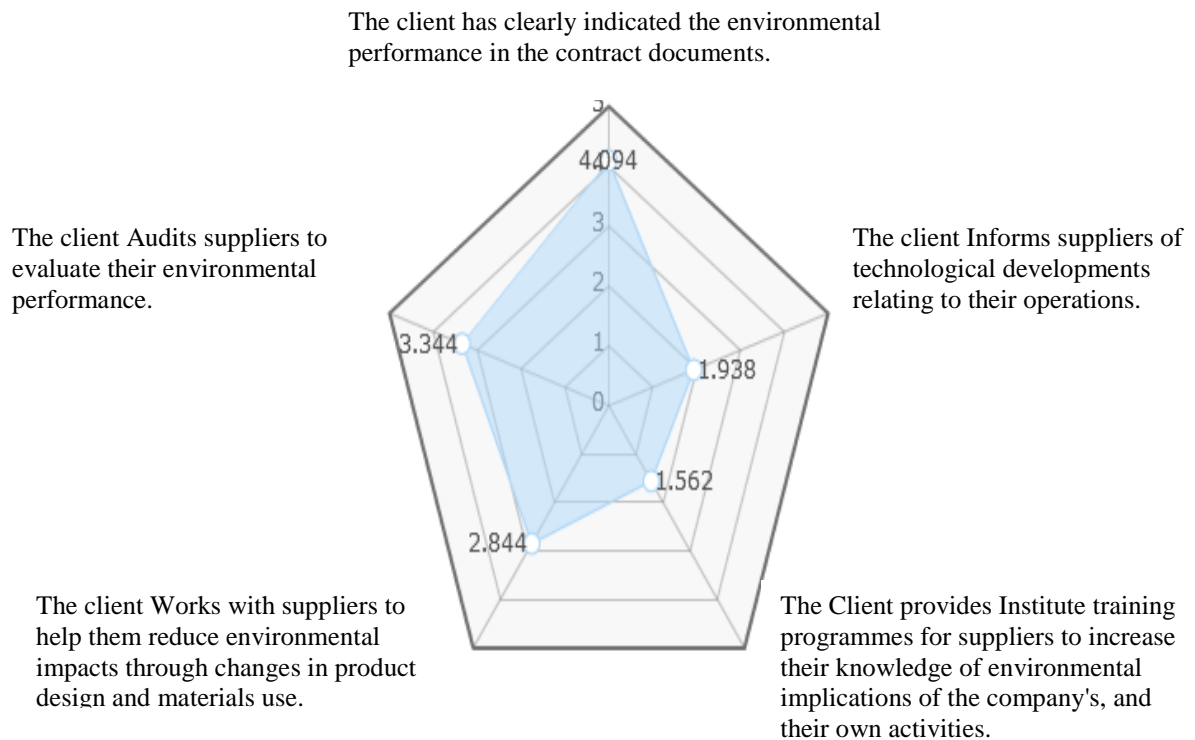


Figure 18 Overall group scorecard – client /consultant input

5.2.3 Contract Content

This section tests the contract content and its adequacy to contain the environmental criteria within its documents. The section is composed of six statements which examine whether: contractual liquidated damages concept is implemented to protect the environmental obligations in case of contractor's contract breach, the right of random and selective inspections of the processes is attained to ensure avoidance of contract breach, environmental prequalification criteria are stated in the contract, the required environmental technical specifications of the required services without which they will be rejected; like material selection, chemical content, and characteristics of products are stated in the contract documents, the right to exclude the contractor whose contract was terminated earlier because of environmental contract breach are attained, and if additional clauses that guarantee the application of the green contract are inserted in the contract documents.

The results came, as shown in Figure 19, to demonstrate that the principles of attaining random inspections by the client, the environmental prequalification criteria, and the required environmental technical specifications of the required services are prioritised out of the balance other three criteria. Also, Figure 19 visualise how the content of the contract documents tend to flow towards the three elements of the client’s right of random inspections, stating the environmental prequalification criteria, and determining the required environmental technical specifications. However, the other three elements are still present but in less representation.

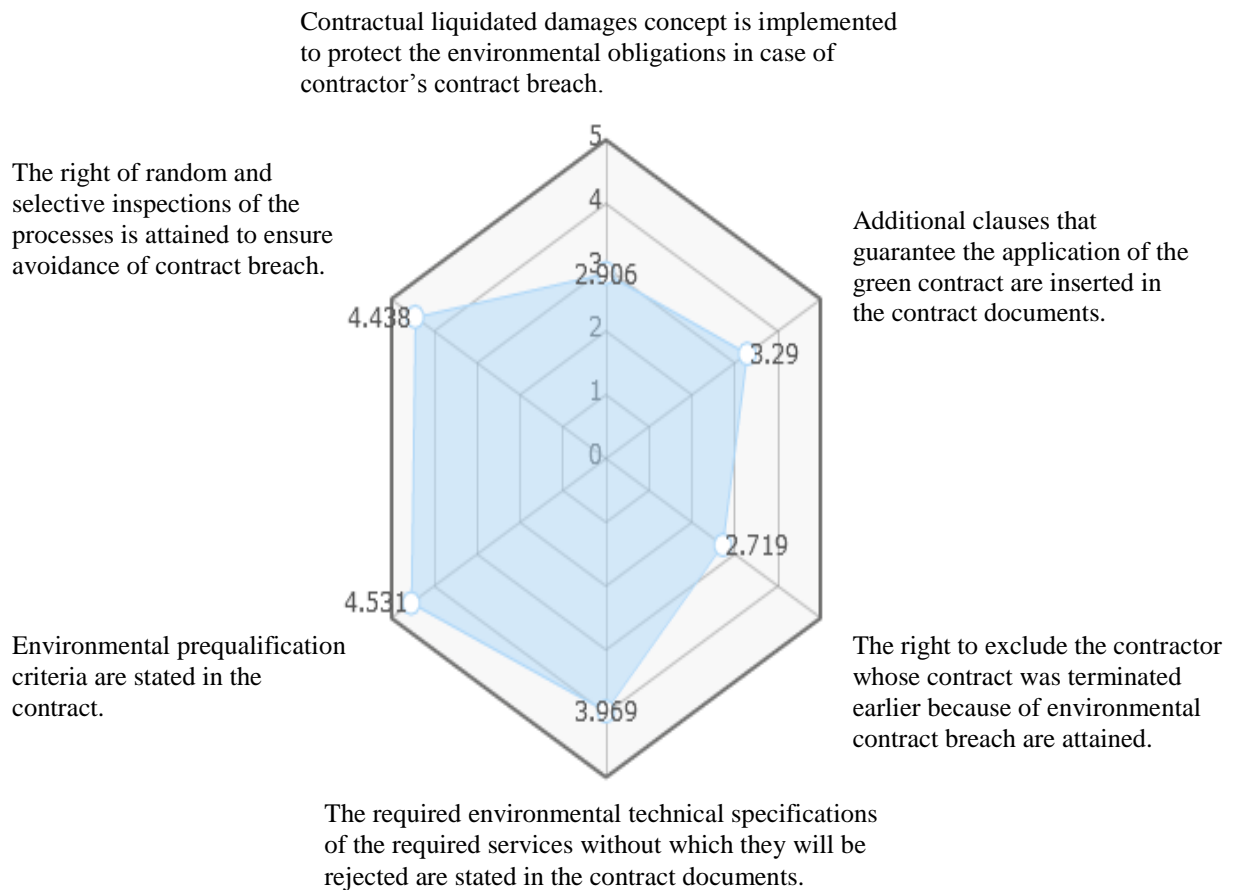


Figure 19 Overall group scorecard – contract content

5.2.4 Contractor / Supplier Compliance

The last part of the survey questionnaire that spots the light on the compliance of contractors / suppliers, and their attitude towards green construction procurement. The contractors / suppliers compliance is tested through four survey statements: contractors / suppliers have disclosed information about their environmental practices and pollution discharges, contractors / suppliers have implemented and maintained environmental management systems, contractors / suppliers have certified their environmental management systems to a recognized standard such as ISO 14001, and contractors / suppliers have provided timely and accurate information on their environmental practices.

Figure 22 reflects the group scorecard of the contractors / suppliers' compliance with green procurement requirements as obtained from questionnaire analysis. It is obvious that the contractors / suppliers compliance with the four parameters is high and nearly evenly distributed.

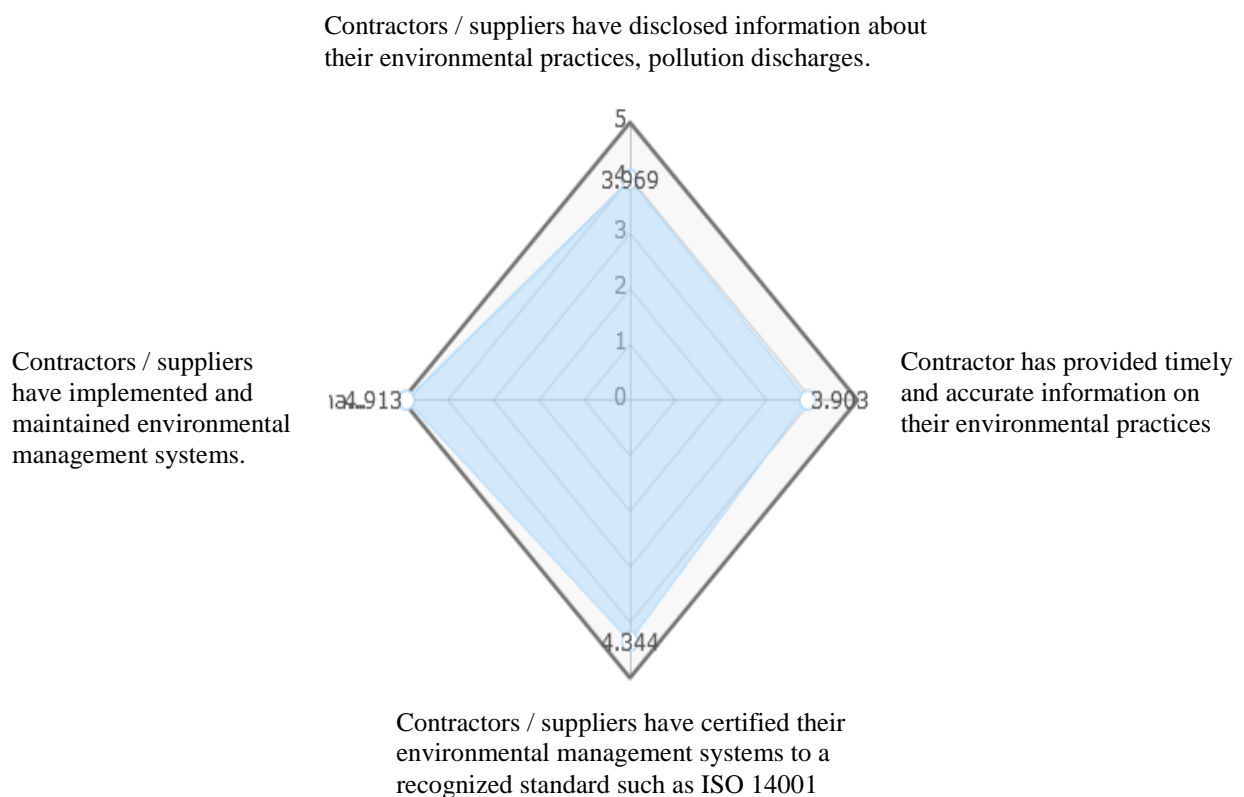


Figure 20 Overall group scorecard – contractors / suppliers compliance

5.3 Interview response and analysis

The interviews were conducted with three main contractors' professionals in construction industry in the local market of UAE. Their designations were Project Manager, Commercial Manager, and Procurement Manager. The Project Manager was working on a semi-governmental project which its value is 450 million Dirham. The Commercial Manager was working on a public utility project of 250 million Dirham value. Finally, the Procurement Manager was working on a private project of a value of 560 million Dirham.

The interview was structured and asked the pre decided questions, which were about firstly, the reasons for inclusion of environmental criteria in current procurement process. Secondly, the source of forces of implementing the green procurement in their respective project. Thirdly, the role of client in implementing green procurement, and whether the client's enthusiasm changes across the project life cycle. After that, the interview discussed the contractor response and attitude to comply with the emerging green requirements. Then, the adequacy of the current contract documents to contain the emerging green requirements. Finally, whether there is any incentive from the clients to adopt green procurement process.

5.3.1 Interview Results

The interviews with the construction professional revealed that both the project manager and the commercial manager were working under the conditions of green criteria although they were from different projects. However, the interview with the procurement manager concluded that his project was totally out of green criteria consideration. The following analysis and Table 5.1 summarise the interview results.

A. Project Manager and Commercial Manager Interview

The project manager confirmed that the project where he is responsible for is complying with green requirements in all its operations and surely the signed contract. He expressed that his organisation as a main contractor, at the time of

job proposal, was asked to comply the environmental criteria in all the project life cycle. Therefore, all the operations are subject to close monitoring from client and the representative consultants to ensure that the processes are complying with the green requirement. Finally, both the project manager and commercial manager confirmed that no incentive scheme proposed by the client related to the compliance of green construction except that future projects may be awarded to their organisations because of their performance. The project manager added that it is the need of the market that the contractors must comply with it.

B. Procurement Manager Interview

Procurement manager interview was negative to the green criteria adoption in his specific project despite that it is of high value; 560 million Dirham. The reason is that the project ownership is private, and there is no direct inspection from external authorities. The authorities monitoring is concerned with completing the formalities and bureaucracy requirements. However, the procurement manager valued the move towards green construction, demanded the authorities to be more involved in construction projects life cycles, and versioned a prosperous future.

Table 5.1 Green Procurement Interview Results

Interview Core Questions	Project Manager	Commercial Manager	Procurement Manager
the reasons for the inclusion of environmental criteria in the current procurement processes	public procurement legislation	Client oriented	none
Forces of implementing green procurement in this project	government legislations, client's requirements	Internal forces	none

The role of the clients in implementing the green procurement	Major	Major	Major if any
The contractor response and his willingness to comply with the green procurement requirements	Responsive and complying	Responsive and complying	Responsive and complying
The adequacy of the current contract documents and clauses to contain the green requirements	Adequate and binding	Adequate and binding	Currently not adequate – originally not considered
Incentives from the client	Positive	Negative	Negative

5.4 Literature review, survey questionnaire, and interview results contrast

It is vital, after conducting the questionnaire and the interviews, to contrast and examine the results obtained against the previously concluded green procurement requirements from literature review.

In reference to table 2.4, questionnaire results, and interview outcomes, Table 5.2 summarises the gaps between the three sources of green procurement criteria. It is found that more efforts are requested from clients in order to enhance the efficiency of the green procurement. These efforts must concentrate on two aspects: the client / consultant role, and the contract documents.

The client / consultant role must be expanded to allow for coordination with external experts from other economic sectors, promote and allow for innovation, creating sustainable culture amongst all project sides, sharing and spreading government policy frameworks, developing training programmes for project managers, and providing training and development for contractors and suppliers.

On the other hand, the contrast of contract documents role in attaining green procurement shows that the applications of liquidated damages criteria against the contractors is limited despite it is an effective procedure to protect the obligations of the contract.

Since the green procurement process is directly connected to the client and /or consultant operations, it is noted that the contractor flexibility to accommodate such requirement is acceptable. Therefore, the contractors have the ability to develop their operations according to client requirement, and hence, the contractor's effort to accommodate the green procurement requirements, till this moment, is adequate.

Table 5.2 Contrast of green procurement criteria between literature review, survey questionnaire, and structure interviews

	Green procurement criteria as concluded from literature: Table 2.4	Green procurement criteria as concluded from survey questionnaire	Green procurement criteria as concluded from structured interviews	Identified Gaps
Client / Consultant Input	<ul style="list-style-type: none"> • Coordination with experts • knowledge sharing with partners • Innovation management • Sustainable culture creation • Listed tender requirements mainly are EMS and EIA • Government policy frameworks • Develop sustainable indicators • Client input • Development programmes for project managers • Specifying products environmental standard • Specifying behaviour standards of the suppliers • Client and supplier collaboration • Suppliers training and development • 	<ul style="list-style-type: none"> • The client has clearly indicated the environmental performance in the contract documents. • The client audits suppliers to evaluate their environmental performance. • The client Works with suppliers to help them reduce environmental impacts through changes in product design and materials use. 	<ul style="list-style-type: none"> • Environmental criteria • Forces of implementing green procurement in this project • Incentives from the client 	<ul style="list-style-type: none"> • Poor coordination with experts • Lack of innovation management • Need to create sustainable culture • Weak governmental policy frameworks • Lack of development programmes for project managers • Poor suppliers training and development
Contract Document	<ul style="list-style-type: none"> • Random and selective inspections • Detailing the environmental conditions • Implementation of liquidated damages concept • Contractor's prequalification • Termination of contract in case of breach • Detailing of green specification 	<ul style="list-style-type: none"> • The right of random and selective inspections of the processes is attained to ensure avoidance of contract breach. • Environmental prequalification criteria are stated in the contract. • The required environmental technical specifications • Additional clauses that guarantee the application 	<p>-----</p>	<ul style="list-style-type: none"> • Lack of implementation of liquidated damages concept

	Green procurement criteria as concluded from literature: Table 2.4	Green procurement criteria as concluded from survey questionnaire	Green procurement criteria as concluded from structured interviews	Identified Gaps
Contractor	Literature considers the green procurement process is client / consultant oriented.	<ul style="list-style-type: none"> • Contractors / suppliers have disclosed information about their environmental practices, pollution discharges. • Contractors / suppliers have implemented and maintained environmental management systems. • Contractors / suppliers have certified their environmental management systems to a recognized standard such as ISO 14001. • Contractor has provided timely and accurate information on their environmental practices 	<ul style="list-style-type: none"> • contractor response and his willingness to comply with the green procurement requirements • The adequacy of the current contract documents and clauses to contain the green requirements 	NONE

Chapter Six: Conclusions and Recommendations

6.1 Conclusions

The research presented here was about examining the current construction procurement systems against the recent evolving criteria of “green procurement” in construction industry in the United Arab Emirates. A theoretical frame work (Figure 10) was developed in order to identify the research flow and define the required methodology to achieve the research objectives. Analytical procedures were undertaken to the literature review, survey questionnaire results, and structured interviews outcomes made the researcher conclude:

1. Global and local driving factors for sustainability are identified in Table 2.1
2. Environmental sustainability is requested to be part of the Corporate Social Responsibility statement of the organisations in order to be a good citizen of the world.
3. Obstacles of transformation from currently adopted construction procurement systems to green ones are recognised in Table 2.4
4. Transformation requirements are stated in Table 2.4

The gaps between the current procurement systems and the green procurement systems are identified through contrasting the literature review output, survey questionnaire, and structure interviews with professionals from construction sector. The major gaps were identified and illustrated in Table 5.2. These gaps are related to client / consultant input, and contract documents. The client / consultant input has to expand to include coordination and cooperation with external experts, innovation adoption, sustainable culture creation amongst all stake holders, knowledge sharing, introducing training programmes for high level managers, and providing training to all contractors and suppliers. While the contract documents must include a clear and firm liquidated damages articles that hinders the contractors and the suppliers from violating the green criteria.

It is concluded also that the process of transforming to green procurement is totally steered and controlled by the client. Therefore, contractors are found to comply with green criteria and use this compliance as self motivation for preserving future works.

6.2 Recommendations

Greener (2008) defined recommendations as practical suggestions that made their application feasible. The researcher introduces here a set of recommendations that are to be followed by procurement specialists in order to provide a smooth transformation to green procurement in construction industry:

1. Understanding the strategic plan of the country is a key factor that leads to a compliant processes
2. Awareness and knowledge of the local authorities laws and regulations keep the process on the track
3. Knowledge sharing amongst all the project stakeholders make the process easy to understand and hence, easy to implement.
4. Identifying the threats and weaknesses of the stakeholders in order to find remedial actions
5. Building on strength and opportunities of the stakeholders such as experience, market share, volume of projects, etc. makes the application of new and innovative ideas easier.
6. Allow for external advice from experts to build on your own experience.
7. Allow for training and development of the project stakeholders in order to increase awareness and knowledge of green procurement systems.
8. Assign milestones while building the green procurement strategy and implement periodical check – ups against standards and regulations.
9. Keeping a proper archiving and reporting systems is vital to identify roles and responsibilities, and to take lessons of previous mistakes.
10. Disseminating the built and agreed green procurement system to all project stakeholders.

6.3 Limitation of the Study

The current research has the following limitations:

1. The research has been prepared based on United Arab Emirates construction market. Hence, the obtained results can not be generalised to other countries unless further verifications have been conducted
2. Generalisation since sample size was small (32 respondents) and not all types of construction contracts were examined.

6.4 Recommendations for further studies

The researcher would recommend that:

1. Further research would be conducted on the stages of application of the green procurement systems in order to understand deeply where the application of the green procurement vanishes if any.
2. Further research would be conducted on cost implication of applying green procurement systems in construction industry.

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Appendices

Appendix A

- 1. Research contract**
- 2. Questionnaire**
- 3. Interview Questions**

1- Research Contract

Dear Sir/Madam,

This questionnaire gives you the opportunity to express your views on the application of green / environmental procurement in construction industry in the United Arab Emirates. Please note that there is no right or wrong answer.

The questionnaire will be used to collect the primary data needed for a research study. Therefore, we seek your assistance to be as open, fair, honest as possible as you can in your responses.

The researcher assures you that no individuals will be identified from their responses and there are no requests for confidential information included in the questionnaire. The results of the analysis will be strictly used by the researcher for study purposes *only*.

The questionnaire comprises four parts:

1. General information
2. Client / consultant input
3. Contract documents content
4. Contractor / supplier compliance

Your response and cooperation will contribute positively to the construction development in the United Arab Emirates

Thank you for your co-operation

Researcher

2- Survey Questionnaire

PART ONE: GENERAL INFORMATION							
<i>Please tick one box for each question or fill in the correct answer</i>							
A. Role in Project (<i>Project Manager, Procurement Manager, etc...</i>)							
B. Project Type							
(1) Building	()						
(2) Civil Engineering Services	()						
(3) Plants	()						
(4) Others (<i>Please Specify</i>)							
C. Client Type							
(1) Public	()						
(2) Private	()						
D. Contract Type							
(1) Lump Sum (Traditional Procurement)	()						
(2) Design and Build	()						
(3) Turn Key	()						
(4) Others: (<i>Please Specify</i>)							
E. Project Cost							
PART TWO: CLIENT / CONSULTANT ROLE							
<i>(Please tick one box for each item)</i>							
Indicate if you agree that the following statements are true of your current project (1 = Totally disagree, 7 = strongly agree)	1	2	3	4	5	6	7
1. The client has clearly indicated the environmental performance in the contract documents.							
2. The client Audits suppliers to evaluate their environmental performance.							
3. The client Works with suppliers to help them reduce environmental impacts through changes in product design and materials use.							
4. The Client provides Institute training programmes for suppliers to increase their knowledge of environmental implications of the company's, and their own activities.							
5. The client Informs suppliers of technological developments relating to their operations.							
PART THREE: CONTRACT CONTENT							
<i>(Please tick one box for each item)</i>							
Indicate if the following statements are true of your current project (1 = Least relevant, 7 = Most relevant)	1	2	3	4	5	6	7
6. Contractual liquidated damages concept is implemented to protect the environmental obligations in case of contractor's contract breach.							

Indicate if the following statements are true of your current project (1 = Least relevant, 7 = Most relevant)	1	2	3	4	5	6	7
7. The right of random and selective inspections of the processes is attained to ensure avoidance of contract breach.							
8. Environmental prequalification criteria are stated in the contract.							
9. The required environmental technical specifications of the required services without which they will be rejected; like material selection, chemical content, and characteristics of products are stated in the contract documents.							
10. The right to exclude the contractor whose contract was terminated earlier because of environmental contract breach are attained.							
11. Additional clauses that guarantee the application of the green contract are inserted in the contract documents.							
PART FOUR: CONTRACTORS / SUPPLIERS COMPLIANCE							
Please tick one box for each item)							
Indicate if you agree that the following statements are true of your current project (1 = Totally disagree, 7 = Strongly agree)	1	2	3	4	5	6	7
12. Contractors / suppliers have disclosed information about their environmental practices, pollution discharges.							
13. Contractors / suppliers have implemented and maintained environmental management systems.							
14. Contractors / suppliers have certified their environmental management systems to a recognized standard such as ISO 14001.							
15. Contractor has provided timely and accurate information on their environmental practices							

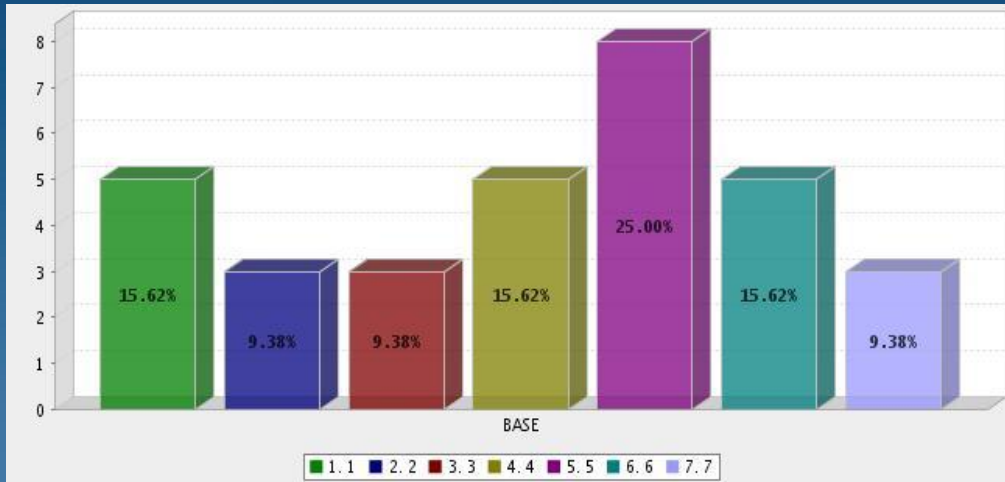
3- Interview Questions Theme project specific

- what are the reasons for the inclusion of environmental criteria in the current procurement processes (they may talk about the client, legislation or themselves doing it because they care)
- Where do you see forces of implementing green procurement in this project
- The role of the clients in implementing the green procurement. Does his enthusiasm changed across the life cycle?
- The contractor response and his willingness to comply with the green procurement requirements
- The adequacy of the current contract documents and clauses to contain the green requirements and what is required to be done.
- Any incentives from the client?

Appendix B

A - Survey Results: Illustrates the percentage and number of participants for each survey question.

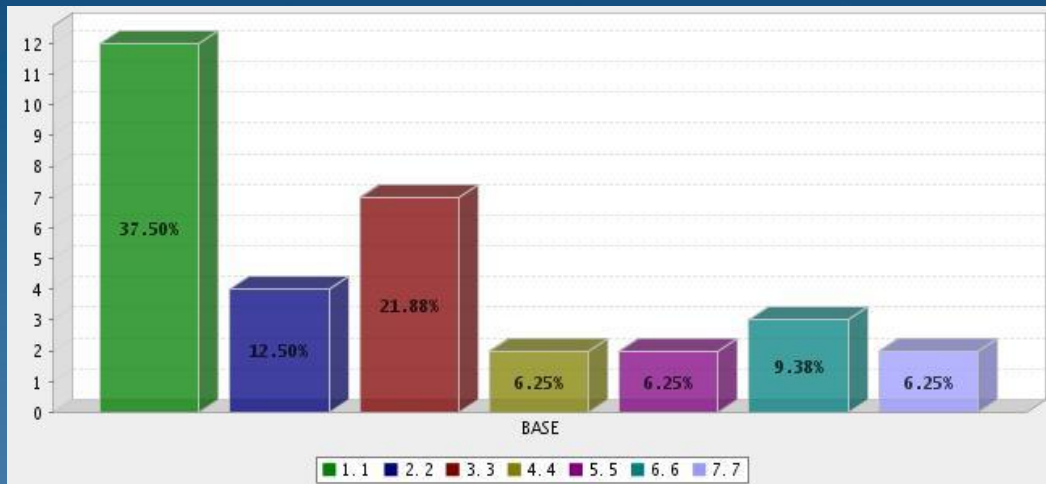
1. The client has clearly indicated the environmental performance in the contract documents.



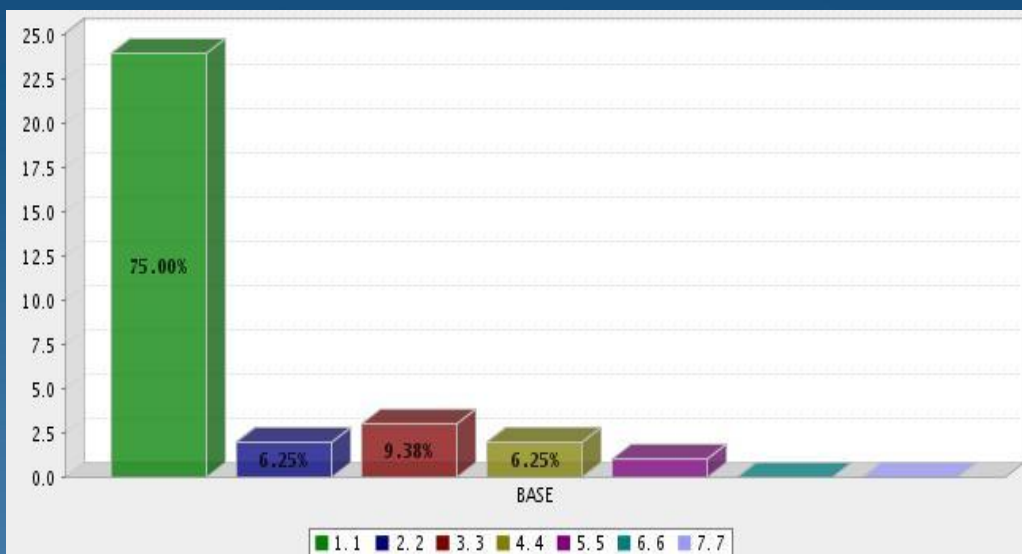
2. The client Audits suppliers to evaluate their environmental performance.



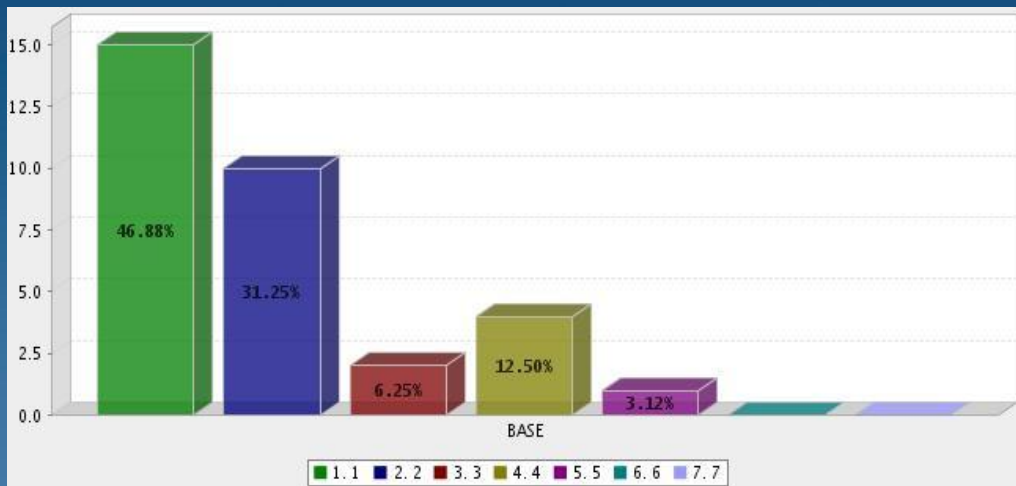
3. The client Works with suppliers to help them reduce environmental impacts through changes in product design and materials use.



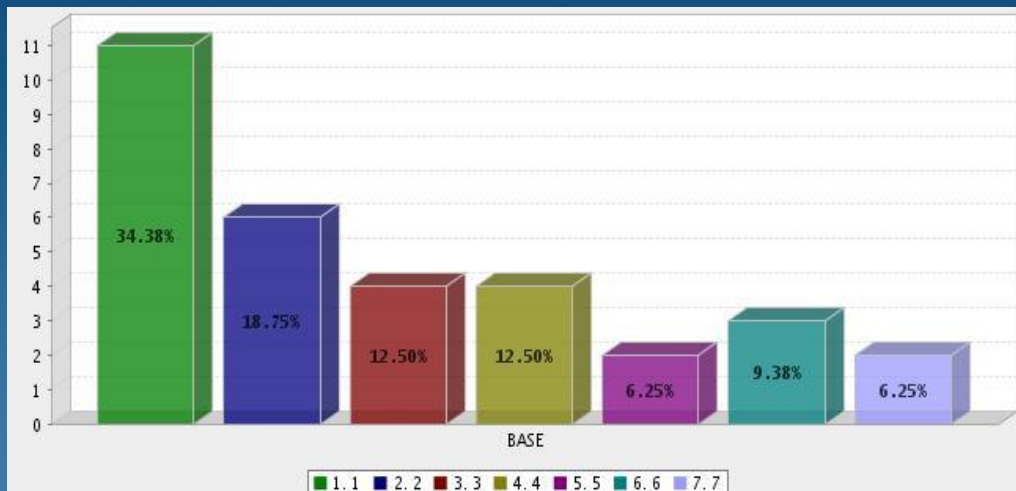
4. The Client provides Institute training programmes for suppliers to increase their knowledge of environmental implications of the company's, and their own activities.



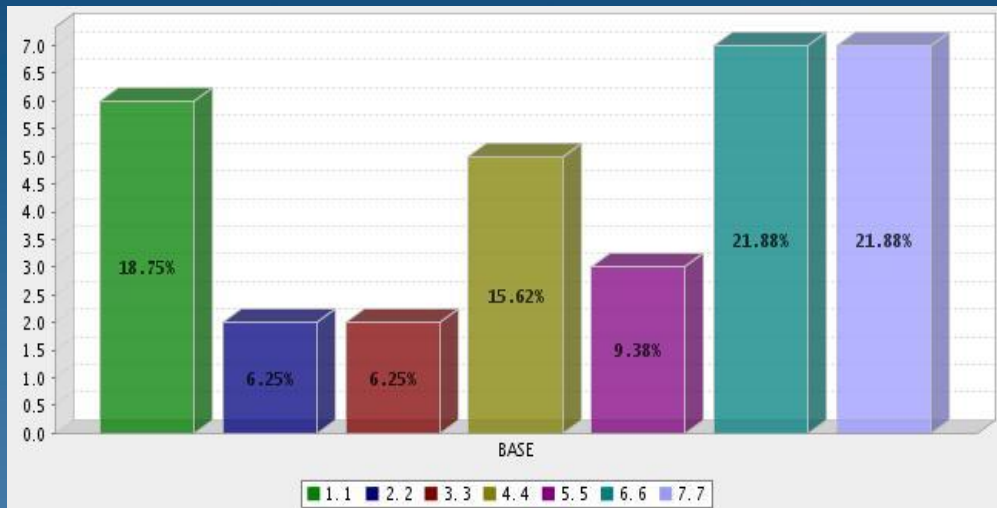
5. The client informs suppliers of technological developments relating to their operations.



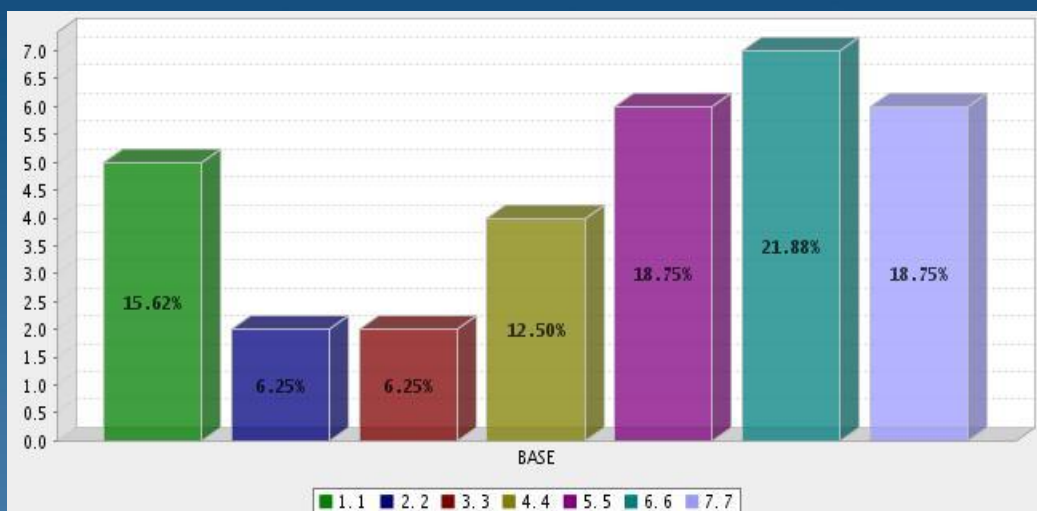
6. Contractual liquidated damages concept is implemented to protect the environmental obligations in case of contractor's contract breach.



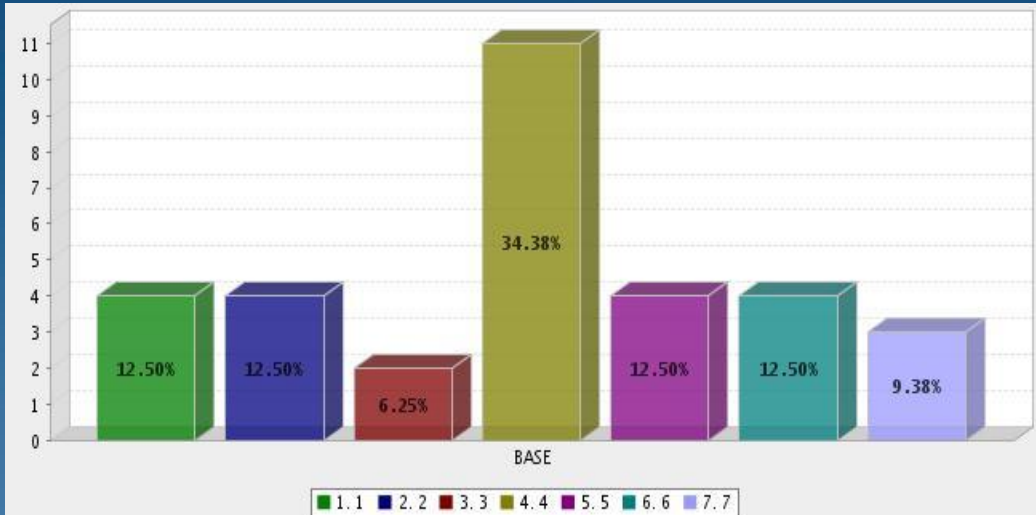
7. The right of random and selective inspections of the processes is attained to ensure avoidance of contract breach.



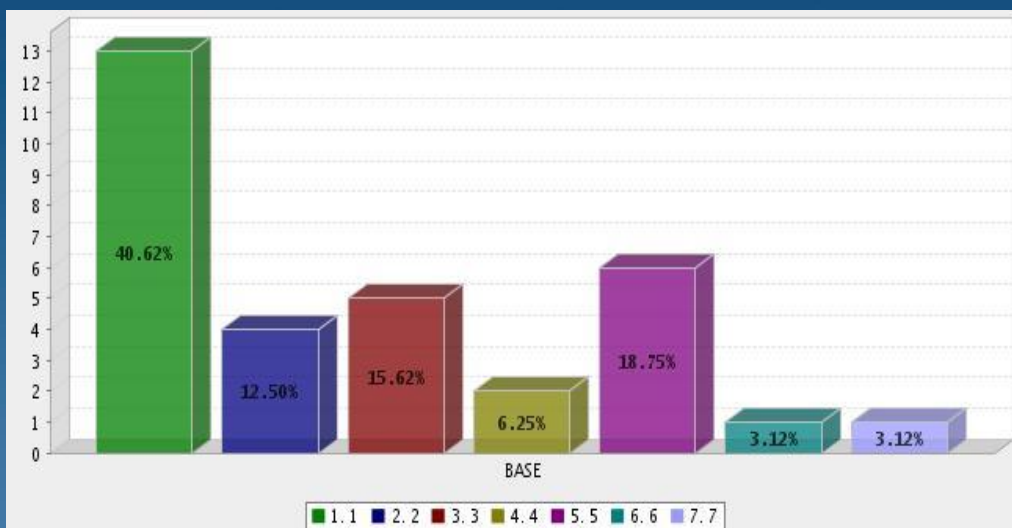
8. Environmental prequalification criteria are stated in the contract.



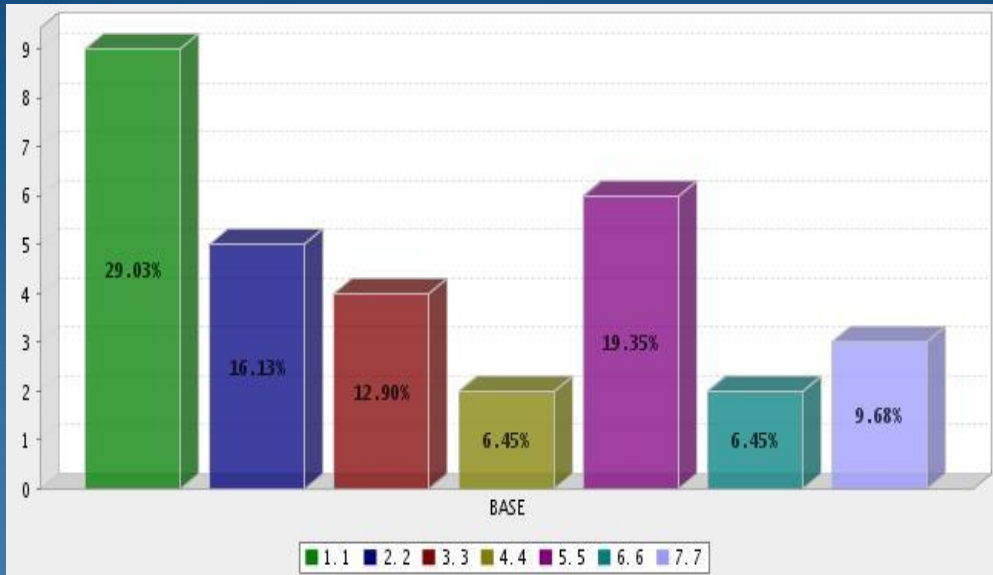
9. The required environmental technical specifications of the required services without which they will be rejected; like material selection, chemical content, and characteristics of products are stated in the contract documents.



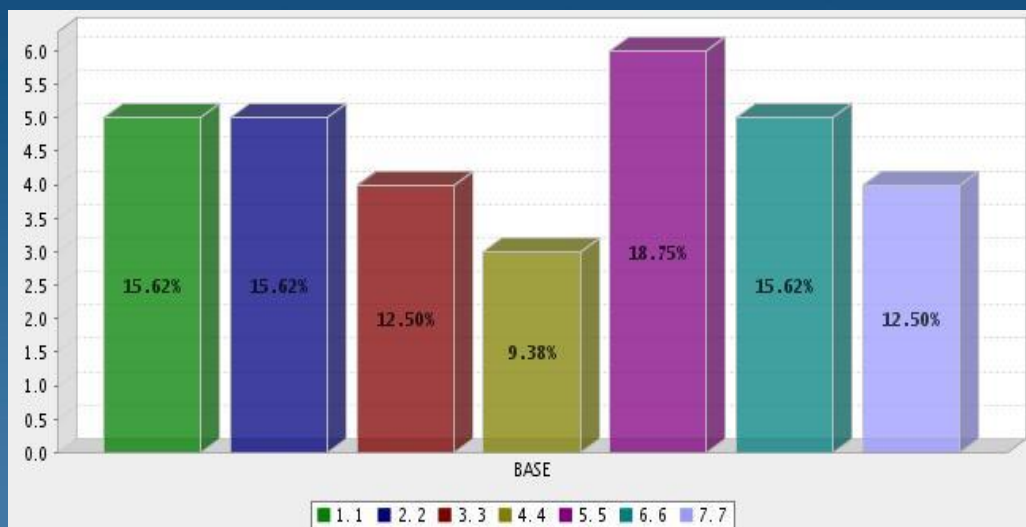
10. The right to exclude the contractor whose contract was terminated earlier because of environmental contract breach are attained.



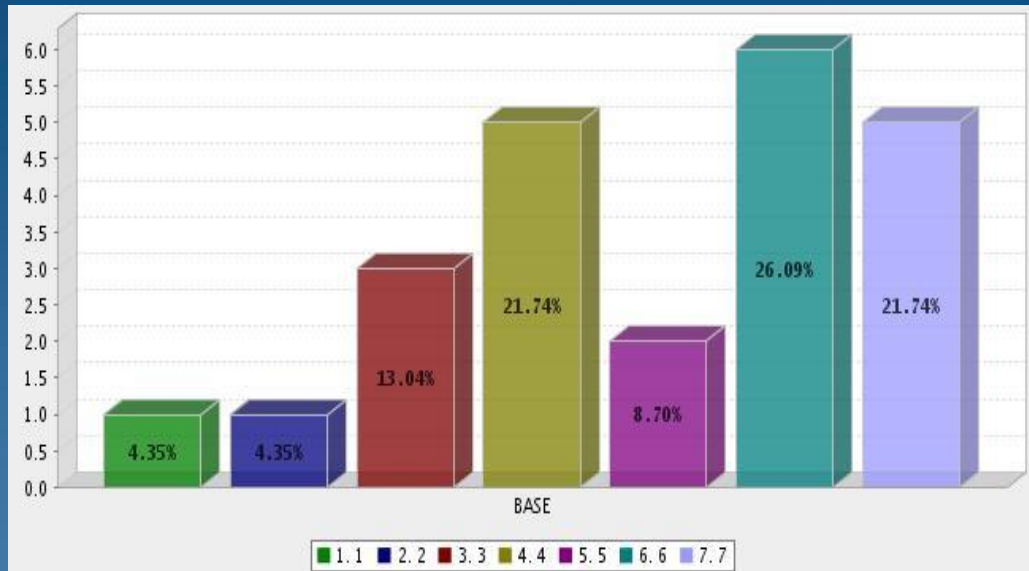
11. Additional clauses that guarantee the application of the green contract are inserted in the contract documents.



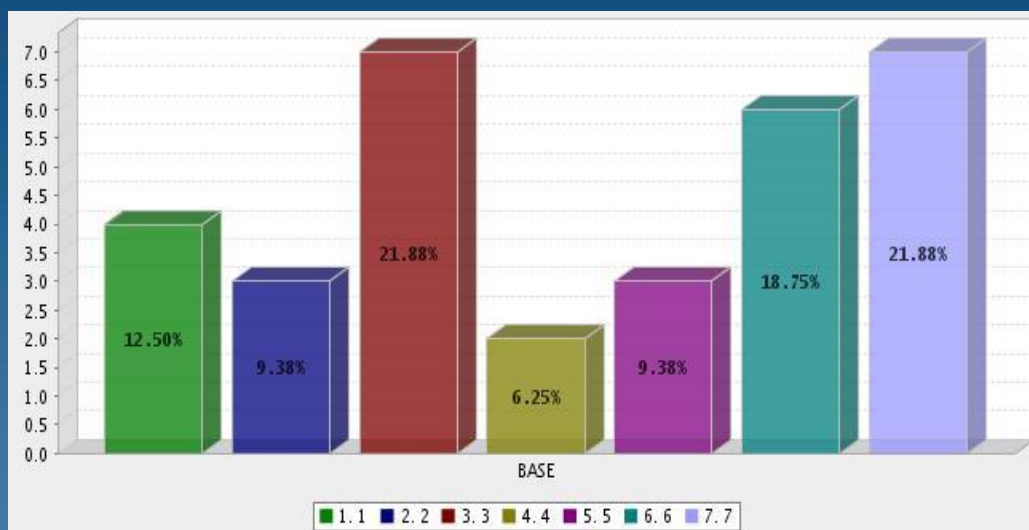
12. Contractors / suppliers have disclosed information about their environmental practices, pollution discharges.



13. Contractors / suppliers have implemented and maintained environmental management systems.



14. Contractors / suppliers have certified their environmental management systems to a recognized standard such as ISO 14001.



15. Contractor has provided timely and accurate information on their environmental practices

