STAKEHOLDERS' PERCEPTION OF SUSTAINABLE CONSTRUCTION IN SOUTH SUDAN

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Abstract
The Republic of South Sudan (RoSS), the world's newest nation, suffers from lack of infrastructure and environmental devastation resulting from decades of war for its independence. The nation faces the need for rapid development and provision of facilities. To this end, the government of the RoSS must balance its developmental efforts with environmental and sustainability issues at the policy, planning and execution levels to encourage all stakeholders, including the construction industry, to adopt sustainability principles. Thus sustainable construction (SC) should be a key issue in the nation's development agenda. The aim of this study was to examine the level of understanding, use and prospects of SC in the RoSS. An exploratory questionnaire survey of contractors, clients, designers and government (regulatory) officials in Juba, the capital city, provided data on sustainable development and SC. The data were analysed using frequencies and mean scores. The results revealed a high level of awareness of SC. The key drivers of SC were government policies and enforcement of regulations, while the major barriers were the lack of awareness of the benefits of SC and the absence of design strategies. It was concluded that, despite the challenges, the prospects for SC in the country were good.

Keywords: *Construction industry, Republic of South Sudan, stakeholders' perception, sustainable construction*

INTRODUCTION

Following the signing of the Comprehensive Peace Agreement which gave birth to the Republic of South Sudan (RoSS) in 2011, there has been a rapid rise in construction activities in the country, particularly in Juba, the capital city. Residential and non-residential buildings, roads, bridges and other facilities are being constructed across the country to meet an enormous demand. According to Ranganathan and Briceno-Garmendia (2011), these rapid growth and development activities are in some cases replacing natural forests, agricultural lands and wetlands and affecting historical sites. This creates an urgent need for the government of the RoSS to balance its responsibility for providing facilities to meet the immediate needs of its long-deprived citizens with the long-term goal of environmental protection and sustainability.

It is a well-established fact that construction has a huge impact on the environment. The construction industry has taken up the challenge to search for ways to reduce the environmental impacts of its activities by adopting and implementing SC. Also, the magnitude and severity of the environmental problems and challenges posed by development activities have been recognised by many governments, non-governmental organisations, professional bodies and research institutions worldwide. The new nation of the RoSS is expected to take a cue from other nations in this regard.

SC is better practised in the developed world where the share of construction output is in decline (Bon & Hutchinson, 2000). According to Bon and Hutchinson (2000), this is in contrast to the situation in developing and newly industrialised nations where construction outputs are rising in the face of limited national and institutional capacities to implement SC. From the foregoing, it is clear that the government of the RoSS has the responsibility to balance its developmental needs with environmental concerns at the

policy, planning and execution levels to encourage all stakeholders, including the construction industry, to adopt sustainability principles. Thus SC should, no doubt, be a key issue in the nation's development agenda. . It is against this background that this study aimed to examine the level of understanding, adoption, use and prospects of SC in the construction industry in the RoSS.

SUSTAINABLE DEVELOPMENT AND SUSTAINABLE CONSTRUCTION

To better understand the concept of SC and its significance in sustainable development, it is first necessary to discuss the output of construction, the resources it consumes and its impact on the environment. Spence & Mulligan (1995) provide an extensive coverage of the impact of the construction industry on the environment. These include the use of fossil fuels (required for the production and operation of buildings) which is approximately 10-15% the total lifetime energy use. Secondly the construction sector is believed to be a leading polluter of the environment due to its high consumption of fossil fuels and cement manufacturing. Construction also generates some gases that deplete the ozone layer. The other major impact of construction on the environment is the loss of soil and agricultural land caused by quarrying and mining, road building, urbanisation, and other civil engineering projects. These contribute to climate changes in the form of global warming which is threatening to reduce further the available water amidst high demands (Kibert, 2007).

The construction industry is unquestionably one of the largest end users of natural resources and also one of the largest polluters of both the natural and the manmade environment (Ding, 2008). For example, the UK construction industry accounts for over 25% of industry-related pollution, 19% of construction and demolition wastes and 50% of greenhouse gas emissions (Halliday, 2008).

Table 1: Definitions of sustainable construction

Definition	Author/Reference
Creating a healthy built environment using resource-efficient, ecologically based principles	*Kibert (1994 cited in Hill & Bowen, 1997*
SC, in its own processes and products during their service life, aims at minimising the use of energy and emissions that are harmful for environment and health and produces relevant information to customers for their decision making	*Huovila & Richter (1997)*
A way of building which aims at reducing (negative) health and environmental impacts caused by the construction processes or by building or by the built environment	*Lanting (1998)*
A possible strategy to better meet the needs of clients and owners while ensuring success in an increasingly competitive and constrained operational environment	*Augenbroe et al. (1998)*
A construction process which incorporates the basic themes of sustainable development	*Parkin (2000)*
A way of designing and constructing buildings that support health(physical, psychological, and social) and which is in harmony with nature, both animate and inanimate	*Hendriks (2001)*
The application of Sustainable development to the construction industry	*Khalfan. (2002)* *Reffat (2004)*
Building social housing, transport and commercial	

infrastructure in an environmentally and economically sustainable manner. *It is a holistic process aiming to restore and maintain harmony between the natural and the built environments, and create settlements that affirm human dignity and encourage economic equity*	*The CIB Agenda 21: SC for Developing Countries (cited in Du Plessis, 2002)*

Various definitions of the concept of SC are shown in Table 1 above. Although none of these definitions has been found to be comprehensive enough and generally adopted, they share the following themes:

- SC involves triple bottom line that balances social, economic and environmental issues
- SC involves a cradle to grave system which uses construction life cycle to address sustainability issues (from material extraction to deconstruction)
- SC incorporates local values and cultures into technology
- SC considers long, medium and short term needs of people and environment now and in the future.

The benefits, drivers and challenges of SC

Besides improved environmental quality, there are also financial and social benefits, though most are long term ones. Some of the benefits are reduced energy costs (Van Bueren, 2000; Van Bueren & Priemus, 2002), effective resource utilisation, improved environmental image and costs saving due to reduced environment related convictions (Shen *et al*, 2006). As shown in Table 2, the key drivers for the adoption and implementation of SC range from "increased stakeholder awareness" to "the need to improve public image".

Table 2: Drivers of Sustainable construction

Driver	Source/Reference
Increased stakeholder awareness	*Robichaud & Anantatmula (2011); Halliday (2008); Son et al, (2009);Pitt et al.(2009); Hakkinen & Belloni (2011)*
Education and training	*Halliday (2008)*
Financial incentives	*Irurah, (2001); Kibert (2007); Pitt et al, (2009); Hakkinen and Belloni (2011)*
Government commitment	*Halliday (2008)*
Government policies and regulations	*Halliday (2008); Pitt et al, (2009) ;Hakkinen and Belloni (2011)*
Client demand	
Academic institutions/R&D	*Pitt et al,(2009;Hakkinen and Belloni, (2011)*
Client awareness	*Du Plessis (2007*
Improved public image and reputation	*Hakkinen and Belloni, (2011), Shen et al. (2006)*

According to Myers (2005) and Warnock (2007), since the launch of SC there has been little success in terms of implementation. The barriers impeding the successful

implementation of SC are shown in Table 3. The nature of the barriers and their impacts has been extensively discussed in the literature by the authors.

Table 3: Classification of the barriers to sustainable construction

Barrier	Source/Reference
Technical	Hakkinen & Belloni (2011); Pearce & Vanegas (2002); Du Plessis (2002); (Scheuer & Keoleian (2002); Ding, 2008.
Cultural	Du Plessis (2002, 2007); Shen *et al* (2006); Kibert (2008)
Institutional	Du Plessis (2002); Emuze & Smallwood (2011); Van Bueren (2000); Van Bueren and Priemus (2002); Irurah (2001).
Economic	Van Bueren (2000); Van Bueren & Priemus (2002); (Robichaud & Anantatmula (2011); Emuze & Smallwood (2011); Du Plessis (2002).

SUSTAINABLE CONSTRUCTION IN THE AFRICAN CONTEXT – CHALLENGES AND OPPORTUNITIES

Sustainability and SC in Africa take a completely different dimension from the western perspective (Du Plessis, 2005). The differences are based on variations in priorities, cultures, values and capabilities (Adebayo, 2001). Du Plessis (2001) explains these complexities and concludes that the reconciliation of different "world views" of development could make sustainability and SC a success. According to her, Africa's main problems are poverty, resource scarcity and rapid urbanisation which should provide an impetus to kick start SC and that these can be addressed through urban development. However, urban development needs to be conducted in a way that considers cultural values and African traditions rather than the imposed western systems that have practically failed or weakened the African social cohesion.

In linking sustainable development and poverty, Prasad & Hall (2004) concluded that the most effective action to enhance SC is poverty eradication. While this thinking might be true, the current unimpressive level of implementation of SC in rich countries casts a serious doubt. From the African perspective, the implementation of SC is faced with challenges such as making sustainability a priority, balancing sustainability and profitability, mobilisation of resources, public awareness, improving the quality of the construction process and products, reducing resource use, environmental health and safety, and procurement processes(Du Plessis, 2001). On the positive side, the acute level of underdevelopment, social disharmony with nature and low consumption and production rates provide a good opportunity for initiating and implementing the desired SC policies proactively to avoid repeating the mistakes of the West (Du Plessis, 2002).

These challenges appear to be more acute in the RoSS due to its turbulent history of conflict and deprivation as well as its low level of human and technological development compared to the rest of Africa. The best opportunity for SC in the RoSS is provided by the low level of development of the built environment calling for mass construction of physical assets. It is against this background that this study aimed to examine the level of understanding, adoption, use and prospects of SC in the RoSS construction industry.

RESEARCH METHODOLOGY

A questionnaire survey of contractors, designers, clients and government officials was conducted in Juba, the capital city of the RoSS, in May - July 2012. An exploratory

approach using a combination of convenience and snowball sampling was adopted to select 50 respondents. The researchers had to use their personal contacts to reach out to respondents in the absence of any properly organised construction and other institutions that could be approached for a more scientific survey. Thirty-four (34) of the respondents completed and returned the questionnaires. This approach was found to be the best option in the face of the lack of institutions and the low level of organisation in the new nation's construction industry. The data collected were analysed using frequency analysis, percentage scores and mean score analysis. The mean score (MS) is given as follows:

$$MS = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{(n_5 + n_4 + n_3 + n_2 + n_1)}$$

where n_1 = number of respondents who chose option 1 (e.g. "Very low")
n_2 = number of respondents who chose option 2 (e.g. "Low"), etc.

DATA ANALYSIS AND RESULTS

The background profile of the respondents from whom data were obtained is presented in Table 4.

Table 4: Profile of respondents

	Frequency	Percentage
Stakeholder Type (N=34)		
Government institution	*6*	*17.6%*
Contractor	*24*	*70.6%*
Designer	*1*	*23.0%*
Private sector client	*3*	*8.8%*
Professional background (N=34)		
Quantity surveying	*4*	*11.8%*
Architecture	*7*	*20.5%*
Planning	*2*	*6.0%*
Other	*3*	*8.8%*
Respondents' years of experience (N=34)		
Less than 1 year	*0*	*0%*
1-5 years	*8*	*23.6%*
6-10 years	*13*	*38.2%*
Over 10 years	*13*	*38.2%*
Position of respondent in the organisation (N=34))		
Top manager	*12*	*35.2%*
Senior staff	*20*	*58.8%*
Junior staff	*2*	*6.0%*

Respondents' understanding of sustainable construction

Table 5 shows that all of the respondents had some understanding of SC.

Table 5: Respondents' understanding of sustainable construction

Description of sustainable construction	Frequency	Percentage
Creating and operating a healthy built environment based on resource efficiency & ecological design	*7*	*20.6*
A holistic process intended to restore and maintain harmony between natural and built environments, while creating human settlements that affirm human dignity and encourage economic equity	*17*	*50.0*
Building social, housing, transport and commercial infrastructure in an environmentally & economically sustainable manner	*10*	*29.4*

Respondents' application of the principles of SC

Respondents were asked to indicate how often they applied the principles of SC. In Tables 6 and 7 the responses of clients and contractors are shown.

Table 6: Clients' frequency of application of SC principles

SC Principle	No. of responses 1	2	3	4	5	MS	Rank
Demand for sustainable project delivery	0	0	0	2	1	4.33	1
Investing proceeds from non-renewable resources	0	0	0	3	0	4.00	2
Contracting environmentally responsible contractors	0	0	2	1	0	3.33	3
Accept price increment due to sustainability issues	1	2	0	0	0	1.67	4
Giving financial incentives to contractors/suppliers	2	1	0	0	0	1.33	5

1- Never 2- Not Often 3- Average 4- Often 5- Very Often

Table 7: Contractors' frequency of application of SC principles

SC Principle	No. of responses 1	2	3	4	5	MS	Rank
Minimised destruction of sensitive landscape	2	1	0	6	15	4.29	1
Reduction of pollution	2	0	2	12	8	4.00	2
Skills training & capacity building for project users	1	2	3	9	9	3.96	3
Use of renewable resources	0	2	8	4	10	3.92	4
Reduced consumption of our generic resources	4	0	2	6	12	3.92	4
Maximised resource reuse & recycling	2	3	3	7	9	3.75	5
Sourcing locally available materials	1	6	2	7	8	3.63	6
Application of labour- intensive construction methods	1	5	4	9	5	3.50	7

1- Never 2- Not Often 3- Average 4- Often 5- Very Often

The results seem to suggest that clients often demand sustainable project delivery, while contractors put a premium on protecting the environment.

Perceptions of the benefits of SC

Table 8 shows that the most important benefit the respondents attributed to SC was the "Control of pollution" and "Creating aesthetics" the least

Table 8: Perceived benefits of sustainable construction

Benefit	No. of responses 1	2	3	4	5	MS	Rank
Control of pollution	0	0	0	10	24	4.71	1
Construction wastes management	0	0	0	11	23	4.68	2
Efficiency in construction materials use	0	0	1	15	17	4.48	3
Provision of basic services	0	0	4	9	19	4.47	4
Creating employment opportunities	0	0	2	11	21	4.44	5
Water efficiency	0	0	3	13	17	4.42	6
	0	2	1	13	16	4.34	7
	0	2	2	12	17	4.33	8
	0	1	3	16	13	4.24	9

Serviceability of facilities	*1*	*1*	*4*	*11*	*15*	*4.19*	*10*
Health & safety of onsite workers/occupants	*0*	*3*	*4*	*11*	*16*	*4.18*	*11*
Energy efficiency	*0*	*2*	*6*	*16*	*9*	*3.97*	*12*
Durability of facilities	*1*	*2*	*7*	*13*	*10*	*3.89*	*13*
Enhancing standards of living	*2*	*5*	*6*	*8*	*11*	*3.66*	*14*
Wellbeing/quality of life	*1*	*9*	*8*	*5*	*11*	*3.47*	*15*
Conservation of cultural values							
Long term savings							
Recycling							
Creating aesthetics	*2*	*7*	*8*	*7*	*9*	*3.42*	*16*

1- Very Unimportant 2- Unimportant 3- Average 4- Important 5- Very Important

Drivers and barriers of sustainable construction

The key drivers of SC are government policies and their implementation (Table 9). This is not surprising in a new nation like the RoSS where the government dominates almost every form of social and economic activities.

Table 9: Drivers of SC in the RoSS

	No. of responses						
Drivers	1	2	3	4	5	**MS**	**Rank**
Policies & regulations for enforcing SC application	*0*	*3*	*0*	*1*	*30*	*4.71*	*1*
Availability of technical skills for implementing SC	*1*	*1*	*3*	*9*	*20*	*4.26*	*2*
Increased demand from clients/developers	*0*	*0*	*11*	*7*	*15*	*4.12*	*3*
Increased awareness about the benefits of SC	*3*	*4*	*2*	*4*	*21*	*4.06*	*4*
Availability of tools for measuring sustainability	*0*	*4*	*7*	*7*	*16*	*4.03*	*5*
Long term low costs & high benefits of SC	*6*	*3*	*4*	*12*	*9*	*3.44*	*6*
Financial incentives granted to businesses	*1*	*11*	*3*	*11*	*8*	*3.41*	*7*

1- Very insignificant 2- insignificant 3- Average 4- Significant 5- Very significant

Table 10: Barriers to SC practice

Barrier	No. of responses						
	1	2	3	4	5	**MS**	**Rank**
Lack of awareness about SC benefits	*0*	*1*	*0*	*10*	*23*	*4.62*	*1*
Lack of clear sustainable design strategy	*0*	*0*	*2*	*11*	*21*	*4.56*	*2*
Absence of policies/regulations to enforce SC	*3*	*0*	*1*	*13*	*17*	*4.21*	*3*
Lack of technical skills to practise SC	*0*	*4*	*1*	*16*	*13*	*4.11*	*4*
Lack of expressed demand	*3*	*3*	*5*	*8*	*15*	*3.85*	*5*

1- Very insignificant 2- insignificant 3- Average 4- Significant 5- Very significant

In Table 10, "Lack of awareness" and "Lack of clear sustainability strategies" are the major barriers. Again, this is not unexpected in a nation like the RoSS with its history of conflict and underdevelopment.

Measures for promoting sustainable construction in South Sudan

The respondents unanimously agreed that the creation of awareness was a key step. There was also a strong agreement on the need to establish guiding policies and regulations. (Table11). A large majority of the respondents (77%) also believed that there was good prospect for widespread acceptance and implementation of SC in the country if the appropriate policies and strategies were adopted.

Table 11: Respondents' opinions on strategies that can promote SC in the RoSS

	%		
Measures	**YES**	**NO**	***Total***
Introduce sustainable construction course in universities	*79*	*21*	*100*
Integrate sustainable construction into design and procurement	*97*	*3*	*100*
Establish regulations& policies to guide implementation of SC	*97*	*3*	*100*
Involve all stakeholders in sustainable construction process	*82*	*18*	*100*
Create awareness among participants in construction	*100*	*0*	*100*
Integrate modern tools/methods/techniques with tradition ones	*85*	*12*	*97*
Prioritise SC in all government construction projects	*91*	*9*	*100*
Educate/train all stakeholders on sustainability needs	*88*	*12*	*100*
Initiate, develop and implement research on sustainability	*82*	*15*	*97*
Sourcing locally produced materials	*82*	*18*	*100*
Introduce financial incentives for best practice	*65*	*35*	*100*

CONCLUSION

Sustainable development and SC are key issues in global efforts to combat climate change. The level of implementation of SC differs between developed and developing nations who face different challenges of adoption and implementation. This study examined the current state of implementation and future prospects for SC in the RoSS with its peculiar background and current state of development. The results showed that there was a high level of understanding of the SC concept among construction industry participants. The key drivers of SC were found to be government policies and enforcement of regulations, while the major barriers were the lack of awareness of the benefits of SC and the absence of design strategies to promote it. In spite of the challenges facing the new nation, a vast majority of the respondents were optimistic about the future prospects for the implementation of SC in the country. It is acknowledged that the exploratory nature of this study which used a small sample size limits the validity and generalisability of the results. It is hoped that the study will generate interest in and provide a basis for further research into SC in this new, virtually unexplored territory provided by the RoSS. This will be the ultimate contribution of this paper.

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