

**Factors Hindering the Adoption of Sustainable Design and  
Construction Practices: The Case of Office Building Development in  
Dar es Salaam, Tanzania**

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## **Abstract**

Sustainability is a key global development goal. Countries, especially in the Western world, have created systems that ensure sustainable development including in the area of design and construction. On the other hand progress is rather slow in developing countries like those found in Sub-Saharan Africa. The overall intention of this study is to contribute to the ongoing debate on how to mainstream sustainability in developing countries, especially Africa South of Sahara. This study investigates factors hindering the adoption of Sustainable Design and Construction (SDC) principles in Tanzania. In order to realize these objectives, the study investigated key design and construction industry stakeholders' understandings of SDC and how their understandings of sustainability impact current architectural trends. Findings show that the current design and construction practices ignore the local context, especially the economic, social and environmental challenges, and this has far reaching consequences for the built environment and for the people who live and work in urban Tanzania. The central question of this research was, why aren't SDC practices part of current architectural trends in Tanzania?

A case study using both qualitative and quantitative methods was carried out in Dar es Salaam. Data was obtained through expert interviews, questionnaire surveys, focus group discussions, observation, document reviews and a literature review of previous studies on the factors hindering SDC in developing countries. Findings indicate that a lack of awareness and understanding of the concept of SDC, the absence of building laws and guidelines, a lack of formal training on SDC in higher learning institutions, developer and designer mindsets and egos, perceptions of investment costs, an influx of foreign investors and lack of professional ethics are key factors hindering the adoption of SDC in urban Tanzania. Significant differences exist in the understanding of SDC among key actors in the construction industry and there is a lack of a comprehensive and practical knowledge, which hinders SDC practices. The lack of knowledge of SDC among key stakeholders is a reflection of the absence of SDC concepts in the teaching curriculum in higher learning institutions, in the procedures

for approving designs and in issuing building permits, in the laws governing activities in the construction industry and in the procedures for the employment of operational staff to undertake design and construction work.

Thus, the study concludes by suggesting that the Government of Tanzania through the Ministry of Works, academic institutions, local government authorities, professional regulatory bodies and professional associations should make a greater and preferably joint effort to establish a clearer professional meaning of SDC so that stakeholders will share a holistic understanding of the concept, thus facilitating the creation of a common goal of mainstreaming sustainability in the Tanzanian design and construction industry. The study further suggests that SDC should be emphasized in the prioritization of national research so that findings can be utilized in the construction sector. The major contribution of this study is to provide an expert holistic understanding of SDC and the factors hindering its adoption from the perceptions and experience of policy, managerial and operational stakeholders. The study lays a needed foundation for stakeholders in the construction industry from which to promote sustainable development.

**Keywords:** Construction Industry, Dar es Salaam, Managerial, Operational, Office Buildings, Policy, Stakeholders, Sustainable Design and Construction.

## **Zusammenfassung**

Nachhaltigkeit ist ein entscheidendes globales Entwicklungsziel. Länder, insbesondere in der westlichen Welt, haben Systeme erschaffen, die eine nachhaltige Entwicklung sicherstellen einschließlich des Bereichs Entwurf und Baukonstruktion.

Der Fortschritt in Entwicklungsländern wie diejenigen in Sub-Sahara Afrika ist andererseits eher langsam. Die allgemeine Absicht dieser Arbeit ist, einen Beitrag zu leisten zur laufenden Debatte über wie Nachhaltigkeit in Entwicklungsländern in den Mainstream überführt werden kann; insbesondere für Afrika südlich der Sahara. Diese Arbeit untersucht Faktoren, welche die Annahme von Prinzipien des nachhaltigen Entwurfs und der Baukonstruktion (SDC) Prinzipien in Tansania erschweren.

**Um diese Zielsetzung zu erreichen, hat die Arbeit das Verständnis von Schlüsselakteure in der Entwurfs- und Bauindustrie untersucht und wie deren Verständnis von Nachhaltigkeit Einfluss auf die gegenwärtigen Architekturtrends hat.**

Die Ergebnisse zeigen, dass die gegenwärtigen Entwurfs- und Konstruktionspraktiken den lokalen Kontext außer Acht lassen; insbesondere wirtschaftliche, soziale und ökologische Herausforderungen. Dies hat weitreichende Folgen für die bebaute Umwelt und für die Menschen, die im städtischen Tansania leben und arbeiten. Die zentrale Untersuchungsfrage war, warum SDC Praktiken keinen Eingang in die gegenwärtigen Architekturtrends von Tansania erhalten.

Eine Fallstudie zu Dar es Salaam wurde durchgeführt anhand qualitativer und quantitativer Methoden. Datenmaterial wurde gewonnen durch Experteninterviews, Fragebogenuntersuchungen, Gruppendiskussionen, Beobachtungen, Dokumentenanalyse und Literaturstudie zu vorangegangenen Studien zu Faktoren welche eine nachhaltige (SDC) Herangehensweise in Entwicklungsländern erschweren. Die Ergebnisse deuten darauf hin, dass ein fehlendes Bewusstsein und Verständnis des SDC Konzepts, fehlendes Baurecht und Baurichtlinien, ein Mangel an formeller Ausbildung an Hochschulen, die Denkweisen und Selbstgefühle von Entwicklern und Entwerfern, die Wahrnehmung von Investitionskosten, der Einfluss ausländischer Investoren und fehlende Ethik im Berufsstand Schlüsselfaktoren sind,

welche eine Annahme von SDC im städtischen Tansania erschweren. Signifikante Unterschiede bestehen im Verständnis von SDC unter Schlüsselakteuren in der Bauindustrie und es fehlt an umfassenden und praktischen Wissen, so dass SDC Ausübungen behindert werden.

Das fehlende Wissen zu SDC unter Schlüsselakteuren ist eine Spiegelung des fehlenden SDC Konzepts im Curriculum von Hochschulen, in den Verfahren, um Entwürfe zu genehmigen und Baugenehmigungen zu erteilen, in den Gesetzen, die Aktivitäten in der Bauindustrie regulieren und in den Verfahren für die Einstellung von betrieblichen Mitarbeitern für Entwurfs- und Bauaufgaben.

Daher zieht die Arbeit den Rückschluss, dass die Regierung von Tansania durch das Arbeitsministerium (Ministry of Works), akademische Institutionen, Kommunen, Fachverbände und -vereinigungen eine größere und bevorzugt gemeinsame Anstrengung unternehmen sollten, eine klarere fachgerechte Bedeutung von SDC zu etablieren, so dass Akteure ein umfassendes Verständnis des Konzeptes teilen und dadurch die Entstehung eines gemeinsamen Ziels des Mainstreaming von Nachhaltigkeit in der Entwurfs- und Bauindustrie in Tansania erleichtern. Weiterhin empfiehlt die Arbeit, dass SDC größere Bedeutung beigemessen werden sollte in der Priorisierung der nationalen Forschung, so dass Erkenntnisse im Bausektor genutzt werden können. Der größte Beitrag dieser Arbeit besteht darin, dass sie ein umfassendes Expertenverständnis von SDC und den Faktoren zur Verfügung stellt, welche eine Umsetzung erschweren, nach Ansicht und Erfahrung von Akteuren aus Politik, Management und operativen Betrieb. Die Arbeit legt eine notwendige Grundlage zur Förderung nachhaltiger Entwicklung für Akteure in der Bauindustrie.

**Keywords:** Bauindustrie, Dar es Salaam, geschäftsführend, operativ, Bürogebäude, politische, Akteure, nachhaltiger Entwurf und Konstruktion

## **Dedication**

This dissertation is dedicated to my late father, ROBERT MAGIRI MARWA and my late father in law ARTHUR WILLIAM HEILMAN who did not live to see the end of this work. Two men who loved, supported and encouraged me to break boundaries.

Two Men who in their last days asked when will I finish my dissertation?

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# Table of Contents

Abstract .....	i
Zusammenfassung .....	iii
Dedication .....	v
Acknowledgement .....	vi
Table of Contents .....	viii
List of Figures .....	xv
List of Tables .....	xvii
List of Acronyms .....	xviii
<b>1 INTRODUCTION .....</b>	<b>1</b>
1.1 Background .....	1
1.2 Research Gap.....	3
1.3 Problem Statement.....	7
1.4 Significance of the Study .....	9
1.5 Purpose, Objectives of the Study and Research Questions.....	10
1.6 Structure of the Thesis Report .....	11
<b>2 CONCEPTUAL FRAMEWORK: ARCHITECTURE AND SUSTAINABILITY DISCOURSE .....</b>	<b>14</b>
2.1 Introduction.....	14
2.2 The Global Evolution of the Concept of Sustainability in Architecture .....	14
2.3 Contested Notions of Sustainable Design and Construction (SDC).....	19
2.4 Sustainability in Architecture: The Pre - Rio Discussions and Practices.....	23

2.5	Definition, Principles and Practices of SDC .....	28
2.5.1	Definition of SDC .....	28
2.5.2	Principles and Practices of SDC .....	30
2.6	Current Debate of SDC in Developing Countries .....	33
2.7	Requirements for SDC in Developing Countries .....	37
2.8	Challenges of Adopting SDC Practices in Developing Countries. ....	41
2.9	Theoretical Standpoints .....	46
2.10	Conceptual Model.....	48
<b>3</b>	<b>METHODOLOGY .....</b>	<b>51</b>
3.1	Introduction.....	51
3.2	Overview of the Research Design .....	51
3.3	Criteria for Selection of the Case Area and Generalization.....	52
3.4	Categories of Stakeholders .....	54
3.5	Obtaining Information and Data from the Selected Case.....	55
3.5.1	Literature Review.....	56
3.5.2	Document Review.....	56
3.5.3	Attending Professional Meetings.....	57
3.5.4	Preliminary Field Study.....	59
3.5.5	Observation and Photographic Registration.....	60
3.5.6	Expert Interviews .....	61
3.5.7	Focus Group Discussions .....	64
3.5.8	Questionnaire Survey: .....	66
3.5.9	Population, Samples and Sampling Procedure .....	67

3.6	Limitations of the Study .....	72
3.7	Reliability and Validity .....	73
<b>4</b>	<b>DAR ES SALAAM AS A CASE FOR STUDYING SDC PRACTICES IN URBAN TANZANIA.....</b>	<b>76</b>
4.1	Introduction.....	76
4.2	Geography and Climate of Dar es Salaam .....	76
4.3	Dar es Salaam Architectural Trends over the Years.....	79
4.3.1	Arab Architecture (1862-1870).....	80
4.3.2	German Architecture (1887 –1916) .....	82
4.3.3	British Architecture (1916-1961).....	83
4.3.4	Post-colonial Architecture (1961 – 2002) .....	84
4.3.5	Current Architecture (2003 – 2013).....	85
4.4	Conclusion .....	91
<b>5</b>	<b>INSTITUTIONAL LANDSCAPE FOR SDC IN URBAN TANZANIA.....</b>	<b>94</b>
5.1	Introduction.....	94
5.2	Construction Industry’s Guiding Policy and SDC.....	95
5.3	Governmental Regulatory Institutions and Regulations for SDC .....	97
5.3.1	National Environmental Management Act No. 20 of 2004 .....	97
5.3.2	National Construction Council Act of 2008.....	98
5.3.3	Architects and Quantity Surveyors Registration Act No. 4 of 2010 .....	98
5.3.4	Contractors Registration Act of 1997 .....	100
5.3.5	Engineers Registration Act No. 15 of 1997 .....	101
5.3.6	Tanzania Local Governments Act of 1982 .....	101

5.3.7	Tanzania Green Building Council (TZGBC) .....	103
5.3.8	Other Institutions and Their Regulations .....	105
5.4	Procedures as Provided for by Laws .....	106
5.4.1	Building Design and Construction Implementation Procedures.....	106
5.4.2	Methods for Selection and Appointment of Consultants.....	108
5.4.3	Method for Selection and Appointment of the Contractors .....	109
5.4.4	Building Permit and Issuing Process .....	110
5.5	Conclusion .....	111
<b>6</b>	<b>KEY STAKEHOLDERS AND THEIR UNDERSTANDINGS OF SDC.....</b>	<b>114</b>
6.1	Introduction.....	114
6.2	Most Influential Stakeholders and Stakeholders Mapping .....	114
6.2.1	Findings from Policy Stakeholders .....	114
6.2.2	Findings from Managerial Stakeholders.....	118
6.2.3	Findings from Operational Stakeholders .....	121
6.2.4	Findings from Questionnaire Survey.....	123
6.2.5	Stakeholders Mapping.....	124
6.3	Stakeholder's Understandings of SDC .....	126
6.3.1	Familiarity with the Concept of SDC.....	126
6.3.2	Meanings of SDC .....	130
6.3.2.1	<i>Environment, Cultural and Economic Responsive Design and Construction</i> .....	<i>130</i>
6.3.2.2	<i>Low Cost Design and Construction</i> .....	<i>133</i>
6.3.2.3	<i>Environmentally Friendly Design and Construction</i> .....	<i>136</i>
6.3.2.4	<i>Efficient and Effective Design and Construction</i> .....	<i>137</i>

6.3.2.5	<i>Durability of Building Products</i> .....	139
6.3.2.6	<i>Meeting Client Needs and Development Standards</i> .....	140
6.3.2.7	<i>Doing the Right Thing</i> .....	142
6.4	Basis of Stakeholders Familiarity and Meanings of SDC .....	145
6.4.1	Document Related Sources: .....	146
6.4.1.1	<i>Publications Presented in the Professional Development Seminars</i> ...146	
6.4.1.2	<i>Publications Presented in International and Local Conferences</i> .....149	
6.4.1.3	<i>Publications of the Best Projects Awards by the AQRB</i> ..... 150	
6.4.2	Information and Communication Technology (ICT) Based Sources:.....	153
6.4.3	Learning from Each Other .....	155
6.5	Conclusion .....	158
<b>7</b>	<b>FACTORS HINDERING THE ADOPTION OF SDC PRACTICES IN URBAN TANZANIA</b> .....	<b>161</b>
7.1	Introduction.....	161
7.2	Perceptions of Office Building Architectural Trends in Tanzania .....	161
7.2.1	Glass Architecture: Cladding Buildings in Glass.....	162
7.2.2	Profit Driven Architectural Trends: A Quick Return on an Investment ....	169
7.3	Forces behind Urban Tanzania’s Architectural Trends of Office Buildings.....	174
7.3.1	Durable, Maintenance Free and Easy to Work With.....	174
7.3.2	Influence of Building Material Suppliers.....	175
7.3.3	Designers and Developers Mind-sets and Egos .....	178
7.3.4	Rubber Stamping of Imported Designs by Local Designers.....	183
7.3.5	Lack of Building Regulations .....	187
7.3.6	Architectural Design Software .....	188
7.4	Challenges of Adopting SDC Practices in Urban Tanzania.....	189

7.4.1 Lack of Awareness and Understanding of the Concept.....	189
7.4.2 Lack of Policies and Regulations.....	193
7.4.3 Technical Knowledge Deficit .....	195
7.4.4 Perception of Investment Costs.....	197
7.4.5 Improper Procurement Process for Consultancy Work .....	199
7.4.6 Influx of Foreign Investors .....	201
7.5 Conclusion .....	202
<b>8 EMERGING ISSUES, CONCLUSION AND RECOMMENDATIONS .....</b>	<b>205</b>
8.1 Summary of the Study .....	205
8.2 Synthesis and Reflection on Key Emerging Issues at Policy, Managerial and Operational Levels.....	205
8.2.1 At Policy Level .....	206
8.2.2 At Managerial Level.....	208
8.2.3 Operational Level .....	209
8.3 Conclusion .....	210
8.4 Contribution to the Debate.....	212
8.5 Recommendations for Scientific Research Community .....	213
8.6 Recommendations for Further Research.....	213
8.7 Recommendations for Practice .....	214
List of References .....	218
Appendix I: Questionnaire Survey Used.....	230
Appendix II: Expert Interview and Focus Group Discussion Guide.....	236
Appendix III: General Background of the Questionnaire Respondents .....	238

Appendix IV: Sample of Expert Interview Analysis.....	239
Appendix V: Familiarity of SDC in Relation to Age Group.....	241
Appendix VI: Abstract of the Published Paper .....	242
Appendix VII: Research Permits .....	243
Appendix VII: Energy Consumption of Office Buildings in Dar es Salaam .....	245
Appendix VIII: List of Expert Interviews Respondents .....	246
Appendix IX: List of Participants in the Focus Group Discussion Held at the National Housing Corporation Head Office on 29.11.2013 .....	248
Appendix X: List of Participants in the Focus Group Discussion Held at Ardhi University on 30.04.2014.....	249

## List of Figures

Figure 2.1 Timeline of Events Explaining the Evolution of the Sustainability Concept in Architecture .....	14
Figure 2.2 Conceptual Model. ....	49
Figure 3.3 Focus Group Discussion at Ardhi University .....	65
Figure 4.1 Map of Dar es Salaam.....	77
Figure 4.2 Study Area in Dar es Salaam City Centre/CBD Area .....	78
Figure 4.3 Old Boma Building (left) and White Fathers House (right) .....	81
Figure 4.4 Kivukoni Court (left) and Ocean Road Cancer Institute (right).....	82
Figure 4.5 State House Building, in the German Era and Re-construction in 1922 .....	83
Figure 4.6 NBC House (left), Ministry of Lands Building (right).....	84
Figure 4.7 PPF and PSPF Towers (left), Kempinski Hotel and BOT (right) .....	85
Figure 4.8 Exim Tower (left) and Amani Place (right).....	86
Figure 4.9 The Extent of Current Office Buildings Constructed in DSM .....	87
Figure 4.10 Consumption of Electricity by Office Buildings Built (1961-2002) in DSM.	89
Figure 4.11 Consumption of Electricity by Office Buildings Built (2003-2013) in DSM .	90
Figure 4.12 Samora Avenue (left) and Sokoine – Karimjee Drive (right): Quality of Streets Covered with Buildings Constructed during Colonial and Post-Colonial Time. ....	92
Figure 4.13 Mirambo Street: Quality of Streets Covered with Current Architecture. ...	92
Figure 5.1 Institutional Set Up for SDC: Featuring National and Local Governments Institutions .....	104
Figure 5.2 Main Stages of the Design and Construction Process and Key Procedures	106
Figure 6.1 Stakeholders Mapping .....	125
Figure 6.2 Familiarity with the Term SDC.....	128
Figure 6.3 Example of One of the Unintelligible Pages from the Proceedings Binder.	148
Figure 7.4 AQRB Best Project Award 2012 .....	151
Figure 6.5 Most Important Stakeholder and Influence on SDC Practice.....	159
Figure 7.1 Air Condition Units on the Roof .....	164

Figure 7.2 Interior View of an Office Building in DSM .....	165
Figure 7.3 New Office Buildings in DSM .....	166
Figure 7.4 Building Condemned for Demolition in DSM .....	172
Figure 7.5 Perception of Current Architectural Trends of Office Buildings in DSM....	173
Figure 7.6 Advertisement by the Material Supplier .....	176
Figure 7.7 Awareness of the Monthly Cost of Electricity Incurred by Building Users .	182
Figure 7.8 Translation of Green Building to “Ujenzi wa Kijani” .....	191

## List of Tables

Table 3.1 Categories of Stakeholders .....	55
Table 3.2 Population of the Operational, Policy and Managerial Stakeholders in DSM. .....	68
Table 5.1 Overview on Institutions, Regulations and Their Focus .....	105
Table 6.1 Summary of the RII and Ranks for the Most Important Stakeholders with Influence over SDC Practices in Tanzania.....	123
Table 6.2 Summary of Meanings of SDC Given by 42 Interviewees from Three Categories of Stakeholders .....	144

## List of Acronyms

AAT	Architects Association of Tanzania
AIA	American Institute of Architects
AUA	African Union of Architects
AQRB	Architects Quantity Surveyors Registration Board
BOT	Bank of Tanzania
BOQ	Bills of Quantities
BREEAM	Building Research Establishment Environmental Assessment Method
CBD	Central Business District
COSTECH	Commission for Science and Technology
CPD	Continuing Professional Development
CRB	Contractors Registration Board
CSIR	Council for Scientific and Industrial Research
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen
DSM	Dar es Salaam
DSP	Dar es Salaam Sustainable Project
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
ERB	Engineers Registration Board
FGD	Focus Group Discussion
GBCSA	Green Building Council South Africa
GDP	Gross Domestic Product
ICT	Information and Communication Technology

ISTIC	International Science Technology and Innovation Centre
LEED	Leadership for Energy and Environmental Design
LGAs	Local Government Authorities
NBC	National Bank of Commerce
NCC	National Construction Council
NEMC	National Environmental Management Council
NGOs	Non-Governmental Organizations
NHC	National Housing Corporation
PPF	Parastatal Pension Fund
PPR	Public Procurement Regulation
PSPF	Public Service Pensions Fund
RII	Relative Importance Indices
SADE	School of Architecture and Design
SBAT	Sustainable Building Assessment Tool
SBCI	Sustainable Building and Construction Initiatives
SDC	Sustainable Design and Construction
SGBC	Singapore Green Building Council
TANESCO	Tanzania Electric Company
TBA	Tanzania Building Agency
TIQS	Tanzania Institute of Quantity Surveyors
TZGBC	Tanzania Green Buildings Council
UIA	International Union of Architects
UN	United Nations

USAID United States Agency for International Development  
USD United States Dollar  
USGBC United States Green Building Council

# 1 INTRODUCTION

## 1.1 Background

The United Nations Environmental Programme, Sustainable Building and Construction Initiatives (UNEP - SBCI, 2009) identified the construction industry as having the potential to significantly reduce environmental problems. However, the construction industry in developing countries shows little environmental concern (Ofori, 1998). According to Sjostrom & Bakens (1999), the construction industry and the built environment are the main consumers of resources, energy and materials globally. It is estimated that buildings and their associated functions are responsible for 40% of the world energy consumption (USGBC, 2009). They generate 30% of the CO<sub>2</sub> emission and approximately 40% of all manmade waste (Sjostrom & Bakens, 1999). Thus, if properly designed, constructed and managed, their contribution to environmental problems could be significantly reduced.

Due to a rising understanding from scientific research on the impact of the construction industry on the environment, SDC (Sustainable Design and Construction) has received considerable attention, especially in developed countries' design and construction practices. Building Research Establishment Environmental Assessment Method (BREEAM) was devised in 1990 in the UK to provide guidelines on how to minimize the negative impact of buildings on the environment and encourage environmentally responsive designs while promoting sustainable practices of design and construction. With the same intention, the United States established Leadership for Energy and Environmental Design (LEED) in 1998. Australia established The Green Star rating system in 2003 and Germany's Sustainable Building Council (DGNB) established The German Sustainable Building Certification Authority in 2008. The establishment of BREEAM, LEED, Green Star and DGNB has had a tremendous impact on the built environment by promoting and creating awareness of environmentally

responsive designs among stakeholders. BREEAM, LEED, Green Star and DGNB assessment tools have become “increasingly accepted as a meaningful measure of SDC in developed countries” (Ozolins , 2010: ii).

In contrast, as pointed out by Ozolins (2015) construction projects in developing countries do not adequately contribute to sustainable development. This was also pointed out earlier by Du Plessis (2001), who noted that the construction industry in developing countries has neglected sustainable construction and there is a lack of information and research on sustainable construction solutions. According to Guedes (2014: 423), until “today there is very little information on issues of sustainable building that is adapted to the climate, social–economic and cultural context in African countries”. Reffat (2004: 2) noted that an additional problem associated with the lack of information and research is that SDC in developing countries is perceived as a luxury, an addition to “normal practice<sup>1</sup>”. It is not seen as a necessity or as a main motivator in making design and construction related decisions. As such SDC is perceived to increase costs and reduce profit. This perception, according to Reffat (2004), comes from stakeholders’ understanding that SDC requires additional investment in equipment, machinery, training and design technology for the application of sustainable design concepts to replace the normal design and construction practice. It is evident that developing countries are facing a number of challenges, including the lack of resources, lack of research and information in many sectors that makes sustainable design impractical.

Wines & Jadidio (2000) argue that investments have to be made in order to achieve sustainability in the construction industry. Nonetheless Barnett & Browning (1999), based on research conducted by the Rocky Mountain Institute of Research and

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<sup>1</sup> Normal design and construction practice in this study refers to basic design and construction practices, where space, aesthetics and structural stability of a building is key. No additional design and construction elements to accommodate SDC are taken into consideration.

Education, Colorado, USA, highlighted that sustainable buildings cost about the same as normal buildings and sustainable buildings have lower operating costs because they use less energy and produce less pollution. Based on a study by Larson, et.al, (2008), sustainable buildings cost little or no more to build with operating expenses 20% to 50% less than normal buildings of the same scale. The perception of the high cost of sustainable buildings in developing countries, as pointed out by Reffat (2004), implies that there is a significant need to research as to whether the current perception is true and can be supported with evidence in developing countries, and if not, why does it persist despite the global discussion about the benefits of SDC practices.

## **1.2 Research Gap**

Developing countries, particularly African countries, face a number of challenges including poverty, high solar heat, high levels of humidity, unreliable access to water and electricity, a lack of sewer services, and high energy costs. Despite all these challenges, which can also be viewed as potentials, the trend of building design and construction in major cities, including Dar es Salaam, barely show concern for environmental sustainability in terms of building materials, building energy use, and other resources that go into the building sector. A study by Lauber (2005) in Africa (Togo and Cameroon), South America and Asia, reveals that many of the modern buildings and settlements in developing regions reflect an uncritical repetition of conventional 'pre-green' European buildings without taking into consideration the special climatic, economic, and social conditions of the home country.

Lauber (2005) revealed a true picture of the architectural development in many African countries where it is not uncommon in places like Dar es Salaam to find completely glass enclosed buildings using energy intensively for cooling in a hot and humid climate. With the challenges and potentials African countries face, glass towers pose problems in terms of high energy needs to create comfortable interiors where energy supplies are unreliable, importing materials and equipment is costly, and the

overall impact of these buildings on the outdoor environment creates discomfort, thus negatively impacting the economic and social well-being of users and the surrounding communities. Lauber (2005) argues that copying a modern and Western way of life (design and construction) is considered a symbol of wealth and progress and the major reason for the minimal response in terms of design and construction suited for the local climate.

Chavez (2006)<sup>2</sup> noted that most modern architectural buildings (in the tropics) ignore very basic principles of sustainable design in terms of their conscious response to climate, culture and traditions as well as in their use of energy and natural resources. He also found that the use of locally available and renewable materials (an important element of SDC) is declining and is undervalued in many developing countries, which hinders the adoption of sustainable building construction practices. He argues that copying from the so called international and post-modern architectural style (pre-green designs) in the tropics is one of the reasons for the declining use of locally available renewable materials and the lack of buildings' response to the climate. International and post-modern architectural style is characterized by a high dependency on artificial systems for cooling, heating, and lighting, which in turn contributes to a large consumption of fossil fuels.

Lauber (2005) and Chavez's (2006) argument that copying a modern Western way of life and architectural styles in the tropics are the main reasons for Africa to lag behind in adopting SDC practices. Their argument call for more research to contribute to the debate on SDC in Sub-Saharan Africa to uncover empirical evidence for explanations of Africa to lagging behind in adopting SDC.

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<sup>2</sup> A professor at the Metropolitan Autonomous University of Mexico City, drawing from his study carried out in Mexico City (representing tropical regions) in 2006 on the integration of SDC technologies into the bioclimatic design in a house prototype.

Additionally, their work shows that recent architectural design and construction in developing countries is influenced by the “old fashioned” architectural styles found in the developed countries before climate change and sustainability in construction became major concerns. In other words, there is a good reason to support what Guedes (2014) pointed out, that there is very little information on issues of sustainable buildings adapted to the climate, social – economic and cultural context in Africa countries and why the construction industry in developing countries lags behind in its response to environmental, social and economic problems.

A number of studies, including Guedes (2014), Ozolins (2010) and (2015), Chavez (2006), Lauber (2005), Reffat (2004), and Ofori (1998), have been conducted on sustainability in the construction industry in developing countries, especially in Asia, South Africa, West Africa and South America, where considerable attention is paid to the built environment and individual buildings. However, findings from these studies may not be applicable to the context in Tanzania, and Dar es Salaam in particular, for a number of reasons including differences in culture, climatic and socio-economic conditions, environmental challenges, design and construction processes and policies, and sensitivity to the concept of sustainability in learning institutions.

Research in Tanzania on sustainability in the construction industry has not been given enough attention, especially on understanding how stakeholders perceive the concept of sustainable design and why sustainability is not adopted in the design and construction practices. One exception to this trend was a study conducted by Ozolins (2010). His study was based on his building design work in Dodoma, Tanzania and his practical experience of working in developing countries to weigh the applicability of LEED, BREAM and Green Star in the Tanzania and Madagascar contexts. His findings suggested that for sustainability to be adopted in Africa and other developing countries, research that contributes to an improved understanding of the key issues of sustainability related to a developing country’s context needs to be carried out. Based on findings from his research, performance standards relevant to the context of a

particular region need to be identified and developed. Similarly, Abidin (2010) suggested that progress towards understanding and adopting sustainability in developing countries mainly depends on improving awareness, knowledge, and understanding of the impact of people's actions on the environment.

Another study by Gibberd (2003) in South Africa reveals that the understanding of the implications of sustainable development for building and construction in developing countries is lacking. As such developing an understanding of sustainable development and integrating it into mainstream practice in the construction industry will be increasingly important for sustainability to be achieved in Africa (Gibberd, 2003). A collaborative study by the University of Wales, United Kingdom and the University of Stellenbosch, South Africa on "Consumers' Perception of Green Design and Construction in South Africa", by using a perception survey and document analysis, suggested that in order to gain a holistic understanding of the perception of sustainable design in South Africa, one will have to conduct a study with a wider sample group of stakeholders rather than just consumers (Raubenheimer & Botha, 2010). Ozolins (2010), Abidin, (2010) and Gibberd (2003) argue for the need to have studies carried out in specific countries, the collaborative study by Raubenheimer & Botha, (2010) draws our attention to the issue of methodology, specifically on the importance of making the study comprehensive/holistic in terms of the categories of stakeholders involved.

Therefore, building on the findings of Guedes (2014), Ozolins (2010), Abidin (2010), Lauber (2005), Chavez (2006), Reffat (2004) and Gibberd (2003), that focused on built environments and individual buildings at the expense of taking into account stakeholders understandings, this study focuses on understanding the perceptions of sustainability among stakeholders in the built environment in Dar es Salaam. The goal of this study is to generate up to date knowledge of stakeholder understandings of factors affecting the application of SDC practices in the Tanzanian context with the intention of promoting SDC practices in the Tanzania construction industry.

It is argued that, the current level of knowledge of sustainability in developing countries is no doubt a major factor contributing to the architectural trend, highlighted by Lauber (2005) and Chavez (2006), of unimaginative and inefficient designs and construction processes currently seen in developing countries, including Tanzania. In Dar es Salaam, for example, one will find buildings with full single glazed facades exposed to the east and west sun, which heats up the building for an air conditioning system to cool all day. This leads to a high level of energy consumption and adds considerable costs to the construction process by importing materials and skilled labour. Additionally, tenants are left with the problem of devising ways to cope with high cost of electricity the supply of which is also unreliable.

There is a need to evaluate the standard explanations from previous studies for the difficulties of promoting and adopting SDC practices in Tanzania. However, it is important to understand SDC from a stakeholders' point of view as well as looking for new insights into understanding this dilemma.

### **1.3 Problem Statement**

Previous studies, including Chavez (2006) and Lauber (2005), my observations of Dar es Salaam, my experiences of working with students and practicing architects in Tanzania, suggest that architects working in developing countries, such as Tanzania, inappropriately copy pre-green modern and post-modern design concepts and construction techniques from developed countries and impose them on their clients. This practice of ignoring the local context has far reaching consequences for the built environment and for the people who live and work in developing country cities as discussed in section 1.2. Given the high costs of copying pre-green modern and post-modern office buildings, there is a need for an up-to-date and critical evaluation of the factors hindering the adoption of SDC practices in developing countries.

The current debate over SDC in developing countries, as discussed in section 1.2, centers on three arguments:

1. Whether the cost of constructing sustainable buildings is too high making them uneconomical for building owners.
2. Whether developing country architects and building owners are copying outdated developed country architectural styles for reasons of status and prestige.
3. Whether new trends, pioneered in the developed countries, require new skills, technologies, and industries that currently are lacking in developing countries for sustainability to be widely adapted.

But these arguments are based on scant empirical evidence with limited inputs from developing country stakeholders. This situation highlights the need for an up to date comprehensive study in the developing country context.

In Tanzania, research on sustainability in the construction industry, especially on understating of how stakeholders perceive the concept of SDC, and the lack of application of these concepts, has largely been neglected. Existing studies in a developing country context hardly focus on stakeholders' understandings and perceptions of the concept of SDC as an explanation for the architectural trends seen in African cities. There is a need to understand why developing countries are lagging behind in adopting SDC practices despite the rising worldwide understanding of the impact of the construction industry in achieving sustainability in resources use. This study addresses this knowledge gap through by gaining an understanding of how key stakeholders in the Tanzania construction industry perceive the concept of SDC and why SDC practices have largely been ignored. The study was conducted in Dar es Salaam, which is the main commercial and state administrative center in Tanzania and which is experiencing a construction boom of office buildings that ignore SDC principles.

#### **1.4 Significance of the Study**

This study examines the factors hindering the adoption of SDC practices in the Tanzania construction industry. This study intends to reduce the existing research gap in relation to stakeholders' understandings of SDC in the Tanzania context, which has many similarities with other developing countries, thus contributing to the debate on the appropriateness of SDC in African countries.

Another contribution of this study is to provide an in-depth holistic understanding of the design and construction experience of different stakeholders. This will lay the needed foundation in the construction industry to promote sustainable development by fostering a wider awareness of the essence of SDC among stakeholders, hence creating an incentive for changes at the national, municipal and individual level.

The study's findings are meant to generate knowledge to help Tanzania's architects, planners, engineers and construction professionals to create built environments that take advantage of sustainable designs and construction practices in order to help the country cope with environmental and social-economic problems and reduce impacts from climate change.

The study findings also provide a basis for policy makers and environmental activists to promote SDC through a review of existing national and municipal policies and urban development regulations for controlling spatial development and to establish priorities for consideration in the preparation of building guidelines for urban Tanzania.

Furthermore, the study findings are useful for architecture training institutions in Tanzania to spur reviews of teaching curriculum with the aim of incorporating more strongly SDC. Currently the curriculum does not sufficiently expose architecture

students to the principles, concepts and benefits of SDC appropriate for Tanzania, especially in the design studio projects.

### **1.5 Purpose, Objectives of the Study and Research Questions**

The major purpose of this study is to contribute to the ongoing debate on sustainability in developing countries by uncovering the factors hindering the adoption of SDC practices in Tanzania. Moreover, this study seeks to provide a basis for the construction sector in developing countries, particularly Tanzania, to enhance the practice of SDC in the built environment. Specifically, the study seeks to:

1. Analyse factors hindering the adoption of SDC practices in office buildings in urban Tanzania.
2. Analyse who are the key stakeholders with the most influence over the implementation of SDC practices and their understanding of the concept.
3. Generate knowledge to contribute to the ongoing debate on SDC in developing countries.
4. Develop recommendations to support the application of SDC practices in urban Tanzania and in developing countries in general.

The study seeks to answer the following research questions:

1. Why aren't SDC practices part of current architectural trends in Tanzania?
2. Who are the most important stakeholders with the most influence over the implementation of SDC practices in urban Tanzania?
3. How do these stakeholders understand the concepts of SDC?
4. What parameters can be used to promote SDC practices in urban Tanzania and in developing countries in general?

## **1.6 Structure of the Thesis Report**

The thesis report is divided into eight chapters. Chapter one gives an overview of the study including the background of the research problem, the objectives and justification of the study.

Chapter two presents the conceptual framework for this study. It describes the concept of sustainability as applied in developed and developing countries and the academic debates surrounding the application of this key concept. This chapter examines how previous studies have tried to capture stakeholders' perceptions of sustainability in developing countries. Factors hindering the adoption of SDC in developing countries from previous studies are discussed in this chapter.

Chapter three presents the research methodology. A description of how the research was conducted, the methods used, and a brief assessment of the methods used are in this chapter. The criteria for selecting data collection methods, the case study area and the mode of analysis for responses to the research questions is discussed in this chapter.

Chapter four provides the background and context of the study. It introduces Dar es Salaam and its architectural trends over the years (pre-colonial, colonial, and post-colonial). The chapter also gives an overview as to why Dar es Salaam is the best area for studying the application of SDC practices in Tanzania.

Chapter five gives an overview of SDC in the Tanzania construction industry. It paints a general picture of how building design and construction projects should be undertaken and the laws and procedures involved. The chapter discusses the institutional set up for SDC, guiding laws and procedures for selecting stakeholders

involved in the construction projects as provided for by the laws. It concludes by giving an overview of the status of SDC in urban Tanzania by showing the performance of the construction industry to support SDC in Tanzania.

Chapter six presents empirical findings in regard to the understandings of SDC among key stakeholders in the construction industry in urban Tanzania. The chapter commences by mapping and discussing stakeholders with the most influence over the implementation of sustainability in the construction industry before embarking on a discussion of how stakeholders understand the concept of SDC. Stakeholder familiarity and meanings of sustainability are examined. The chapter concludes by reflecting on the mapping of stakeholders and their understandings of sustainability.

Chapter seven presents empirical findings in regard to the factors hindering the adoption of SDC practices in urban Tanzania. In this chapter, empirical findings on the forces behind the current unsustainable architectural trends of urban Tanzania and the challenges of adopting SDC practices are discussed.

Chapter eight concludes the study by reflecting on the uncovered knowledge. It also discusses the study's contribution to the sustainability debate in developing countries. Lastly, the chapter gives the conclusion of the study and makes research and practical recommendations for promoting SDC in urban Tanzania and recommendations for future research.



## **2 CONCEPTUAL FRAMEWORK: ARCHITECTURE AND SUSTAINABILITY DISCOURSE**

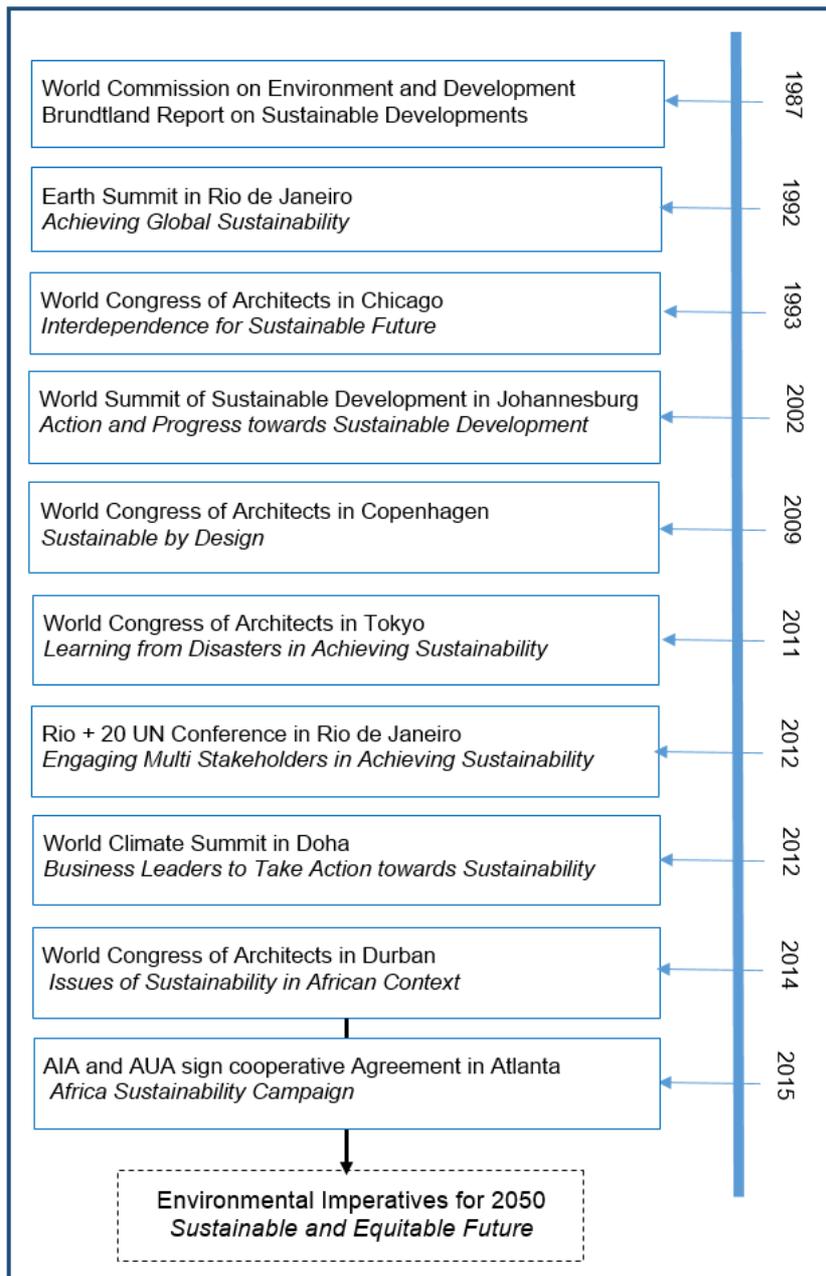
### **2.1 Introduction**

This chapter presents a conceptual framework for this study. It describes the concept of sustainability as applied in developed and developing countries and the academic debates surrounding the application of this key concept. The chapter commences by discussing the international evolution of the concept of sustainability. Meaning, principles and practices of sustainable design and construction (SDC) in the developed and developing countries context are discussed. The chapter also examines how previous studies have tried to capture stakeholders' perceptions of sustainability and the factors hindering the adoption of SDC in developing countries.

### **2.2 The Global Evolution of the Concept of Sustainability in Architecture**

According to Bennetts, Radford, & Williamson (2003) the notion of sustainability in architecture is how architecture responds to concerns about the effects of human activities on the environment, socio-cultural milieu and economy of a place. Meaning buildings should express long-term suitability to the environment, social-cultural and economic context of their geographic location. Figure 2.1 below shows the timeline of different international events that took place to embrace the notion of sustainability in architecture.

**Figure 2.1 Timeline of Events Explaining the Evolution of the Sustainability Concept in Architecture**



Source: Author's construct, 2016

Sustainability became a global concern after the 1987 Brundtland Report for the World Commission on Environment and Development titled: *Our Common Future*. In this report sustainable development is defined as “development that meets the needs of the present, without compromising the ability of the future generation to meet their own needs” (WCED, 1987: 54). Although this definition does not necessarily focus on

architecture and the built environment, it is nonetheless applicable as a basis for understanding sustainability in architecture as well as many other professions. The Brundtland Report's definition of sustainable development is generalized to meeting the needs of today's development, that may include technological advancement in shelter provision and use of energy while keeping in mind the principle that meeting today's development challenges must not compromise the ability of future generations to meet their development challenges. As such, it refers to environmental, *social and economic qualities* and the wellbeing of the people in all generations (Vezzoli & Manzini, 2008). The concept of sustainable development encompasses issues of resource control. This implies that present consumption is threatening the availability of resources for the coming generation and hence Bennetts, Radford, & Williamson, (2003) endorse the concept of sustainable development as improving the quality of life for all generations by considering limitations on the current use of available resources.

The 1992 Earth Summit in Rio de Janeiro again raised the issue of preserving resources for future generations. The Summit, which included environmental and development stakeholders from all over the world, reached a consensus between the developed and developing countries on issues regarding the environment and development (United Nations, 1992). The Rio Declaration on Environment and Development, with 27 principles, was adopted for achieving global sustainability. One of Rio's principles influencing this study is that "human beings are at the centre of concern for sustainable development. They are entitled to healthy and productive lives in harmony with nature" (United Nations, 1992). This principle implies that present and future generations are to be taken care of and are entitled to a healthy environment. All stakeholders involved in the environment and development sectors need to take responsibility for managing the resources available today so that they will also be available for the next generation. The construction industry needs to be in the forefront of the sustainability movement because, according to Sjostrom & Bakens (1999), the built environment is the main consumer of resources, energy and materials globally making it a primary contributor to environmental degradation.

At the September 2002 World Summit on Sustainable Development in Johannesburg new commitments for achieving sustainable development at all levels and from different stakeholders in government and the private sector were made (United Nations, 2002). At this forum, where the theme was to ‘promote action and major progress towards sustainable development’, the UN was given a mandate to promote effective, democratic, international and multilateral institutional and multi-stakeholders participation in achieving progress towards sustainable development (United Nations, 2002).

In architecture, the issue of sustainability started to take a central place at least nine years prior to the 2002 Johannesburg World Summit. In June 1993, the International Union of Architects (UIA) organized a World Congress of Architects in Chicago. The congress recognized sustainability in the context of interdependence, partnership, equity and balance among parties (Majekodunmi & Maxman, 1993). The “Declaration of Interdependence for a Sustainable Future” was signed and the commitment was made by building industry professionals to ensure sustainable design becomes the normal practice.<sup>3</sup> The goal of ensuring that sustainable design becomes a normal practice was furthered in the UIA Copenhagen Declaration in 2009 under the theme “Sustainable by Design” (Cox, 2009) and in the UIA 2011 Tokyo Declaration where commitments were made by architects to learn from disasters and take responsibilities while working towards achieving sustainability.

Engaging multi stakeholders in achieving sustainable practices was underscored in the Rio + 20 United Nations conference held in Rio de Janeiro, Brazil in 2012. Among the resolutions adopted by the general assembly were numbers 42 to 55 in section C:

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<sup>3</sup> See the signed declaration for detailed commitments to sustainable design and construction made in the world congress of Architects in Chicago, published in the International Union of Architects website in January 1993.

*Engaging major groups and stakeholders*, recognizes the important roles each stakeholder can play to implement and achieve sustainable development practices. As such, meaningful involvement, active participation and providing relevant and appropriate information on the three dimensions of sustainability is key (United Nations, 2012: 7). In particular, resolution number 46 stipulates that: “We acknowledge that the implementation of sustainable development will depend on the active engagement of both the public and the private sectors... we support national regulatory and policy frameworks that enable business and industry to advance sustainable development initiatives, taking into account the importance of corporate social responsibilities. We call upon the private sector to engage in responsible business practices...” (United Nations, 2012: 8). This statement calls for all stakeholders including developers, architects and engineers, to take responsibility to promote sustainable practices, where national policies and sectorial regulations need to be in place for stakeholders to be actively engaged.

The UIA World Congress in Durban in August 2014, under the theme: “Other where: looking elsewhere for other ways of creating a better future, to find ways to re-discover a lost respect and responsibilities for the environment, commitment to our communities and healthy social interaction” (UIA, 2014) emphasised sustainable practices in the African context. With the Congress being held in Durban, the issue of sustainability in the construction industry was considered within an African context with African concerns in mind while exploring concepts of sustainability (UIA, 2014). As pointed out by du Plessis (2001), to understand and implement SDC in Africa, it is necessary to understand the development priorities and cultural context within which buildings exist and construction takes place. Along the same line, the signed declaration of the UIA World Congress 2014 in Durban “suggested that solutions, new approaches and sustainable practices could be learnt from the African continent together with alternatives forms of engagements and decision making strategies” (Osman, Judin, Makeka, & Morojele, 2014).

Furthermore, UN-Habitat in recognizing the critical role of architects in achieving sustainable development, supported and endorsed the UIA World Congress, Durban 2014 Declaration to “Environmental Imperatives for 2050”. This declaration by the UIA made a commitment to a “sustainable and equitable future” (UIA, 2014) by recognizing that action needs to be taken to reduce the risks and effects of climate change for the benefits of future generations. Therefore, the goal of reducing carbon emissions to zero by 2050 was set. In 2015, the American Institute of Architects (AIA) and the African Institute of Architects (AUA) signed the cooperative agreement to share knowledge, tools and resources to advance the “Africa Sustainable Campaign” initiated in the US and by the Africa Leaders’ Summit in 2014. According to the AUA President, “the agreement will help develop the use of Africa’s local materials and encourage sustainable research to advance recycling and energy conservation (Omisore, 2015 found in Schneidawind, 2015).

### **2.3 Contested Notions of Sustainable Design and Construction (SDC)**

Bennetts, Radford, & Williamson (2003: 6) noted the imprecision in the concept of SDC that includes high-tech office buildings in Western countries and a mud or thatch house common in traditional architecture in Africa, or any biodegradable building material used in passive system buildings in developing countries. All were labeled sustainable buildings in their context. Reffat (2004: 2) stated two notions of sustainable design exist because of the timing, “while developed countries have made some progress in addressing the essential requirements of sustainable construction, developing countries are only now beginning to consider how to address the requirements from within the broader developmental challenges they are facing”. To recognize this dilemma, Adebayo (2001) suggested that the adoption of the sustainable concept from the West requires questioning and understanding to ensure it reflects the specific requirements of African societies and incorporates African values. Similarly, du Plessis (2001) suggested that the contested notions of sustainability in developed and developing contexts needs to be reconciled and unified by taking the

best of each to create a new face of sustainability appropriate for Africa. This implies that in the implementation of SDC appropriate to African cities, it is appropriate to learn from the concepts of sustainable design from Western countries while considering the unique physical context, socio-cultural setting, economy, technological advancement and development challenges of African cities.

In regard to high tech SDC practices dominating the low tech SDC in African countries, Ozolins (2015: 1) pointed out the problem of trying to have a “one size fits all approach to SDC”. He argued that the problem is caused by the available literature on green/ sustainable buildings being typically based on the experience and context of more economically developed countries, unlike African architecture which lacks scientific documentation based on western standards. According to Ozolins (2015), the dominance of literature from a developed country perception paints a picture that green building is similar all over the world, hence strategies of sustainable design unique to the developing country context are overlooked. He further urges that SDC in developing countries needs to be built on the present, traditional, and colonial architectures which are “always, and still are sustainable” (Ozolins, 2015: 31). UN-Habitat (2014) observed the inappropriateness of high tech solutions in African cities noting that “high tech solutions do not automatically qualify as the best and most appropriate. Low tech SDC systems that are cheap compared to high tech systems and easy to maintain often connect better with local conditions and advantages”. This is in line with Ozolins (2015) observation that implementing technological driven design solutions that rely on a continuous and stable supply of electricity in a developing country context, ends up being counterproductive. Hence a fusion of traditional building materials and technology (low tech) available in an African context combined with appropriate modern technology is key to achieve green (sustainable) buildings in Africa (Iwuagwu & Elijah, 2015). Whether low tech or high tech SDC, it needs to be defined, strategized and the benefits to the environment, social and economic settings need to be clearly identified.

Spinoli (2010) argued that smart buildings play a major role in achieving sustainability. Smart buildings, also referred to as 'intelligent buildings' or 'digital buildings' (Albino, Berardi, & Dangelico, 2015 and Watson, 2011) and are characterized by the installation and use of advanced and integrated automation systems such as air conditioning control, lighting control, power control and metering (Siponoli, 2010: 3). Siponoli (2010: 5) pointed out that since the driving forces for smart buildings are economics, energy, and technology, building automation systems in smart buildings "play a major role in determining the operational energy efficiency resulting to savings and efficiencies." Energy efficiency is achieved automatically by shutting off unused equipment and turning off plug-load devices by using sensing devices (Weng & Agarwal, 2012). Based on the merits for smart buildings pointed out by Siponoli (2005), it can also be argued that mud and thatch houses are smart buildings in their context, because they possess the merits of achieving sustainability without investing heavily in technology. It all matters on how one analyses the built environment in question.

Gann & Drewer (1994: 20) refer to the design and construction of smart buildings that require the integration of complex new technologies into the fabric of the building. They argue that smart buildings are technologically driven and those technologies are subjected to major innovations and developments. Meaning that technological advancement, especially in ICT, is the major force behind smart buildings and that is why there is a need to apply advanced technology in buildings. However, this technology is facing continuous upgrades and innovations, thus costly in coping with changes. This raises the point of being dependent on continuous updates of new versions of the technology originally utilized in the building. Gann & Drewer (1994) further warned about the danger of having the construction sector being driven by the technology supply sector into using technologies that is subjected to continuous upgrade and innovation costs. Along the same line of catching up with the new innovative technology, which also entails the cost that goes with it, Yang (2012:5) pointed out the issue of affordability. He argued that although "many innovative (smart) technologies promise (positive) environmental outcomes (in the long run) but

in their present form they often come with a major financial burden initially”. As such installing, use and maintaining these technologies have a major impact on the cost of the building (Weng & Agarwal, 2012). Moreover, Bruckner, et.al. (2014) challenges that the fast rate of innovation in information technology is inherently linked to the notion of sustainability. They argued that sustainability has to do with longevity of the smart technology. In particular, “smart technology and equipment are expected to work for decades in buildings (to achieve sustainability) which is still a challenge for information technology and their fast innovation rate” (Bruckner, et. al. 2014: 676).

Houghton (2010) added that smart (ICT) equipment has a negative impact on energy consumption and on the environment from materials that are used in the production of the smart (ICT) equipment. He further argued that “impact of ICT (smart) on the environment should take account of the entire life cycle, rather than direct impact of the products” (Houghton, 2010: 238). Wong & Wang (2005) noted the insufficiency of the performance evaluation model of intelligent (smart) buildings in achieving the sustainability goal, especially in the economic and financial aspect. They pointed out that the evaluation models often failed to provide a comprehensive picture in terms of return on investment. As such the information to allow investment decisions in terms of economics and profitability of intelligent (smart) buildings is lacking (Wong & Wang, 2005: 143).

In the context of developing countries, the approach of smart buildings, smart homes and smart cities has been received with skepticism by some researchers. Watson (2015) relates the term “smart” to “fantasy”. She clearly pointed out that the smart cities (high tech) concept is not a good fit for Africa where poverty, corruption, weak governance, and a low level of infrastructure development is still a big challenge. Giving examples of Konza ICT City in Nairobi and Hope City in Ghana Watson maintained that in countries with a predominantly poor population (based on Western criteria, “one dollar a day” for instance) achieving prerequisites for smart cities including “infrastructural and human capital is a major challenge” (Watson, 2015: 37).

Furthermore, she warned about the low level of understanding of what it takes for a city to be smart in the African context and that the motivation for fantasy (smart) cities in Africa are political status, commercial profit, international property developers and a finance sector in search for new markets. In the end, human and social dimensions of smartness in relation to the African context, including poverty and the fact that a large population lives in unplanned settlements with minimum services is being ignored (Watson, 2015: 37 & Watson, 2014: 216). This raises a question of what is smart in African context.

Cain (2014) raised a point on the economic/financial sustainability of these fantasy (smart) projects in Africa. Giving the example of the Kilamba Centralidade project in Luanda Angola, where the state had to intervene by allocating subsidies to make the project affordable, he warned about the need to question and research more on the financial sustainability of these smart projects. This is in line with Watson's (2014) argument that Africa is at the receiving end of smart technology and a gateway for international investors. This leads to an over-supply of high-end smart buildings which are too expensive even for a middle class Africans. This confirms the Habitat 2014 report on the state of African cities, which stated that imported urban development models from advanced economic nations conceived under conditions different from African realities have limited use, are incapable of attaining development visions, and add to the social, economic and political pressure in African countries. As such finding solutions that fit local, contextual needs and embracing integration between design, planning, infrastructure and technology choice is essential (UN-HABITAT, 2014).

#### **2.4 Sustainability in Architecture: The Pre - Rio Discussions and Practices**

Bennetts, Radford, & Williamson (2003: 14) defined SDC as “a creative adaptation to ecological, socio-cultural and built context supported by credible cohesion arguments.” Although not directly, this definition captures the three dimensions of

the sustainable development; environment, society and economics, which are also known as the 'triple bottom line' of sustainability (WCED, 1987) and are considered to be a foundation of the approach of sustainable architecture. Hence it is argued that SDC is the contribution of construction industry to sustainable development (Dickie & Howard, 2000).

There are two schools of thought about the beginning of SDC practices in architecture. One believes that SDC has its historical roots in the indigenous architecture of the world. Van der Ryn & Cowan (1996: 25) argued that "ecological design by necessity has been brought to a high level of excellence by many different cultures faced with widely varying conditions." They referred to the Australian Aborigines, where rules of designs persisted for millennia based on their skills in preserving the ecological map of their land. Furthermore, Hill & Bowen (1997) argued that the concept of SDC was understood by earlier human civilizations. For example, the South African San people (Bushmen) had a practical understanding of the fact that humans are dependent on the earth's life support systems of survival and they were keen in the utilization of resources provided by nature in a sustainable manner. In terms of resources and skills use, the Brundtland Report (1987) acknowledged that traditional cultures have practiced sustainable resource use for millennia (WECD, 1987). This school of thought implies that living in harmony with nature is a way to achieve sustainability through only taking small amounts of resources that do not upset the natural balance and this has been a practice from a very early stage of human civilization.

The other school of thought believes that the concept of sustainable design started in the early 1970's as a response to the oil and energy crisis, an increased number of world environmental catastrophes and the effect of economic damage caused by environmental disasters (Bauer, Mosle, & Schwarz, 2010). With the heavy dependence on energy imports, Bauer, Mosle, & Schwarz (2010: 10) argue that energy crisis

triggered building developers and users to think of energy efficiency, and sustainable building concepts with low energy and operating costs.

According to Bailey (2002) the recognition that human civilization is an integral part of the natural world has come to the forefront in the 1970's. This is when it was recognized that nature must be preserved and perpetuated if the human community is to sustain itself indefinitely. Bailey (2002: 1) argued that "future technology must function with the way nature works". Furthermore, Guy & Moore (2005: 4) pointed out that sustainable design was stimulated by a growing scarcity of resources, the debate about climate change and the threats of sick building syndrome.<sup>4</sup> They argued that "this is when more and more architects have taken the mantle of promoting ecological concerns" by focusing on reducing energy use in buildings through insulation, low energy lighting and natural ventilation.

There had been many indications that historically people were concerned with the environment and the social consequences of the way we design our buildings and utilize the available resources. Walker (2006: 20), in *Sustainable by Design: Exploration in Theory and Practice*, and Langston & Ding (2001: 15), in *Sustainable Practices in the Built Environments* and McLennan (2004: 10) consider that the publication of *Silent Spring* in 1962 by Rachel Carson created a growing concern about the actions of human beings and the threat we posed to the future. They argue that Carson's publication drew attention to the interconnections between the

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<sup>4</sup> The term 'Sick Building Syndrome' (SBS), also known as 'Tight Building Syndrome', is used to describe the situation in which building occupants express their dissatisfaction with the quality of the overall indoor environment in a building. It is defined as "the occurrence of an excessive number of subjective complaints of headache, irritation of eyes, nose and throat, chest tightness and inability to concentrate by the occupants of the building. Factors that can contribute to the SBS includes inadequate air supply and ventilation distribution and presence of contamination in the air conditioning system or in carpets." (Stolwijk, 1991).

environment, economy and social wellbeing, and her work is referred to by many as the start of sustainable movement.

Long before the energy crisis in the 1970s, sustainable concerns in architecture could be traced back to the work and design philosophy of Frank Lloyd Wright (1867 – 1959), an architect and a scholar. His work became influential in the world of architecture and in 1949 his work was recognized with AIA Gold Medal, the highest honor of the American Institute of Architects (Rattenbury, 2000: 17). Wright deeply believed that “the closer man is associated with nature, the greater his personal, spiritual and even physical wellbeing will grow and expand as a direct result of that association” (Pfeiffer, Gossel, & Leuthauser, 1991). Frank Lloyd Wright is known as the father of ‘organic architecture’ because of his attitude towards nature and his respect for the environment in his design works. He defined a building to be organic if it was “appropriate to time, appropriate to place and appropriate to the man”. His guiding forces were respect for nature, human values, ethical values and spirituality. Among all the forces the goal was to create buildings that were harmonious with and even enhancing the environment (Pfeiffer, Gossel, & Leuthauser, 1991). This is what we are defining today with the term sustainable design and construction.

Organic architecture implies that building design should be appropriate to the climate, local context, social-cultural context and economic context in order to promote the health of the surrounding environment and the wellbeing of people living in it. Whereas today we call it ecological design, green design, sustainable design or environmental design but all the terms used today mean the same thing; respect for the environment, people and culture, as was promoted by Frank Lloyd Wright. “Architecture should be connected with nature, with humanity and with ethical values and spirituality” (Rattenbury, 2000).

To conclude this section, it is worthwhile to recall McLennan (2004: 11-26) who asserted that sustainable design has many beginnings. The underpinning of

sustainable design can be traced to the distinctive stages in human civilization. In recognizing the many beginnings of sustainable design, McLennan has elaborated four distinct evolutionary stages that are characterized by the desire to seek comfort and the unique building structures of that stage that alter the environment. Biological beginnings of sustainable design can be traced from termite mounds, beavers and honey bees - all known as 'habitat builders'. Indigenous beginnings refer to the different structures developed in different ancient cultures, using locally available materials and technology to provide solutions for comfort. The industrial beginnings of sustainable design grow out of the industrial revolution where technology in cooling, heating, and lighting allowed buildings to achieve comfort. Buildings were designed to celebrate technological advancement, but this is when people started to take notice of the environmental degradation caused by industrialization and hence started taking conscious action to reverse this process. Health of the people, modern activities and the environment became a core concern in the designs.

The modern beginning of sustainable design is believed to have emerged in the second half of the twentieth century, after they realization that they must change their ways. McLennan (2004: 27) argues that "sustainable design is a subset of the modern environmental movement and it is the building industry's reaction to the realization that how it does business is a large contributor to the environmental problems we face today." As pointed out by Bauer, Mosle, & Schwarz (2010) a crucial point in the environmental movement and sustainable design movement was reached in the era of the 1970s energy crisis and further fueled by environmental catastrophes. In other words, the sustainable design movement was forged by disasters rather than intellectual discourse based on research.

Following the Brundtland Report's encouragement of a global understanding of sustainable development, consecutive international forums on sustainable design, and the establishment of green rating tools in many developed countries, as discussed in section 2.2 and in section 1.1, sustainable design entered the mainstream of

architecture. The definitions and guiding principles were established by many scholars in their desire to achieve SDC. They are discussed in the following section.

## **2.5 Definition, Principles and Practices of SDC**

### **2.5.1 Definition of SDC**

SDC is understood by different names such as ‘green design and construction’, ‘ecological design and construction’ and ‘environmental friendly design and construction’. All these terms carry similar meanings (McLennan, 2004; Bennetts, Radford, & Williamson, 2003). In this study the terms SDC and green design and construction will be used interchangeably because both are widely used in the construction industry and carry more or less the same meaning as used in architecture.

SDC is guided by the notion of sustainability. It has the connotation of a better fit for the planet, the local climate, the site and the specific place we build, live and work in. It is about designing communities that increase natural and human capacities (Williams, 2007). Jason McLennan (2004: 4) defined sustainable design as a “design philosophy that seeks to maximize the quality of the built environment while minimizing or eliminating the negative impacts to the natural environment.” This definition highlights the key component of SDC, which is the goal of maximizing quality and minimizing negative impact. He perceived SDC as the “philosophical basis of the growing movement of individuals and organizations that literally seek to re-define how buildings are designed, built and operated to be more responsible to the environment and responsive to people” (McLennan, 2004: 4).

Similarly, Van der Ryn & Cowan (1996: x) emphasized the principle of minimizing environmental impact. This can be seen in their definition of ecological design as “any form of design that minimizes environmental destructive impacts by integrating itself

with living processes”. The key component of this definition, beside the design goal of minimizing the negative impact to the environment, is the integration with living processes. This definition emphasizes that one of the ways to achieve integration with living processes is the need to understand the context we are designing for, in terms of environment, socio-cultural aspects, and the economy of a particular place.

Furthermore, Bennetts, Radford, & Williamson (2003: ix) think of sustainable architecture as a “revised conceptualization of architecture in response to a myriad of contemporary concerns about the effects of human activity” that adequately protects the environment from pollution and degradation caused by human activities. For Bennetts, Radford, & Williamson (2003) ‘good’ designs are differentiated from designs that do not address the negative impact of human activities on the environment. The major component of this definition is that it identifies the cause of environmental degradation as being human activities. Human activities are influenced by the designs we make and according to WCED (1987) humanity has the ability to make (or not to make) development sustainable. This depends on human activities with their designs and construction activities.

This study adopts and adds to McLennan’s definition of sustainable design (mentioned above) as a design philosophy and *construction techniques*<sup>5</sup> that seek to maximize the quality of the built environment while minimizing or eliminating the negative impacts to the natural environment, *economy and social well-being*. The strength of this definition is that it highlights a key aspect of the sustainable design philosophy, namely that this is an approach to design and not a design style (McLennan, 2004, Van der Ryn & Cowan, 1996). A design style can with time eventually be phased out or overtaken by another style. In contrast a design philosophy cannot go out of fashion and can be applicable in any type of building;

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<sup>5</sup> Words in italic are added to McLennan’s definition by the researcher to suit this study.

hence adding to McLennan's definition offers a more concrete meaning of SDC when compared to the definitions given by other scholars.

### 2.5.2 Principles and Practices of SDC

There are various attempts by scholars, who understand and accept sustainability of the construction industry, to outline the principles of sustainable design. McLennan (2004) argues that sustainable principles are not invented but discovered by individuals or groups and further suggests that the true principles exist in some form in nature already (McLennan, 2004).

Vale & Vale (1991)<sup>6</sup> proposed six main principles for SDC which are centered on, energy conservation, work with climate, minimal use of resources, respect for users, respect for the site and holistic thinking. Sim Van der Ryn (1996)<sup>7</sup> largely echoed Brenda and Robert Vale's principles. In addition, they discovered that for SDC to be achieved one needs to evaluate the *environmental* impact of the proposed or existing buildings and to honour the special knowledge each player has, by considering that *everyone is a designer*. Furthermore, in 2004, Jason F. McLennan<sup>8</sup> published six major principles of sustainable design that were similar with those of Vale & Vale (1991) and Van der Ryn & Cowan (1996). In describing the principles he also used the word "respect" to convey an overall attitude or reverence and responsibility for the principles described (McLennan, 2004). McLennan used the term 'Respect for the process' – 'Holistic thinking' to explain another principle of sustainable design. This principle emphasizes change in the way designs are done, in the way people think about design and construction, in the way industry stakeholders interact with each

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<sup>6</sup> Winners of the UN Global 500 Award for Environmental Achievements, proposed six principles of SDC in their book *Green Architecture: Design for a Sustainable Future*.

<sup>7</sup> Emeritus professor of Architecture and founder of the Ecological Design Institute in California, highlighted five main principles of sustainable design in a book *Ecological Design*, co-authored with Stuart Cowan (1996: 54).

<sup>8</sup> In his book *Philosophy of Sustainable Design*

other and in the process of design and construction (McLennan, 2004: 85). He further argued that in achieving change, one has to make a “commitment to collaboration and interdisciplinary communication, commitment to lifelong learning, commitment to challenging rules of thumb, commitment to allowing for time to make good decisions and to rewarding innovation” (McLennan, 2004: 88-94).

Other scholars including Williams (2007) and Yeang (1999) have described their principles of sustainable design. It is noted that the principles of sustainable design identified by scholars are related closely to each other with a major focus on environmental sustainability. Economic and social sustainability of building designs and construction are not given the same weight as environmental sustainability. According to Williams (2007) sustainable design should create solutions to solve economic, social and environmental challenges. Pitt, Tucker, Riley, & Longden (2009) argue that true sustainability needs to achieve the right balance between environmental responsibilities, social awareness and economic profitability.

Yet another way of looking at the principles of SDC is through the Green Buildings Rating Tools like LEED, BREAM, Green STAR and DGNB. Although these rating tools were established to assess and certify a building’s level of sustainability once the building has been completed, they are often used as guiding principles in the design process. It is clear that most green building rating tools were developed to guide SDC but show little concern for the social-cultural and economic side of sustainability in designs (Except DGNB established in 2007 in Germany considered the aspects of economic sustainability in addition to environmental aspects). This can be seen, for example, in the US Green Building Rating system (2015)<sup>9</sup>, where the seven rating criteria used focuses on “*sustainable site, water efficiency, energy and atmosphere,*

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<sup>9</sup> See US Green Building Rating system (LEED V4 for Buildings Design and Construction, published in July 2015)

*indoor environment quality, materials and resources, regional priority, innovation in design, (USGBC, 2015)*

Ozolins (2010) pointed out that to more comprehensively address sustainability in the construction industry, green ratings need to pay more attention to the larger economic, social and environmental context rather than treat sustainability as only environmental and technical issues. Gibberd (2003) also highlighted the missing social and economic links between green rating tools and the reality of sustainability. He further argues that the tools only emphasize technology and how using different and better technology will result in a reduced environmental impact. However, sustainability is more than just technological fixes to reduce environmental impacts.

Drawing from the above scholars, it can be concluded that principles of sustainable design and the green rating tools “lags behind international development within the area of sustainable development which now has an increasing emphasis on the broader and more holistic concepts of sustainability” (Gibberd, 2003: 108). The principles of SDC should be based on the concept of sustainable development, as pointed out by Ebonoh & Rwelamila (2001: 2): “the concept of sustainable construction now transcends environmental sustainability, embracing economic and social sustainability, which emphasizes possible value added to the quality of life of individuals and communities.”

The observation by Ozolins (2010) and Gibberd (2003) is complemented by Sassi’s (2006: 8) argument that divided SDC principles in two major groups. First, sustainable buildings should “metaphorically tread lightly on the earth by minimizing the environmental impact associated with their construction, their life in use, and at the end of their life, sustainable buildings should have small ecological footprints.” Second, “sustainable building should make a positive and appropriate contribution to the social-economic environment they inhabit, by addressing peoples’ practical needs while enhancing their surrounding environment and their psychological and physical

wellbeing.” Nevertheless, principles of SDC discussed were established in developed country contexts to accommodate pressing issues in developed countries.

## **2.6 Current Debate of SDC in Developing Countries**

In the context of developing countries (particularly in Africa), SDC has not been clearly defined and developed in the form of green ratings tools (Gibberd, 2003). In the absence of a clearly defined and developed path to achieve SDC, Ozolins (2010) concluded that green building rating tools from developed countries are often adopted and used in developing countries. However, its appropriateness is questionable following the contextual differences, development priorities, and technological advancement gaps compared to the context where the tool was developed (Ozolins, 2010).

Although there are common issues to be addressed by SDC in both developed and developing countries, du Plessis (2001) pointed out that it is necessary to understand the developmental priorities as well as the cultural context within which design and construction will take place. Understanding different approaches with respect to priorities and cultural contextual differences and available resources to a specific place is the key to achieving sustainability in the developing countries.

Developing countries, particularly in Africa, are characterized by poverty, resource scarcity, rapid urbanization, and infrastructure deficits, poor access to technology, water scarcity and electricity rationing. It is estimated that the population of Africa will reach 2 billion people by 2040, where the level of urbanization is projected to rise from 40% in 2010 to 50% in 2035 and 58% in 2050 (UN-HABITAT, 2014). In regard to the level of poverty and access to basic requirements like water and electricity, UN-HABITAT (2014) revealed that about 50% of population in Africa live with the income of USD 1.25 a day or less, which according to the World Bank poverty is extreme poverty, which is typical of the world’s poorest countries (World Bank, 2015). It is

estimated that more than 60% of African population do not have access to safe sanitation (UN-HABITAT, 2009) while approximately of 600 million people (about 60% of the population) in Africa lack access to electricity (USAID, 2014). This is where the very basic needs of human beings, like decent shelter and enough food, are yet to be met.

Looking at the construction industry in developing countries, it is very fragmented and underdeveloped with inadequate capacity for the planning and design (Shafii, Ali, & Othman, 2006). SDC, as a part of sustainable development, needs to consider the challenges of many African countries while avoiding negative impacts on the environment, society and economy. Ofori (2007: 5) argues that researchers in construction have a duty to contribute to the efforts to lift billions of people who live in developing countries out of poverty and to address other challenges facing these countries through research until a clear understanding among stakeholders is achieved. Architectural design and construction trends so far are yet to incorporate these recommendations because of what Ofori (2007) and du Plessis (2001) have noted as inadequate knowledge and a lack of clear guiding principles and awareness of SDC among stakeholders in developing countries.

Buildings and the built environment in Africa must be designed, built, maintained and adapted in ways which meet the many and challenging needs and priorities of African communities. The biggest challenge for the construction industry in developing countries, according to du Plessis (2007: 71), “lies in finding a holistic approach to make sure that its contribution to the physical, economic and human development meets the requirements of sustainable development” despite the underdevelopment of developing countries. However, Reffat (2004) argues that current levels of underdevelopment particularly Africa, can provide an opportunity for development eliminating the need to follow the same route as in developed countries. This will not only help avoid problems currently faced by developed countries, like tremendous energy and resource use by buildings and CO<sub>2</sub> emissions, but also it gives room for

devising appropriate ways to create harmony between the built environment and the culture, economy and natural environment to meet the developmental challenges in Africa.

South Africa's construction industry has been in the forefront of promoting sustainable building design and construction principles in Africa. The Council for Scientific and Industrial Research (CSIR) developed the Sustainable Building Assessment Tool (SBAT) with the aim of integrating sustainable development into building designs and construction processes and to develop awareness and support for sustainability among stakeholders (Gibberd, 2003). In an effort to promote sustainable development, SBAT embraces the three pillars of sustainability; environmental, social and economic sustainability in assessing and measuring the level of a building's sustainability. According to Gibberd (2008), SBAT has 15 assessment criteria divided into three major groups. 1. Environmental sustainability is assessed based on; water conservation, energy efficiency, reduction of waste, respect for the site and building materials selection. 2. Economic sustainability is assessed based on the consideration of the local economy, efficiency of use of the building spaces, adaptability and flexibility of the building design, and the ongoing costs and capital costs of the building. 3. Social sustainability is assessed based on the: occupants comfort, inclusive environments, access to facilities, participation and control by building users and the aspect of education, health and safety of local contractors (Gibberd, 2008). These assessment criteria were developed through the "process of describing and understanding buildings in terms of their relationship to social, economic and environmental systems" with the aim of assessing both the performance of a building in terms of sustainability and the building's contribution to support and develop more sustainable systems around it (Gibberd, 2008: 3; Gibberd, 2001: 3).

However, these tools has been met with skepticism in South Africa where many stakeholders are not willing to invest in SBAT projects because they do not see local

economic and social impacts as part of their responsibility (Gibberd, 2005 cited in Gibberd, 2008: 5).

Interestingly, apart from working with SBAT's three pillars of sustainability, in 2007 the Green Building Council South Africa (GBCSA) established the Green Star South Africa rating system with the aim of insuring that buildings are designed, built and operated in an environmentally sustainable way (GBCSA, 2015). The Green Star South Africa is a replica of the Green Star Australia. It was adopted for use in South Africa while embracing all the credits from the Australian version with minimum additions to address the South African context. As yet it is used as an official registration and assessment tool for green buildings in South Africa. The assessment credits are based on the; project management, indoor environmental quality, energy efficiency, alternative and efficient transport with minimum CO<sub>2</sub> emission, water efficiency, reduction of material resources, land use and ecology, reduction of overall emissions, and innovation strategies and technology, which allow for environmental initiatives beyond the Green Star SA benchmarks (GBCSA, 2015).

Like most ratings systems in developed countries, Green Star SA is used to assess buildings after they are constructed and occupied. The influence of this tool to achieve sustainability starting from the design is overlooked and according to Eden, Birgersson, Dyrseen, & Simes (2003) and Gibberd (2003), this should be dealt with from the design briefing and initial stages of the design and at the level of managing the built environment. It is obvious that Green Star SA, much like Green Star Australia, focuses more on the environmental sustainability of the building industry with absolutely no consideration of social-cultural and economic sustainability. According to Langston & Ding (2001), from an economic point of view, it is crucial to balance all different facets of environmental quality and economic incentives in ways that lead to environmental improvements. Langston and Ding propose the use of environmental economics; a study of environmental problems from the perspective and analytical ideas of economics. According to Langston and Ding, environmental

economics is developed to incorporate environmental concerns into the traditional frameworks of an economic system. It plays an important role in identifying possible options for efficient natural resource use and environmental management with the aim of reducing the impact of human activities on the environment and shifting the development process in a more sustainable direction (Langston & Ding, 2001: 65).

Furthermore, a conference on 'Promoting Green Building Rating Systems in Africa' organized by the United Nations Human Settlements Programme (UN-HABITAT) in 2010 in Nairobi Kenya, led to the signing of the Nairobi Declaration on Green Buildings for Africa. The conference consisted of a number of stakeholders from building industry professionals, national and local government officials from 19 countries in Africa, including Tanzania. The goal was to encourage the adoption of green building practices in Africa by promoting the use of green building rating systems. The strength of a signed resolution in Nairobi is that it acknowledges "the importance of taking into account social and cultural specificities of Africa in particular". It also put more emphasis on the importance of "sourcing building materials and appropriate technology that are locally available; designing buildings taking into account climatic conditions of the continent and by so doing making use of naturally available energies that can be harnessed profitably; recognizing the role of urban design and planning in sustainable urban development; and using renewable energy and or use of green buildings rating systems" (UN-HABITAT, 2010: 5). The Declaration for Green Buildings in Africa aim beyond environmental sustainability as it is with Green Star SA, LEED, BREAM and Green Star Australia. This is in line with Cole's (1999) call for the second generation rating tools to accept the new agenda, which focus on broader sustainability aspects.

## **2.7 Requirements for SDC in Developing Countries**

A number of studies focusing on the construction industry in developing countries (Ozolins, 2010; Sev, 2009; Ali & Al Nsairat, 2009; du Plessis, 2005 and 2007; Reffart,

2004; and Gibberd, 2003) have paved the way showing different approaches as to how sustainability can be instilled in the practice of design and construction in Africa and are worth taking into account. A study by Gibberd (2003) aimed at supporting improvements in methodologies designed to integrate sustainable development into briefing and designing buildings in developing countries. After conducting a major review of different sustainable building assessment tools and indicators developed to measure the progress of sustainable development, he effectively proposed specifications for an assessment tool that integrates sustainable development into the briefing and design of buildings in developing countries. Gibberd (2003: 152) felt that a key goal for an assessment tool should be; "... that there is adequate understanding about sustainable development and buildings amongst stakeholders to enable informed discussions and development and agreements of sustainable development performance targets for the building". This observation is crucial for this study as it calls attention to reasons as to why sustainability is not implemented and how stakeholders in the construction industry understand the concept of sustainability as it relates to the construction industry. This information is a precursor to devising ways to integrate the sustainability concept in design and construction.

Reffat (2004: 2-4) proposed six essential requirements for sustainable construction in developing countries.

1. Find ways to capitalize on the benefits of sustainability to increase profitability.
2. Efficiently manage resources to deal with the scarcity of resources in developing countries.
3. Share responsibilities between the government, the construction industry, citizens, politicians, manufacturers, local authorities and the built environment professionals. This is key to achieving decisions to secure change towards sustainability.
4. Reduce resource wastage in design and construction while improving the quality of construction processes and products.

5. Improve the capacity of the construction sector by increasing the number and the skill levels of human resources.
6. Research building technology, design and planning needs in a holistic manner with a stress on the coordination and cross-sector work between agencies.

He further recommended that for the above key elements of sustainable construction to be implemented, guidelines for SDC should be formulated. He also suggested the need for liaising with other sectors and advising the government on appropriate policy and legislation. Raising awareness among government officials and politicians is also key. He argued that, if the “politicians are in full understanding and support of the concept of sustainability, they will be a very powerful force for advocacy and raising awareness among the public” (Reffat, 2004: 7). This is in line with Cole’s (2011: 432) observation that “solutions and actions (towards the implementation of sustainable construction) emanating from the (construction) industry can make it easier for political leaders to have confidence to commit to negotiations because they can envision the potential for delivering outcome.”

Creating the requirements for SDC for developing countries and devising ways of integrating them in the design and construction stage will be successful if the mainstreaming of sustainability among stakeholders is undertaken. The report by du Plessis (2005) sketched two important ways for mainstreaming sustainable building design and construction in Africa. The first was the establishment of “a foundation of knowledge for sustainable building design and construction” and the second was “the establishment of a champion agency that would drive the process.” She further elaborated that the establishment of a foundation of knowledge can be achieved by a circular process of gathering and creating knowledge to be shared amongst peers and transferred through education. Actors in the construction industry need access to this knowledge so they can apply it to project design and construction. Implemented projects should be monitored and evaluated to inform new designs. Research and collaborations, education and training programs, outreach and awareness raising

programs are key elements in the establishment of this foundation of knowledge (du Plessis, 2005: 411 - 413).

A recent study by Ozolins (2010: 156) reveals that sustainable building in Tanzania should contain building elements that different building users would recognize as forming part of their world and history and be reflective of their worldviews. He further highlighted specific issues that need to be addressed for SDC to be achieved in an African context, particularly Tanzania as:

1. building design, specifications and construction techniques should contribute to the alleviation of poverty,
2. building designs must consider different approaches to waste control and recycling of resources and durability of building materials and construction, maintainability of sustainable buildings should be within local materials and labour resources,
3. use of passive systems for cooling and ventilating interior spaces,
4. provide means to ensure physical security,
5. limiting or forbidding the use of endangered materials.

Sustainable buildings in Tanzania must respond to the critical issue of sustainable development in a context which includes “environmental degradation through deforestation, overpopulation in urban areas, limited capacity of human and financial resources for maintenance, inadequate and unaffordable water and sanitation, unaffordable non-renewable energy sources for electricity, and endemic poverty and the lack of employment opportunities” (Ozolins, 2010: 162). It is clear that a meaningful strategy for SDC in an African context can be formulated and achieved despite the challenges facing the continent. According to du Plessis (2007: 75), the achievement can come from dialogue between the different levels of government, the broader construction industry stakeholders, universities, research centers and civil society associations at the national and regional levels.

## 2.8 Challenges of Adopting SDC Practices in Developing Countries.

A study on challenges of SDC in Kuwait conducted by Alsanad, Gate, & Edwards (2011) investigated the level of awareness and behavior towards adopting the concept of sustainability among building developers and other stakeholders in the construction industry.<sup>10</sup> Findings of the study revealed that in a country where the building industry is ranked second (after the oil sector) as an investment priority (Alsanad, Gate, & Edwards, 2011: 2199), the very low level<sup>11</sup> of implementation of SDC practices is due to a majority of stakeholders (54.10% of the respondents) having a moderate level<sup>12</sup> of knowledge and understanding of SDC concepts. Level of knowledge was also captured from stakeholders' views that green (sustainable) buildings require more initial costs compared to conventional buildings. The study findings suggest that economic incentives, rules, codes or standards and legislation should be imposed by the government as one way to achieve a higher level of implementation of sustainable principles in the construction industry and hence create a standard practice. Furthermore, the study also revealed that developers, architects, consultants, and contractors are influenced by the demands of clients and the existing market situation. As such, more effort towards creating awareness and knowledge of the benefits of SDC among investors, be it private or government, is crucial.

Abidin (2009 and 2010) investigated the awareness of the developers regarding the issue of sustainable construction and whether developers have applied the concepts in their current practices in Malaysia. Findings from survey questionnaires and documents revealed that despite the growing concern of environmental protection worldwide, and despite the Malaysian Construction Industry Development Board

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<sup>10</sup> Their study used 122 survey questionnaires on a selected sample of stakeholders (engineers, contractors, consultants, clients and developers) in both the private and government sector.

<sup>11</sup> Very low level is not clearly defined in the paper. Hence it is subjective.

<sup>12</sup> Measure for moderate level of knowledge and understanding of sustainable design concepts is based on self-assessments of the questionnaire respondents.

identifying the environment and other sustainability related issues as top priorities (Abidin 2009: 809), Malaysia developers have between a low and moderate level of knowledge on SDC concepts. The study further revealed that developers' understandings of SDC is exclusively about protecting the environment. Social and economic aspects of sustainability are yet to be understood by the building developers in Malaysia.

Consequently, the study revealed that although a majority of developers agree that sustainability concepts should be implemented starting at the early stages of design, the current level of implementation in Malaysia is low.<sup>13</sup> According to Abidin (2009: 812; 2010: 425), it is caused by a number of reasons including; the lack of enforcement, lack of government intervention through policies and incentives, a low priority for the sustainability agenda in the education system, financial constraints and the belief that sustainable buildings are economically not viable as they add project costs, a lack of urgency surrounding the issue of sustainability in practice, the belief that sustainable construction is an academic pursuit and not viable in practice, and most important is a lack of political will. It is apparent that sharing appropriate knowledge on SDC through research dissemination and presentations, conferences, workshops and seminars is fundamental. Abidin (2009: 812) suggests that academics should play an active role in educating not only in learning institutions but also through collaboration and consultancy teams.

In the same context of Malaysia, Shari & Soebarto (2012) investigated stakeholders' barriers and aspirations in delivering sustainable building strategies. Findings from interviews with consultants, developers, builders, facility managers and policy makers practicing in Kuala Lumpur, Selangor and Putrajaya revealed a number of barriers for implementing SDC which were summarized as lack of interest by the client caused by a lack of awareness and the perception that SDC will increase cost and reduce profit;

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<sup>13</sup> Low level of implementation is not clearly defined in Abidin's study.

lack of political will, legislation and enforcement; lack of knowledge, information and technical understanding by the project team leading to non-consideration of sustainability measures in projects; lack of incentives and unavailability of sustainable materials, products and systems in Malaysia which leads to the importation of these materials adding to the cost of the project (Shari & Soebarto, 2012: 10). The study further indicated that end users of the building have a great potential to influence demand for sustainable buildings. However, lack of awareness, understanding, skills and a knowledge gap among clients and other project teams is a major hindrance for adoption of SDC in Malaysia. In addition to Abidin's (2009:813) suggestions that academics should play an active role in educating and provide knowledge of sustainability, Shari & Soebarto, (2012:10) suggested actions needed to be taken by the government such as giving financial incentives and tax relief, which they argue "are much more effective in delivering sustainable construction than those which involve legal regulations and impositions."

Djokoto, Dadzie, & Ababio (2014) gave more insights on the barriers affecting the implementation of SDC in Ghana.<sup>14</sup> Findings from the Relative Important Index (RII) analysis method revealed barriers in a descending order: 1. Lack of demand from clients and customers; 2. Lack of strategies to promote SDC which include policies and regulations; 3. Higher initial costs; 4. Lack of public awareness about the benefits of sustainable buildings; 5. Lack of government support in promoting sustainable practices; 6. Lack of cooperation among actors; 7. Risk of investment; 8. Lack of building codes and regulations; 9. Higher investment costs; and 10. Lack of measurement tools. Since the key findings are related to lack of awareness, knowledge and expertise in the area of SDC and lack of government support, their study further suggested the need for government initiatives through policies and regulations on

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<sup>14</sup> The study obtained data using interviews and survey questionnaires with architects, engineers, quantity surveyors and project managers.

green (sustainable) issues to stimulate the demand for sustainable construction (Djokoto, Dadzie, & Ababio, 2014: 141).

Yet another study, conducted in Mozambique, investigated the challenges and opportunities facing construction organizations in regard to the implementation of sustainable construction practices. Using a case study of construction projects and interviews with project clients, environmental consultants, design consultants and contractors, Baloi (2003: 296) revealed that a lack of awareness, education and training on both technical and managerial aspects of sustainability, perceptions of cost increase, low supply of green materials and components, poor environmental legislation and lack of commitment are the main challenges of implementing sustainable construction. However, Baloi relates sustainable construction to environmental management aspects, where social and economic aspects were not considered. In concluding, Baloi (2003: 296) suggested the need for a legal framework where compliance with the environmental legislation and regulation are the main drivers for the environmental management (sustainable construction) implementation.

A study by Hoffman & Cloete (2014) on “Factors Limiting Green Development in South Africa” provided another insight as to why the adoption of green and SDC practices is lagging behind developing countries. The study concluded with three major findings based on data gleaned from questionnaire surveys with 42 architects. The study revealed that a majority of stakeholders interviewed showed that they are aware of the requirements for green buildings and they are aware of the existence of the South Africa green rating tool. However, the application is low because the green rating tool used in South Africa (SAGBC Green Star), is complicated and cumbersome. As such, they suggested the need for the South African Green Building council to create more awareness of the Green rating tool among the construction industry professionals in South Africa (Hoffman & Cloete, 2014: 74).

The need to create awareness and knowledge of sustainability among stakeholders in specific contexts was thoroughly discussed in the 3<sup>rd</sup> International Holcim Forum in Mexico City in 2010. The forum involved architects, engineers, urban planners, natural and social scientists, politicians, administrators, civil society and business representatives. All these stakeholders were looking at “how must architecture, engineering and construction evolve so that sustainability is automatically embedded in a way the built environment is designed, constructed, used and recycled” and more specifically on “how to stimulate stakeholders to deliver changes towards sustainable construction” (Wallbaum, et. al. 2010). In that forum, it was agreed that “there is a conscious need to create opportunities to activate stakeholders within a specific context, with shared visions and responsibilities and participation to deliver change.” It was further elaborated that change towards sustainability can be achieved by “involving and motivating all players beyond the normal stakeholders in the construction industry and by providing incentives to cultivate an understanding for each player based on a feeling of pride and empowerment” (Wallbaum, et. al. 2010).

Based on the belief that sustainable buildings add cost, in 2013, the 4<sup>th</sup> Holcim Forum in Mumbai, India created a wider discussion on the economy of sustainable construction. According to the discussion by Lucas Bretschger, a professor of economics at the ETH Zurich specializing in climate and sustainability, “the benefits and gains of SDC can be realized at low cost with the right blend of building in the construction sector, coupled with supportive macro-economic and political conditions” (Bretschger, 2013). He further argued that there is a direct economic benefit from sustainable buildings through reduced costs for energy, water, maintenance and a healthier and more productive environment but all these benefits are met by a number of barriers including different stakeholders’ understandings of sustainability.

In regard to creating knowledge of sustainability, Sassi (2006: 8) clearly pointed out that “sustainability is not an academic pursuit or even a professional activity. It is a

way of life affecting everything an individual does.” Nevertheless, Cole (2011: 432) suggests both top–bottom leadership and bottom–up initiatives by building industry stakeholders. An important task is the need to develop new forms of cooperation and information exchange (Lutzkendorf et. al cited in Cole 2011: 432).

Additionally, in order to overcome barriers of SDC and implement change towards sustainability, Bretschger, in the 4<sup>th</sup> Holcim Forum in Mumbai, proposed three major focuses that the construction industry should consider. That is to introduce incentives for sustainable designs, stakeholders in the industry should share information about possible solutions and create awareness of efficient solutions and opportunities available, and building users should provide feedback to developers and architects and other stakeholders (Bretschger, 2013). This was complemented by Aravena’s (2013) argument in his presentation at the same forum that the main barrier to “achieving high quality reconstruction (sustainable construction) is not cost, but rather the multiplicity of players requiring extensive coordination” and the lack of understanding of other stakeholders parameters and needs (Aravena, 2013).

## **2.9 Theoretical Standpoints**

The review of literature shows the contested notions of SDC, which it can be argued lack clarity on the notion of sustainability, thus contributing to the low level of understanding and implementation in developing countries, particularly in Africa.

SDC entered the mainstream of architecture way before the Brundtland Report “Our Common Future” of 1987. It has been a practice from very early stages of human civilization as seen in the indigenous architecture. Climate, social values and minimum of resources, use of local resources were the key consideration. However, the Brundtland report is perceived to be the major driver of SDC. The concept of taking responsibility for future generations became a vital agenda for the continuing architecture forums. Although the sustainability agenda started taking place in the

1993 World Architects Forum in Chicago and in the 2014 Forum in Durban, the indigenous design and construction approach is sustainable and still influences the practice of sustainability today.

There exist divergent and contested perceptions of SDC. High levels of technology and automation systems in buildings is the trend for SDC in developed countries. While in developing countries, where the level of technology is low and many other challenges exist including severely limited supply of resources like energy and water, the emphasis of SDC is on passive systems, use of biodegradable materials and use of appropriate technology. However, the trend now in developing countries is to achieve SDC as it is perceived in developed countries. These perceptions left the doors open for different translations and perceptions of SDC in the African context. Clearly the two contested perceptions need to inform one another while considering the challenges and priorities of African countries for sustainability to be appropriately promoted and implemented.

Principles of sustainable design in developed countries center on the environment and technology. Social equity and economic considerations are not major considerations and hence do not carry equal weight in the principles of sustainable design produced in developed countries. This leaves a knowledge gap of sustainability in developing countries where consideration of social equity and economics is essential, considering the lack of research and documentation on principles of SDC in developing countries. This study is a step towards understanding the principles of SDC relevant for developing countries, and Tanzania in particular, that address the environment, socio-cultural and economic sustainability in design and construction activities based on relevant assumptions of the economic, social and environmental realities in Tanzania and other developing countries.

The absence of a clear meaning and principles of sustainability appropriate for developing countries leaves room for different interpretations, coping and adopting principles from developed countries. This ignores the context, socio-cultural, economic dynamics and environmental potentials and challenges of Africa.

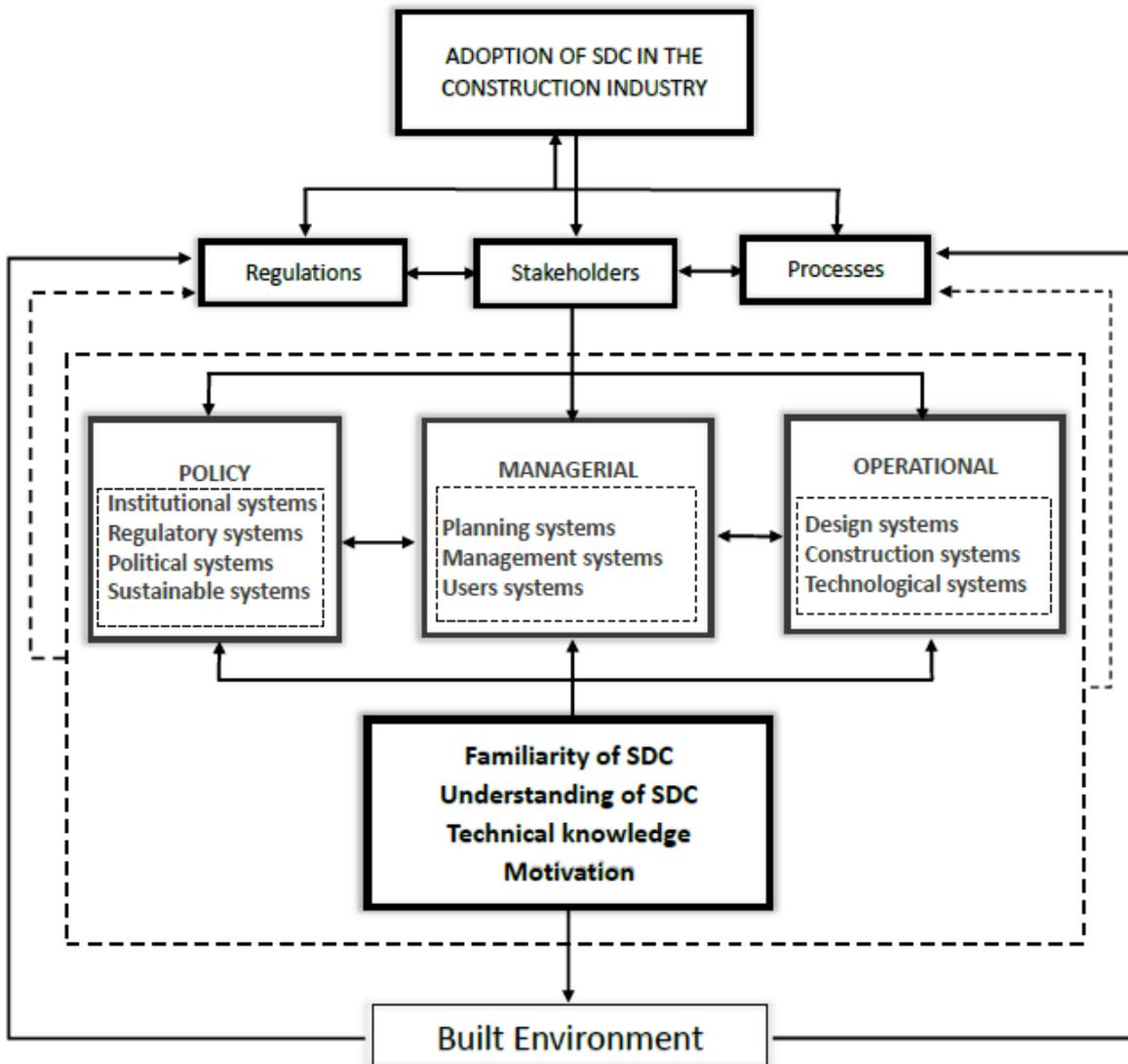
SDC is not a new phenomenon. It is a normative practice. However, its implementation in developing countries is neglected. The last part of the literature review on the application of SDC in developing countries revealed dominant challenges of implementation being a lack of awareness and knowledge of the concept of sustainability. Again relying on literature from developed countries, where the understanding is exclusively on protecting the environment, contributes to the lack of knowledge appropriate for Africa's cultural and economic context. In Tanzania the literature on SDC is hardly available. Nonetheless, the available studies on barriers for implementing SDC in developing countries focused on either developers or consultants or a small group of stakeholders. The methodology used is either interviews or a questionnaire survey, which does not provide a holistic results from a bigger population. This shows a methodological gap in getting a holistic understanding and opinions from a bigger population using multiple sources of evidence. As a way of addressing this gap, this study analyzed factors hindering the application of SDC practices in Tanzania from both operational, managerial and policy stakeholders using multiple sources of data collection and analysis methods as discussed in chapter three.

### **2.10 Conceptual Model**

In this study, SDC with the goal of achieving sustainable buildings and a sustainable built environment is conceptualized as a complex process composed of interrelated systems. Developing a sustainable building involves a number of inputs from the managerial, policy, and operational actors with respect to the environmental, economic and social processes in a specified context. Sustainability systems (economy,

environment and social), stakeholders systems (managerial, operational and policy), which includes design and construction systems in developing countries context need to be interlinked for achieving sustainable buildings and built environments. The study therefore adopts a modified systems approach to describe and analyze the actors and processes involved in the making of sustainable buildings in the Tanzania context. In this case, the frame of reference is research & knowledge on SDC. Figure 2.2 below illustrate such a relationship of different systems for achieving a SDC. This framework allows this study to understand the interactions between systems and establish points of intervention.

**Figure 2.2 Conceptual Model.**



Source: Author's construct, 2016

## 3 METHODOLOGY

### 3.1 Introduction

This chapter discusses the research process undertaken to understand the factors hindering the adoption of SDC (sustainable design and construction) practices in Tanzania. A description of how the research was conducted, the methods used, and a brief assessment of the methods used are included in this chapter. The criteria for selecting data collection methods, case study buildings and the mode of analysis for responses to the research questions is provided. Research problems encountered in the field are also discussed. This chapter also reflects on the issue of reliability and viability of the study and the generalization of information from the case study.

### 3.2 Overview of the Research Design

The main aim of this study was to understand the factors hindering the adoption of SDC practices in urban Tanzania. In particular data was needed about how construction industry key stakeholders understand sustainability and why they have their particular understanding of sustainability. Further information was sought on the factors influencing the current architectural trends in urban Tanzania as one way to understand the challenges of implementing SDC practices in the Tanzania construction industry. This study was guided by pragmatism for selecting appropriate methods to understand and respond to the research problem (Creswell, 2009), thus multiple methods of data collection and analysis were used.

To fulfill the above mentioned objectives a case study method was utilized. A case study method was found ideal for this study because the concept of SDC in the Tanzanian context is a recent development yet to be explored systematically and in depth. The study needed to get a deep understanding of stakeholder's perception as to why sustainability has not yet been implemented in the Tanzania context. This is in

the line with Yin's (2009: 18) definition of a case study as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real life context."

A case study using both qualitative and quantitative methods was carried out in the selected urban center. A combined research strategy was ideal for this study allowing for a greater depth of understanding (Roberts, 2010; Groat & Wang, 2002). A combined research strategy enabled the validation of each method via triangulation. In particular the qualitative approach was used to create a better explanation for quantitative findings.

### **3.3 Criteria for Selection of the Case Area and Generalization**

Tanzania has four urban centers (Dar es Salaam, Mwanza, Mbeya and Arusha) accommodating 27% of the national population. The design and construction sector is active in varying degrees in the urban centers and thus each center constitutes a suitable case for the study. However, it is neither realistic nor necessary to study all the urban centers in order to obtain lessons for urban Tanzania. A prudently selected case can have pre-requisite qualities adequate for generating lessons applicable to the whole urban Tanzania. In order to ensure that the selected urban center is suitable in representing SDC practices in urban Tanzania, the following criteria were taken into account: (i) the urban centers' population and its population growth rate, (ii) natural environmental qualities of the urban center (iii) social-economic dynamics, (iv) architectural trends and, (v) the ease of availability of information and data. The four urban centers were analyzed and evaluated to select an information rich case suitable to represent other urban centers in Tanzania.

Following the analysis of the four urban centers in Tanzania using the above mentioned criteria, Dar es Salaam was identified as a suitable case to study the factors hindering the adoption of SDC in urban Tanzania. Dar es Salaam, being the country's largest city with the total population of 4.3million people (URT, 2012), is experiencing

massive construction activities to accommodate the growing demand of its residents. It is estimated that the urban population growth rate for Dar es Salaam is 6.5% (URT, 2012). The other urban centers also show a growing urban population. According to URT (2012) Mwanza has a total population of 2.8 million people, of which a total of 706,453 people live in urban Mwanza and the urban population growth rate is 6.4%. Mbeya has 2.7 million people, urban Mbeya houses 385,279 people, and the urban population growth rate is 7.9%. Arusha has a population of 1.6 million people, while 416,442 people are in urban Arusha, and the urban population growth rate is 3.3%.

Based on the rapid urban population growth rate for urban centers and the fact that Dar es Salaam is the commercial capital of Tanzania, where all central government and the largest private business headquarters are housed, the city is experiencing a construction boom following contemporary architectural trends with many buildings enclosed completely by glass, which raises a question of its applicability in terms of energy use. According to a Tanzania Electricity Supply Company (TANESCO) report of 2014, more than half of the electricity generated in the country is used in Dar es Salaam. This suggests that Dar es Salaam was key for investigating factors hindering the adoption of SDC practices compared to other urban centers. Contemporary architecturally designed office buildings in Dar es Salaam's city center, which were constructed between 2003 and 2013 were purposefully selected for study. Furthermore, a historical analysis of construction trends from pre - colonial to contemporary buildings in Dar es Salaam provides rich data regarding SDC among different types of buildings in the city.

Dar es Salaam's climate offers extreme natural environmental qualities for architectural designs to take into account. The minimum - maximum temperature ranges between 25°C to 35°C, annual average rainfall is 1145 mm and humidity reaches 100% at night. In comparison with other urban centers, the average temperature for Mwanza ranges from 17°C to 28°C with an average precipitation of 1116mm. In Mbeya the temperature ranges between 12°C and 23°C and annual average precipitation of

955mm. And Arusha temperature ranges between 14°C and 25°C and the annual average rainfall is 1052mm. Extreme temperature, humidity and rainfall ranges in Dar es Salaam provides a useful case from which to maximize lessons that can be learnt from it and the recommendations that can be applicable to other urban centers.

Another reason for the selection of Dar es Salaam was the researcher's in depth understanding of it and easy access to different offices for data collection because the researcher was raised, studied and worked in Dar es Salaam. Familiarity with the city eased the data collection process and facilitated finishing the study within the planned timeframe. A more examination of the qualities of Dar es Salaam as a suitable case for studying SDC practices are discussed in chapter four.

### **3.4 Categories of Stakeholders**

There are a number of key stakeholders from different professions involved with construction in policy, managerial and operational functions. However, the three categories are inter-dependent and they do their work in teams. For example, policy stakeholders have a role of advising on the development of the construction industry by reviewing and making policies, legislation and laws that guide managerial and operational activities in the industry. They also have a role of regulating professional activities and advise on the development of training curriculum. Managerial stakeholders are the managers of the built environment. They are involved in establishing planning and building guidelines, and they issue building permits. However, members of this category are also involved in the policy making process and lobbying through their institutions being key participants in the construction industry. Operational stakeholders are the ones who make things happen through producing designs, cost estimates and engaging in construction activities. This category involves teams of designers and contractors who undertake construction activities according to the regulations and conditions set by the managerial stakeholders and the guiding policies, legislation, and laws put in place by the policy

stakeholders. Table 1 below presents stakeholders involved in the policy, managerial and operational categories as used in this study.

**Table 3.1 Categories of Stakeholders**

POLICY STAKEHOLDERS	MANAGERIAL STAKEHOLDERS	OPERATIONAL STAKEHOLDERS
Central government	Urban Planners	Architects
Teaching Institutions	Building Developers	Quantity Surveyors
National Construction Council (NCC)	Local Governments	Consulting Engineers
Professional Associations	Tanzania Building Agency	Contractors
Professional Registration Bodies	Building users	Specialists
National Housing Building Research Agency	National Environmental Management Council (NEMC)	
International Organizations	Occupational Safety and Health Administration (OSHA)	
NGOs	Public Procurement Authority (PPA)	
Politicians	Business Registration and Licensing Agency (BRELA)	
	Tanzania National Road Agency (TANROAD)	

*Source: Author's construct, 2014*

### 3.5 Obtaining Information and Data from the Selected Case

Since a study of this nature needs to capture a wide range of stakeholders' understandings, multiple sources of data are used to describe and explain how key Tanzanian stakeholders understand the concepts of sustainable design and their perceptions on the factors hindering its implementation. This not only contributes to the body of knowledge, but also informs the development of recommendations and strategies to support the application of SDC in shaping and managing the built environment in urban Tanzania and in developing countries in general. The following research tools were used to collect needed data: literature review, expert interviews, focus group discussions, documents analysis, buildings analysis, and survey questionnaires. Direct observation was used to explore the extent to which the built environment in urban Tanzania has applied the principles of SDC and the resulting implications for the built environment.

### 3.5.1 Literature Review

This study started with a review of previous studies on SDC in developed and developing countries. In addition to examining factors hindering the adoption of SDC practices in Tanzania, a review of policies and laws that govern the construction industry and the environment were conducted as a base-line to establish policy limitations and a starting point for developing recommendations on the ways to promote sustainable design. The literature review was a major source of information for the study and helped to situate this research in a wider context. From the development of the proposal, the literature review helped to create an understanding of the underlying debates surrounding SDC in the developing world. Many studies on sustainable design were uncovered by conducting a thorough literature search, and through that the research gap was identified that this study addressed.

### 3.5.2 Document Review

Documents showing design and construction processes were reviewed to determine the extent to which the principles of SDC were considered. These documents shed light on the perception of key decision makers towards the implementation of SDC concepts, especially during the design phase. Documents related to the building permit approval process and urban control processes were reviewed to determine the degree of sensitivity to SDC in the approval processes on the part of municipal and central government. Rules and regulations used by the professional regulatory bodies in Tanzania were examined in order to determine their influence on the built environment.

In August 2013, prior to the start of expert interviews, document reviews of materials related to SDC were conducted. Two research assistants were trained on what material to collect and the objectives of the study. Research assistants spent time in the library collecting newspaper articles with relevant information on the construction industry

in Tanzania. This review helped to create up to date knowledge of the happenings in the Tanzania construction industry.

The *Ardhi University Prospectus of 2013/14* was examined to get an understanding of whether the concept of SDC was included in the courses taught in the architecture programme. It was noted that there is no structured courses related to sustainable design listed in the prospectus. This means the students who will play a central role in Tanzania's built environment are finishing their studies without being exposed to SDC and this problem is reflected in the designs we see in urban Tanzania.

The construction Industry Policy of November 2003, The Environmental Management Act, and different acts guiding activities of professionals in the construction industry were reviewed. The term SDC appears in the construction industry policy, but there is no clear definition of the terminologies and no act or regulations give clear guidelines on how to achieve SDC.

Up to date information was obtained from the UN Habitat, Tanzania Office, "Programme to Promote Energy Efficiency in Buildings in East Africa" that stresses the importance of creating awareness of the concept of SDC for construction industry professionals. Conference proceedings and a 292 page *Draft Handbook of Sustainable Architecture in the East African Community Climates* of May 2013, were reviewed. From these documents, awareness of sustainable design was the key agenda in order to promote energy efficient designs. The document also reminded architects the basics of physics and the physiology for creating comfort in buildings.

### 3.5.3 Attending Professional Meetings

Attending meetings relevant to the research topic, which were organized for professionals in the construction industry in Tanzania, were the way of capturing stakeholder understandings and perceptions of the concept of SDC through observing people's reactions to the papers presented and the discussions. Three meetings were

attended, two in Dar es Salaam and one in Mbeya between December 2013 and March 2014. Architects and Quantity Surveyors and Registration Board (AQRB) organized a regular Continuing Professional Development (CPD) meeting known as 20<sup>th</sup> Anthony Almeida/Samuel Uronu Lecture Series on December 6, 2013 at the British Council auditorium, Dar es Salaam. A paper titled “Sustainable and Integrated Building Designs” was presented and the retired architect Almeida shared pictures of his design work that led him to receive a Green Africa Award 2012 for his lifelong contribution for sustainable architecture in Tanzania. A strong debate on the meaning of sustainable design, green design, integrated design and passive designs with comparison to the work of architect Almeida was very informative. The researcher had an opportunity to ask a question related to this study with the aim of getting the perception of the participants on the architectural trends of Dar es Salaam. The discussion was recorded by the researcher and later analyzed it to get a general understanding of stakeholders’ perceptions and understanding of the concept of SDC and their opinion of the factors hindering the adoption of SDC practices in urban Tanzania.

The second meeting attended was “A Stakeholders Meeting to Discuss the Establishment of a Green Building Council of Tanzania” organized by the Association of Consulting Engineers, Tanzania, held on January 31, 2014 at the Serena Hotel, Dar es Salaam. Five papers were presented, where the researcher had the opportunity to co-present a paper on “The Green Building Experience in Tanzania”. Papers presented were structured to create awareness of the green building concept in Tanzania, and share the experiences and initiatives of green buildings in Tanzania and from other countries. A resolution to establish the Tanzania Green Building Council (TZGBC) was signed and the researcher was selected as one of the executive committee members to work on the requirements, procedures and guidelines and what needed to be done in order to establish TZGBC. The establishment of a TZGBC led to the signing of a Memorandum of Understanding with the Singapore Green Building Council (SGBC) to share tools, research and information, and prepare joint workshops to promote Green buildings in Tanzania.

The AQRB 21<sup>st</sup> Continuing Professional Development Seminar on the use of Modern Technology and Challenges of Urbanization, on 20 – 21 March 2014 in Mbeya at the Mkapa Conference Centre, was the third conference the researcher attended. Despite the task of being a session chair for a paper titled “Green Building Concept” presented by a participant from Singapore, the researcher was able to record and follow the discussion and the reactions to the paper presented. Before the start of the presentation, the researcher introduced the research she was conducting, and requested the audience to fill out the distributed questionnaires after the session. 150 questionnaires were distributed and 90 questionnaires were collected.

#### 3.5.4 Preliminary Field Study.

Data collection started with a preliminary stage using a qualitative approach. The aim was to experiment with interview questions and protocols and confirm if they will produce the needed information. The preliminary stage provided the opportunity to refine questions so that they produced data relevant to the objectives of this study, before continuing with the main data collection task. Preliminary interviews were conducted with six different stakeholders representing the three categories of stakeholders involved in the construction industry in Dar es Salaam (Operational, Managerial, and Policy stakeholders). Informal discussions with architects and colleagues in the Department of Architecture at Ardhi University was another technique used to gather information on how stakeholders understood the factors hindering the adoption of SDC practices and to test the interview questions. The results from the preliminary stage were later used to develop guiding tools for the focus group discussion, to sharpen interview questions and to guide the direct observation process.

Training research assistants was done after the revisions of the interview tools and direct observation guide. Confirmation of research tools allowed the researcher to provide training to research assistants employed to assist in the data collection. The

training covered the understanding of the objectives of the study, methods to be used, the study respondents targeted and the guidelines for the built environment study. Setting appointments for expert interviews, direct observations of the Dar es Salaam City centre, searching for relevant documents, and conducting questionnaire surveys and data entry were partly carried out by the research assistants.

### 3.5.5 Observation and Photographic Registration

Direct observation of architectural trends in urban Dar es Salaam was conducted starting in August 2013 and continued parallel with the document review process. It was conducted through walking in the Dar es Salaam City Center, along different major streets where office buildings are located including Ohio Street, Garden Avenue, Mkwepu Street, and Samora Avenue, from 10am to 3pm. The main reason for this exercise was to get a firsthand experience of the built environment and to document architectural trends in the city center. It was conducted in the afternoon hours in order to get the real feel of the outdoor environment and to take note of impact of not adopting SDC practices, including the sun's effect on the buildings envelopes. For example, on Ohio Street the glare from the sun's reflections off glass facades dominates the street creating visual and thermal discomfort to pedestrians. Observations were used in devising interview and survey questions.

During the direct observation process, pictures of building facades and streets were taken. Three categories of buildings were established: historic office buildings - built before 1961, office buildings built after independence (1962-2002), and new office buildings built from 2003 - 2014 and the researcher purposefully photographed examples of these buildings and later analyzed them in relation to the elements of SDC discussed in chapter 2. Locations of these three categories of office buildings were marked on the DSM Satellite Map in order to prepare maps showing how the construction boom of contemporary buildings was replacing old or historic buildings.

Modern office buildings of different design concepts - those which were enclosed completely with glass, those which were partially enclosed by glass and those with other elements like shading devices on the facades - were noted for further analysis. This information was used to compile a list of professionals involved in the design and construction of those buildings. Their contacts were listed for interviews or to be contacted to fill in questionnaires as part of a larger survey.

A number of challenges were encountered by the researcher and the research assistants during the observation exercise. One was a fear of cameras being snatched by robbers in the streets. While walking on the streets the researcher and research assistants sometimes noticed people following them. They would ask questions about what they were doing. Some thought they were reporters or journalists but the researcher feared some of the curious onlookers were robbers. The concern over crime and the many questions from onlookers prolonged the time for direct observation extending what the researcher hoped would take one day to accomplish into a multi-day activity. In addition, the researcher and research assistants were not allowed to take photos of some buildings in the city, although they had an introduction letter from Ardhi University explaining the academic reasons for taking pictures. Despite the difficulties, direct observation and photographic registration provided a strong base for analysis of stakeholders' understanding of sustainability and factors hindering its practice. It helped to highlight the implications for the built environment of the information obtained through interview questions and questionnaire surveys.

### 3.5.6 Expert Interviews

Expert interviews were used in this study to capture stakeholders' understandings of the concept of SDC and to know their perception of the factors hindering the implementation of SDC from their responses to open ended questions. Interviews were conducted starting in November 2013 and ended in April 2014. Representatives from the three categories of stakeholders (operational, managerial and policy makers) were selected for interviews. More specifically architects, urban planners, building

owners, members of the Construction Industry Association of Tanzania, regulatory bodies, building developers, academicians, and municipal and central government officials were interviewed. Heads of professional associations and academic departments of architecture, engineering and quantity surveying as well as director generals of private firms, presidents of the professional associations, and registrars of the professional regulatory bodies were purposefully selected for interviews. Furthermore, professionals involved in office designs which were noted during direct observation and the photographic exercise were selected for expert interviews. Retired and foreign architects were also selected for interviews to get their views on architectural trends in Dar es Salaam.

Interview questions were prepared with the aim of getting a clear picture of the basis of informants' understanding of sustainable architecture, their perceptions on architectural trends in Dar es Salaam, and their views in regard to factors hindering SDC practices in Tanzania. This method was an efficient way of obtaining insights and background information while still providing the opportunity to discuss specific information in detail with different stakeholders.

A total of forty two expert interviews were conducted, all but two were recorded. Forty two interviews was adequate because the sample covered all key leaders of the institutions in the construction industry in Tanzania as well as others who were representatives of important stakeholders in their institutions.

Following research ethics, permission to record the interviews was always sought after the introduction of the study and the aim of the interview explained. Two respondents did not give their permission to have the interviews recorded. Scheduling for interview day and time was done by either calling the personal secretary of the interviewee and follow up calls were made to seek confirmation. Tape recorder, note book and interview questions were the main tools used in interview sessions which lasted from one hour up to one and a half hours.

A number of challenges were experienced while conducting expert interviews. Although most information was relevant to the study, interview took a long time and lasted for more than one and half hours in some cases because some interviewees, for example, in the local government offices, wanted to discuss off point issues. Issues raised included problems and challenges they are facing in their work places, which includes lack of resources and manpower in the municipality. It was also noted that some of the interviewees did not like to respond sincerely to the questions if it reflected negatively on their work. For example, when asked “*Do you implement sustainable design concepts in your design work?*” The researcher could read from architects’ faces that they were not ready to answer that question. The same question was then rephrased in a softer tone. “*What are the problems you encounter when implementing SDC concepts in your design work?*” Therefore, during interviews the researcher provided allowance to modify and ask questions differently when problems were encountered in at least three interviews in a row.

Honoring appointment times was also a big problem. Despite the confirmation of an appointment over the phone, the researcher would travel to offices two or three times only to find the interviewee not available and no information was left for the researcher. So the process of securing an appointment had to start again, or the researcher had to look for another interviewee in the same category of stakeholder for a replacement.

In this study expert interviews and focus group discussions were the key methods to gain data relevant to the main objectives, namely stakeholders’ perceptions of factors hindering the adoption of SDC in urban Tanzania. According to Groat & Wang (2002: 199), these methods are “appropriate for understanding the meaning and processes of people’s activities and artifacts.” Yin (2009: 108) also confirmed that “behavioral events and human affairs of case study can be understood or better studied through interviews.”

A major output from the interviews are stakeholders' understandings of the factors affecting the adoption of SDC practices, their perception of the urban architectural trend in Dar es Salaam, and what they believed to be effective strategies for the implementation of SDC practices in Tanzania. The findings from these interviews were analysed in relation to four key questions;

1. Why aren't SDC practices part of the current architectural trends in the Tanzanian construction industry?
2. Who are the most important stakeholders with the most influence over the implementation of SDC practices in urban Tanzania?
3. How do these stakeholders perceive the concepts of SDC?
4. What parameters can be used to promote SDC practices in urban Tanzania and in developing countries in general?

#### 3.5.7 Focus Group Discussions

In this study, focus group discussions (FGD) were used to gather information to complement the data obtained from expert interviews. Two FGDs were conducted. One was conducted after completing ten percent of the expert interviews and the second was conducted at the end of the expert interview period. The first FGD was conducted on October 29/11/2013 at the National Housing Corporation Head Office (NHC HQ) with four National Housing Head Office staff who were mentioned in an expert interview with the NHC Director of Property Development and Maintenance to have attended training in Singapore on green buildings and were actively involved in the green development projects for National Housing Corporation in Tanzania. Permission to record this FGD was not granted. The main aim for this discussion was to understand the motivation behind their involvement in green building trainings and practices, the challenges they are facing in their practice, and finally to get their perceptions and views on why sustainability is not practiced and how the Tanzania construction industry can adopt the concept of SDC practices. The discussion lasted for one hour and thirty minutes.

The second FGD was conducted on the 30<sup>th</sup> April 2014 at Ardhi University. The researcher selected a group of 13 participants including five young generation lecturers, from the School of Architecture and Design who had an interest in SDC as evidenced by their work and research. The FGD was filled out by eight 4<sup>th</sup> year students who studied a sustainable design elective course. Interaction and discussion with a mix of participants, for this case mature students in architecture and teachers with a similar interest in SDC created what Patton (2002) called high quality hybrid data. This discussion was guided by the following main themes: perceptions of the factors hindering the adoption of SDC practices, perceptions of the teaching curriculum at Ardhi University and sustainable design practices, and proposals on what should be done to promote SDC in the country. This focus group was particularly helpful in identifying the most important stakeholder and ways to promote sustainability in the Tanzania context. The discussion lasted for one hour and forty minutes.

**Figure 3.1 Focus Group Discussion at Ardhi University**



*Source: Author, April 2014*

Since the two FGDs were conducted before and after expert interviews were completed, they provided rich discussions and fresh insights from the students, younger generation lecturers and NHC staff who had a relatively clear understanding of the concept of SDC. However, the FGD presented some challenges worth discussing. One challenge was 'the group dynamic'. For one of the FGDs the participants were a senior architect, a senior quantity surveyor, a junior architect, and a junior engineer. This combination created an environment where the senior staff felt like they should speak first. Despite researcher's effort to pose questions directly to the junior staff, the junior staff appeared to echo the same thoughts and suggestions posed by senior staff. Furthermore, when the researcher requested permission to record the conversation, one of the junior staff was quick to respond "it is ok" but one of the senior staff did not give his consent and suggested the researcher only take written notes. This situation in the beginning of the discussion created an environment where junior staff hesitated to speak first and just echoed what their seniors said without adding much information. Later, in the following week the researcher organized a one on one interview with one of the junior staff who seemed to understand the project implementation process and was involved with one of the first modern green buildings in Tanzania. Although the respondent was closely in touch with NHC's overseas experts in sustainable design, but for the FGD he was not comfortable to speak much. The follow up interview was very informative and the researcher was able to get a copy of guidelines for green buildings developed by a Singapore Green consultant for NHC office building in Dar es Salaam.

#### 3.5.8 Questionnaire Survey:

From the initial analysis of expert interviews, the researcher was able to establish a pattern of responses to different questions. The responses were used to structure closed questions for a questionnaire surveys. For instance, when interviewees were asked to explain the factors they think are influencing lack of implementation of SDC practices, the responses were either it is caused by lack of awareness and understanding of the concept, or lack of policies and regulations, or lack of technical

knowledge, or perceptions on cost of investment. The questionnaires were formulated with the above selections and there was room for the respondent to add their views. Therefore, the questionnaire consisted of semi-structured, structured, and open ended questions and they were formulated to focus on the four major areas:

1. General background data of the respondents
2. Key stakeholders with the most influence over the implementation of SDC practices and their perceptions of the concept of SDC.
3. Factors hindering the adoption of SDC practices in urban Tanzania.
4. Knowledge that may guide in adopting the concept of SDC

### 3.5.9 Population, Samples and Sampling Procedure

A total population made up of three categories of stakeholders in the construction industry was established from the five professional registration bodies who represent architects, quantity surveyors, consulting engineers, urban planners, and contractors. Based on the AQRB (2014) register for registered Architects and Quantity Surveyors in Tanzania, which is updated annually, there are 328 registered architects practicing in Tanzania while those practicing in Dar es Salaam are 277. Registered quantity surveyors practicing in Tanzania are 204 of whom 196 are in Dar es Salaam. Registered Urban Planners in Tanzania are 236 of whom 116 are in Dar es Salaam (Register of Town Planners, 2014). For the case of building contractors, the study only considered class one and class two building contractors because these are the only two classes certified to undertake large construction projects, including multi-story office buildings in Dar es Salaam. According to the CRB (2013) there are 84 Class One Contractors in Tanzania, with 61 in Dar es Salaam. There are 33 Class Two Contractors in Tanzania and in Dar es Salaam there are 18. Registered consulting engineers are 305 in Tanzania, in Dar es Salaam there are 287. Therefore, the total population of stakeholders was 1,106 registered professionals with a total of 894 practicing in Dar es Salaam. Although registered individuals practicing in any region in Tanzania are

allowed to practice in Dar es Salaam as well, this study focused on stakeholders based in Dar es Salaam because of accessibility, time and research funds limitations.

The above population size of 894 professionals are practicing in either of the three categories of stakeholders in the construction industry (Operational, Managerial and Policy Stakeholders). However, the overlap of stakeholders' activities posed a challenge to establishing the population size for each category. Nonetheless, the respondents were purposefully selected based on a particular category of stakeholders. In this study, the population size for each category was established by manually counting, calculating and estimating based on the data from the institutions involved in each of the categories, staff directories, interviews, physical observation and counting, and experience of the researcher by deducting managerial and policy stakeholders from the total population as shown below. 42 stakeholders were reduced from the total population of 894 because they were previously involved with expert interviews, hence a total population of 852. Since the questionnaire survey seeks to analyze findings from the three groups separately, Stratified Random Sampling was used whereby samples from within each group were selected randomly.

**Table 3.2 Population of the Operational, Policy and Managerial Stakeholders in DSM.**

1	<b>Operational Stakeholders</b>	<b>Population</b>
	Architects	201
	Quantity Surveyors	102
	Consulting Engineers	196
	Contractors	79
	<i>Total Population</i>	<i>578</i>
2	<b>Managerial Stakeholders</b>	
	Urban Planners	61
	Building Developers: (Architects, Quantity Surveyors and Engineers)	
	▪ National Housing Corporation (NHC)	13

	▪ Parastatal Pension Fund (PPF)	12
	▪ Public Service Pensions Fund (PSPF)	9
	▪ Government Employees Provident Fund (GEPF)	13
	▪ Private Developers	7
	Local Governments: ( Architects, Quantity Surveyors and Engineers)	
	▪ Ilala	12
	▪ Kinondoni	14
	▪ Temeke	9
	<i>Total Population</i>	<i>150</i>
3	<b>Policy Stakeholders</b>	
	Professional Associations	
	▪ Architects Association of Tanzania	4
	▪ Association of Consulting Engineers of Tanzania	5
	▪ Tanzania Institute of Quantity Surveyors	4
	▪ Contractors Association of Tanzania	4
	▪ Tanzania Urban Planners Registration Board	6
	Professional Registration Bodies	
	▪ Architects Quantity Surveyors Registration Board (AQRB)	6
	▪ Engineers Registration Board (ERB)	5
	▪ Contractors Registration Board (CRB)	5
	▪ Tanzania Urban Planners Registration Board.	5
	National Construction Council (NCC)	9
	Tanzania Building Agency	12
	Central government (Architects, Quantity Surveyors, Engineers)	
	▪ Ministry of Lands Housing and Human Settlements Development	10
	▪ Ministry of Works	6
	Teaching Institutions	
	▪ Department of Architecture, Ardhi University	9
	▪ Department of Quantity Surveyors, Ardhi University	7
	▪ School of Engineering , University of Dar es Salaam	9

	▪ Department of Urban Planning, Ardhi University	7
	National Housing Building Research Agency	5
	International Organizations	
	▪ UN- Habitat	3
	NGOs	3
	<i>Total Population</i>	<i>124</i>

*Source: Author's construct, 2014*

A sample size of 223 for Operational Stakeholders, 99 for Managerial Stakeholders and 80 for Policy Stakeholders was obtained by using an online sample calculator (<http://www.surveysystem.com/sscalc.htm#one>) with a 95% of confidence level and confidence interval or margin of error of 5.15. Respondents were then selected randomly.

With the help of trained research assistants, the researcher administered three sets of questionnaires to suit the three categories of stakeholders in the construction industry. The questionnaires were administered in Dar es Salaam from January 2014 to July 2014. A total of 415 questionnaires were distributed including 230 to operational stakeholders, 100 to managerial stakeholders and 85 to policy stakeholders. Questionnaires were delivered in person or emailed to respondents using the available contact information from the registry. Some questionnaires were administered at a conference the researcher attended. Filled and returned questionnaires were 262 in total, including 181 from operational stakeholders, 45 from managerial stakeholders and 36 from policy stakeholders. The response rate represents 79% of the operational stakeholders contacted, 45% for the managerial stakeholders and 42% of the policy stakeholders contacted, with the overall response rate of 61% of all the stakeholders contacted. The response rate for the managerial and policy stakeholders in Dar es Salaam was low despite having a short questionnaire with a cover page explaining the purpose of the study. Questionnaires were constructed with 28 structured questions

and only two open ended questions. They were designed for the respondent to spend 15 – 25 minutes to fill. Assistant researchers and the researcher made efforts to get back distributed questionnaires by physically following up with stakeholders, by making phone calls, and by sending reminder emails.

A number of problems were encountered while conducting the survey. Many of the non-academic respondents did not take academic research seriously. Most of the contacted respondents were asked to be left with questionnaires to fill in and pick up the next day. But the researcher ended up having to go back and forth only to find either the questionnaire was misplaced and then she was asked to leave another questionnaire, or she found it was not filled and she was asked to come another day, or she found the contacted person was not available despite the phone calls made before. Some of the respondents (some contractors) asked for payments before filling the questionnaire after a long time of avoiding to meet with the researcher.

The main aim of the questionnaire survey was to look for patterns that could be later analyzed and explained using the findings from interviews and focus group discussions to get a holistic understanding of the factors hindering SDC practices in Tanzania. In addition, stakeholders were asked two open ended questions on what strategies could promote sustainability in Tanzania and to name at least three office buildings that they consider to be sustainable. These questions were later analyzed by matching patterns. The responses informed this research in developing recommendations for promoting SDC in Tanzania and also helped to compare respondents' definitions of sustainable design with the examples of sustainable buildings mentioned. Data entry was managed by using IBM SPSS statistics 20 software and analysis was done using Stata 12 software.

A Relative Importance Indices (RII) approach was used to analyze and identify the most important stakeholder. A question was asked in the questionnaire survey where the respondents were asked to rank from a pre - coded list of design and construction

stakeholders who they think is the most influential stakeholder, using 3= most important, 2= slightly important and 1= not important. The use of the RII approach was based on confidence in the approach given by previous researchers. For example, Asiedu & Alfen, (2014: 16) pointed out that the RII method is “one of the key statistical instruments in ranking factors based on Likert type scale”. The RII score for each stakeholder was calculated using the equation below and the indices are ranked for policy, managerial, operational and all stakeholders.

$$\text{RII. (\%)} = \sum \left( \frac{a_i n_i}{3N} \right) * 100$$

Where: RII is Relative Importance Indices

$a_i$  is the constant expressing the weight assigned to each stakeholder by the respondents of the  $i^{th}$  rank

$n_i$  is the frequency of the respondents of the  $i^{th}$  rank

N is the total number of respondents

### 3.6 Limitations of the Study

The study focused on Dar es Salaam. Measures were taken in the selection of Dar es Salaam as it is a suitable case to generalize to other urban centers in Tanzania. These measures are discussed in detail in chapter 4. In a nutshell, measures taken include the analysis on urban centers’ populations and their population growth rate, the natural environmental qualities of urban centers, social -economic dynamics, architectural trends and the ease of access to information and data. Dar es Salaam being the country’s largest city and a commercial capital, with massive construction activities and extreme natural environmental qualities, stood out as a suitable case. However, the generalization to other urban centers in African countries is not guaranteed because of differences in terms of policies and laws governing the

construction industry and the education systems for preparing professionals for the construction industry.

### **3.7 Reliability and Validity**

According to Yin (2009) reliability is logical and clearly documented procedures used in conducting research. For scientific research, reliability refers to obtaining consistent results. If two researchers apply similar procedures in a similar case, they should obtain the same results. However, in qualitative research there are many specific elements, contingencies, and differing interpretations (Gillham, 2000). Thus the concern of reliability in qualitative research is about the research process, the quality of data, and the measures taken to minimize biases that are likely to occur during data collection. Reliability refers to being transparent about how data was collected and analyzed so that other researchers can trace the research procedure employed in a particular study and make informed judgments on the quality of the data.

In this study different approaches were used to enhance reliability including documenting the research procedures in a field diary. All details of the data collection process were recorded including for all interviews, who was interviewed, where the interview took place, when and how expert interviews were conducted. Also recorded in the field diary were challenges faced in collecting data and recommendations from interviewees on how data gathering tools could be modified and the research also asked respondents for recommendations of other people to be approached for further information. Seeking consent of the respondents to be interviewed was done not only to fulfill research ethics but also enhance the reliability of the study. For example, before using a voice recorder and camera for an expert interview and FDG, the

researcher would ask for permission from the respondents. This ensures ethics and transparency in the research method used.

All raw field data has been stored in a database and can be accessed for reliability. This includes: the field diary, filled and returned questionnaires from policy, managerial and operational stakeholders, recorded voices from expert interviews and FGDs, photographs, and a list of respondents.

In terms of enhancing research validity, this study applied a number of measures to establish the trustworthiness of the results and assure validity of the study. Measures employed by this study include; use of multiple methods of data collection, peer reviews in conferences and colloquium meetings, and the use of thick description of the study area, and the way data was analyzed and reported. Five data collection methods were used: expert interviews, FGD, questionnaire survey, documents review, and first-hand observations. Multiple data collection methods allowed for the triangulation and corroboration of data from multiple sources. The triangulation process was used to clarify meanings behind research findings using multiple perceptions. For example, findings from the expert interviews and questionnaire survey helped to compare and clarify respondents' definitions of SDC with the examples of sustainable buildings mentioned by questionnaire respondents. Data collected from one method was then cross checked with data acquired from another method. For example, through expert interviews it was learnt that there exists a green building in Tanzania and this was confirmed through observation and documents review.

Thick description of the study area and a detailed description of findings using direct quotes from the respondents was another approach used by this study to ensure validity. The detailed description of urban Dar es Salaam provided in this study helps to orient reader.

Peer reviews at a conference and at colloquium meetings was another measure used in this study to ensure quality of the research findings. Peer reviewing was carried out by two blind reviewers on a paper presenting preliminary findings submitted and published in the conference proceedings of the 'Ninth Built Environment Conference', 2-4 August 2015, Durban, South Africa. The same paper was later reviewed by two more blind reviewers for publication in the Journal of Construction, South Africa. This research was presented as a work in progress in a colloquium comprising professors and other PhD candidates on June 2015 at the Faculty of Architecture and Planning, University of Stuttgart.

Informal discussions with fellow researchers/lecturers and professors at Ardhi University on different stages of the research, from developing a research proposal to data collection and analysis, was also employed to ensure validity. The researcher participated in construction industry related conferences in Tanzania. In particular, a stakeholders meeting on the establishment of a Green Building Council in Tanzania, consisting of stakeholders in the Tanzanian construction industry provided the researcher with the opportunity to learn how attitudes toward SDC were evolving at stakeholders meetings. Additionally she was able to present some of the preliminary research findings. Comments, questions and suggestions received from all peer reviews contributed to improving the validity of this research.

## **4 DAR ES SALAAM AS A CASE FOR STUDYING SDC PRACTICES IN URBAN TANZANIA**

### **4.1 Introduction**

This chapter gives an overview of Dar es Salaam as a suitable case for studying SDC (sustainable design and construction) practices. The chapter commences with the geography and climate of Dar es Salaam before giving the city's historic background. Colonial Arab, German, British and current office building architectural trends will be discussed to draw attention to the impact of design on the qualities of Dar es Salaam's built environment. This chapter concludes by discussing Dar es Salaam as a case study area and reasons for generalizing to Tanzania's other urban areas.

### **4.2 Geography and Climate of Dar es Salaam**

Dar es Salaam is the commercial capital of Tanzania. It is located in east-central Tanzania on the Indian Ocean. It is the country's largest city with 4.3 million people, or 10% of the country's population (URT, 2012). Dar es Salaam is located at the 6° 48' South, 39° 17' East, experiencing south-east and north-east monsoon winds and cool breezes from the Indian Ocean. Dar es Salaam covers a surface area of 1,393 square kilometres of land mass, which is about 0.19% of the Tanzania mainland area (URT, 2004). For administrative purposes the city is divided into three municipalities, namely; Ilala, Kinondoni and Temeke. The Central Business District (CBD) is located in Ilala Municipality (see figure 4.1). This study focuses on part of the CBD where many government and private offices are located.

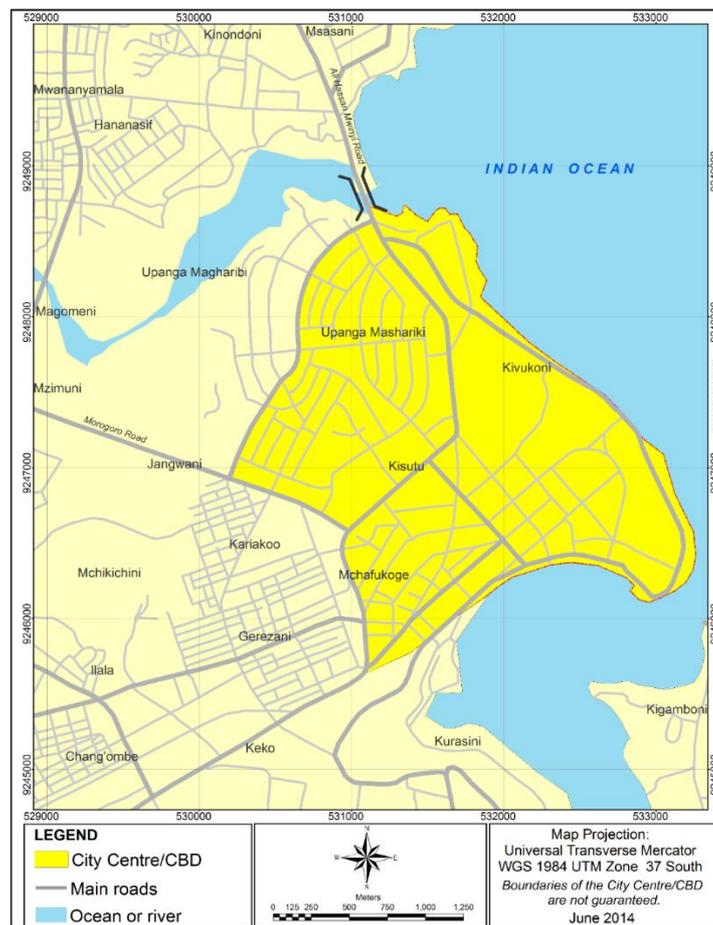
Figure 4.1 Map of Dar es Salaam



Figure 4.2 shows boundaries of the city centre/CBD study area. The study area extends from Kivukoni area to Mchafukoge excluding Kisutu and Upanga. This area is suitable for a case study because it possess rich information on different types of office building architectural designs from the colonial period to the present. Different types of architectural designs over the years can easily be observed in the CBD and portray different ways of building in response to the climate of Dar es Salaam, which has a big

impact in the built environment. Findings can also be duplicated in other Tanzanian cities like Arusha, Mwanza and Mbeya for a number of reasons discussed in chapter three. For example, according to the URT (2012), Mwanza and Mbeya have growing populations of 2.8M and 2.7M respectively and the cities are experiencing construction booms, especially for office buildings, so that the negative impact buildings to the built environment is a major concern in other growing cities.

**Figure 4.2 Study Area in Dar es Salaam City Centre/CBD Area**



Dar es Salaam has a hot and humid climate with a small seasonal and daily variation in temperature. The annual mean maximum temperature varies from 28° C to 32°C and the annual mean minimum temperature ranges from 19°C to 26°C. October to March are the hottest months where the temperature can rise up to 35°C. May to August are

the relatively cool months with an average temperature of about 25°C (URT, 2004). Dar es Salaam experiences a short rainy season between October and December and a heavy rainy season between March and May. The average rainfall is 1000 mm per year with a considerable variation. Relative humidity can reach up to 100% at night and it can drop to 55% during the day. The climate of Dar es Salaam is also influenced by the south-east and north-east monsoon winds from April to October and from November to March.

### **4.3 Dar es Salaam Architectural Trends over the Years**

Dar es Salaam was home for the Swahili people known as the *Zaramo* and *Shomvi* before the Sultan of Zanzibar Seyyid Majid claimed it in 1862. According to Brennan & Burton (2007) Sultan Majid was attracted to Dar es Salaam as an ideal place to take refuge from the growing courtly and political pressures in Zanzibar. After negotiations the local leaders granted permission for the Sultan to settle in Dar es Salaam in 1862 (Brennan & Burton, 2007). The design of the city was believed to be made by Sultan Majid and in 1865-66 he brought skilled masons, artisans and labourers as slaves from Zanzibar to construct buildings, streets and water wells (Sutton, 1970). The Sultan's palace and the old Boma (discussed in section 4.3.2.1) were some of the big buildings constructed by Sultan Majid and are still standing until today. After his death in 1870, his brother sultan Seyyid Barghash became a successor (Brennan & Burton, 2007)

In 1887 the *Deutsche Ostafrikanische Gesellschaft* (DOAG) (German East African Company) agreed with Sultan Barghash to establish their station in Dar es Salaam. The company was later replaced in 1891 by the German government and Dar es Salaam became the seat for administration, main port, commercial and communication centre for German colonial East Africa (Sutton, 1970). During the period of German colonial occupation in Dar es Salaam (1891-1916) major investments focused on the administration and military. Administrative buildings, like the government main offices on Azania front, city hall, State House were constructed, and the old Boma

built by Sultan Majid was turned into a jail. Dar es Salaam experienced a re-planning of the town by the colonial Germans and the first building ordinance was put in place in 1891 to organise the future development of their colonial capital (Brennan & Burton, 2007). After World War I, the British government took over Dar es Salaam and colonised Tanzania (Tanganyika) from 1916 to until independence in 1961. The British government continued to implement what the German government started in terms of Dar es Salaam's building construction and town planning, whereby in 1924 the German plan for Dar was adopted and implemented by the British government. A number of buildings were constructed during this time which include the reconstruction of the State House, Karimjee Hall, the old Museum building, and bungalow houses for government residences. In 1964 Tanganyika united with Zanzibar and became the United Republic of Tanzania. The population of Dar es Salaam has grown from 900 in 1867 to 4.3 million people in 2012.

In order to better understand the current office building architecture in Dar es Salaam and what influences it, this sections explores the architectural history of Dar es Salaam in relation to a hot and humid climate. Office buildings in the colonial (Arab, German and British) and post-colonial periods (1961-2002) are briefly discussed. This is followed by a discussion of 2003 to current architecture. In this study post-colonial architecture comprises buildings constructed after independence in 1961 to the time before LEED for green building practices was officially launched by the USGBC in the United States in 2000, which impacted on sustainable building practices in other countries as well. Thus the current architecture from 2003, when the first buildings with glass curtains (PPF Tower, designed in 1996) was constructed in Dar es Salaam is classified as the current era. Post-2002 shows different architectural approaches in dealing with the hot and humid climate in comparison to 1961-2002 era.

#### 4.3.1 Arab Architecture (1862-1870)

The first office buildings in Dar es Salaam can be traced back to the 1860s and were among the first big buildings constructed by Sultan Majid. The buildings were

constructed for the purpose of serving as his palace and the sultan's palace enclosed other buildings including the now old Boma building and the White Fathers' House built in 1865 which are still standing until today.

**Figure 4.3 Old Boma Building (left) and White Fathers House (right)**



*Source: Sulemanji, 2011*

Sultan Majid's buildings shows common features of architecture common to the traditional east African coast that can also be seen in Zanzibar and Bagamoyo (Casson, 1970). These features include, thick walls made up of a coral hard-core with lime mortar and white wash plaster. Floors are coral blocks laid on cut rafters and mangrove poles. The carved entrance doors have a floral and geometrical pattern and decorated parapet walls at the roof (Casson, 1970). In terms of buildings response to climate, thick walls were used to protect the interiors from heat gain. Windows were mainly placed on the north and south side with small proportion windows on the east and west small facade to respect the sun's movement and wind direction. The location of windows and orientation of the buildings not only helps to reduce heat gain but also helps to capture breezes and monsoon winds for ventilation and cooling. The white plaster was also essential to reflect solar heat. These buildings show an Arabic version of dealing with the hot humid climate.

#### 4.3.2 German Architecture (1887 –1916)

The Germans invested heavily in building construction and infrastructure development in Dar es Salaam. There are a number of buildings built during the German colonial period which still exist in Dar es Salaam. Some of the office buildings include the office of the German Governor (now second Vice President's office), Nyumba ya Mayai (now Tanzania Revenue Authority offices) and the old high court (now Kivukoni Magistrates court). During this time many more buildings, including churches, hotels and monuments, were constructed. Some buildings in this period show the influence of Islamic coastal architecture and some have a simple classic architectural style.

**Figure 4.4 Kivukoni Court (left) and Ocean Road Cancer Institute (right)**



*Source: Sulemanji, 2011*

Casson (1970) describes the architectural features of Germany buildings: “The offices were constructed from 1891 onwards in a simple classical style, without Islamic influence, hitherto unseen in this country. The form of construction also differed from that of the Arab buildings at the western end of the harbour front. Their lower storeys were built of masonry, reputedly taken from the old Sultan’s palace. The upper storeys, by contrast, consisted of wide verandas of steel joists and carved timber rafters and screens, pre-fabricated in Germany. Floors and roofs were built of vaults of concrete spanning between small iron joists. The high ceilings, large wide verandas and white painted plaster work with black painted joists and frames, combine with

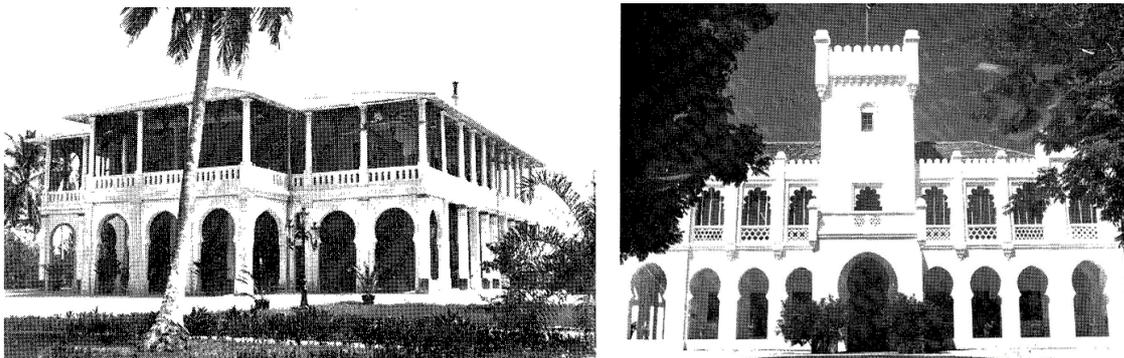
absence of ornament to give these buildings a simple dignity and coolness.” (Casson, 1970: 182)

In terms of their response to a hot and humid climate, the German buildings were constructed with thick walls and with a long façade facing east and west while wide verandas were used to shade the buildings from the sun. White washed plasters were also common used to reduce heat absorption through walls.

#### 4.3.3 British Architecture (1916-1961)

During the 46 years of British occupation in Dar es Salaam a number of office buildings were constructed that still exist and are used for same purpose until today (for example the buildings that house the Ministry of Education, Ministry of Foreign Affairs, the Karimjee Hall and Old Museum). Some of the British buildings were re-constructions of German buildings destroyed during the World War One, this includes the reconstruction of the State House. British maintained some architectural features from the Germans and Arabs in their re-construction projects. One good example to illustrate this is the State House buildings.

**Figure 4.5 State House Building, in the German Era and Re-construction in 1922**



*Source: Casson, 1970*

Architectural features like thick walls, and wide and deep verandas can still be seen in the British colonial architecture. During this time, it was also noted that Indians

started investing more in building construction in Tanzania. Their construction took place mainly in segregated settlements along India, Jamhuri and Indira Ghandi streets. They invested in commercial-residential buildings, mosques and temples. There are a number of Asian buildings from the British colonial era that stand today in Dar es Salaam adding to the architectural vibrancy of the city.

#### 4.3.4 Post-colonial Architecture (1961 – 2002)

In the 42 years after independence, Dar es Salaam has undergone construction activities to cater for the development of the capital city and to accommodate an increasing population. Residential housing, offices, hotels, churches and mosques were constructed. Casson (1970) described the architectural style immediately after independence to be more of a functional and international style. It is characterized by plain geometrical forms based on functional requirements and the facades are plain with no ornaments. Construction activities increased rapidly in Dar es Salaam after 1985 when the socialist *Ujamaa* policy governing the country was replaced with the liberalization *Mageuzi* policy. Under *Mageuzi* private investments were encouraged, which lead to the construction of more private office buildings in Dar es Salaam. Government, private sector and parastatal funded office buildings were constructed with liberalization.

**Figure 4.6 NBC House (left), Ministry of Lands Building (right)**



Source: Author, 2012

Data collected during researcher's observation and photographing exercise, indicate that most buildings built from 1961 to 2002 show similar approaches in responding to the hot and humid climate, such as: appropriate orientation of buildings with short facades facing east-west to reduce exposure to the sun; cross ventilation through the proper location of windows on the south and north sides of the buildings; and the use of courtyards for ventilation including using stack effects in buildings to deal with humidity and to cool indoor spaces. During this time, most of the buildings depended on passive systems of cooling because the use of air conditioning systems only became popular in late 1990s. Horizontal, vertical and egg crate sun shading devices are commonly seen on facades that are exposed to the sun and where appropriate orientation was not easy to achieve. The construction techniques are dominated by the use of blockwork for walls and a framed structure of concrete columns and slab. A change of Dar es Salaam's skyline in terms of building height was possible due to the change in construction technique towards the use of concrete.

#### 4.3.5 Current Architecture (2003 – 2013)

The current architecture of Dar es Salaam shows a drastic change from the functional and international to a post-modern style characterized by aesthetic driven designs. After 2003 is the time when curtain walls started to be used. For example, in 2002 the first tall office building (PPF Tower) was completely enclosed in a glass curtain wall. From 2003 to date, most of the office buildings are characterised by the extensive use of glass façades replacing or cladded on block walls. Generally, the current architecture of office buildings in Dar es Salaam shows a replica of the buildings designed and constructed in developed countries.

**Figure 4.7 PPF and PSPF Towers (left), Kempinski Hotel and BOT (right)**



*Source: Author, 2014*

The rule of thumb for dealing with the hot and humid climate (proper orientation, shading and cross ventilation) is not as prevalent in the current architecture. Instead, mechanical systems for cooling and lighting are deployed in order to create comfortable interiors. This is contrary to an international architectural agenda where the emphasis is on being environmentally friendly, energy efficient and sustainable.

It was, however, noted that not all recent office buildings are enclosed in glass boxes. There are a few buildings that still show sensitivity to the hot humid climate of Dar es Salaam. These buildings are characterised by appropriate orientation with shading devices on facades that are exposed to the sun. Even though air conditioning systems are used for cooling the interiors, the cooling load is much reduced by the measures taken to protect the building from the sun. Some of the buildings in this category include Exim Tower, Umoja House and Amani Place.

**Figure 4.8 Exim Tower (left) and Amani Place (right)**



*Source: Author, 2014*

Most of the new office buildings replaced Dar es Salaam's historical buildings, colonial residences, and Indian buildings. Demolition to pave way for new buildings is still happening. The process has been received with a lot of scepticism by the city dwellers. The cry over the loss of Dar es Salaam's architectural identity can be evidenced in a number of newspaper articles condemning the demolition of historic buildings to pave the way for glass skyscrapers. A map below shows the extent of current architecture in Dar es Salaam which are predominantly buildings enclosed in a glass box.

**Figure 4.9 The Extent of Current Office Buildings Constructed in DSM**

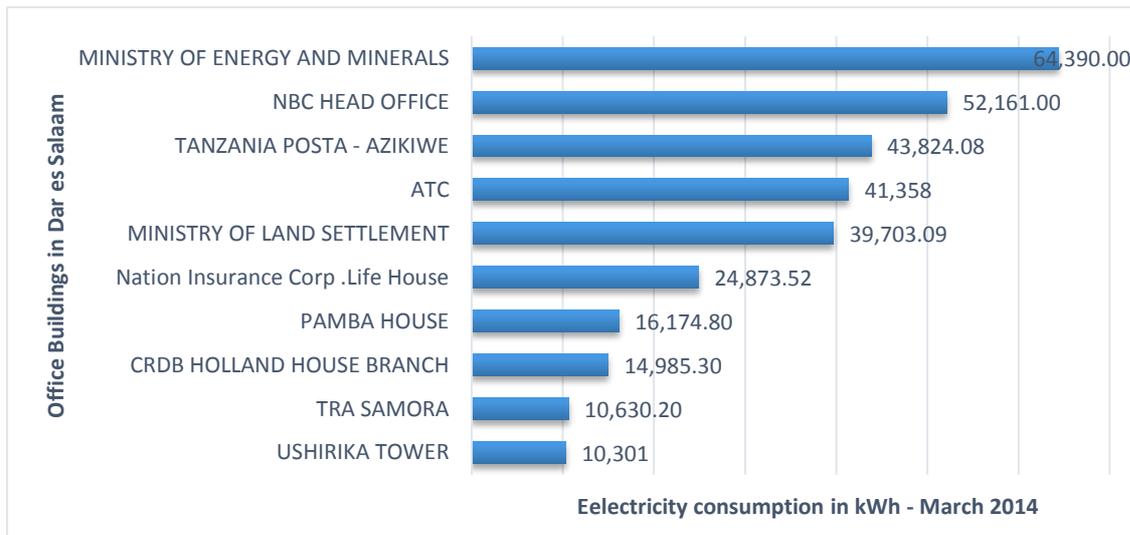


For one of the poorest countries, like Tanzania, which experiences unreliable electricity and power rationing, glass skyscrapers consume unacceptable amounts of energy for cooling, cause unbelievable costs for the owners, and are uncomfortable to be in, especially when the electricity goes off. According to the Energy Audit Report for government buildings, energy bills in government buildings cost a significant amount, thus crippling other socio-economic activities (URT, 2006). The extent of

energy consumption by buildings in Dar es Salaam and its impact is revealed more in newspaper articles in the *Mwananchi* newspaper of February 27, 2014 titled “*Ghorofa tatu zatumia umeme zaidi ya Mkoa wa Mtwara*” (“Three modern buildings in Dar es Salaam use more electricity more than Mtwara Region”) and “*TanESCO: Matrillion kumaliza mgao wa umeme nchini*” (“Tanzania Electric Supply Company: Trillions of Tanzania shillings to combat power rationing in the country”). The newspaper articles stressed that the consumption of electricity by buildings in Dar es Salaam is alarming. While a lot of money is set aside to produce more energy for the country, little effort is put to promote efficient usage of electricity. Another article in the *Habarileo* newspaper of August 4, 2014, titled: “*JK aalika wawekezaji katika umeme*” (“President JK is inviting investors in the electricity sector) illustrates the effort by the government to encourage investments to generate more energy because the country is running short of electricity, reiterating the point that government policy is aimed at increased energy production at the expense of promoting SDC in dealing with energy shortfalls.

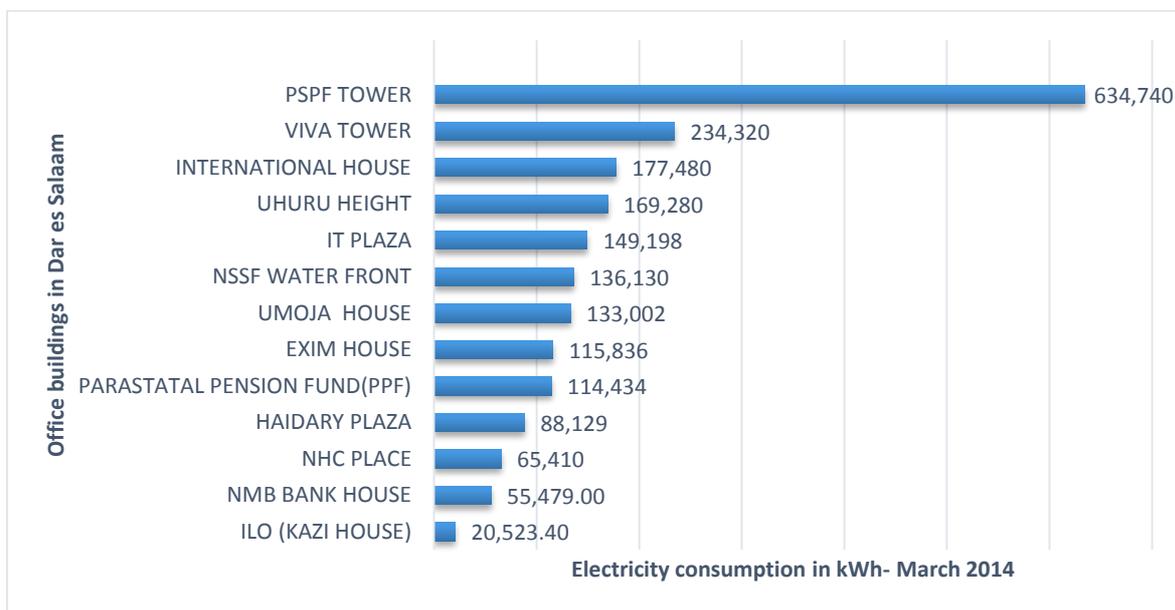
Furthermore, according to the data obtained from TANESCO, it appears that buildings constructed between 1961 and 2002 are consuming less energy even though they were transformed from using passive system for cooling to using air conditioning systems as compared to buildings constructed from 2003 to date. Most of the buildings constructed in the current architecture consume up to ten times the electricity consumed by buildings built between 1961 and 2002. It is however noted that, building sizes in terms of area and number of storeys are not of the same but the comparison is made with the consideration that even a smaller scope building like IT plaza or Exim tower consumes more energy than a bigger scale building like Ministry of Lands and Settlement or Ministry of Energy built before 2002. Figure 4.10 and 4.11 below shows the differences in energy consumptions in kWh by some office buildings in Dar es Salaam.

**Figure 4.10 Consumption of Electricity by Office Buildings Built (1961-2002) in DSM**



Source: TANESCO, 2014

**Figure 4.11 Consumption of Electricity by Office Buildings Built (2003-2013) in DSM**



Source: TANESCO 2014

According to the TANESCO director Eng. Felsichesm Mshana, in the “TanESCO na maendeleo” (TanESCO and development) episode on Tanzania Broadcasting Corporation (TBC) in 2014, the current maximum demand of electricity for the whole

country is 900 Megawatts and Dar es Salaam alone consumes about 530 Megawatts while only 24 % of the of the population in Tanzania mainland is connected to electricity (MEM, 2014). The high consumption of electricity in the current office buildings in Dar es Salaam is part caused by the glass material which is extensively used on building facades. Lack of consideration for appropriate orientation and building form to reduce a building's exposure to the sun is another factor contributing to high consumption of electricity by buildings for cooling. Extensive use of air conditioning systems and artificial lighting during the day is a trend in current office buildings and it creates a major impact in the use of electricity. There is an urgent need to dramatically change the way electricity is consumed by office buildings in urban Tanzania so that it can be more sustainable and meet the current and future needs for electricity. Energy efficiency in building design and construction is key in achieving sustainability. The current architecture of urban Dar es Salaam is far from implementing this concept. As such, the Dar es Salaam built environment provides a window for studying SDC practices for the construction sector in developing countries, particularly Tanzania.

#### **4.4 Conclusion**

This chapter discusses the architectural trends of the Dar es salaam Central Business District (CBD). First it presented the geography and climate of Dar es Salaam. The historic background and the architectural trends of office buildings over the years was discussed to draw the attention on the qualities of the built environment in relation to the concepts of SDC.

Lessons drawn from this chapter are that there is a changing quality of the built environment in Dar es Salaam. This is the result of the changing architectural trends where glass skyscrapers are dominating in a hot humid climate. Infrastructure, like roads, storm water systems, drainage systems, water supply systems are the ones built in the colonial and immediate post-colonial time. Problems like traffic jams, water

shortage and floods during rainy seasons are not uncommon. Dar es Salaam's city centre is perhaps best described as a congested built environment where glare and heat reflect off the glass facades of the mushrooming skyscrapers causing discomfort to pedestrians.

Comfort, especially for the pedestrians, is becoming less important with current architectural design and construction. Technology, for example solar reflective glass and mechanical systems like air conditioning, are widely used in order to create comfortable interiors. But what is happening outside the building, and the experience of passers-by is not considered. This is evidenced in the areas of the city that still house the colonial and historic buildings where there is a more comfortable and humane environment for people walking on street. These areas are quite different from the streets covered with glass encased skyscrapers that do not protect pedestrians from the heat of Dar es Salaam (see photos below).

**Figure 4.12 Samora Avenue (left) and Sokoine – Karimjee Drive (right): Quality of Streets Covered with Buildings Constructed during Colonial and Post-Colonial Time.**



*Source: Author, 2013*

**Figure 4.13 Mirambo Street: Quality of Streets Covered with Current Architecture.**



*Source: Author, 2013*

There are a number of design and construction principles that guide SDC practices as discussed in chapter 2. However, these principles can hardly be seen in the current architecture of Dar es Salaam. This is despite of having a basic approach to sustainability in colonial and post- colonial buildings in Dar es Salaam. This shows that architecture is driven by forces other than the basic principles of designing to take into account the environment, context, culture, people and economy. A focus on SDC practices is lacking. Why? Do policies and laws support this concept of sustainability? The next chapter examines the extent to which SDC is supported by policies, laws and procedures guiding the construction industry in Tanzania.

## 5 INSTITUTIONAL LANDSCAPE FOR SDC IN URBAN TANZANIA

### 5.1 Introduction

This chapter paints a general picture of how building design and construction projects should be undertaken and the laws and procedures involved. The main goal of this chapter is to analyze the extent to which SDC is supported by policies, laws and procedures. The chapter commences with a review of the Tanzania construction industry policy of 2003 which guides all construction activities in the country. Institutional set up for SDC, guiding laws and procedures for selecting stakeholders involved in the construction projects as provided for by the laws are discussed in the chapter. The chapter concludes by giving an overview of the status of SDC in urban Tanzania by showing the performance of the construction industry to support SDC in Tanzania.

The construction industry produces long lasting products which have a long term impact on the environment, economy and society. URT (2003) defined the Tanzania construction industry as “a sector of the economy that transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development.” This definition shows more emphasis on social and economic development leaving the aspect of environmental management aside. The Tanzania construction industry conducts a wide range of infrastructure and building construction activities, including, but not limited to, roadwork, bridges and dams and buildings. Hence it is a major component of the country’s economy by expenditure and employments. The economic impact of the construction industry in Tanzania measured by its contribution to the Gross Domestic Product (GDP). It is estimated to have grown from 7.8% in 2012 to 8.6% in 2013 (URT, 2014). The construction industry grew by 10.2% in 2010 and by 14.6% in 2013/14 (URT, 2015).

Despite the positive impact of the construction industry on the Tanzanian economy, it is a major consumer of the national budget and resources like energy and materials.

The construction industry's consumption of the national budget grew from 13.0% in 2010/11 to 20.6% in 2011/12 (Mgimwa, 2012). In terms of consumption of resources, it is estimated that under the current practice the construction industry will demand about 39.7% of the total electricity produced in the country by the year 2040 (Kichonge, John, Mkihala, & Hammer, 2014). Hence the construction industry creates an opportunity for Tanzania to invest in SDC practices to reduce the amount of resources used and wastes produced that are associated with construction activities in the country.

## **5.2 Construction Industry's Guiding Policy and SDC**

The construction industry in Tanzania is regulated by the Ministry of Works through the Construction Industry Policy of 2003. The Construction Industry Policy of 2003 is an umbrella policy guiding all construction activities in the country. It caters for all activities in the construction industry in Tanzania to ensure compliance to the national social and economic development goals. The policy guides a number of activities in the construction industry including, promoting and ensuring appropriate construction practices and technologies and that products are not harmful to both the environment and human health. The Construction Industry Policy of 2003 also addresses issues of improving capacity and the competitiveness of local construction actors, mobilizing adequate resources from both public and private sectors for construction purposes and improving coordination and collaboration among actors in the industry.

In order to achieve the goals outlined in the construction industry policy, the policy stipulates strategies. These strategies are provided in section 8.2 covering a number of cross cutting issues in the industry. Two strategies of interest to this study are in section 8.2.1 and 8.2.2 on the application of appropriate building regulations and standards and promoting the application of (environmentally) sustainable construction practices. Section 8.2.1 (a) addresses the issue of having outdated

building regulations, lack of enforcement, and lack of appropriate regulations and standards as factors contributing to the poor quality of products and services in the construction industry. Part (c), in the same section, calls for the formulation and updating of building regulations and standards.

Section 8.2.2 (a) covers the issue of environmental damage and health hazards caused by poorly managed construction activities. In this section, the policy acknowledges that there are a number of activities in the construction industry that are not environmentally sustainable due to a lack of awareness and technological knowhow to achieve environmentally sound practices. Policy directions stipulated in part (c) in the same section include; to promote and undertake research programmes geared toward application of technologies, products, and practices, which are not harmful to the environment, human health and safety; to promote education and training programmes on environmental sustainability, sustainable construction practices and human health and safety issues; and to establish procedures for environmental impact assessments (EIAs) for all projects and to enforce their application.

The construction industry policy of 2003 supports SDC practices to a certain extent. It offers policy directions that are geared towards the adoption of SDC in the construction industry. However, there are loopholes in the policy that delay the adoption of SDC in the Tanzania construction industry. The loopholes include a too broad Construction Industry Policy 2003 where by buildings are not given the required attention due to the lack of detailed policy directions for their development in a sustainable manner. Emphasis on environmental development and sustainability construction industry policy is lacking, making the three pillars of sustainability namely, environment, social and economy to not have equal attention in the policy. In the same vein, the policy offers only a detailed explanation of the importance of the construction industry to the economy and economic development of the country in section 3.0 and section 4.1. Explanations on the importance of the construction industry to the environment and social-cultural development is lacking. Furthermore,

the policy lacks a clear definition of SDC to guide the industry, which also contributes to the lack of understanding and awareness of SDC among stakeholders.

### **5.3 Governmental Regulatory Institutions and Regulations for SDC**

#### **5.3.1 National Environmental Management Act No. 20 of 2004**

Following the resolution of the Stockholm Conference on Environment and Development in 1972 on establishing and strengthening national environmental councils to advise the government and international communities on environmental issues, the government of Tanzania established the National Environmental Management Council (NEMC) in 1983. NEMC is now guided by the National Environmental Management Act (EMA) No. 20 of 2004. The main purpose of establishing NEMC was to undertake enforcement, compliance, review and monitoring of environmental impacts assessments and to facilitate public participation in environmental decision making (URT, 2004). According to EMA, 2004, functions of NEMC includes to carry out environmental audits, to enforce and ensure compliance with national environmental quality standards and to render advice and technical support.

NEMC is becoming an important player in the construction industry to fulfill the requirement for Social and Environmental Impact Assessments of construction projects in Tanzania. NEMC supposed to conduct Environmental Impact Assessments (EIAs), which are mandatory for multistory buildings in the city center, large-scale projects and for aid funded development projects. EIAs look for any negative environmental impacts of the project. However, the EIA is undertaken as a standalone process and it is normally done at a late stage in the design phase. It has almost no integration with the design phase because there is no room to influence the design towards environmental sustainability (Mwalyosi, Hughes, & Howlett, 1999).

Furthermore, Mwalyosi, Hughes, & Howlett (1999) pointed out that stakeholders lack awareness of and pay little attention to EIAs. If designers were paying more attention to EIAs at their early stages of their project designs, then the EIAs would contribute more to SDC.

### 5.3.2 National Construction Council Act of 2008

The National Construction Council Act, 2008 governs the development of the construction industry in Tanzania. It empowers the National Construction Council (NCC) to coordinate all the institutions engaged in construction industry activities. Part II section 4 (a-o) states fifteen functions of the council, which range from advising the government, providing technical assistance, coordinating training and research, monitoring implementation of regulations and standards, evaluating performance of the construction industry to resolving disputes in the construction industry. In terms of promoting SDC practices, specifically, section 4 (m) states one function of the council is to promote environmentally sustainable construction practices including health and safety aspects. Section 4 (h) deals with the promotion of innovative technologies and the application of best practices in the construction industry. Environmental sustainability is mentioned in general terms in the act without providing a clear guide on how it can be achieved. Furthermore, the act lacks a clear guide for promoting sustainability in the construction industry, which also includes the economic and social aspect of sustainable construction activities. Following the functions of the NCC mentioned above, that include advising the government and evaluating the performance of regulations in the industry, NCC has a potential to influence the adoption of SDC in the construction industry if there is awareness and understanding of the benefits of SDC to the country's economy, environment and social set up.

### 5.3.3 Architects and Quantity Surveyors Registration Act No. 4 of 2010

The Architects and Quantity Surveyors Registration Act. No.4, of 2010 is the principle legislation guiding architectural and quantity surveying in the country. It provides power to the Architects and Quantity Surveyors Registration Board (AQRB) to regulate the activities and conduct of the architects and quantity surveyors and their firms in Tanzania. Part II section 5 of the act provides a list of functions of the board, which includes registering architects, quantity surveyors and their firms, inspecting construction sites to verify if they are in accordance with regulations and laws, promoting continued professional development (including new concepts such as SDC) and facilitating training and offering advisory services to the public and the construction industry. For example, for architects, section 5 (1) of AQRB act No.4 of 2010, provides 17 functions of the board which were formulated with the aim of; *Monitoring, regulating and safeguarding professionalism; protecting the health, safety and welfare of public through regulation of practice; promoting awareness for both the public and professionals; collaborating with regulatory organs and stakeholders.* Some of the functions stipulated in section 5(1) include:

1. Regulate the activities and conduct of architects, quantity surveyors and their firms, graduate architects, graduate quantity surveyors, architectural technicians, and architectural draughts men;
2. Enter building sites and inspect building or construction works for the purpose of verifying and ensuring that the works are undertaken by registered architectural or quantity surveying firms and that the works comply with all governing regulations and laws of the country including the requirement for safety; a signboard, which shows the title of the project, names, addresses, phone numbers, and e-mails of the client, architect, quantity surveyor and, project registration stickers allowing for legal action to be taken against the defaulter there of;
3. Promote, monitor and provide continuing professional development opportunities and facilities for the study and training in architecture, quantity surveying and allied subjects;

4. Take disciplinary action against architects, quantity surveyors and other semi-professionals registered by board;
5. Liaise with both local and international professional boards and associations involved in the construction industry for the purpose of consultations, exchange of ideas, and experiences;
6. Promote and enforce professional conduct, ethics and integrity for architects, quantity surveyors and firms practicing in Tanzania;

While, the issue of SDC practices is not mentioned in the act, it is not prohibited either. It is left for the boards to include the topic in the continuing professional development training. This create and opportunity for AQRB to support SDC through continuing professional development seminars and trainings offered.

#### 5.3.4 Contractors Registration Act of 1997

The Contractors Registration Act, 1997 empowers the Contractors Registration Board (CRB) to register and regulate the conduct of all contractors in the country. Key functions of the board as stipulated in part II section 4 of the Act include: registering all the contractors in the county; inspecting construction activities at site to enforce laws and regulations; offering training, courses and workshops to contractors and regulating their activities in general. Specifically section 4(M) stipulates one of the functions of the board is *“To ensure that all construction sites are horded and labor laws, occupation health and safety regulations in the construction industry are adhered to.”* This section focuses on the health and safety of workers in construction sites as part of the main activity of regulating contractors’ conduct. However, regulating contractors’ conduct in the aspects of environmental protection, as well as economic and social considerations is not mentioned in the act. There is room for CRB to influence and promote SDC practices through trainings, workshops and their participation and influence in the review of different policies in the country.

### 5.3.5 Engineers Registration Act No. 15 of 1997

The Engineers Registration Board (ERB) which is responsible for monitoring and regulating engineers' activities in the country is guided by the Engineers registration Act No. 15 of 1997. Part II section 4 of the act stipulated key functions of the board. These include: *"To sponsor, arrange and provide for facilities for the study of and for professional trainings in engineering"*; in section 4(d), *"To promote and maintain professional conduct and integrity of the engineering profession"*; in section 4(e) and in section 4(f) *"to arrange for the publications and disseminations of materials produced in connection with the work and activities of the board."* These specific functions of the board provide an opportunity to promote SDC practices through professional trainings the board can sponsor or organize, through publications and dissemination and through the process of maintaining professional conduct and the integrity of engineers. However, more awareness and understanding of SDC is needed and it needs to be clearly stipulated in the act.

### 5.3.6 Tanzania Local Governments Act of 1982

Local Government Authorities (LGAs) as part of the Tanzania government system were established to strengthen peoples' participation in making and implementing decisions that directly affect their livelihood at the local level. A major goal is to promote development and democracy at local level. LGAs are guided by the Tanzania Local Governments Act of 1982. Part v section 54 of the act stipulates three key functions of the LGAs. These are (a) *to maintain and facilitate the maintenance of peace, order and good government within its area of jurisdiction.* (b) *to promote the social welfare and economic well-being of all persons within its area of jurisdiction.* And (c) *subject to the national policy and plans for rural and urban development, to further the social and economic developments of its area of jurisdiction.* It is clear from the key functions, the priority of LGAs is centered towards social and economic development. However, section 55 (b) stated one of the duties of an urban authority is; *to take and*

*require the taking of measures for the conservation of natural resources, the prevention of soil erosion and the prohibition and control of cultivation* and section 55 (g) focuses on preventing health problems that can be caused by poor sewage and rubbish collection systems. Specifically these two duties of urban authorities broadly touch the aspect of environmental protection and management through protection of natural resources and management of wastes. Based on LGA's (urban authorities) duty stipulated in section 55(g) there are a number of initiatives in place to deal with environmental protection and management. One of the initiatives was the Dar es Salaam Sustainable Project (DSP) as part of the sustainable cities programme initiated by UN-Habitat and UNEP to promote socially and environmentally sustainable human settlements by enhancing the capacities of local government authorities in environmental planning and management practices (UN-Habitat & UNEP, 2005).

DSP was established in 1992 following the government of Tanzania's request to UNDP for technical assistance to review the Dar es Salaam Master Plan because of increasing environmental problems and unguided growth of the city (UN-Habitat & UNEP, 2005). The government's desire to partner with UN-Habitat and UNEP stemmed from wanting to ensure sustainable human development by responding to environmental challenges and constraints faced by the city (Burian, 2000). The environmental problems referred to by the Tanzania government in its request to UNDP, which became the focus for the DSP, were uncollected garbage, air pollution, and traffic congestion that posed threats to health and created hazardous conditions for city dwellers. The overall objective of the DSP was to "promote environmentally sustainable growth and development in Dar es Salaam city by strengthening local capacities to plan, coordinate and manage urban development in a way that would enhance availability and use of natural resources and reduce exposure to environmental hazards" (UN-Habitat & UNEP, 2005).

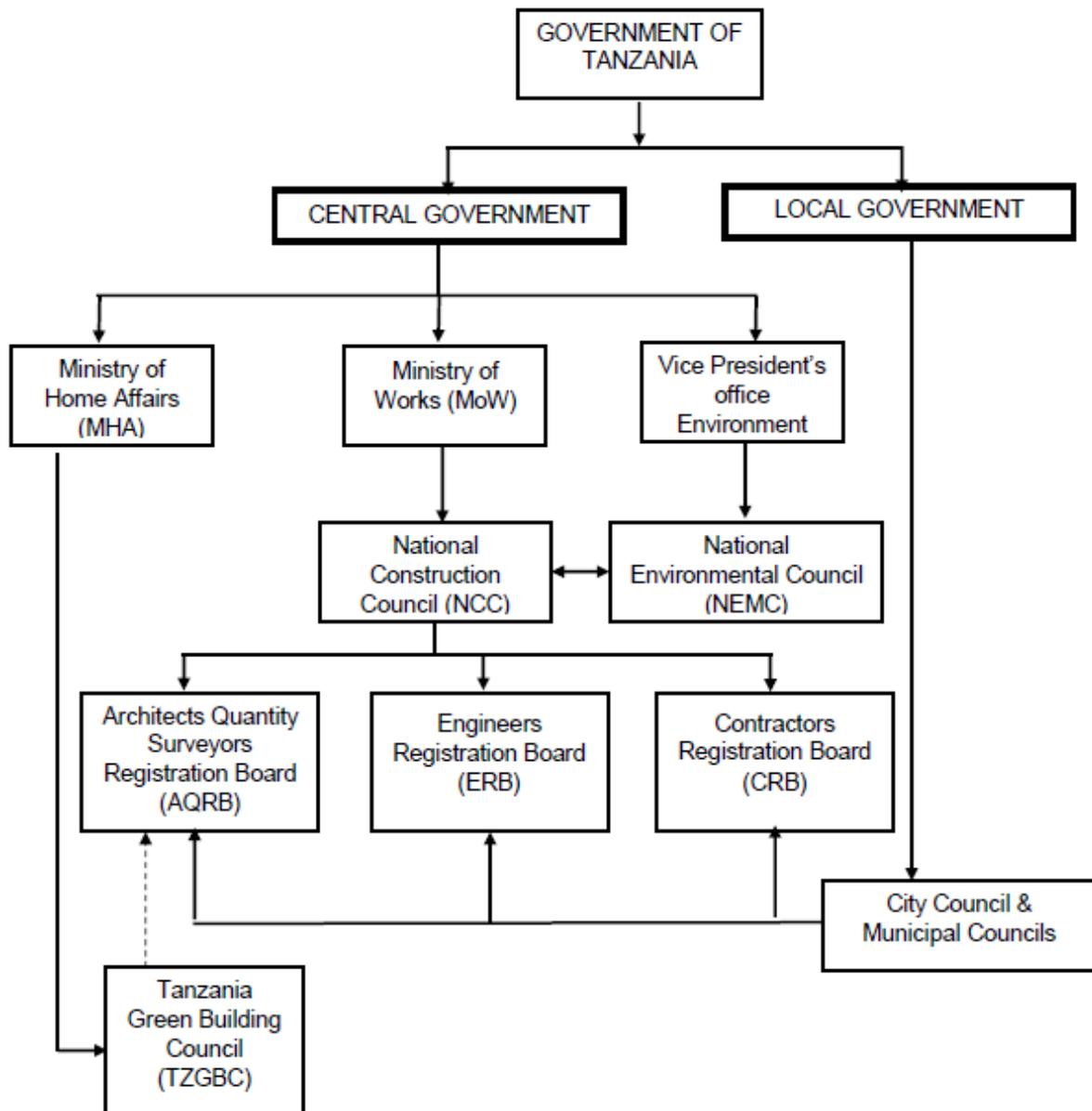
One major output of the DSP is the establishment of environmental city profiles for Dar es Salaam and other cities involved in the project. According to the URT (2004)

there was inadequate solid waste management, overcrowding, unplanned and poorly serviced settlements, increasing vehicular and pedestrian congestion, air pollution, and surface and ground water pollution. DSP's major environmental goals were to improve solid waste management, upgrade un serviced settlements, better manage surface water and liquid wastes, improve air quality and urban transportation, better manage open spaces and recreational areas and integrating petty traders into the legal economy, and better managing urban agriculture (Burian, 2000). This implies that the DSP focused only on urban planning and management with the goal of cleaning up the city, improving service provision and creating a proper management scheme for the city. However, the impact of building design and construction, particularly for office buildings, on the built environment in terms of energy consumption, water conservation, building materials and waste reuse and recycling was not a direct concern of the DSP.

#### 5.3.7 Tanzania Green Building Council (TZGBC)

The Tanzania Green Building Council was established in January 2014 and registered in the country through the Ministry of Home Affairs in October 2014. TZGBC was established to mainstream the practice of green design and construction in Tanzania. It is an independent national organization that creates a platform for promoting environmental friendly, sustainable, efficient and healthy planning, design, construction and use of buildings in Tanzania. TZGBC is in its infancy. It is a replica of the Green Mark Singapore modified for the Tanzania context. From its establishment, it has contributed to promoting awareness of environmentally friendly design and construction through conferences conducted in Dar es Salaam and Arusha in 2014 and 2015 respectively. TZGBC has a goal of making changes in the construction industry towards sustainability by influencing policy, building codes and the professional regulatory bodies and the community at large. The establishment of the TZGBC in Tanzania is a milestone for Tanzania to join the international move towards sustainability.

Figure 5.1 Institutional Set Up for SDC: Featuring National and Local Governments Institutions



Source: Author's construct, 2015

### 5.3.8 Other Institutions and Their Regulations

There are other institutions established under the Executive Agency Act No. 30 of 1997 involved in the construction industry, depending on the nature and scope of the construction activities. These include the Tanzania National Road Agency (TANROAD), Tanzania Building Agency (TBA), Business Registration and Licensing Agency (BRELA), Occupational Safety and Health Administration (OSHA) and the Public Procurement Regulatory Authority (PPRA). Figure 5.1 below presents the hierarchal structure of the construction industry's institutional set up.

**Table 5.1 Overview on Institutions, Regulations and Their Focus**

<b>Government Institution</b>	<b>Regulation</b>	<b>Focus</b>
Ministry of Works (MoW)	<i>The Construction Industry Policy of 2003</i>	Guide all construction activities in the country.
National Environmental Management Council (NEMC)	<i>National Environmental Management Act No. 20 of 2004</i>	Enforce, monitor, review and assess environmental impacts and facilitate public participation in environmental Management practices.
National Construction Council (NCC)	<i>The National Construction Council Act of 2008</i>	Coordinate all institutions in the construction industry.
Architects and Quantity Surveyors Registration Board (AQRB)	<i>Architects and Quantity Surveyors Registration Act No. 4 of 2010</i>	Regulate activities and conduct of architects and quantity surveyor.
Contractors Registration Board (CRB)	<i>Contract Registration Act of 1997</i>	Monitor and to regulate contractors activities.
Engineers Registration Board (ERB)	<i>Engineers Registration Act No. 15 of 1997</i>	Monitor and to regulate engineering activities.
Local Governments Authorities (LGAs)	<i>Tanzania Local Governments Act of 1982</i>	Promote development and democracy at local levels.
<ul style="list-style-type: none"> <li>▪ Municipal Councils</li> </ul>	<i>Tanzania Local Governments Act of 1982</i>	Regulate construction activities by issuing building permits, inspect construction sites and

		issuing certificate of occupancy in respective municipals.
Tanzania Green Building Council (TZGBC)	-	Promoting awareness on green and sustainable design and construction.
Tanzania National Road Agency (TANROADS)	<i>Executive Agency Act No. 30 of 1997</i>	Develop and maintain road networks.
Tanzania Building Agency (TBA)	<i>Executive Agency Act No. 30 of 1997</i>	Provide design and construction consultancy for government funded projects.
Business Registration and Licensing Agency (BRELA)	<i>Executive Agency Act No. 30 of 1997</i>	Administer and regulate business companies.
Occupational Safety and Health Administration (OSHA)	<i>Occupational and Health and Safety Act. No. 5 of 2003</i>	Regulate healthy and safety practices for workers and of workplaces.
Public Procurement Regulatory Authority (PPRA)	<i>Public Procurement Act of 2004</i>	Regulate all procurement activities by public bodies in Tanzania.

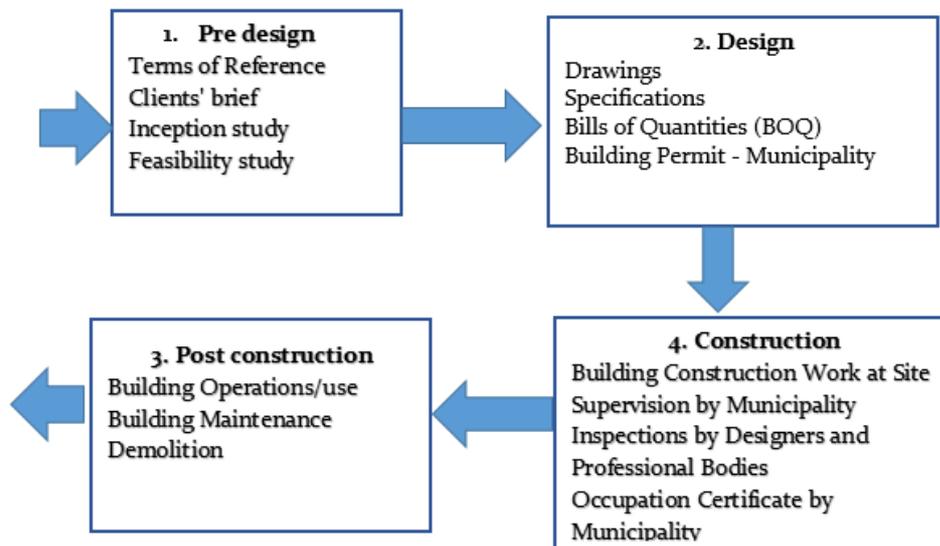
(Source: Author's construct, 2016)

## 5.4 Procedures as Provided for by Laws

### 5.4.1 Building Design and Construction Implementation Procedures

The building design and construction implementation process in Tanzania can be divided into four main stages, namely; pre-design, design, construction and post-construction. Figure 5.2 below shows the main stages of the design and construction process and key procedures undertaken within each stage.

#### Figure 5.2 Main Stages of the Design and Construction Process and Key Procedures



*Source: Author's construct, 2015*

Design and construction activities are the main tasks undertaken by the operational stakeholders (architects, engineers, quantity surveyors and contractors) who are supposed to work in teams. The formation and nature of a team depends on the nature and scope of the project and the method used for engaging a consulting team. There are two main ways consultants are involved in construction projects in Tanzania. There is the traditional approach and the design and build approach. Traditional approach is where the client / developer engages an architect or a team of designers to undertake the project. This is when the architect becomes the team leader and he or she is referred to as the main consultant with the role of coordinating and managing the design tasks and inspecting the construction work together with other consultants. In a design and build method the contractor is directly approached by the client and becomes the team leader. The potential for SDC practices in the two approaches depends on the awareness and understandings of SDC by the client and architect in the traditional method while in the design and build approach the contractor also has room to influence SDC practices.

The four main stages of the design and construction process highlighted in figure 5.2 above, involve a number of sub-stages and teams of different stakeholders. Key stakeholders involved are the developer/client, designers, contractors and building users. Their involvement in the design and construction activities are guided by the regulations, laws and acts of the professional regulatory boards they belong to and the general policy guiding the construction industry in Tanzania (URT, 2003). The following section discusses procedures for the selection and appointment of key stakeholders involved in the design and construction activities.

#### 5.4.2 Methods for Selection and Appointment of Consultants

As discussed in section 5.4.1, design and construction activities start with the developers/client engaging a consulting team. According to the Public Procurement Act (PPA) of 2004 and its regulation of 2005 (selection and employing a consultant) used in Tanzania for public funded projects, the developer is required to invite an Expression of Interest (EoI) by advertising in local or international media or by inviting a few consultants to compete. The level of competition for the consultants is based on the four categories stipulated in the regulation (2005) where either international competitive, national competitive, restricted competitive or single source selection can be used. The appropriate category and level of competition is left to the developer/client to decide based on the project value, scope and nature of the project.

Selection criteria of a winning consultant depends on the criteria specified in the Public Procurement Regulation (PPR) 2005. This includes, selection based on technical quality, selection based on the technical quality with price consideration, selection based on compatibility of the technical proposal and the least cost consideration, and selection based on quality and fixed budget. The developer is left to choose any of the four selection criteria depending on the project complexity and its expected output. The evaluation of the submitted proposals to get the winning

consultant is done by assessing the quality of the proposal submitted and the proposed cost for undertaking the work. The evaluation of the quality of the proposal focuses on the experience of the consultant, his/her professional reputation, his/her knowledge of the project environment in Tanzania, inclusion of local firms and expertise in the team, understanding of the terms of reference, the overall quality of the proposed plan and methodology for undertaking the task and language proficiency (URT, 2005).

The main objective of the project starts with the developer/client. If the project is to meet sustainability targets this needs to be communicated to the consulting team through the term of references for the project (TOR) in the pre-design stage. However, the method for selection and appointment of consultants specified in the PPR 2005 does not give room for achieving a sustainability target in the criteria for consultant's selection. The selection criteria according to PPR 2005, is primarily based on the quality of the proposal and the cost for undertaking design work. However, the consultants' selection and appointment method shows a potential to include SDC measures in the evaluation criteria for quality of the proposal.

#### 5.4.3 Method for Selection and Appointment of the Contractors

Similar to the appointment of consultants, contractors' selection and appointment is also specified in the PPR 2005 (for goods, works, non-consultants services and disposal of public assets by tender). International, national and restricted tendering are also the categories required for inviting contractors. Key criteria for the selection of contractors specified in the PPR 2005 include contractors proposed cost for undertaking construction work, efficiency, equality of participation, transparency and fairness (URT, 2005). In terms of contractors application of sustainable construction practices, for example, minimizing waste, minimizing use of resources and the amount of embodied energy that goes in acquiring building material and construction activities does not feature in the PPR's selection criteria. The nature of the

appointment of the contractor, like in many other countries, is that the contractor is an implementer of the developers' ideas, through the consultants' design and specifications. So at this point the responsibility of applying SDC practices is left to the developer and consultants' initiatives, unless that practice is an added advantage to the contractors' profit then the contractor will not consider it without being told by the consultants or the developer.

#### 5.4.4 Building Permit and Issuing Process

Local Governments Authorities (LGAs) through municipal councils and the Tanzania Building Agency (TBA) are the two agencies in Tanzania responsible for issuing building construction permits. LGAs issue building permits for all building construction projects (except government buildings) taking place in their respective municipalities. The TBA issues building permits for government funded projects. For Dar es Salaam city alone, there are three municipalities (Ilala, Kinondoni and Temeke) that issue building permits for their respective administrative zones. The issuance of building permits is based on the urban development standards and drawings submission requirements required by the municipality. The submission requirements differ from one municipality to another but the procedures for scrutinizing the drawings submitted are similar to all municipalities.

According to By- laws in some LGAs, for instance Kinondoni Municipality, the developer is required to submit four sets of architectural drawings (at scheme design level) and two sets of engineering drawings with calculations of structural stability, copies of the legal ownership of the plot and the application form and pay the required fees. Once the request is received and the fees are paid, the drawings are scrutinized based on the development standards established by the municipal council for the specific zone where the project will take place. Conformity to the development standards are based on the standards for the total built up area allowed, plot coverage, plot ratio, building height and setbacks.

The files with submitted drawings rotate from one department to another for approvals. The five departments that approve or reject the request for building permits include the lands department for legal ownership issues, town planning department for conformity with urban development conditions, environment health department for waste water disposal, architecture department and the engineering department. Through their respective departments, the Municipal Land Officer, Municipal Town Planner, Municipal Environmental Health Officer, Municipal Architect, and Municipal Engineer have to scrutinize the requests based on specific issues of concerns in their departments before gaining the consent of the urban planning committee. After issuing the building permit, the municipal officials have the responsibilities to inspect the site before issuing the permit and after issuing the permit to confirm that the construction process is in accordance to the approved drawings.

In terms of SDC practices in the building permit issuing process, the basic principles of SDC practices are yet to be considered by the local government departments that approve the drawings. Focus on the approval process is centered on land use, building use, structural stability and waste water disposal. The department of environmental health is looking into the waste water disposal systems proposed. This implies that there is room in the building permit process to include principles of SDC including, measures for water efficiency, energy efficiency, reduction of the use of resources and waste in the building products.

## **5.5 Conclusion**

It appears that there is a good intention by the government in terms of policy to mainstream and promote SDC practices in the construction industry but not in the design. However, there are some loopholes in the policy and laws that guide the construction industry. This includes, the lack of mechanism to enforce laws, lack of a

clear definition of SDC in the policies and laws to guide the industry towards SDC practices and the lack of emphasis on buildings design and construction in the umbrella policy guiding construction industry in Tanzania. Furthermore, Tanzania does not have a building law in place like those found in many other countries, whereby the building law could give a clear guide for building development in a sustainable manner.

Professional registration acts and the procedures for appointing design and construction teams and the public procurement procedures used in Tanzania do not offer adequate guides for SDC practices. The professional regulatory bodies and procurement methods leave the doors open for professionals to design and build according to the paying client's need as long as it is within national laws, which neglect sustainability. Likewise, in the building permit process, there is a lack of the initiatives for SDC practices among the local governments/municipal councils who are responsible for giving building permits.

As an effort to promote SDC practices in Tanzania, there are a number of initiatives by the government, NGOs and international organizations to deal with one or some key issues related to sustainability in the built environment. Examples of the initiatives include the establishment of a sustainable cities project by the UN in 1993 – 2003, The initiative on energy efficiency in buildings by the UN-Habitat in collaboration with UNEP and the Tanzania Government in 2011, conducting energy audits for some government buildings in 2002 – 2004 by the government following recognition of increasing energy consumption by government office buildings in Dar es Salaam and the US Presidential Power Africa project initiative of 2013. However, a mechanism is lacking to enforce recommendations from different initiatives.

The major focus of the initiatives by the government, NGOs and international agencies center on the efficient use of electricity and the provision of electricity to a bigger population in Tanzania. Other basic principles of sustainability like water

efficiency, the use of appropriate building materials, social and economic sustainability are yet to be promoted in the Tanzania construction industry.

Lack of coordination of the cross cutting issues in different policies in Tanzania hinders the adoption of SDC practices. For example, the National Energy Policy of 2003 provides policy statements that call for energy efficiency and conservation by all other sectors in Tanzania. But the same attention to energy efficiency is lacking in the construction industry policy. Instead the construction industry's policy generally calls for sustainable construction practices that are environmental friendly.

Lastly, it is clear that the inclusion of SDC practices depends of the awareness and acceptability of the concept among the stakeholders. Lessons drawn from this chapter show the need for increased awareness and understanding of SDC among the Tanzania construction industry stakeholders. The next chapter deals with key stakeholders' and their awareness and understanding of SDC.

## **6 KEY STAKEHOLDERS AND THEIR UNDERSTANDINGS OF SDC**

### **6.1 Introduction**

This chapter presents empirical findings in regard to the understandings of SDC (sustainable design and construction) among key stakeholders in the construction industry in urban Tanzania. Stakeholders in this study means actors in the policy, managerial and operational aspects of the construction industry. The chapter commences by mapping and discussing stakeholders with the most influence over the implementation of sustainability in the construction industry before embarking on a discussion of how stakeholders understand the concept of SDC. Stakeholder familiarity and meanings of sustainability are examined. The chapter concludes by reflecting on the mapping of stakeholders and their understandings of sustainability.

### **6.2 Most Influential Stakeholders and Stakeholders Mapping**

#### **6.2.1 Findings from Policy Stakeholders**

Policy stakeholders interviewed pointed out that local governments, which include the three municipalities in Dar es Salaam (Kinondoni, Ilala and Temeke), are the most influential stakeholders for the implementation of SDC. Major roles of the local governments in relation to the built environment are to establish urban development standards, to issue building permits and to manage the built environment by following up the implementation of the approved drawings at the site, and eventually issuing the occupancy certificates at the end of construction stage. Certificates of occupancy are issued by the municipal councils to certify that the construction is in accordance with the approved drawings and hence safe for occupation.

Stakeholders elaborated that the local governments have the most influence over other stakeholders because there is room to include principles of SDC in urban

development standards, building permit regulations and in issuing certificates of occupancy. As such, other stakeholders will have to adhere to local government regulations in order to get building permits and certificates of occupancy. One respondent narrated:

*“... in the Tanzanian system, local government is the most influential player in the construction industry because they give out building permits, they approve drawings, for example, the approval for a building permit has to go through seven departments for scrutiny, that is urban planning, architecture, land officer, structural engineer, fire safety, and more. If a sustainable design requirement has to be put in the regulation that one must conform to before getting a building permit, people will comply. Local governments have a considerable authority because all cities in Tanzania are under local governments and inside the local governments you will find the professionals like architects, engineers, quantity surveyors, and planners.”* (Training officer, ERB, Interviewed on 30<sup>th</sup> October 2013, in Dar es Salaam. Translated from Swahili)

However, other policy respondents are of the opinion that professional regulatory bodies such as AQRB, CRB, and ERB have the most influence over the application of principles of SDC in Tanzania. According to these respondents, if the regulatory bodies require their professionals to design and implement the design in respect to sustainability and if the developers are aware of the benefits of SDC and demand it in the design, then the consultants will have no choice but to deliver. According to one respondent:

*“I think professional regulatory bodies (have more influence), because they deal with professionals who produce buildings. If more awareness is created with the professionals, and the bodies require them to implement, they will adopt and be key stakeholders to influence the whole industry...”*

(Assistant registrar, AQRB, interviewed on 26<sup>th</sup> November 2013, Dar es Salaam. Translated from Swahili)

The functions of the boards as discussed in chapter 5 section 5.3.3, stretch from regulating professional activities and conducting training, to enforcing professional conduct. This implies that through the functions of the board, the principles of SDC can be taught and enforced, hence making professional regulatory bodies important stakeholders to influence change towards sustainability in the construction industry.

Furthermore, some of the policy respondents are of the opinion that academic institutions are the most important stakeholders in regard to the application of the principles of SDC. Other respondents mentioned building developers, while others are of the opinion that urban planners and architects are the most influential stakeholders.

In a focus group discussion with teachers and students at Ardhi University, participants felt that politicians have a great influence in promoting new ideas in the country. All participants overwhelmingly agreed that the most important stakeholder for the application of principles of SDC in Tanzania are politicians. To illustrate this point, one of the participants explained that once the politicians are aware of the advantages of SDC, they will be willing to advise and set policies and laws to influence change. As he narrates:

*“Important stakeholders are politicians, because politics is everything here (in Tanzania), once there is a political will everything is possible. If we need to move forward with this concept of sustainability, we need politicians on board and from politicians we need some who can advise the president ... so when the government is advised and politicians agree, we will definitely have policies, laws, and regulations in place and we will*

*move forward. Otherwise we will be just talking about it ...*” (Focus Group Discussion, Ardhi University, 30/4/2014. Translated from Swahili)

Involvement of politicians to get things done was also pointed out in a national symposium organized by the Uongozi Institute: Institute of African Leaders for Sustainable Development in Dar es Salaam in August 2014, on “Making Urbanization Sustainable: Meeting the Challenges of Implementing Urban Master Plans”, where I attended as a participant. The challenges of implementing urban master plans in Tanzania was an important topic of discussion. A number of challenges were discussed, including, lack of coordination in the planning process, plans are not long term, and the bureaucracy in the approval and implementation process. But in the end most participants pointed out that, there is a need to involve politicians if urban master plans are to be implemented. One of the participants explained:

*“Politics have a lot to do with the laws, with decision making processes, and in policy making. When we talk about politics, we talk about people, we talk about participation so we cannot ignore politicians, for master plans to be successful and implemented in time we need politicians in...”*

(Participant, Uongozi symposium, August 2014, Dar es Salaam)

Emphasizing the need for involving politicians, one of the resource persons in the symposium, Prof. Ivan Turok of the Human Sciences Research Council, South Africa, elaborated that planning is an inclusive process, politicians have to intimately be involved, to get them to feel that they are partners, owners of the process and get their support. He added that politicians are vital to achieve sustainable planning in Tanzania. The first step is to get them involved and then laws and regulations will follow.

Therefore, policy stakeholders believe that the application of SDC principles in Tanzania will take place if politicians, local governments, professional regulatory

bodies, academic institutions and building developers take their roles to lead and influence change.

#### 6.2.2 Findings from Managerial Stakeholders

Expert interviews with managerial stakeholders revealed that many of the respondents are of the opinion that academic institutions, including Ardhi University and the University of Dar es Salaam, have the most influence over whether the principles of sustainable design are to be applied in the country. Ardhi University and the University of Dar es Salaam are two older and prominent universities that produce architects, engineers, quantity surveyors and urban planners who play big roles in the construction industry. In elaborating the influence of academic institutions towards sustainability practices, one of the respondents shared his experience on how academic institutions are utilized to make changes in the built environment.

*“Higher learning institutions have a big influence ... Of recent I was in Kampala (Uganda) attending a meeting and I learnt that the Kampala city authority is depending more on people from academic institutions to advise them on many issues. The president appoints people who are affiliated with a university to discuss issues with the city authority with researched evidence and the results are included in implementation. We don't have this system in our country”* (City Planner, Dar es Salaam City Council planner, interviewed on 3<sup>rd</sup> December, 2014 in Dar es Salaam)

The respondent above given an example of Kampala a successful example on how to use expertise from the academic institutions to create changes in the construction industry. He learnt from another country where the president appointed someone who has done research on a certain issues and contributed to problem solving with researched evidence. This is in addition to other respondents who mentioned the teaching professional as one the influence of the academic institutions.

Other managerial stakeholders are of the opinion that architects, together with other designers, are the most important actors with influence over the application of the principles of SDC. According to the respondents, architects are the professionals who come up with the design, so they know better about the best design and construction solutions compared to others in the construction industry. One of the respondents, stressing the influence of designers over other stakeholders, had this to say:

*“Architects themselves together with engineers and quantity surveyors (have the most influence). Because they are the ones who come up with design solutions and the government is there but they are not professionals, they are politicians and they are waiting for professionals to tell them... The government is driven by people, it listens to people and gets reactions from people on certain issues...”* (Dar es Salaam city Quantity Surveyor, interviewed in Dar es Salaam, on 10<sup>th</sup> December 2013. Translated from Swahili)

The role of architects and other professionals to advise the government, as pointed out by the respondents, is considered crucial by most managerial stakeholders. However, other managerial stakeholders believe that the government should take the leading role by setting policies and laws for professionals to follow. One of the respondents gave this opinion:

*“There must be a responsible government. Government must think of future plans in the sense that they need to look at where the city is going. For example, demolition of old buildings to put up new buildings done by the government, we lose our architectural heritage. Dar es Salaam was planned with nodes, landmarks and roads with air pockets, but they are not there anymore ... unfortunately we don’t have any policies, we are not informed ... the government has responsibilities to set policies to guide the built environment that include sustainable planning and construction...”*

(Urban planner/ Senior lecturer, interviewed in Dar es Salaam on 13<sup>th</sup> January 2014.)

The earlier planning process for Dar es Salaam and production of a master plan started in 1978. Planning was last revised in 2012 (ongoing). According to a respondent, the main features of the earlier plans are disappearing to give room for new proposed plans. The main concern of this respondent is that, potential urban planning features and architectural heritage are disappearing because of government decisions. If the government was better informed, it could make better decisions to influence the practice of SDC through policies.

Some managerial respondents believe that instead of the central government, policy makers, including the National Construction Council of Tanzania (NCC) have the most influence on the application of principles of SDC in Tanzania because of their roles in the construction industry. This was narrated by a respondent:

*“The first stakeholder with influence is the National Construction Council (NCC). NCC is the leader in the construction industry in putting policies, regulations and laws in place...”* (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

This implies that the issue is to have policies in place to guide professionals and other stakeholders in the application of the principles of SDC in Tanzania. Therefore, for managerial stakeholders interviewed, academic institutions are the most important stakeholder for the application of principles of SDC in Tanzania. Whereas second on the list is architects and other designers, followed by the central government and policy makers.

### 6.2.3 Findings from Operational Stakeholders

Expert interviews with operational stakeholders revealed that nearly one half of the respondents in this category believe that teaching institutions in Tanzania can be a powerful stakeholder with influence over the application of the principles of SDC. According to operational stakeholders, teaching institutions can create a good foundation for understanding the principles of SDC. One respondent in the category of operational stakeholders elaborated how academic institutions can influence the construction industry:

*“The most important stakeholder would be schools of architecture. Because teachers and students are the people who are going to continue with design. So they have the most influence. Architects have to really be knowledgeable in this area so that they start influencing the public by example, not by talking but by designing designs that can be emulated. Then people will understand what they mean. Otherwise, lectures are not enough. We don’t need any lectures on sustainability, we need people - architects, engineers who can assimilate the concepts and use them in their designs ...”* (An Architect/retired lecturer/ Director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 11<sup>th</sup> October 2013.)

Teaching should be the foundation on which the principles of SDC practices will be implemented. However, as noted earlier, the teaching curriculum in the school of architecture is missing the component of SDC in its undergraduate and master’s programme. But the above respondent raised another point, that teaching alone is not enough. Sustainable designs needs to demonstrated in buildings, for example at the university campus, for others to learn and appreciate. Another respondent is banking on the young architects in the academic environment to have more influence on the application of the principles of SDC. He stated:

*“I think the academic environment is responsible, particularly young architects at the university, and if they decide they can actually change the trend because they would be teaching, they would be designing and eventually after some years, say ten years, most of the students who graduate, they will be able to change the environment. I can see what is coming up in the city. When you look at most of the buildings in the city, most of the glass buildings are designed by senior architects but younger architects are doing much better designs, although sometimes they have put a lot of glass, as other architects, in order to stay in the competition... I believe young architects will create change ...”* (An architect/director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 9<sup>th</sup> October 2013.)

From the operational category respondents, the academic environment, especially schools of architecture, is considered the stakeholder with the most influence. The central government is ranked second. Some of the respondents in the operational stakeholder' category believe that the central government is the stakeholder with the most influence over the application of the principles of SDC in the country. The respondents in this category believe that the government has the most influence because they can set the legislation, policies and acts and hold professionals accountable to abide by the laws that focus on sustainability. However, they also pointed out that for the laws and policies for SDC to be put in place, architects, as professionals sensitive towards design, have a role to pressure the government to establish conducive policies and legislation. One of the respondents had this to say:

*“The government has a big role to play. The government needs to set up a guiding policy, they have been preparing it for a very long time ... In the industry there are so many players, architects, engineers, material suppliers, contractors and more, there must be a law that guides all these players. Now everyone is operating based on their professional laws that*

*guide them in their practice, so there is no uniformity in terms of laws and legislation that guide them in totality. So building law will guide all stakeholders to get a good built environment ...”* (a senior quantity surveyor/lecturer/director of a quantity surveying firm Interviewed on October 10, 2013 in Dar es Salaam)

Building policies and laws set by the governments to make professionals accountable for their work, as pointed out by the above respondent, was the opinion of other operational stakeholders. In addition, some respondents were of the opinion that architects have more influence. Other respondents felt building developers have more influence and others argued that local governments have more influence. This implies that operational stakeholders are of the opinion that teaching and enforcement of the law are the main ways to apply SDC and the main stakeholders to influence the industry are academic institutions and the central government.

#### 6.2.4 Findings from Questionnaire Survey

In order to get more opinions over the most influential stakeholders in regard to the application of the principles of SDC. A Relative Indices (RII) approach was used to analyze and identify the most important stakeholder.

**Table 6.1 Summary of the RII and Ranks for the Most Important Stakeholders with Influence over SDC Practices in Tanzania.**

s/n	Important stakeholders	Policy		Managerial		Operational		All	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
1	Architects	96.97	1	88.62	1	94.62	1	94.53	1
2	Academic institutions	94.79	3	79.67	5	89.03	2	87.18	2
3	Local governments/Municipals	93.75	4	80.49	4	88.41	3	87.15	3
4	Central government	92.71	5	73.98	8	85.50	5	86.75	4
5	Policy makers	90.63	7	81.30	3	88.19	4	85.76	5

6	Engineers	85.42	8	75.61	7	80.95	8	84.42	6
7	Urban planners	91.67	6	78.05	6	81.37	7	83.42	7
8	Building developers	95.83	2	82.11	2	83.02	6	78.51	8
9	Quantity surveyors	58.33	12	65.85	10	77.85	9	76.37	9
10	Building users	73.95	9	63.41	11	71.01	11	71.78	10
11	Professional regulatory bodies	65.63	10	67.48	9	72.26	10	64.81	11
12	Contractors	61.46	11	57.72	12	64.18	12	64.63	12

*Source: Questionnaire survey, 2013-2014*

The findings from the questionnaire survey reveal that policy stakeholders are of the opinion that the three most important stakeholders with the most influence over the application of the principles of SDC in Tanzania are architects, building developers and academic institutions, ranked 1 to 3 respectively. From the point of view of the managerial stakeholders, the stakeholder with most influence are architects, building developers and policy makers. Operational stakeholders are of the opinion that architects, academic institutions and local governments are the three stakeholders with most influence in the Tanzania construction industry.

It is revealed, however, despite different rankings by individual stakeholders as discussed above, all the three categories of stakeholders agree that architects (RII=94.53), academic institutions (RII=87.18) and local governments (RII=87.15) are the most influential stakeholders over the implementation of the principles of SDC in Tanzania. Generally, the top three rankings from the questionnaire survey conform to the top rankings of the three categories of stakeholders from the expert interviews where, academic institutions and local government were pointed out as having the most influence.

#### 6.2.5 Stakeholders Mapping

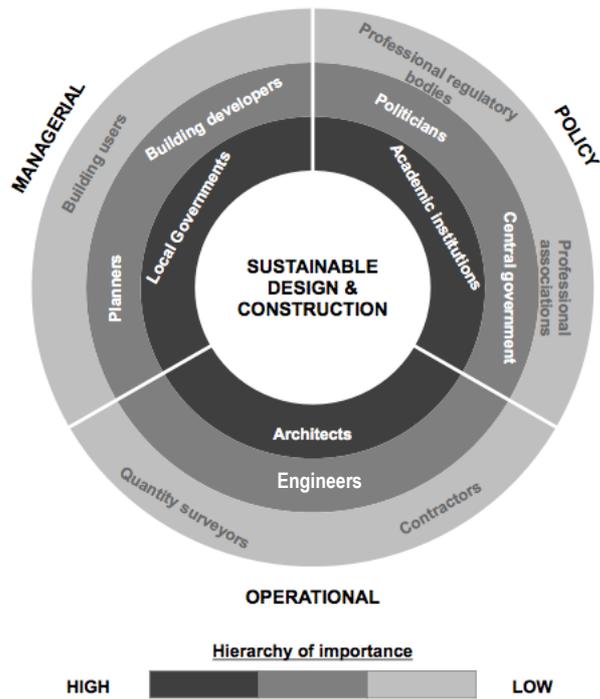
Findings from stakeholders' interviews, FGD and questionnaire surveys presented in section 6.2 provides a basis for mapping the stakeholders with the most influence.

Information on the most important, slightly important and not important stakeholders are based on the triangulation of findings from interviews, focus group discussion and questionnaire survey respondents. Table 3.1 in Chapter 3 section 3.4 provides a list of stakeholders involved in the Tanzania construction industry. However, the stakeholders mapping in this study does not involve all stakeholders listed table 3.1. It focuses on the key stakeholders as revealed by the respondents.

The essence of stakeholders mapping in this study is to generate essential information on stakeholders with the most influence over the implementation of SDC in Tanzania. This information provides a platform to relate stakeholder influence on the adoption of sustainability to their understanding of the concept of sustainability. The goal is to assess the linkage between stakeholder understandings and their position to influence change towards sustainability practices. In addition, this assessment also provides a step towards understanding the factors hindering the adoption of SDC in Tanzania.

Figure 6.1 mapped stakeholders by their categories and level of influence over the implementation of SDC. Very important refers to stakeholders with the most influence over the adoption and the implementation of SDC practices in Tanzania. Slightly important referred to stakeholders who are important in the industry but they have a perceived lower influence over the practice of sustainability. And little importance refers to stakeholders with minimal influence over the implementation of sustainability.

#### **Figure 6.1 Stakeholders Mapping**



Source: Author's construct, 2015

Based on the triangulation of stakeholders' opinions it was identified that academic institutions, architects and local governments are considered very influential stakeholders. Stakeholder mapping shows that a combined effort from architects, local governments and academic institutions is key to spearheading the adoption of SDC practices in the Tanzania. However, this raises the question of whether they have a common and clear understanding of the concept of sustainability as it is applied in design and construction practices.

### 6.3 Stakeholder's Understandings of SDC

#### 6.3.1 Familiarity with the Concept of SDC

Familiarity with SDC was considered key for capturing the meanings held by the stakeholders. Determining whether respondents are aware of the existence of the concept of SDC is one step used in this study to capture how stakeholders understand SDC. In the questionnaire survey, familiarity was measured using a scale of 1-3 with

the interpretation of 1 = not familiar, 2 = slightly familiar and 3 = very familiar. For this study, very familiar, means, a stakeholder possesses knowledge on how to achieve a sustainable building. Slightly familiar means a stakeholder can only define the term but lacks knowledge on how sustainable buildings can be achieved. Not familiar means they have never heard of the term SDC.

The questionnaire survey findings revealed that very few stakeholders, only 4% of all from all three categories said that they were not familiar with the concept of SDC (sustainable design in construction). However, most of the policy respondents (51%), managerial respondents (66%) and many operational stakeholders (47%) are only slightly familiar with the concept of SDC. Based on the definition of slightly familiar that guides this study, these stakeholders have an understanding of SDC but lack practical knowledge on how to achieve a sustainable building.

As indicated in Figure 6.2 below, 45% of the policy stakeholders, 34% of the managerial stakeholders and 50% of the operational stakeholders are very familiar with the term SDC, meaning that they feel that they are able to produce buildings in accordance to the principles of the concept. The results also reveal a notable difference of the level of familiarity among the managerial and operational stakeholders as most of the managerial survey respondents (66%) show slight familiarity suggesting they lack practical knowledge, while most of the operational stakeholders (50%) claim that they are knowledgeable and can design and produce sustainable buildings. This implies that operational stakeholders, who are the design and construction implementers, possess more knowledge on how to achieve a sustainable building than managerial stakeholders, who are the city managers who set development conditions that guide the development of cities.

The term sustainability has recently been widely used in many areas. In Tanzania a step towards the concept of sustainability in design and construction was officially introduced into the construction industry in January 2014, following the signing of a

resolution to establish a Tanzania Green Building Council in Tanzania. (TZGBC). The establishment of TZGBC was a joint initiative by the Tanzania Association of Engineers (ACET), Association of Architects Tanzania (AAT), Association of Tanzania Quantity Surveyors (TIQS) and the Association of Contractors in Tanzania (CATA). This resolution in addition to stakeholders meetings has to a certain extent increased familiarity of sustainable design in the construction industry in the way shown by the figure 6.2 below.

**Figure 6.2 Familiarity with the Term SDC**



*Source: Questionnaire survey, 2013-2014*

It may be that familiarity with SDC is also based on the term sustainability being highly publicized by actors in many areas like in politics, economics, ecology, agriculture, education, and health. However, the extent to which SDC is actually familiar to stakeholders in the construction industry and has become a part of urban Tanzanian design and construction practice is debatable. As discussed in chapter four, the current architectural trends of urban Tanzania, in terms of buildings designed and constructed, show a minimal concern for the concept of SDC. As such, stakeholders' familiarity with SDC is not reflected in the urban Tanzanian built environment,

suggesting that there are limitations for the operational stakeholders because they cannot practice what they are not familiar with. While policy makers also showed familiarity with SDC, nonetheless their impact on the Tanzanian built environment is not seen. It can also be argued that operational and policy stakeholders' familiarity is then blocked by the managerial stakeholders, who are unable to guide the built environments toward sustainability as their level of familiarity with SDC may also be lower than what is needed.

In regard to the debate about whether SDC is a recently known concept in developing countries, as pointed out in chapter 2, this research shows that the majority of the respondents who are very familiar with SDC range in age from 35 – 45 for policy and operational stakeholders and therefore they are relatively new in the construction industry. As such, this new generation of policy and operational stakeholders is more familiar with the concept in comparison to the older generation. Based on the Tanzania education system, first degrees are typically earned at the age of 23-25. In architecture, for example, there is a 2 year mandatory internship after graduating. So familiarity with is strongest with the generation that started working in the industry around the turn of the century (2000) and most of this generation is not yet in important decision-making (policy and operational) positions in their careers and thus it is difficult for them to influence practice. For details of familiarity of SDC in relation to age group refer to appendix V.

On the contrary, data from managerial stakeholders shows that respondents who are very familiar with SDC increase with age, while the generation of 35-45 shows slight familiarity with SDC. This implies that the younger generation in this category lacks practical knowledge on how sustainable buildings can be achieved from the design to construction, but they can only define what SDC means. However, most respondents in the generation of 55 years show that they possess knowledge on how to achieve a sustainable building. This study went further to seek a clear meaning of how

respondents' understand SDC. Presented below are the findings on the meanings of SDC among stakeholders in the Tanzanian construction industry.

### 6.3.2 Meanings of SDC

Meanings of SDC, revealed from expert interviews with 42 key stakeholders and 2 focus group discussions can be summarised in seven emerging themes. These were 1. Environmental, cultural and economic design and construction; 2. Low cost design and construction; 3. Environmentally friendly design; 4. Efficient and effective design and construction; 5. Durability of building products; 6. Meeting clients' needs and development standards; and 7. Doing the right thing. Discussion of these seven meanings of SDC, is followed by an examination of the basis of stakeholders' understandings.

#### 6.3.2.1 *Environment, Cultural and Economic Responsive Design and Construction*

As discussed in chapter 2, this study is guided by McLennan's (2004) definition of SDC as "design philosophy *and construction techniques*<sup>15</sup> that seeks to maximize the quality of the built environment while minimizing or eliminating the negative impacts to the natural environment" *where environmental, social and economic aspects of the building are the key aspects for consideration*. Expert interviews with stakeholders revealed that very few respondents have a comprehensive understanding of SDC that is in line with the definition guiding this study. The interview results however, are in contrast with the results from the questionnaire survey, which show that an average of 61% of all the survey respondents from the three categories understand SDC as environmental, economic and social cultural responsive design and construction activities. This implies that very few of those interviewed and who are in top leading positions in different institutions possess a proper understanding of the term SDC. While the results from the question survey could be a reflection of respondents in the generation

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<sup>15</sup> Words in italic font are added in McLennan's definition to by the author to suit the study.

of 35-45 years, many of whom revealed a slight familiarity with SDC but they are yet to move into leadership roles in the construction industry. The rest of the expert interview respondents, understand it as one or a combination of the following: low cost design and construction, environmental friendly design, traditional design and construction, efficient and effective design and construction, durability of buildings, meeting clients' needs and development standards and as doing the right thing.

Few respondents described the meaning of SDC comprehensively as construction activities that take care of the environment, nature, culture, traditions and people of a given place. Terminologies like continuity, which represent a dictionary meaning of sustainability and the word friendly were used often by the respondents to explain the meaning of SDC. It was noted that these few respondents possess more of a theoretical meaning of SDC rather than expressing a practical understanding when asked to describe how sustainability can be achieved in the Tanzanian context. A deep theoretical understanding can be clearly seen in an expert interview with a senior quantity surveyor/lecturer/director of a quantity surveying firm in Dar es Salaam.

*“I link SDC to continuity, but as a professional (Quantity Surveyor) in the construction industry, I link SDC with green buildings ... that are friendly to nature and do not have a negative impact on the environment. But as a layman, sustainability, I link with the dictionary word that is continue to exist. But as a professional I understand that sustainability means more than that. It means friendly. When you talk of friendly it means friendly to the environment, friendly to the society and again one might ask when you talk about the environment it is not about the ground water, the forest but it encompasses the location, people, land, water, everything. So it is a friendly structure to the external environment, people, climate etc.”*  
(A senior quantity surveyor/lecturer/director of a quantity surveying firm in Dar es Salaam Interviewed in Dar es Salaam on October 10, 2013.)

The respondent went further to explain that his understanding is based on what he heard from student presentations. Nonetheless the respondent showed a good understanding of the theory behind SDC. When discussing the principles and the strategies of achieving it in the building design and construction the respondent, like many respondents, showed very minimal practical knowledge on how sustainability can be achieved.

It was also noted that among the few respondents who stated the meaning of SDC in a more comprehensive way, only one was in the managerial category. This respondent is an engineer and the Director of Property Development and Maintenance working with the main developer and owner of office buildings in Dar es Salaam, the National Housing Corporation (NHC). He showed both a good theoretical and practical understanding of SDC. Due to this double understanding, he has helped to apply this concept in one of their office building projects in Dar es Salaam by advising and working with overseas and local consultants in the design and construction implementation process. He described the meaning of SDC as a building product which is financially, environmentally and socially viable.

*“When we talk about the concept of SDC, we are talking about a building which is sustainable financially, environmentally and socially. You are in the right place here, we as developers, NHC, even our headquarters that we plan to move into in three months, we followed SDC concepts ... this is very important because you get more benefits from living in an environment which is comfortable in terms temperature difference between inside and outside, you use less energy and save costs for energy and you are also contributing in conserving Tanzania’s environment ... ”*  
(Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

Clearly, this respondent is knowledgeable in the area of SDC because while explaining the meaning (in theory) he was able to state (the practical) advantages and benefits of a sustainable building in Tanzania. Nevertheless, he was only one out of the few respondents who gave the fullest meaning of SDC and he only represents one company (NHC) that has started investing in SDC practices in Tanzania in collaboration with consultants from Singapore. It is clear that both awareness, theoretical knowledge and practical know how and understanding of the benefits of SDC are key qualities needed for all other stakeholders to be able to implement SDC practices. Learning from other expertise in the field, as pointed out by the respondents, is also key in gaining practical knowledge.

#### *6.3.2.2 Low Cost Design and Construction*

Expert interviews with key stakeholders revealed low cost as a meaning of SDC. Some respondents discussed the meaning of SDC in terms of affordability of buildings by its user, less building maintenance cost, and less time for design, approval, and construction implementation, which is reflected in lower overall project cost, and lastly lower building operational costs. In particular, these respondents categorized costs in the following areas: 1. Design related costs, which includes costs for paying for the time invested by the consulting team and in the approval process; 2. Construction related costs, which includes the time and costs for procuring building materials, importation of materials, and construction implementation; 3. Operational related costs which includes building maintenance and running cost and the overall affordability of the building product by the building users. In addition, avoiding delays, getting up to date designs with low cost of construction in less time, are the key features pointed out by the respondents in order to reduce project costs. This is evident in an interview with the President of the Architects Association of Tanzania (AAT) who explained his meaning of SDC in terms of costs.

*“The term SDC, means continuity and affordability. When you say sustainable design you look at the clients (design and operational cost of*

*the building) and those who build it (construction technology required), can they (building users) afford it? ... So when we say SDC we look at, do you have a good design and can it be constructed? And if constructed, is it in a specific time? If not then the cost of the project will be escalated because of the time delay and hence not be sustainable. Another thing is construction. Is it using locally available building materials? Because locally available materials are affordable. When you look at imported materials, they are not that much strong and it takes more time for importation and construction. So SDC has to be within a specific time to avoid cost escalation and ensure quality. But at the end of the day cost is key". (Interview with the President of the Tanzania Association of Architects, Dar es Salaam, November 28, 2013.)*

In addition to the dictionary meaning of sustainability shown by this respondent, he also relates sustainability to affordability by the building users in terms of the end cost of the building. According to the respondent the cost of a sustainable building relates to the design and construction process as a key factor. He also points out how to reduce cost and to create an affordable product. He suggested measures like avoiding unnecessary delays in the project execution, use of locally available materials because they are less costly and are of good quality, and to avoid imported materials because they take longer time to reach the site and the quality is not good as locally available materials. However, it is worth pointing out that the cost of locally available material is not necessarily cheaper if one is to compare, for example, hardwood (Mninga) locally available in Tanzania and imported aluminium for window a frame, although in terms of strength and durability, hardwood (Mninga) would be superior. Likewise, not all locally available materials are stronger than imported building materials.

It is obvious that one way of relating the cost element of sustainability in the design and construction industry is to look at the economic dynamics of a country, where efforts to lower maintenance costs and capital investment costs of the building are key

to achieving SDC. In that sense affordability of building by owners and users, which results from the minimum costs involved in the design, construction and maintenance of buildings is key for SDC. Based on this stakeholder's explanation of the meanings of SDC, it appears that the issue of cost is unfortunately considered in isolation from environmental and cultural issues. This leads to SDC practices being partially understood and achieved.

As discussed in section 2.2 in chapter 2, the concept of SDC encompasses issues of resource control. In poor developing countries, particularly in Tanzania, financial resources that go in the design and construction of buildings need to be managed because of the economic challenges facing the country. Therefore less resources will result in less costs, thus producing a built environment that is affordable in terms of space production, rent and operation, and maintenance. According to the Marakesh task force report on cooperation with Africa of 2009, energy consumption, water and sewage costs are the major contributors to building operational costs. As such, monitoring and minimizing costs in these areas is a key consideration for achieving the economic sustainability of a building (BMU, 2009).

Some respondents in the managerial stakeholder group discussed low cost in terms of the financial viability of a project related to minimizing resources that go into maintaining buildings, for example, in ventilating the building. One of the managerial respondents narrated:

*“What I understand about the concept of SDC is that it results in buildings that take care of the environment in the sense that once they are built, the building will help lower the maintenance costs. For example, less cost (to users) for paying for services like energy because the building should be properly ventilated... And the building should use materials that can easily be sourced within the vicinity...”* (Registrar of the Contractors’

Registration Board, interviewed in Dar es Salaam on 20<sup>th</sup> November 2013, translated from Swahili)

This respondent is also echoing the use of locally available materials as one way to reduce cost for building users. But he also emphasized the maintenance and running cost incurred by building users, for example the cost for creating comfortable interiors. As discussed in chapter 4, current office building architectural trends in urban Tanzania lack consideration of the costs incurred by the buildings users in the designs and in the selection of materials. Ozolins (2015) pointed out that for any building development in the least developed countries, effort need to be made to minimize both construction and running costs (but he did not talk about costs of the design process) as one way of dealing with poverty and achieving SDC. In line with Ozolin's (2015) arguments, expert interview findings revealed that some stakeholders in decision making positions from all the three categories in the construction industry in Tanzania are conscious about the construction and running cost of building projects, affordability of the building product to consumers, as such they refer it as the meaning of SDC.

### *6.3.2.3 Environmentally Friendly Design and Construction*

Environmentally friendly design and construction and ecological design and construction are widely used to represent green designs and construction activities, and sometimes used as a synonym for SDC (discussed in chapter 2 section 2.4). This study reveals that some interview respondents from the operational and policy category described the meaning of SDC as environmentally friendly design and construction. According to these respondents, environmentally friendly designs and construction are activities that consider climate, context, and they are ecological in the sense that they are responding to contextual aspects including materials and terrain to create comfort. This meaning of SDC was also echoed in the focus group discussion conducted at Ardhi University where the participants related the meaning

of SDC to mean environmentally conscious buildings. One of the participants had this to say:

*“When we say sustainable design, to me, it means having a building that is environmentally conscious, a building that does not distract or add problems to the ecological system, whether during construction or after construction or during use, or during maintenance. That means all those building stages should be sustainable, and that will depend on the materials you use, the location ...”* (participant, in focus group discussion, on 30<sup>th</sup> April, 2013 at Ardhi University. Translated from Swahili)

This participant, raised another important point worth discussing, that the environmental consciousness of a building needs to be evaluated for sustainability in all stages of the building’s existence from design to demolition (after building use). While the participant was concerned with only an environmental evaluation of buildings, this study argues that SDC is more than environmentally friendly design and construction. Social, cultural, and economic sustainability need to complement environmental sustainability for SDC to be achieved. This finding implies that for some of the respondents, SDC is exclusively about protecting the environment, or protecting buildings from environmental forces, or taking advantage of the environment in designs and construction activities, thus indicating a need to create more awareness of social and economic aspects of sustainability.

#### *6.3.2.4 Efficient and Effective Design and Construction*

The interviews revealed another meaning of SDC as efficient design and construction. Some respondents<sup>16</sup> used the term efficient design in explaining the meaning of SDC by relating it to the efficient use of energy in buildings, efficient use of spaces in and outside the building, and the overall efficiency of the intended function of the

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<sup>16</sup> Operational respondents and policy respondents.

building by allowing easy movement from one point to another, by creating convenience for building users, by allowing optimal use of space for comfort and by considering people with disabilities. It was also noted that the term efficient design was explained differently in interviews with operational and policy stakeholders. Policy stakeholders referred to efficient design as the optimal use of space and convenience for all space users and allowing flexibility in the use of space. One of the respondents representing policy stakeholders explained:

*“SDC in the context of buildings, you have structure, how optimal is it used? That’s number one. Number two is the issue of the quality of the structure, which is more engineering and for contractors, but space use is a sustainable design component ... issues of convenience, comfort and functional interrelations between other functions means sustainable design ...”* (Dean, SADE interviewed in Dar es Salaam on 13<sup>th</sup> January 2014.)

In addition, this respondent added the issue of quality of a structure, where quality is determined by the comfort of space in the designs, which is realized in buildings by the engineers and contractors. But the important consideration in this category for SDC is efficiency, effectiveness, convenience and comfort in the use of space and building structures.

On the other hand, operational stakeholders interviewed relate efficient and effective design and construction to energy efficiency. Based on interviews, energy efficiency was described in two ways. One description of energy efficiency was using less embodied energy for building construction activities, meaning that efficient use of energy that goes into the preparation of building materials, construction and demolition of building structures. The other description of energy efficiency was centered on the efficiency of buildings’ operational energy use to create comfort in buildings, for example for lighting and cooling.

*“When we say SDC is like, an effective design ... It’s a design that when you come to economy you would not suffer much to maintain. It has to sustain in the sense that it has to go with the current situation, it has to go with current use of power as in energy consumption and energy conservation. That is as far as I understand ... the thing is historical background, in those days we were talking about tropical architecture, everybody was relying on the sun, weather as a guiding factor. It is now that with the growth of technology, tropical challenges are not there anymore”. (Interview with the Director of Training, AQRB, in Dar es Salaam, on 22<sup>nd</sup> November 2013.)*

Another interesting point raised by this respondent is that energy efficiency in buildings used to be achieved by designing and constructing with respect to the climate, sun’s movement and the context of a place. But now with the dependence on technology and technological advancements, designing with the Tanzania climate to achieve energy efficiency while creating comfortable interiors is ignored. Artificial lighting and cooling are deployed in office buildings, where the issue of energy efficiency becomes critical in Tanzania. But the important thing to note here is energy efficiency, conservation and reducing energy consumption and hence reducing the cost of energy to maintain buildings are considered SDC by some of the respondents interviewed. Considering the meaning of SDC guiding this study, energy efficiency is one step on the environmental sustainability ladder in, which is one component of SDC.

#### *6.3.2.5 Durability of Building Products*

Some policy stakeholder respondents defined SDC as durability of building products. In describing the meaning of SDC, durability was explained in terms of a long building lifespan, which is the product of good quality building materials, design style, and

specifications. According to the respondents, durability of building products is based on the design specifications, which entails less requirements for building maintenance and hence is less costly to maintain. One of the respondents explains his meaning of SDC.

*“I understand the concept of SDC in the perspective that it is a construction activity that thinks of the future. That is construction starts with the design itself, design should consider the life-time of the building, health of the building users and maintenance of that building should be less costly. So when we talk about SDC it should start with the design and when it comes to the construction, and for the building to last for a long time and to be used efficiently, construction has to consider standards, design specifications and materials have to be of good quality based on the specifications. Of course we are now talking about quality products in totality. Materials should meet standards ... so we need to start looking from the quality of materials itself”. (Director of Training, CRB interviewed in Dar es Salaam, on 26<sup>th</sup> November 2013, translated from Swahili)*

Key features from this respondent’s explanation of the meaning of SDC are good quality building materials used in the construction, efficient use of the buildings based on the intended purpose and longevity of building products. As such designers, developers, and contractors play a major role in the design and material specification and construction of a durable building. The respondent’s narration above is one of many respondents interviewed who relate the meaning of SDC to the durability of the the building.

#### 6.3.2.6 Meeting Client Needs and Development Standards

A different meaning of SDC was shown by some respondents, all from the category of managerial stakeholders, specifically from local government offices. They

conceptualized it as design and construction that meets clients' needs and that are in accordance to the development standards. While describing the meaning of SDC, a municipal architect said:

*“The way I understand the concept of SDC is a construction that meets clients' needs and it is in accordance with the standards that guide construction development activities”* (Municipal Architect interviewed in Dar es Salaam, on 30<sup>th</sup> October 2013, translated from Swahili)

This implies that the meaning of SDC as meeting client needs and development standards is based on stakeholders' day to day activities and procedures of managing the built environment. For example, in issuing building permits, the drawings are scrutinized based on the development standards established by the municipal council. According to the Kinondoni Municipal Council, building permits are issued when the drawings are in conformity with the standards for the total built up area allowed, plot coverage, plot ratio, building height and setbacks. Drawings need to be approved by the Municipal Land Officer, Municipal Town Planner, Municipal Environmental Health Officer, Municipal Architect, and Municipal Engineer before gaining the consent of the urban planning committee. As such, for the project to be approved by the municipal council, meeting development standards and client's needs is a normal practice for local government officials, which was also reflected in their meanings of SDC.

One respondent from the Dar es Salaam city council office explained the meaning of SDC in relation to the design and construction activities in accordance with planning and city development standards:

*“My perception is that many designs in our city do not follow this concept. It is not followed because for the most part designs are implemented based more on a political agenda than professional and city planning standards.”*

*... For example, when you design, at the design stage you understand that there are standards that you must provide a certain number of parking spaces for building users or provide open space, but developers need to make profit, even the designers don't consider the standards set to include open spaces. They consider it is a waste so they put in a building for the client to get more money, but there are very few who take it serious. So many designers do not follow development regulations and standards ..."*  
(Dar es Salaam city Quantity Surveyor, interviewed in Dar es Salaam, on 10<sup>th</sup> December 2013, Translated from Swahili)

The concern for political forces behind project implementation was also echoed by another city council official in an unrecorded interview in Dar es Salaam on 10<sup>th</sup> December 2013, where he explained about building designers and developers not following city planning development standards in Dar es Salaam. Instead, the implementation is based on corruption and political influence, even if it is against the city's development regulations. Giving an example of the 18 storey commercial and residential building built a few blocks from the Tanzania State House where the city development plan allows only 6 storey buildings in that area. The developer, and government officials were taken to court following concerns of safety at the State House raised after the building was completed. The court ruled in February 2014, that the building above 12 storeys be demolished. According to the respondent, corruption and political forces are one of the hindrances in achieving SDC in Tanzania. Furthermore, two respondents, leading local government officers in municipal councils, declared that they did not know the meaning of SDC.

#### *6.3.2.7 Doing the Right Thing*

Some stakeholders' interviewed, all from the operational stakeholder category, conceptualized the meaning of SDC as "doing the right thing". The respondents are retired architects and their work and contribution to Tanzania architecture by designing with the climate through using passive cooling systems to create comfort in

buildings is recognized. One of them received a 2012 Green Africa Award in the category of Green Design and Building for his “lifelong contribution for sustainable architecture in Tanzania”. The Green Africa Award was established in 2010 and officially announced in 2011 in Mauritius by the Allied Network for Policy Research and Advocacy for Sustainability (ANPRAS) in agreement with the US based Earth Day Network (EDN) “to give special recognition to its Green Awards”. According to ANPRAS the Green Africa Award was inspired by the UN Millennium Development goals 7 and 8, which are to ensure environmental sustainability and to develop a global partnership respectively and its aim is to “contribute to unite Africa for the cause of sustainability.” (<http://www.greenafricaawards.org>. Accessed in November 17<sup>th</sup> 2014).

This respondent revealed that to him SDC means “Doing the right thing”. He felt the term SDC was “just a new terminology for the right practice”. When I asked him to explain his take on SDC, he said:

*“Look, I will tell you why (showing his certificate for the Green Africa Award) ... I was doing my work without knowing it is a subject or anything ... what is happening in today’s world, modern terminologies, creation of new words, sustainability what not, where did our grandfathers, who built, who worked with traditions in the correct way, where in their dictionary was sustainability? You just do the correct thing and what is required. My work, for example, takes into consideration three or four things. One is the location of the building, orientation and climate, coming into details, does it face the west? What climate? .... Then the requirements, of which the most important is the function, so function, location and climate ... and then next thing is ventilation taking advantage of the location. Economy, is it economical, affordable to the client, do you understand? ... I was doing the right thing because our forefathers brought us up in the right way, today ... new names,*

*terminologies and what not, it is nothing, it was there ...”* (Retired chartered Architect, interviewed in Dar es Salaam, on 17<sup>th</sup> November 2013).

As discussed in chapter 2, section 2.3 on the debates about SDC in architecture, this respondent has a perception that SDC started with our forefathers in the indigenous architecture where the structures were developed in different ancient cultures, using locally available materials and local knowledge of climate to provide solutions for comfort. He also argued that doing the right thing has a component of doing justice to the clients, to the environment, culture and economy while following work ethics and that this is essential for SDC. This is in line with another retired architect respondent who described the term “*doing the right thing*” as designing and building using the basic knowledge of design with climate, context, and budget as taught in architecture schools.

The table below provides a summary of findings from expert interviews with the three categories of stakeholders and focus group discussions discussed above on the emerged meanings of SDC, which were summarized in seven themes.

**Table 6.2 Summary of Meanings of SDC Given by 42 Interviewees from Three Categories of Stakeholders**

S/n	Meanings	Policy	Managerial	Operational
1	Environmental, cultural and economic	2	1	4
2	Low cost	3	2	6
3	Environment friendly	2	-	3
4	Efficient and effective	4	-	2
5	Durability of building products	4	-	-
6	Meeting clients’ needs and	-	4	-

	urban development standards			
7	Doing the right thing	-	-	2
8	Don't know	-	2	-

*Source: expert interviews, September 2013 – July 2014*

From the above findings taken from expert interviews with key leaders in the construction industry and focus group discussions, it appears that there are two meanings of SDC that cut across the three categories of stakeholders. These are environmental, cultural and economic design and construction and low cost design and construction. However, low cost design and construction is considered by a plurality of stakeholders as the meaning of SDC. Only few of the respondents show a comprehensive understanding SDC. Furthermore, the results show that the meanings of SDC differ among stakeholders. The meanings revealed by all stakeholders are the aggregates to environmental, economic and social sustainability but the stakeholders consider just one aggregate, for example low cost or energy efficiency, to carry the whole meaning of SDC. This implies the need for a clear more comprehensive meaning of SDC for the construction industry in Tanzania in order to contribute to the goal of promoting sustainability in the country. The following section further examines the basis of stakeholders' familiarity with SDC.

#### **6.4 Basis of Stakeholders Familiarity and Meanings of SDC**

At least six sources of information on the SDC concept were revealed from expert interviews with key stakeholders and focus groups discussions. These are grouped in three main themes. These are: 1. Document related sources, which includes, publications presented in professional continuous development seminars, publications of best projects awards by the Architects and Quantity Surveyors Registration Board (AQRB) and other agencies and publications presented in international conferences. 2. Information and communication technology based, this includes, internet searches by individual stakeholders and 3. Learning from each other, which includes, learning from office mates who have studied and worked overseas.

#### 6.4.1 Document Related Sources:

##### 6.4.1.1 *Publications Presented in the Professional Development Seminars*

Most respondents interviewed showed that they became familiar with SDC through attending professional development seminars. Tanzania professional regulatory boards for architects, quantity surveyors, engineers and contractors (AQRB, ERB and CRB) organize CPD (continuing professional development) seminars at least twice a year with the aim of creating awareness about different issues in the construction industry. According to the regulatory boards' by-laws, all professionals registered and recognized by the boards are required to attend seminars and gain an accreditation point. AQRB practice notes number 26 stipulates that, "*Architects and quantity surveyors shall have the obligation to ensure that they score minimum of 20 hours per year from the board's CPD (Continuing Professional Development) approved activities*". According to the Director of Training ERB, engineers are required to acquire 30 points on special knowledge beside their ordinary duties, which is also facilitated by the boards through trainings. In 2013 and 2014 organized seminars by the boards centered on energy efficiency, green design, Building Innovation and Modelling (BIM) and integrated design themes.

These themes were selected for seminars by the boards because of the stakeholders' recommendations during the proceeding seminar. Before a seminar is organized, the board, for example AQRB, contacts architects and quantity surveyors in the country to suggest topics or themes of interest for the coming seminar. This is also done at the end of each seminar when filling the evaluation form where there is always an item for suggesting topics for the next seminar. And it is of recent that green design, energy efficient design and BIM dominated the suggestions aired by architects and quantity surveyors. Furthermore, an interview with the training officer of Engineers Registration Board (ERB) revealed that the topic of energy efficiency and ICT for engineers became of interest because of the initiatives of international agencies like UNESCO and ISTIC (International Science Technology & Innovation Centre for South-

South Cooperation) who jointly with ERB conducted seminars to create awareness and knowledge in these areas.

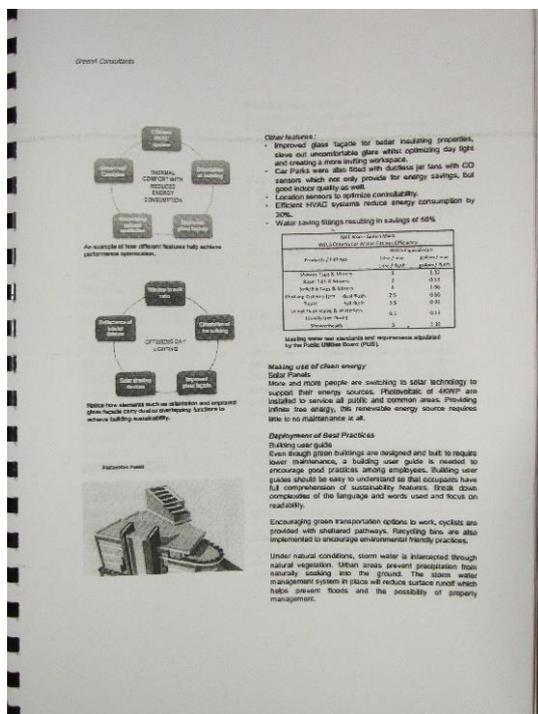
Awareness creation through CPD seminars normally takes a short time and thinly detailed materials are presented. Seminars last from a half-day to two days where the two-day seminars cover more themes and have papers presented. Local and international experts are invited to present papers and participants get the opportunity to ask questions. One interview respondent revealed that knowledge on SDC has become increasingly important to stakeholders in the country and worldwide as such the regulatory bodies are working on creating awareness among professionals in the construction industry.

*“...this concept is new, we (AQRB) have started to create awareness among our stakeholders about the meaning and benefits of sustainable designs (so they can implement its practices). Last year in December we had a public lecture at the British Council and we talked about sustainable integrated design. Many people (local architects and quantity surveyors) attended and for those who did not know, they started to understand what it is, it was a bit complicated but we are starting ...”* (Registrar, AQRB interviewed on 16<sup>th</sup> January 2014, Dar es Salaam.)

The respondent is echoing that SDC is new and awareness is being created through seminars. However, he further pointed out the complications they are facing while creating awareness of SDC such as not having local resource persons and the financial implications of inviting resource persons from overseas. Officials from other professional registration bodies (ERB and CRB) interviewed also revealed that they are making efforts to create awareness among the professionals but they also face the challenge of not having local resource persons who can share their expertise in this area, and in the end they have to rely on international resource persons.

However, it was observed by the researcher that some resource persons from overseas are doing so in an effort to do business. For example, a resource person from a company offering consultants in the area of SDC came with the intention of selling her/his company's services. So the presentations are similar to a sales pitch centered on what the resource person can do and what commercial service they can offer rather than offering perspectives on how sustainable design can be achieved. It was also noted that resource persons share very selective information on SDC to the participants. For example, in a conference organized by the AQRB in Mbeya, a copy of the presentation on "Green Buildings Concepts" circulated in the proceedings' binder to the participants and in the power point presentation, 2/3 of the written and presented material was deliberately made unintelligible. This unintelligible material circulated to the participants had little usefulness as a reference.

Figure 6.3 Example of One of the Unintelligible Pages from the Proceedings Binder.



Source: AQRB, 21<sup>st</sup> CPD seminar on use of modern technology and challenges of urbanization, Proceedings, 20-21<sup>st</sup> March 2014.

This implies that the good intention of local institutions to create awareness on SDC among stakeholders in Tanzania through the CPD seminars needs to be done more carefully so that international resource persons do not just make disguised sales pitches. A thorough search for resource persons who are willing to share skills and information on SDC needs to be done in order to avoid those who are primarily trying to capture markets for consultant work or products in Tanzania. Furthermore, it was noted that seminars on a holistic conceptualization of SDC are yet to be conducted for the Tanzania professionals, instead, it was observed that seminars were focusing on green design, energy efficiency, environmental friendly design and integrated design focusing on design and construction activities. Again cultural and economic sustainability is lacking in efforts to create awareness of the meanings and benefits of SDC.

#### *6.4.1.2 Publications Presented in International and Local Conferences*

International and local conferences and publications like journals were also mentioned by some respondents as the basis for their knowledge of SDC. The respondents mentioned that in May 2013, the UN Habitat Tanzania office in its initiative to promote energy efficient buildings in East Africa, organized a conference in Dar es Salaam. Respondents mentioned this conference as the place where they became aware of sustainable architecture by attending and reading a distributed 300 page “Handbook of Sustainable Architecture in the East African Community Climates”. The aim of this conference was to “to mainstream energy efficiency measures into housing policies, building codes, municipal by-laws and buildings practices in East Africa” (<http://unhabitat.org/tanzania/>).

Looking at the “Handbook of Sustainable Architecture in the East African Community Climates”, energy efficient techniques is the only aspect of sustainable design discussed. Energy efficient techniques for cooling and lighting are discussed using evaluating techniques used in indigenous architecture in East Africa, climatic

parameters and its design approaches, passive systems, air conditioning systems and renewable energy technology. This implies that the understanding and meaning of sustainable architecture by the participants at this conference would be related to energy efficiency only and this was shown in explanations of the meaning of SDC as discussed previously in this chapter.

An interview with the director of training at the Engineers Registration Board (ERB) revealed that his familiarity with SDC started with the CPD seminars he attended and his work with the ISTIC. According to him, the Engineers' Registration Board is now collaborating with ISTIC, which is affiliated with the Asian board of engineers, to create an awareness workshop for players in the construction industry in Tanzania on different issues concerning the industry including energy efficiency and ICT in buildings. According to the Director of Training, ERB, the collaboration was initiated by the UNESCO Tanzania office, who did a study and found out that people lack practical knowledge on new issues like energy and ICT. Some local engineers were able to attend workshops organized by ISTIC and UNESCO in Haiderabag India and Malaysia. He also added that ISTIC is creating a hub in Africa, in Kenya, in order to bring more awareness on energy and sustainable development in Africa. Therefore UNESCO, ISTIC, and UN Habitat have established that a gap of knowledge on energy efficiency exists among professionals in Tanzania and they have created programmes to create awareness and address this gap. As such these platforms can be used to create more knowledge on SDC among professionals in Tanzania.

#### *6.4.1.3 Publications of the Best Projects Awards by the AQRB*

Publication of the best projects of the year awards, by the AQRB was also mentioned by some interview respondents as a source of their familiarity and understanding of SDC. Each year since 2008, AQRB gives a best project award with the aim of promoting creativity and value for money by architects and quantity surveyors in the country. The search for nominations for the best project awards is advertised in the AQRB website and by sending email and letters to architects who are registered by the

board requesting them to submit information about their projects. Assessment criteria differ from time to time. For example, the year 2014 best projects awards was based on the following assessment criteria for pre-contract: “Function adequacy (30 points), creativity and innovation (35 points), environmental consideration (5 points), building structural systems integrity (5 points), building safety in use (fire safety) (10 points), and contribution to human and aesthetic needs and physical planning context (15 points).” ([www.aqrb.co.tz/best projects](http://www.aqrb.co.tz/best-projects), accessed on December 4<sup>th</sup> 2014). According to AQRB, the call for nomination gives architects the opportunity to re-assess their work based on criteria that includes environmental consideration before submitting to compete to the award.

One example of the best project awarded in 2012 by the AQRB was the Aga Khan Primary School in Dar es Salaam, designed by a local architect who has studied and worked in UK, India, Saudi Arabia, Ethiopia and USA. His design philosophy is centered on respecting the climate and culture of a place in all his design works. (<http://www.tharaniassociates.co.tz/philosophy.html>, Accessed on May 11<sup>th</sup> 2015).

**Figure 6.4 AQRB Best Project Award 2012**



Source: <http://www.tharaniassociates.co.tz/award2012.html>, accessed on May 11<sup>th</sup> 2015

In relation to this awarded project, the jury's report commented that "The climatic environment through its cross ventilation throughout the building, especially along the corridors and in the classrooms, having windows on both sides is exemplary. This building doesn't rely on mechanical ventilation and is very simple to maintain, making it a very sustainable development". (Source: <http://www.tharaniassociates.co.tz/award2012.html>, accessed on May 11<sup>th</sup> 2015). This comment from the jury shows a great awareness and understanding of SDC energy efficiency techniques mean and less burden for building users. This implies that more SDC criteria can be promoted and assessed in the best project awards. The publication of the winning project in websites and in the AQRB's promotional calendars creates a wider awareness among the public at large. This also implies that the best project award could make a good forum for promoting the concept of SDC among architects and quantity surveyors.

#### 6.4.2 Information and Communication Technology (ICT) Based Sources:

Some stakeholders interviewed and participants in the focus group discussions revealed that internet searches and relying on teaching staff who have an interest in and have studied and researched on sustainable design in their studies overseas was their basis of their familiarity of SDC. In a focus group discussion with the students and staff in the Department of Architecture, the participants reported that there is no structured course in the school to expose them to the concepts of SDC. This leaves a majority of students graduating without taking a structured course on SDC. One participant narrated:

*“We are studying architecture but most of us don’t really know what sustainable architecture means. I think we should be taught from the beginning of year one. When I first heard of green buildings, I thought they are just buildings with plants on the facades and roofs but after searching on the internet now I understand it is more than just trees and plants, ... it is not in the curriculum but some of us who are taking the environmental science elective are also taught a little bit about sustainable design ...”* (Focus Group Discussion, Ardhi University, 30/4/2014, translated from Swahili)

It is clear from this participant that information available on the internet was the main source for their understanding of SDC. The kind of information accessed and the ability to weigh what is or is not applicable in the Tanzanian context and climate is left for the students to judge because of the lack of structured courses where they can be exposed to SDC issues appropriate for Tanzania. This was evidenced in one of the final design project presentations by an architecture student in 2011 where the researcher was serving as an examiner. The student was designing a sustainable office building in Dar es Salaam. Measures that were proposed by the student were to use mechanical, energy efficient and intelligent technology for ventilation and lighting. What was striking was the proposal of installing humidifiers in the building and the use of

bitumen felt on parking spaces. Clearly, the measures proposed by the student were more suitable for countries with advanced technology and a different climate from Tanzania. But this was the information they accessed on the internet.

Other participants also mentioned their misconception of the term green buildings and sustainable buildings before embarking on internet searches. It was noted in the discussion that there is a misconception that sustainable buildings are not aesthetically appealing. The participant had this to say:

*“My understanding of sustainable buildings is from the internet ... and I feel that sustainable buildings are like machine buildings, just simple boxes, and they are not that beautiful aesthetically ... when you google amazing buildings you find beautiful buildings but when you google sustainable buildings they are not wow! Those buildings are just simple boxes ...”* (Focus Group Discussion, Ardhi University, 30/4/2014. Translated from Swahili)

Clearly, this participant shows a lack of awareness on the meaning and benefits of sustainable buildings. He is relying on selective information that can be easily accessed on the internet to build his own meaning and paint his own picture of a sustainable building. This is the result of not being taught about sustainable design in the School of Architecture.

According to the 2013-14 Ardhi University Prospectus (the only university to offer a degree in architecture in Tanzania during that year), the School of Architecture and Design (SADE) lacks courses in SDC. However, there are courses on environmental science for year one, two and three and an elective course on architectural science for year four. The Architecture Department teaching curriculum of 2012, shows that the environmental science courses offered are seminars on introduction to thermal principles, climates and human body metabolism to achieve thermal comfort (year

one). Year two is focusing on the geometry of solar movement, air movements and prediction of daylight. For year three, the students are exposed to seminars on mechanical aids to achieve thermal comfort. The elective course on architectural science for fourth year students covers building energy, lighting and acoustic principles. This implies that there is little emphasis on SDC in teaching where there is an opportunity to create a strong foundation for the understanding of SDC, where skills acquired for achieving sustainable buildings in Tanzania could be taught and implemented. It is clear that environmental science courses offered are oriented towards a small part of environmental sustainability; social and economic sustainability are yet to be taught and understood.

#### 6.4.3 Learning from Each Other

Interviews and a focus group discussion with NHC officials revealed that the motivation to research and implement sustainable design in Tanzania was based on their newly employed staff who had been educated and worked in the UK and Dubai. The concept of SDC is highly publicized in the UK and Dubai and it is now becoming a normal practice. One interview respondent who studied and worked in the UK expressed his understanding of SDC from studying and working overseas and efforts made to transfer knowledge and create more awareness to the other staff he is working with.

*“... as a chief architect and from my experience in the UK, because there they stress more SDC ... we are also trying to bring awareness to our teams, which is important ... we managed to increase awareness, primarily by exposing our architects to the concept. Some of our architects managed to visit green buildings and attend forums which were organized by the Singapore Green Mark people in Uganda and Kenya as well, then also myself, being a chief architect coming from the UK, you know how green conscious people are, it is a law there ... we have a Director of Innovation coming from Dubai with exposure to SDC, with*

*small spaces we are trying to introduce green concepts in our designs ...”*

(Chief Architect, NHC interviewed on 29<sup>th</sup> October 2013, Dar es Salaam.)

The respondent is pointing out the power of learning from each other and creating more awareness by exposing others to practical examples rather than relying on theories of SDC. Exposure to SDC practices and practical knowledge gained by this respondent and other staff who worked overseas helped them to instill their understanding of the concept of SDC in their workplace. It was taken very serious and NHC gave opportunities to staff who did not know anything about SDC to learn from foreign experts brought in to create more awareness in the NHC. NHC encouraged staff members to attend conferences and meetings overseas to learn more about the concept. As discussed in an interview with the Chief Architect, NHC, SDC will continue to be implemented in all upcoming NHC projects in Tanzania because of the benefits it possess. From the NHC it was noted that some of its staff have a greater understanding of SDC in a practical way in terms of knowing the bolts and nuts of designing, specifying and constructing a sustainable building in practice rather than just being able to define what the concept means.

Furthermore, the focus group discussion with the students and staff at Ardhi University also showed the importance of learning from practical examples. One participant stressing the need to have physical examples of sustainable buildings to inspire others had this to say:

*“Currently we don’t have architects or even projects that inspires us, we don’t have competitions to get inspirations for sustainable designs. Maybe when it reaches a time that we have our teachers designing sustainable buildings and they are built, and people get to visit and see how it performs and understand the cost implications ... so far we don’t have a reference point, even the big architects are being discouraged when they*

*come up with the idea of sustainability...*” (Focus Group Discussion, Ardhi University, 30/4/2014, translated from Swahili)

The respondent is banking on knowledgeable people like teachers in the field of architecture to put their knowledge into reality in order to inspire others in the field to learn and embrace the concept sustainability and adopt its practices in the country. However, the challenge that still exist is that there is very little information and projects for people to learn from.

The finding on the basis for stakeholder familiarity and understanding of SDCs indicates a lack adequate training and exposure on the concept of SDC, as such, their familiarity and meanings of SDC are based on their short time spent at seminars, conferences, internet searches, and reviewing the publications available. This leads to a lack of a comprehensive or practical understanding of SDC as shown by many stakeholders in interviews and in the discussions.

It is also noted that none of the sources discussed above have a system of monitoring their impact to the stakeholders. Meaning that there are no follow up activities after the seminars are conducted by the boards, conferences or internet searches to evaluate the knowledge gained and its impact on stakeholders’ activities. The exception to this is however shown by NHC where efforts to create awareness and expose their staff to SDC can be evaluated through their participation and the inclusion of their knowledge gained in the designs of their buildings.

Efforts by the professional registration boards to create awareness and understanding of SDC for stakeholders in construction indicates a loophole where companies and business people are taking advantage to promote their business rather than helping to create a wider understanding of the concept among professionals in Tanzania. As pointed out earlier, a thorough search for resource persons who are willing to share skills and information on SDC needs to be done in order to avoid those who are

primarily trying to capture markets for consultant work in Tanzania. As such, training local experts is also key.

## **6.5 Conclusion**

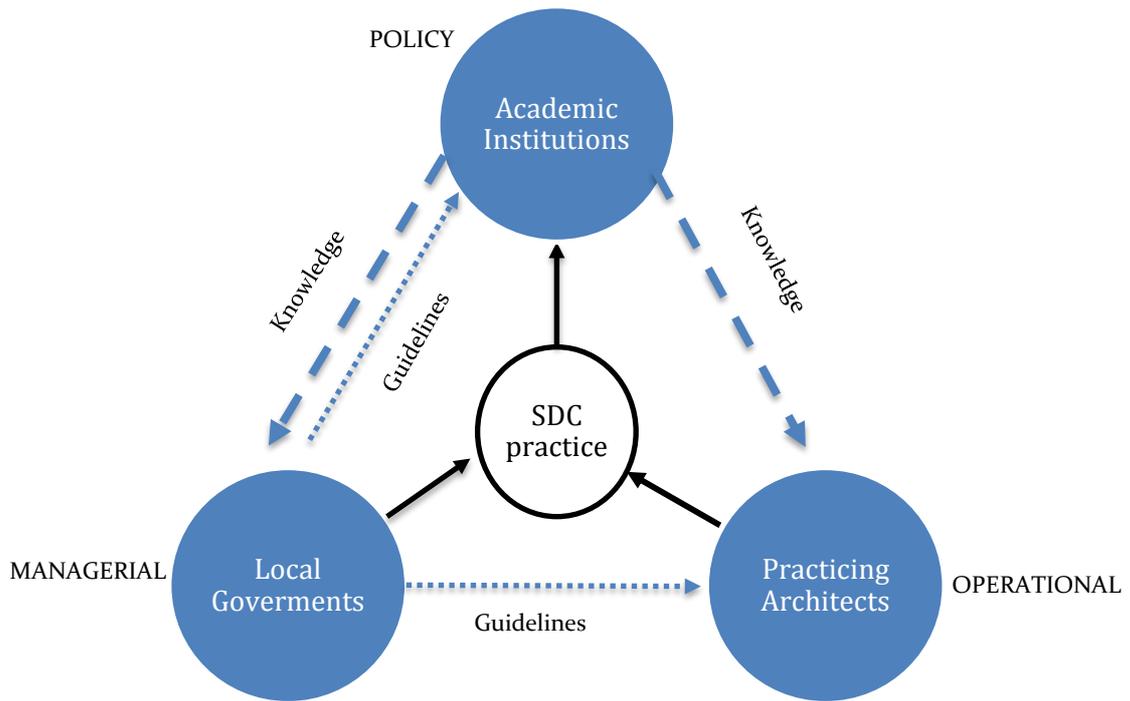
Stakeholder influence mapping reveals that for sustainability to be adopted and implemented in the Tanzania construction industry, the stakeholders perceived to have the most influence are academic institutions, local governments and practicing architects. However, findings from stakeholder understandings show that there is a minimum understanding of the concept of sustainability among the most influential stakeholder. Academic institutions with the role of imparting concrete knowledge to professionals in the construction industry are lacking teaching courses on SDC. As such most architects who are leading the design teams lack practical understandings of the concept of sustainability. This is a clear reflection of the lack of an academic foundation on sustainability not only for practicing architects in the country, but also for professionals in the local government offices where SDC is not on the agenda. In addition, among the three most influential stakeholders, it appears that local government officials, have a minimum understanding of SDC despite the questionnaire survey results on familiarity, which show that managerial stakeholders are very familiar with the concept of SDC. Findings revealed that local government officials who are managers of the built environment possess a different meaning of sustainability (meeting client's needs and development standards), which is based on their day to day activities and a comprehensive understanding by local government officials is lacking.

It was also noted that the understandings revealed by architects at times is not very strong in the sense of being able to design and construct a sustainable building. The awareness shown instead carries a vague understanding of the whole concept, where one can define the meaning correctly because they have heard it in a meeting or read

it somewhere but what it entails to achieve a sustainable design was found hard to explain. This observation implies that for many stakeholders, exposure to SDC is just for a short time, for example in a one or two day conference.

Sound knowledge of SDC to all stakeholders is key. It can be concluded that a strong foundation of knowledge of SDC provided by the learning institutions in the country is lacking. This includes lacking guidelines for achieving SDC practices for the Tanzanian context and mechanisms to enforce those guidelines by the urban managers, in this case local government officials. If proper guidelines were in place, this would leave practicing architects and other designers with no other choice than abiding with the regulations in place. However, this perception is practical only if the architects and other designers are imparted with enough knowledge to see the importance of SCD for the Tanzanian built environment and for them to recognize the need to implement and abide with the regulations. Figure 6.5 below illustrates the relationships between most important/influential stakeholders in policy, managerial, and operational categories and their influence on sustainability implementation in the Tanzanian construction industry.

**Figure 6.5 Most Important Stakeholder and Influence on SDC Practice**



*(Source: Author's construct, 2015)*

## **7 FACTORS HINDERING THE ADOPTION OF SDC PRACTICES IN URBAN TANZANIA**

### **7.1 Introduction**

This chapter discusses the perceptions of key stakeholders in the design and construction industry regarding the factors hindering the adoption of SDC (sustainable design and construction) practices in urban Tanzania. In order to establish the factors contributing to the lack of sustainability practices. The chapter commences with a discussion of the stakeholders perceptions of office building architectural trends in Dar es Salaam and forces behind that trend. The section on perception and forces behind the current architectural trends is followed by a discussion of the challenges of implementing SDC in Tanzania.

### **7.2 Perceptions of Office Building Architectural Trends in Tanzania**

Chapter 4 briefly sketched the current office building architectural trends in Dar es Salaam. This section builds on Chapter 4 by presenting empirical findings on stakeholders' perceptions of office building architectural trends in urban Tanzania. The trends observed cover the period from 2002 to 2013 (for the reasons discussed in chapter 4) and are divided into two categories: glass architecture and profit driven architecture. An initial analysis of the stakeholders' perceptions resulting from the different data collection tools, produced five terms for describing office building architectural trends. However, three different terms - modern, European, and glass - were used to describe essentially the same thing that researcher referred to as 'glass architecture' in this study. In this study glass architecture refers to the design and construction of buildings with an extensive use of glass glazing as an exterior building envelope. Profit driven architecture refers to poor quality design and construction of buildings in order to minimize initial investment costs so that a profit can be realized in a shorter time.

Detailed analysis of stakeholders' perceptions of office building architectural trends was deemed key in this study in order to show how stakeholders relate these trends with their understanding of SDC. This helps to create a coherent picture of how understandings of SDC relate to factors hindering its adoption. The discussion starts with glass architecture because this is the trend identified by most of the respondents and it is the trend that characterizes urban architecture in many developing country cities.

#### 7.2.1 Glass Architecture: Cladding Buildings in Glass

Both expert interview respondents and participants in the focus group discussions characterized new office buildings in Tanzania as examples of glass architecture. They described this as an extensive use of glass in new office building facades. They added that this is due to the importation of building ideas from developed countries where glass is predominantly used as external walls. Almost all respondents from all stakeholder categories mentioned the extensive use of glass in office buildings. As noted in section 7.2, terminologies like glass architecture, modern architecture, European architecture, and Western architecture were used interchangeably to mean the same thing, namely the widespread use of glass in buildings as seen in Western countries.

One policy stakeholder respondent felt that current architectural trends were affected by 'Europeanism', where glass is mostly used. He pointed out the changing role of the designer in Tanzania who works more on functional space design knowing that in the end glass will be used on the facades. Hence, there is no need for façade design.

*"The way I see it now is people trying to maximize function and we envelop with something, I will call it the fashion of putting glass. We focus on the functional spaces ... we need 200 rooms and then clad the thing in glass and that is it. This is the trend we see, especially in the city centre. And it has a lot of repercussions when you clad your buildings in glass.*

*You are adding energy problems, reflections, maintenance ... we are being affected by 'Europeanism'. European designs use glass mostly, rather than going back to the first principles of asking ourselves what do we want, what is our climate, what is the culture of using spaces by our people? We have a lot of challenges ..."* (Registrar, AQRB interviewed on 16<sup>th</sup> January 2014, Dar es Salaam.)

Many respondents were concerned about the repercussions from the excessive use of glass in Tanzania. As pointed out by the respondent above, the basic principles of designing with the climate and culture in mind are ignored increasing problems associated with providing comfortable interiors in a tropical climate. This was also pointed out by another respondent from the operational stakeholder category who felt that office building architectural trends are becoming a burden to the country in terms of the consumption of available energy to create comfortable interiors. He narrated his perception of office building architectural trends as follows:

*"... Mushrooming of skyscrapers with glass curtain walls vis a vie the inability of Tanesco<sup>17</sup> to provide sufficient power, so on one side we don't have a/reliable energy supply and on the other side our designs are very energy intensive. It is kind of a contradiction. So the trend I see is very strong now for the city centre to go high rise, especially for Dar es Salaam, using glass. I don't know whether the glass they are using is the high quality glass, which can sustain the environment, otherwise you get greenhouse effects in the buildings, again necessitating the excessive use of electricity for indoor cooling, which is not available ..."* (Architect/retired lecturer/director of architectural firm, interviewed on 11<sup>th</sup> October 2013, Dar es Salaam).

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<sup>17</sup> TANESCO is short for the Tanzania Electric Supply Company. This is the only company that supplies electricity in Tanzania, where the major source is hydro-power.

This respondent, while acknowledging the glass architectural trend, also raised a number of interesting points. The first refers to the lack of a reliable energy supply. It is not uncommon for Tanzania to experience power rationing because of the lack of electricity generated, especially during the dry season. As pointed out in chapter 4 it is only 24% of the Tanzania population have access to the electricity. As mentioned out by the respondent and as discussed in chapter 4, buildings in urban Tanzania consume unacceptable amounts of energy for cooling and they become uncomfortable to be in especially when the electricity goes off.

The second point is the quality of glass used in Tanzania. This is in terms of its heat transfer properties, heat absorption, reflection and its impact on the interior and exterior of the building. Glass facades are not produced in Tanzania. Getting good quality glass with a low heat absorption rate will depend on the awareness and specifications of the consultants and the budget of the client, if they are willing to pay more for good quality material. This leads to the next point, regulations. In Tanzania there are no building regulations stipulating the type of glass to be used for buildings.

The third point is the greenhouse effect where glass encased buildings trap heat and create a warmer interior as evidenced in some buildings. This situation necessitates extensive use of energy for creating comfortable interiors. During the observation exercise, it was also noted that most buildings built from 2003 in Dar es Salaam city centre are characterized by the use of glass curtain walls with air conditioning units on facades, which reduces the aesthetic value of the building. To reduce this effect some designs opt for placing the units on the roofs as shown in figure 7.1.

**Figure 7.1 Air Condition Units on the Roof**



*Source: Author, 2014*

Usually the exterior wall is either thin glass or glass clad on a block wall. Orientation principles to reduce heat gain, namely the basics of short facades facing east–west, are not followed. It is common to see long facades facing east–west, thus receiving more heat and creating uncomfortable interiors because of the sun rays diffusion inside the building. In order to create comfortable working conditions extra cost is needed to install interior window blinds, mechanical air conditioning and artificial lighting systems.

**Figure 7.2 Interior View of an Office Building in DSM**



*Source: Author, August 2014, Dar es Salaam*

As pointed out in an interview with one of the retired architects in Dar es Salaam, architects are not doing the right thing in regard to the climate, to the resources available, for building users, and to their clients.

**Figure 7.3 New Office Buildings in DSM**



*Source: Michuzi blog, online, August 2014*

Although glass buildings are fashionable in Dar es Salaam, most of the respondents felt glass architecture had a negative impact for both building users and owners in terms of energy consumption and pleasantness of the built environment. As revealed in expert interviews, respondents are aware that glass buildings are often associated with problems of poor workmanship that compromises the quality of buildings exacerbating excessive energy use to create comfort. Poor maintenance of glass buildings, including lack of outdoor cleaning of facades due to the requirement of expensive equipment or cranes is also a characteristic of the new office buildings. Most of the respondents who are concerned about the current glass architectural trend consider the extensive use of this material as inappropriate for urban Tanzania. One of the respondents, when asked to describe architectural trends in Dar es Salaam said,

*“... in fact, the architecture which is being done nowadays is a pity... the current architectural trend does not consider climate. The excessive use of glass is creating more problems not only in the interior but also for the exterior of the building, where people passing on city centre streets experience more heat and glare from the sun’s reflection in glass facades”.* (Architect, Director of architectural firm, interviewed on 26<sup>th</sup> November 2013, Dar es Salaam, translated from Swahili.)

In summary, respondents overwhelmingly felt that glass buildings create discomfort and problems for urban Tanzania and the built environment.

In contrast, some respondents had a positive disposition toward the use of glass in office buildings in Dar es Salaam. They consider glass as a breakthrough in terms of being a maintenance free building material appropriate for Dar es Salaam. One of the respondents, when asked to describe the architectural trend of office buildings, had this to say:

*“The trend now is, we are going to a euro-centric architecture of putting glass. Well, I see it as a good approach as long as the glass used follows sustainable design principles. The glass you see in buildings is not all bad. There is [imported, expensive] glass material that does not allow heat to pass through but only light can go through. ... Glass not only makes buildings look good but it also reduces maintenance costs. We have been spending a lot of money to maintain our buildings, especially for painting outside, but with glass the buildings can stay intact for a long time and there is no need to paint, maybe after 8 – 10 years you just use special material to clean the glass ... so it is sort of maintenance free.”* (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

Besides glass being relatively maintenance free, this respondent also mentioned beauty and aesthetic value, which is added to buildings by using glass. The aesthetic value of using glass was also pointed out by the other five respondents who showed a positive disposition towards. They pointed out more advantages of glass, when asked what they like most in the architectural development of Dar es Salaam. Some respondents<sup>18</sup> claimed that they would like to see more high-rise glass buildings. For them, glass buildings look fancy and are a sign of development and modernity. To illustrate this point, the President of the Association of Architects Tanzania (AAT) narrates:

*“Each era has got its fashion. Fashion does not choose. It can be bad fashion or it can be good. This is the era of glass. When you look at the details of the disadvantages of glass they are many, but people tend to use it as a fashion. It is like, a while ago, we used to dance and dress a certain way and it kept on changing and in the construction industry in the 80’s we had a certain way of roofing called Mozambique style, it was a fashion from Mozambique and now it is glass ...”* (Interview with the President of the Tanzania Association of Architects, Dar es Salaam, November 28, 2013.)

From the respondent’s view it appears that, despite being aware of the disadvantages of excessive use of glass in Tanzania and in a tropical climate, glass is being used because of fashion. Nonetheless being fashionable disregards the short and long term costs of importing the material as well as building and maintaining the building. Despite the available knowledge on the excessive use of glass in the Tanzania, the respondent praised the use of glass in order for the built environment to be up to date and within a fashion trend.

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<sup>18</sup> From the category of policy stakeholder and managerial stakeholders.

Research findings suggest that there are three schools of thought when it comes to the widespread use of glass in Dar es Salaam. The first school believes that extensive use of glass is not good and should not be extensively used in a context like Tanzania with a tropical climate and problems in energy production because it necessitates the intense use of energy for cooling and lighting. The second school believes that the extensive use of glass is good only if it is within the SDC principles. Meaning that, glass that is to be used has to reduce the embodied energy that goes into the building, works well with the climate and if it is economically and socially acceptable then it is good to use. While the third group praises the widespread use of glass as a result of technological advancement, which allows for maintenance free, fancy, modern and up to date buildings. The latter is dominating in the production of the urban Tanzania built environment. SDC theory puts a strong emphasis on the efficient use of resources. Energy efficiency in buildings is key. The second school's ideas on glass being used for office buildings in urban Tanzania reveals an understanding of sustainability to a certain extent. This is from their understanding that glass as a building material should reduce embodied energy that goes in it and should work well with the climate and should be economically and socially acceptable.

#### 7.2.2 Profit Driven Architectural Trends: A Quick Return on an Investment

Some of the respondents from the categories of policy and managerial stakeholders stated that architectural trends for office buildings in Dar es Salaam are profit oriented design and construction. Profit oriented architecture was described by the respondents in terms of poor quality, cheap building products, and a basic design to accommodate required functional spaces allowing developers to invest less in construction and receive a quicker return on their investment. The following is from one interview:

*“There are two types of office buildings. There are buildings that are built by private investors and there are those constructed by parastatal funds or public institutions. The latter are well [designed] and constructed,*

*follow regulations, and are of good quality [in terms of durability]. On the other hand, private sector financed projects concentrate on making profit. Because plots are not owned by private institutions, so private investors get plots through joint ventures with either public institutions or individuals. When they get the plot, they want to invest and recoup the money very quickly. They don't have any interest to invest in something good. All they want is to maximize the profit and they don't care about leaving behind a building which is about to fall down. They don't care. Those are the people who bring a lot of problems. Actually, when you look at the collapsed buildings in the city, most of them are privately owned. Whoever is making the investment at that particular time, his interest is finish fast, get his profit and leave without thinking of long-term impacts. So things like sustainability or long term benefit is not an issue ..."*

(Registrar of the Contractors' Registration Board, interviewed in Dar es Salaam on 20<sup>th</sup> November 2013, translated from Swahili).

Profit driven architectural trends are primarily in the privately owned buildings as pointed out by this respondent. This was also a concern raised by other respondents who commented that most of office buildings in the city centre are privately owned, built very fast and sometimes use substandard materials to save cost. As such, the quality of the buildings is compromised because of the desire to reduce upfront investment cost. These buildings are rented out to different tenants for offices.

This perception by the respondents is evidenced in building collapse cases experienced in Tanzania. The collapsed buildings were privately owned and linked to a lack of municipal supervision and the use of sub-standard material and construction techniques. For example, in Dar es Salaam in March 2013, a 16 storey commercial residential building (privately owned) under construction collapsed on Indira Ghandi Street killing 36 people. The preliminary investigation report revealed that a lack of adequate professional supervision from the consultant and the relevant local

government authorities, led to the use of cheap substandard building materials, like reinforcement bars and inappropriate cement sand mix ratios to reduce construction costs, causing the building to collapse. The newspaper article *“Collapsed building: cutting corners, bribes to figure as prime causes”* speculated that the use of substandard materials and bribes reduced construction cost but also compromised the construction quality of the 16 storey building. This article, published before the investigation report was out, noted *“The point that cannot be avoided at a preliminary level, without any results being given following ongoing investigations, is that the collapse of the 16 storeys structure can only stem from cutting corners with building materials, to reduce costs”*. The Guardian on Sunday, 31<sup>st</sup> March 2013.

The use of cheap and substandard building materials is one way for the developers to save on construction costs under the watch of unethical and corrupted supervisors but in the end they produce buildings that last hopefully long enough for them to get a return on their investment while leaving a poor quality building behind. There are new buildings condemned for demolition due to their poor quality, which poses a threat to the built environment. For example, a 16 storey building (privately owned) was declared for demolition by the government following the building collapse in March 2013 in Dar es Salaam. The Guardian newspaper article titled *“Dar building to be demolished at last”* of 29<sup>th</sup> May 2013 stated:

*“Ilala municipality has issued a one-week demolition notice to the owners of the building opposite the 16-storey building that collapsed in March 29, this year along Indira Gandhi street in Dar es Salaam. The Mayor of Ilala municipality told a press conference in Dar es Salaam yesterday that the decision to issue the notice was reached after a meeting with the Parliamentary Standing Committee on Lands, Natural Resources and Environment held in Dodoma. The notice has been sent to the owner of the building and to NHC who own plot number 1662/75 at Indira Gandhi,*

*Ilala municipality where the building stands". (The Guardian newspaper, 29<sup>th</sup> May 2013)*

**Figure 7.4 Building Condemned for Demolition in DSM**



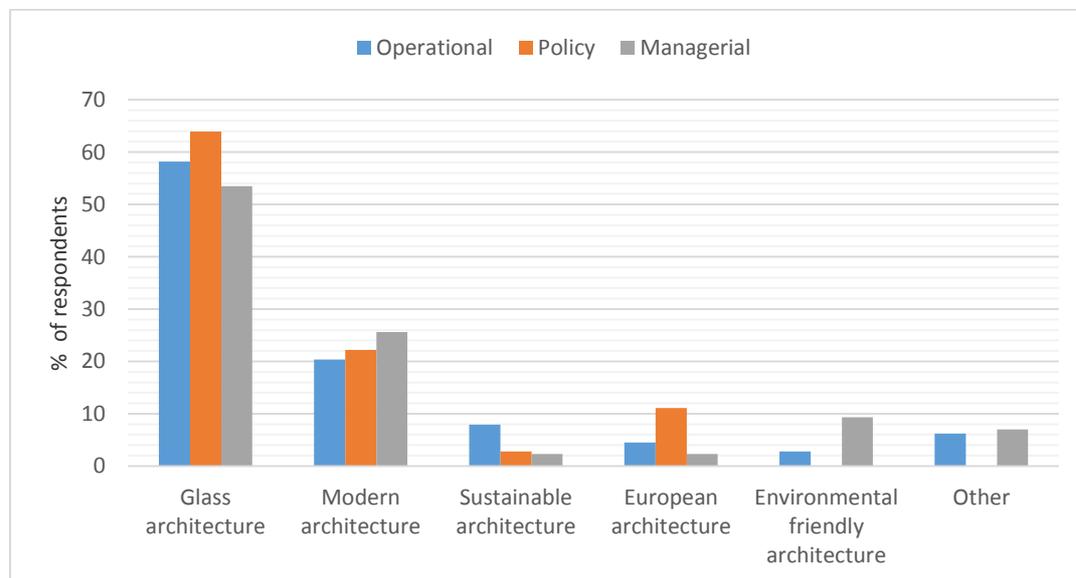
*Source: The Citizen newspaper (online), 24<sup>th</sup> September 2015*

By December 2014, the building was declared structurally not safe, built with sub-standard building materials, but it still stood as the demolition order was yet to be implemented. This implies that there is a bigger problem with managing the built environment. Lack of compliance to building and planning laws, acts and regulations and a lack of professional ethics, open doors for some investors to take advantage of the situation for their own short term benefit. Private investors, with their intention of getting more profit with less investment costs, continue with their practice undisturbed (unless the building collapsed). This shows a problem with enforcing the policies to manage the built environment and a lack of compliance with professional ethics (despite having in place regulatory authorities) by the consultants and contractors who allow investors to use substandard materials and cheap construction techniques under their supervision.

Expert interviews show perceptions of the architectural trends for office buildings in Tanzania summarized into two major themes, glass architectural trends and less investment cost with more profit architectural trends.

Consistently, findings from questionnaire surveys revealed that a majority of stakeholders from all categories perceive the architectural trends as glass architecture. The figure below shows that 63% policy, 54% managerial and 58% of operational stakeholders perceive the architectural trends as being dominated by the use of glass as external walls. Some of the questionnaire respondents felt the architectural trends were “modern architecture” and European architecture. However, as it was noted earlier, modern architecture, European architecture and glass architecture were used interchangeably by the respondents in interviews to mean glass architecture.

**Figure 7.5 Perception of Current Architectural Trends of Office Buildings in DSM**



*Source: Questionnaire Survey, 2013-2014*

In terms of relating the current architectural trends to SDC, it appears that only 4% of all questionnaire survey respondents perceive the current architectural trends of office

buildings as sustainable architecture. It could be this 4% of respondents believe SDC is something other than environmental, cultural and economic responsive design and construction. Clearly, almost all the respondents do not perceive that the architectural trend of office buildings in urban Tanzania is in line with the concept of SDC. Why the unsustainable practices? The following section discusses the factors influencing the unsustainable architectural trends as revealed by the interview respondents.

### **7.3 Forces behind Urban Tanzania's Architectural Trends of Office Buildings**

According to the expert interviews, there are a number of factors influencing the architectural trends for office buildings in urban Tanzania. Factors revealed provide a basis for better understanding the factors limiting the application of SDC practices. The factors pointed out by the respondents are summarized into six themes. These are; 1. Glass is durable, maintenance free and easy to work with; 2. The influence of building material suppliers; 3. Designers and developers mind-sets and egos; 4. The rubber stamping of imported designs by local designers; 5. The lack of building regulations, and 6. Architectural design software.

#### **7.3.1 Durable, Maintenance Free and Easy to Work With**

Out of the respondents who perceived architectural trends as glass architecture, some of them said that glass is widely used because it possess a number of advantages, which include that it can last for a very long time without regular maintenance if compared with block walls. Hence, it is a low maintenance low cost building material. Respondents revealed that glass is easy and cheap to work with. They argued that glass, as a ready-made material, can be mounted on buildings faster than blocks. Since glass has become widely utilized in Tanzania, its availability in the local market is not a problem. One respondent had this to say:

*“... I think beauty lies in the use of glass ... it is an imported finishing material, it is so expensive ... and people prefer glass to show the quality of*

*the building. It's easier to maintain glass and glass materials are easily available ...*" (Architect, Director of architectural firm, interviewed on 26<sup>th</sup> November 2013, Dar es Salaam. Translated from Swahili)

The respondent raised another point on how glass is perceived by many, that it is an expensive imported material. That means, to the respondent, using it adds status, beauty, and increases the overall quality of a building. This was also pointed out by other respondents, that "if glass facades are not included in the design and construction, sometimes developers experience difficulties to get tenants because the building is considered not appealing". One respondent added another point to beauty, status and quality of the building; that using glass exterior walls helps to reduce the cost of building maintenance.

The culture of periodic and routine building maintenance is lacking in Tanzania. Direct observation reveals that it is not unusual to see public buildings and their associated systems like drainage, electric, and plumbing deteriorate because of the lack of regular maintenance. Lack of funds is often the main reason for irregular building maintenance. In 2014 the European Union gave 7 million Euros to Tanzania through the Dar es Salaam Centre for Architectural Heritage (DARCH) for building maintenance and saving historic buildings. The funding came as an intervention to protect historic buildings, which are deteriorating due to a lack of maintenance and are in danger of being demolished.

### 7.3.2 Influence of Building Material Suppliers

The influence of building material suppliers and manufacturers, especially in terms of making glass easily available, was also mentioned as a reason for glass's popularity in Tanzania. Some of the respondents, all from the category of operational stakeholders, revealed that glass architecture in Tanzania is driven by building material suppliers. Advertisements for glass building materials with lists of their advantages like energy efficient glass, being a modern building material, together with pictures of glass

buildings taken from developed countries, attract more developers and designers to use glass in their buildings. Advertisements were often misleading. Although they focus on technical issues, the advertisements are hardly regulated. In one case the term green or sustainable buildings was used with a picture of a glass building in Tanzania, which is not recognized by any institution inside or outside the country as a green building. This was found in an advertisement by the largest material supplier and class 1 contractor in Tanzania, Dar es Salaam Glass Works Limited, which showed their specialty façade design and claims of expertise in green buildings by showing a glass building (implying it is a green building), which is not the case.

**Figure 7.6 Advertisement by the Material Supplier**



*Source: The Official Journal of Architect Association of Tanzania, Vol. V, Jan. – Mar. 2014*

This advert suggests that the building shown in the advert is a green building, hence a green building is a glass building, and therefore glass is inherently a green building material. In line with this observation, one of the respondents pointed out that the construction industry is affected by material suppliers to the extent that some building developers do not appreciate a design if it is not enclosed in a glass box.

*“The building industry is now being affected by some people, some clients if you don’t give them glass, they won’t say the design is good ... You see those who produce glass are not architects, are not professionals. These are just business people who have created a system to produce material for this environment and they have to sell ... what we see now is a constraint for the future development ...”* (An Architect/Director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 9<sup>th</sup> October 2013.)

Building material suppliers promoting the excessive use of glass are seen to dominate professional design decisions in the construction industry as pointed out by the above respondent. The clients are driven by the power of the material suppliers, which then trickles down to demanding the designers include glass envelopes in the designs they are paying for. Another respondent revealed that architects in Tanzania are no longer in control of the design projects and they are overpowered by other forces including building materials suppliers in the country. Revealing this perception over architects lacking control over designs in the country, a respondent had this to say:

*“The Architect seems to be weaker and weaker, they are not that strong as they used to be ... architectural thoughts ... are being overpowered by the other forces like developers, material suppliers, economic influences ...”* (An Architect/Director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 11<sup>th</sup> October 2013.)

The above respondent expressed concern over the diminishing power of architects in determining the nature of the built environment in urban areas of the country to the extent of accepting what the market perceives to be a good design, which is a glass enclosed building. Material suppliers’ business strategies overpower professionals in the construction industry. This means in the long run the built environment in urban Tanzania will be determined by the material in the markets rather than principles for

good designs in terms of respecting the environment, economy and social culture of a place.

### 7.3.3 Designers and Developers Mind-sets and Egos

Respondents argued that developers approach the designers with images, or they specifically require a building with a glass façade as seen in Dubai or in some developed countries. Many developers in the construction industry are competing to show status and the strength of their institution through their buildings. One of the respondents narrated that:

*“The architects are no longer able to sell their ideas to clients. It seems that the clients are commanding the architects to do what they want ... developers and engineers seem to have the upper hand ... and some developers are more interested in their status. Some buildings are put up are for corporate image or a branding kind of thing, so people are looking for an identity using buildings but that kind of approach is not compatible with urban quality architecture.”* (A quantity surveyor/ lecturer/Director of a quantity surveying firm in Dar es Salaam, interviewed in Dar es Salaam on 10<sup>th</sup> October 2013.)

Identity versus sustainability, as pointed out by the respondent, is a driving force for the architectural trends of office buildings in urban Tanzania. Developers' demands and their mindset to show their status in the built environment was expressed by many interview respondents as a factor for the current architectural trends. As seen in the previous section, architects are becoming weaker and weaker in design decisions and instead they just implement what the developers wish for, glass buildings. Architects seem to be not able to provide reasons for a different decision because of their level knowledge on the qualities of SDC as compared to glass architecture. The above respondent pointed out the issue of glass buildings being incompatible with a well-integrated urban fabric but still being encouraged by the material suppliers and

developers in the country. This implies that being compatible with the existing urban fabric is not a major concern for the developers and, unfortunately, for architects. There is no building law in place that requires buildings to respect the established standards of the existing urban fabric, be it in materials, color, and texture of exterior finishing. However, professional practice in the country calls for this simple prudence to use appropriate reasoning in order to sustain and manage the urban fabric.

Likewise another respondent pointed out the issue of cost versus sustainability. According to a respondent there is minimal concern for the cost incurred by developers to build a glass building in Tanzania because of the need to satisfy their ego and survive in the market competition:

*“Nowadays, developers have a certain type of command. You may advise them (with or without examples) that the construction costs could be higher when we use this amount of glass. He can understand your advice but when he thinks of the existing competition, developers fear that without using glass the building might look old fashioned and hence they won’t get tenants or buyers. So he might say, “Let’s incur the costs of using glass and putting in AC so the building can compete in the market. Clients (developers) have that power, and architects may be driven by the developer.” (Architect, AQRB, interviewed on 26<sup>th</sup> November 2013, Dar es Salaam, translated from Swahili)*

Running costs is not an issue for most developers. For privately developed buildings, running cost are often carried by the tenants and building users and for public buildings it is tax payers through government budgets who carry the burden. This is evidenced by the energy audit reports of 2006 where it was revealed that the government had to embark on energy auditing of some government buildings in order to find ways to reduce the cost for paying for energy, which has become a burden

(MEM, 2006). And in privately owned building the burden reflects on the cost that tenants have to pay to the service provider.

The perception that excessive use of glass in building gives a modern and new fashion outlook is superseding the issue of the cost involved as pointed out by the respondent above. Developers are willing to pay more to compete in the market with other developers. Likewise, for the designers, it was revealed that some consider glass enveloped buildings better than other designs. These designers are willing to work with, or possibly take advantage of, developers who are not familiar with the consequences of building with glass in Tanzania. Competition among designers to create their physical, visual and expensive landmarks in the city centre has led to high rise glass buildings, as narrated by one of the respondents.

*“I have a very negative description of the architectural trends in Dar es Salaam ... The problem is with architects. To my knowledge, most architects don't really look at the impact of their buildings on the built environment. They don't even think of about orientation and wind movement anymore. It is unfortunate architects do not want design to concur with the environment. They only look at space requirements and cover the building with glass to imitate Dubai. Most clients don't (yet) know about energy conservation techniques and unfortunately our architects do not advise them and finally the client will struggle with the building by himself, as if it is his problem ..., and the big problem is copying, they are competing among themselves by just copying the designs from Europe that they cannot even modify to suit the environment.”* (CEO, National Construction Council, Interviewed on 30<sup>th</sup> April 2014, translated from Swahili)

In the quest to create physical, visual and expensive glass landmarks by the designers, the basics of designs which includes proper building orientation to reduce heat gain

and the consideration of the impact of what is added to the built environment is often ignored by the architects. The respondents also pointed out the issue of ethics where by the architects do not advise their clients accordingly, instead they turn a blind eye for the sake of competing by copying designs from other countries. Copying and imitating designs from developed countries is a trait of both designers and developers because of their mind sets (strengthened by lack of knowledge on qualities of SDC) and in the end, the developers and building users are left to deal with the consequences. Other respondents expressed the reason for copying glass architectural styles from the developed countries as the competition among developers to show power and visibility in the city in terms of having an (perceived) expensive, modern, Western style building, which stands out in the city in terms of height. One managerial stakeholder respondent explaining the trend of copying western designs with the aim of competing to have the tallest Western look design narrated that:

*“The trend now is a copy-cut, everybody wants glass everywhere, period. Until you make them aware ... the clients, when they come, they say I have seen this glass building and I want it like that ... one of our clients, for example, he wanted a taller building, image, visibility and all that ... it is a competition actually, landlords competition. We are coming with 35 storey building up behind Uhuru Height, Uhuru Height has 27 stories, so we had to beat it ... competition and showing that I can do more is one factor ...”* (Chief Architect, NHC interviewed on 29<sup>th</sup> October 2013, Dar es Salaam.)

It is clearly seen that sustainability has no status in urban Tanzania. Instead developers’ competition and a scramble for visibility and identity through their buildings is the priority. Developers’ and designers’ egos of showing that I can do more (in height and visually), compromises both cost and quality of the built environment and sustainability of all the resources goes in buildings. In terms of cost for creating comfortable interiors, the study analyzed operational stakeholders’ (designers,

quantity surveyors and contractors) awareness of the cost of electricity incurred by their clients for air conditioning and lighting in glass buildings in order to create comfortable interiors for building users by using a questionnaire survey. When asked if they are aware of the monthly cost of electricity for air conditioning and lighting incurred by their clients in the buildings they have designed, 62 % of the respondents showed that they were not aware of the cost of electricity incurred by building users/clients, and only 8% showed that they are very aware.

**Figure 7.7 Awareness of the Monthly Cost of Electricity Incurred by Building Users**



*Source: Questionnaire survey, 2013-2014*

This implies that architects do not care about the running costs of the buildings they design. The burden of paying for running costs is left to the clients. Because of the client's ignorance or having a different perception of good design, this burden is often felt later when a building is in use. Unlike car designers who are very keen on the running cost of a car, the more expensive it is, the more costly it is to run, and the consumer is aware of the running cost in making their choice to buy a car but for office buildings this is missing.

As the survey question about running costs was not open ended and respondents could not explain how they became aware of the cost incurred by their clients, it is assumed that their awareness may be based on client notifications or complaints or from their professional training. One respondent did acknowledge receiving complaints from their tenants about the costs of electricity. He narrated:

*“for our buildings that we are renting out, the tenants are paying the bills (electricity and water bills) ... of course we have heard complaints from our tenants (private tenants) that they are paying high bills ... of course when they were built no one was thinking about energy efficiency issues ... all complaints for now are channeled to the energy supplier, TANESCO because their tariffs are high.”* (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

It is interesting to note, however, that both designers and developers are struggling to satisfy their mindsets and egos at the expense of tenants and building users paying the price for maintaining the buildings' interior comfort.

#### 7.3.4 Rubber Stamping of Imported Designs by Local Designers

The Tanzanian Architects and Quantity Surveyor's Registration Board (AQRB) practice notes number 12 stipulates that “where the developers use standard drawings prepared outside the country, the drawings must be certified by an architect registered in Tanzania, as to conform to local conditions and standards. Under no circumstances shall the foreign designers be involved in any way with the post contract administration like issuing instructions or attending site meetings for instance, unless they secure prior registration with the board.” This clause gives power to local architects to make sure designs that are brought in from outside the country by the developers are reviewed and adapted to the local climate, conditions and standards.

All reviewed drawings should be implemented under the supervision of local architects.

However, some of respondents claimed that there is a tendency for local designers to get paid by developers to certify drawings that are made by foreign designers in order for the developers to be able to implement the project in Tanzania. It was further revealed that once the local designers certify the drawings, they don't have much say about the design and if changes are needed during the construction stage, local designers need to seek approval from the foreign designers. In the end, the local designers make sure the project is implemented as directed from overseas. This situation is explained by one respondent as local designers focusing on survival and getting paid (a little) for not doing their job. The trend of stamping design projects in Tanzania without any design input by local architects is alarming because the designs are not following basic design principles to cope with the climate and local conditions. This is evidenced by a representative of the AQRB, where the drawings have to be submitted and scrutinized before being issued a sticker to display on a signboard for the post-construction stage. As narrated by the AQRB Registrar:

*“Here at the board we are starting to see designs from outside although the rules don't allow. But if you look at the local designer and the previous work done by the same designer, all of a sudden he is coming with a totally different design and if you ask questions he cannot even explain the design, so you get a feeling that the design came from abroad ... that feeling that everything from the West is good but adaptability here is becoming quite poor...”* (Registrar, AQRB interviewed on 16<sup>th</sup> January 2014, Dar es Salaam.)

Poor design adaptability to the local context is pointed out by the respondent as a major drawback of imported design. Local architects are not playing their part to adapt the design to the local context. Other respondents explained that the rubber

stamping of designs from outside without making sure of their adaptability is caused by a lack of appreciation of design and construction services offered by local consultants for developers in the country. This was revealed by some interview respondents who claimed that developers would rather pay more to engage designers from outside and not pay the required amount by the law to local designers. One respondent narrated:

*“I think the main problem in our construction industry in Tanzania is a lack of appreciation for our professions. Maybe professionals are to blame ... We are not giving them enough time to concentrate and come up with the good design ... clients bring in the design from other places and ask them to just stamp for a small amount of money ... They (our professionals) feel that they are not appreciated, you as an architect you know it...”* (Interview with the Quantity Surveyor, AQRB, in Dar es Salaam, on 22<sup>nd</sup> November 2013.)

Lack of appreciation for the work done by local designers could be a reason, but some of conscientious designers mentioned that they were able to turn down rubber stamping imported designs because they were offered a small amount money to do so and clients were unwilling to invest more time and fees to revise the designs. The courage to turn down imported projects lies with designers who are prepared to do the right thing, to do justice to themselves, and to the built environment. One of the respondents, an award winner of the AQRB best project for years 2009–2012, explained that he was able to turn down rubber stamping projects and instead asked those clients to find someone else because he felt that his role as a designer was undermined. But then building construction continues without adaptation measures. Another respondent shared his approach on how he dealt with clients who approached him with imported designs:

*“What I have done in some cases, and it has been successful, is that we don’t argue too much, you take the design, listen to them very carefully, and I design according to what they say and what I believe is the right approach. Now when I bring the proposal, they forget what they told you ... Just prepare a design that counters their previous design, just bring the design, not by talking. I’ve done that in so many cases”* (An Architect/Director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 11<sup>th</sup> October 2013.)

This shows that it is possible for designers to adapt imported designs to the local context if given a chance by developers. The above respondent’s narration shows that rubber stamping is a common practice in Tanzania. However, the ability to convince the developer to turn down or revise the foreign design work to fit the local context is minimal because of the cost already incurred by the developer to get the foreign design.

The tendency of importing designs into Tanzania was also experienced by the researcher in one of the projects she was involved with as an assistant architect in 2008, to design and supervise a government building in Tanzania. The design team received an offer from the service engineer, who was also part of the design team, who suggested that the design team use someone from South Africa to produce a design. What needed to be sent was only the site map and the client’s requirements. He further explained that he has been doing that in other projects and they were successful in terms of meeting the client’s expectations. This implies that some local architects and developers believe in a short-cut way of getting designs from outside the country which are not necessarily cheap, but they consider to be superior because they are from more developed countries. As such, the built environment is ending up with designs that are not appropriate for the climate or social-economic context, and the cost of maintaining these buildings is excessive. As discussed in chapter 4 where

glass boxes consume ten times the energy compared to a buildings of the same scale that utilizes appropriate designs to cope with the local climate.

According to respondents, this tendency may be driven by the ignorance of decision makers, corruption, designers not valuing their job and preferring shortcuts, and lack of appreciation of local design and construction services by developers in the country. And because of this more resources are used to create comfortable interiors, maintenance costs are higher, and burdens are increased for building users.

#### 7.3.5 Lack of Building Regulations

Currently Tanzania does not have a building act in place (policies and regulations governing the construction industry and the built environment are discussed in detail in chapter 5 section 5.3). The nonexistence of a building act and building regulations was revealed as one of the factors influencing architectural trends in Dar es Salaam. Some of the interview respondents noted that they do not have clear guidelines for architectural development. Lack of a building act and regulations opens doors for designers and developers to copy glass designs from outside, with only a small effort to meet urban development standards set by the local municipal council, in order to acquire building permit. Nonexistence of a building act and regulations in Tanzania was also explained by the respondents as encouraging the importation and use of cheap sub-standard building materials in the construction industry. Interestingly, the importers and developers who are using sub-standard materials are not breaking any laws. This is in line with the statement of the president of AAT in a newspaper article of 13<sup>th</sup> April, 2013, titled: *“Architects Want Law on Buildings”*. He was quoted saying *“there is no way the country can operate without laws ... the cry for a building law that carters for the safety and health of the public has been long and it is time to formulate ... There should be a guiding legislation to monitor construction work all over the country”* (Daily News, 13<sup>th</sup> April 2013). The cry for building laws was echoed by 20% of respondents interviewed.

### 7.3.6 Architectural Design Software

Some of the interview respondents from the category of operational stakeholders pointed out another reason for the widespread use of glass in buildings as being a result of the architectural software used for design. Arch Card, AutoCAD, 3DMax and the like, have a library of pre-design elements like doors, windows, curtain walls and other elements that one can just command and have in the design. All this software is produced in Europe and USA using their countries' standards for building components that are not suitable for the Tanzanian context. One respondent argued that since our architects are not the designers of the software, they can only learn how to use it and thus depend on the design elements in the software. In the end they create buildings that look like European buildings. The respondent narrated:

*“I don't know whether our training is part of that. Because of the use of computer design software, it makes students download things [designs] from the internet; so when they download they are Europeanizing our environment. Because the library is made by Europeans, we don't develop our own libraries, so it is easier to download an existing window in Europe and put it in the design, it is easier to download an existing elevation and put in the design so maybe that could be affecting our output ...”* (An architect/ retired lecturer/ director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 11<sup>th</sup> October 2013.)

This observation implies that architects are no longer spending time with their pens and pencils to design and analyze building façades with shades and shadows, or solids and voids as it was traditionally done. Instead they rely on design software and sometimes local designers are not conversant in using it, resulting in copying facades that are contextually inappropriate. It is argued that, if a building act is in place, which will offer guidelines and standards of building elements in order to achieve sustainable design, there may be an opportunity to develop design software that includes elements that take care of the local context.

Forces behind the current architectural trends of office buildings in Dar es Salaam gives insight on the factors hindering the adoption of SDC in urban Tanzania. Appendix IV summarizes the findings from expert interviews on the forces behind the current architectural trends of urban Tanzania. It shows all the factors revealed by 42 interview respondents, which were summarized into the six emerging themes discussed above. To further comprehend the factors hindering the adoption of SDC, the next section explores more factors uncovered by this study.

#### **7.4 Challenges of Adopting SDC Practices in Urban Tanzania**

Stakeholders revealed a number of factors which are summarized using ten themes. These are: 1. lack of awareness and understanding; 2. lack of policies and laws; 3. technical knowledge deficit; 4. perceptions of investment costs; 5. lack of professionalism; 6. improper procurement system for consultant works; 7. influx of foreign investors; 8. developer demands; 9. corruption; and 10. political interference with technical work. Findings discussed are based on expert interviews with key stakeholders in the construction industry representing policy, managerial and operational categories.

##### **7.4.1 Lack of Awareness and Understanding of the Concept**

Expert interviews revealed that most of the responses from all three categories of stakeholders identified lack of awareness and understanding of the concept of SDC among players in the industry as the biggest challenge for mainstreaming the practice of SDC. The respondents described lack of awareness among stakeholders in terms of the concept being new in the Tanzanian construction industry and minimum efforts by relevant authorities to create awareness among stakeholders. Hence, it is becoming difficult to mainstream its practice because of the lack of awareness. One respondent,

while describing the challenges faced when they were trying to apply some principles of SDC in one of their projects, had this to say:

*“The first problem is understanding the concept. It is new in Tanzania. So when we talked about it, people thought we are bringing in new things while we have our usual way of constructing ... so people think you want to bring in new ideas ... that is a big problem, lack of awareness”.* (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

From the respondent, it appears that new ideas are not easily welcomed. This is because of the fear of disturbing the comfort of doing business as usual. Accepting new ideas is only possible when actors are aware of their benefits as compared to the usual practice. Not having a clear definition of SDC in a simple language for it to be easily understood was also pointed out by respondents as a hindrance to creating awareness and understanding among stakeholders. One operational respondent narrated:

*“Architects can’t come up with a design and say this is sustainable design, the clients don’t know about sustainable design ... understanding and embracing SDC is lacking in our society. It is not defined anywhere in our laws or policies for people to know it exists ...”* (A senior quantity surveyor/lecturer/director of a quantity surveying firm in Dar es Salaam, interviewed in Dar es Salaam on October 10, 2013.)

Besides having a clear definition of SDC in laws and policies, the respondent emphasized the point of awareness for both architects and clients. Clients have a major influence on the current architectural trends in urban Tanzania. As such, clients’ awareness of the benefits of SDC will have an impact, helping to mainstream its practice.

The absence of a clear meaning of SDC was also observed by the researcher. For example in figure 7.8, an article in the Uhuru newspaper of 13/2/2015, the term “Green Building” is translated in Swahili as “Ujenzi wa Kijani”. This is a word to word translation from English to Swahili that does not provide a clear meaning of what green building means. It leaves the reader’s imagination to find its own meaning of “Ujenzi wa Kijani”, which could include green colored construction projects. Instead one could translate green building as “majenzi yanayothamini mazingira” (construction that values the environment) from that term one will get a clearer meaning of green building, construction that respects the environment. This implies that the Tanzanian construction industry has to create a meaningful translation with a clear meaning of SDC (or green design and construction) for it to be easily understood and for mainstreaming the practice.

**Figure 7.8 Translation of Green Building to “Ujenzi wa Kijani”**



*Source: Uhuru newspaper of 13/02/2015*

Other respondents argue that the level of awareness is currently low but within no time people will become aware of SDC practices. Their argument is based on the awareness of the short falls of the current glass architectural trends of office buildings in Tanzania. Meaning that people are noticing that glass buildings are energy

intensive and the situation gets worse when the electricity goes off, which is fairly common in Dar es Salaam. In the end tenants may start to vacate the new good looking glass office buildings because of the costs involved for cooling and lighting. The respondents added that the trend of vacating will eventually make the developer/clients evaluate their buildings and seek better ways of designing and constructing. This is when SDC practices will come in.

Lack of awareness and understanding of SDC was also observed by the researcher when attending a CPD Seminar on “The Use of Modern Technology and Challenges of Urbanization” organized by AQRB on 20-21 March, 2014 in Mbeya. It was observed through participants’ questions and comments that there is a lack of awareness and understanding of the whole concept of SDC. The discussion on green buildings was not received well by many participants, because there was a feeling among participants that green buildings are not appropriate for Tanzania, at least not for now. One example is seen in a participant’s comment after the presentation on green building practices in Tanzania.

*“As we all know that most of the energy produced by TANESCO is being wasted during transportation. It seems that we are very much worried about energy used by buildings. Is this the right time to invest in green buildings or it is just a business name? ... It is just 12% of Tanzanians who are using electricity, so why worry about it while we are not even producing enough? I don’t think we are wasting energy but rather we have a deficiency in the production ...”* (Source: participant, AQRB, 21<sup>st</sup> Continuing Professional Development Seminar on the Use of Modern Technology and Challenges of Urbanization, 20<sup>th</sup> March 2014).

His arguments clearly show that there is a need to create more awareness and understanding of the concept of SDC for stakeholders to embrace it and eventually

build a positive attitude towards mainstreaming sustainability practice in construction industry.

#### 7.4.2 Lack of Policies and Regulations

Respondents revealed that a lack of adequate policies and laws regulating the building industry is one of the factors influencing the glass architectural trends in Dar es Salaam. Likewise, some of the responses from all categories of stakeholders echoed that a lack of policies, laws and regulation is posing a challenge for mainstreaming the practice of SDC in Tanzania. Respondents further argued that if the benefits of SDC are recognised by policy makers and translated into laws and building acts, all other stakeholders will have no choice but to implement it. One of the respondents narrated:

*“What is delaying us is the lack of policies and legislation towards the implementation of SDC. Whoever uses this concept does so for their interest, but we don’t have anything that forces us to do so”. (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)*

To illustrate the need for laws and policies in Tanzania to guide professionals in the building industry, another respondent, a foreign architect working in Tanzania, compared the power of laws and legislation to regulate the built environment as it is practiced in the UK to the lack of building laws in Tanzania and how it creates challenges in regulating the built environment towards sustainable practices.

*“If you go to the UK, where I come from, all this (SDC) is regulated. It is controlled, it is not like you have to talk about it. You have to demonstrate the options you have to do. Legislation and laws are there, people who are checking are there, whether in the building permit process or on the client side, they are all checking. It is all regulated and that doesn’t exist here ...*

*how can you talk about SDC without legislation?”* (Foreign architect, director of a firm, interviewed on 19<sup>th</sup> November, 2013, Dar es Salaam)

The respondent is giving a successful example where laws and legislation are in place to regulate the built environment and professionals have to abide by it. This implies that there is an opportunity for an intervention to create awareness and lobby policy makers to mainstream SDC practices by enacting policies and laws to guide the construction industry towards sustainable practices.

Building laws stipulates in detail what should or should not go in the building design and construction. For example, the Kenya building code of 2009 stipulates measures in the design, construction techniques, and building materials selection in favor of SDC practices. Whether existing building policies in Kenya and other countries are working in terms of guiding the construction industry towards SDC practices is arguable. But the point here is, a building policy provides a forum for stipulating measures for SDC practices for all stakeholders to abide to. Take the Kenya Planning and Building Regulation Act of 2009 as an example. Kenya had a building regulation act since 1968 (replica of the British building regulation). It was reviewed in 2009 due to the changing social economic dynamics in Kenyan society (National Planning and Building Authority, 2009). In the review process, the main task of the review committee was to “... *propose an institutional framework for achievement of sustainable, well planned, safe and healthy built environment*” (National Planning and Building Authority, 2009). Some of the merits of the Kenya building regulation 2009 in relation to sustainability, is that the regulation possess guidelines to achieve a sustainable building. For example, in volume 4, part N, issues like energy efficiency and thermal comfort (NN31), water management (NN32) and indoor air quality (NN33) are requirements for all new buildings, alterations and extension of existing buildings. The regulation 2009 also elaborates different ways of achieving energy efficiency, water management and indoor air quality in buildings. For example, it addresses energy efficiency, passive and natural cooling and lighting methods where

solar and other renewable sources of energy should be installed in new housing developments. Specification on rain water harvesting and use of low emitter formaldehyde products, and volatile organic compounds and indoor landscaping are also stipulated in the regulation for water management and good indoor air quality. The item of “offences and penalties” in each section, also provides a baseline for enforcing ethical conduct by professionals, regulators, and developers in the construction industry in Kenya. Clearly, the absence of building regulations in Tanzania is a lost opportunity for mainstreaming SDC practices and enforcing ethical professional conduct. The absence of a building policy creates an opportunity for including guidelines for SDC practices after being explored and understood by stakeholders in the construction industry in a future building policy. Furthermore, not having a building law in place can also be translated as a lack of urgency by the Tanzanian government to implement a global sustainability agenda.

#### 7.4.3 Technical Knowledge Deficit

Insufficient knowledge, lack of technical knowhow and lack of technology was pointed out by most of expert interview responses, as a challenge for mainstreaming the practice of SDC in urban Tanzania. Respondents revealed that there is a knowledge deficit in terms of stakeholders having the skills and expertise to design and construct a sustainable building. One of the respondents used the statement that “*sustainable design is difficult to achieve*”. This suggests that there is a lack of knowledge on how SDC can be achieved. As discussed in chapter 6 section 6.2, SDC principles are not in the teaching curriculum for architecture studies in Tanzania. Lack of a foundation in the training program helps to explain the knowledge deficit among stakeholders in the industry. The absence of courses on SDC in the teaching programme was identified by the former Dean of the School of Architecture in an interview.

*“... as a former dean I must comment on the training programme. Architecture (at Ardhi University) does not train our architects to be aware of local context. Our training does not concentrate on local issues*

*particularly on climate ... SDC issues are not in our curriculum. It is unknown to our students and to ourselves (as teachers), of which we are not aware of what to teach in line with SDC ... then there is another big mistake we are have, namely that we are don't have round table discussions which combine urban planners and architects to resolve local issues ..."* (Former Dean of the School of Architecture and Design (SADE)/ director of an architectural firm, interviewed on January 15, 2014, Dar es Salaam.)

Investing time in teaching and conducting roundtable discussions with different professionals is pointed out by the respondent as one way of gaining and sharing technical knowledge on SDC among stakeholders in Tanzania. Furthermore, it was revealed by another respondent (Architect for the NHC Place project, the first green office building in Tanzania), that one of the main challenges they faced during the design stage is that the local service engineers for the project were not knowledgeable enough to specify appropriate measures and equipment to achieve energy efficiency and water efficiency in the design. Meaning that service engineers, who have an important role to play in order to achieve sustainable designs and construction, lack practical knowledge on sustainable equipment that should be specified in the design. In the end they are still operating in an old fashion way by giving old specifications used in previous projects. This point was also echoed by another respondent who is a foreign architect practising in Tanzania for many years.

*"It is hard to find an understanding of SDC in our disciplines (architecture, engineering). The people who know most are suppliers. Suppliers of solar systems, waste water filtration and refuse systems ... the engineers here (Tanzania) are set up to do things the way they were done many years ago ..."* (Foreign architect, director of a firm, interviewed on 19<sup>th</sup> November, 2013, Dar es Salaam)

This respondent's argument is that material suppliers have more knowledge of SDC measures than engineers and designers who are supposed to give specifications in the design process. This suggests that material suppliers have more influence in the industry than designers because of their knowledge used to capture different markets. Nonetheless, lack of knowledge and technical knowhow among key stakeholders is revealed as a challenge for mainstreaming the practice of SDC in Tanzania.

#### 7.4.4 Perception of Investment Costs

A perceived higher cost of investing in a sustainable building was revealed by some of the responses recorded from all three categories of stakeholders. This is a key challenge for mainstreaming SDC practice in Tanzania. The respondents felt that SDC requires more time to invest in the design process, which is reflected in a higher cost for the design and clients are not willing to pay for this. To illustrate a common argument made by respondents:

*“... time and payments provided by the client to seriously design and focus on getting a good design is not enough and the clients are not willing to pay more ... normally decision makers on the cost of the project always focus on the capital cost. They don't look at the return. They just don't accept the cost on the capital and don't give you room to explain what the return will be for their investment. Putting up a sustainable building means the initial cost is higher but you will always get the return in less than seven years, we have done the numbers ...”* (Chief Architect, NHC interviewed on 29<sup>th</sup> October 2013, Dar es Salaam.)

Besides clients being not willing to pay for more time invested in the design, the respondent raises another point about developers not being interested in investing more in the capital cost of the project compared to what has been invested in other conventional projects. According to the respondents, higher capital cost can be influenced by the time invested in the design, specifications in the design and

construction techniques proposed. Along the same line, another respondent, explained that the cost of SDC can be escalated by the equipment needed in order to achieve efficient use of resources in the buildings. He gave an example of equipment like a waste water treating plant:

*“Mainly because it costs money, re-use of materials, treating and recycling water, they all cost money and it is also difficult to justify the cost-benefit and all that ...”* (Foreign architect, director of a firm, interviewed on 19<sup>th</sup> November, 2013, Dar es Salaam)

Difficulties in justifying the benefits to the clients, as revealed by the above respondent, could be one reason for developers not being interested in paying more and this can be influenced by a lack of practical knowledge on sustainable buildings among designers. The inability to justify the capital cost of investing in a sustainable building was also mentioned by another respondent while sharing the challenges faced in the NHC Place project (first green office building in Tanzania). The respondent pointed out that it was difficult to explain the benefits of reducing the rentable square meters in a building floor in order to provide spaces for sustainable design features, like for plants. It was seen as an additional investment cost while reducing space that could generate more income. The respondent, sharing the challenges they faced on their project had this to say:

*“The problem is the initial cost is bigger than a conventional building, because we planned that we should have space for plants on each floor and we should use special glass on our facades, glass that allows light but not heat and the cost for this glass is high. We also added shades and canopies to shade the building, this also adds cost. But in the long run the cost saving is big ... normally when you have a building with let’s say 8000 square meters, and you expect that you will rent it. But the fact that you took some square meters for plants means you reduce space for rent, who*

*is paying for that space?”* (Director of Property Development and Maintenance (NHC), interviewed in Dar es Salaam, on 25<sup>th</sup> October 2013.)

From this respondent it appears that the cost of investing in SDC practices is perceived to be higher than investing in a conventional building. It is also pointed out that there is a cost savings during the building life. But the most important point here is that, whether there is more cost involved or not, the challenge is for the designer to justify the costs involved in investing in a SDC by showing its benefits for developers. If designers cannot do this, developers take the less costly option. As such, it poses a challenge to mainstreaming SDC practices in Tanzania.

#### 7.4.5 Improper Procurement Process for Consultancy Work

Some of the responses from all stakeholders revealed that the procurement process for the selection of consultants is a challenge for mainstreaming the practice of SDC in Tanzania. According to the respondents, the procurement process focuses more on well written paperwork and qualifications than on the quality of design.

As discussed in chapter 5, the Tanzania public procurement (employment and selection of consultants), regulation of 2005, part IV (selection procedures and conditions for application) stipulates five criteria for the selection of the consultants; 1. *Selection based on technical quality*; 2. *Selection based on technical quality and price consideration*; 3. *selection based on technical quality and least cost consideration* 4. *Selection based on the quality and fixed budget*; and 5. *Selection based on consultants’ qualifications*. (Public Procurement, Employment and Selection of Consultants, Regulations, 2005). The selection criteria shows that technical quality of the proposal and cost to undertake consultancy work, preferably lowest cost bidder, are the main selection criteria. According to the respondents the procurement system requires only a well written technical proposal and lowest cost bid for undertaking the work. As such, it deviates the focus from getting commitments for good designs to preparation

of good paper work to win the project. The technical quality is an evaluation based on *the experience of the consultant, professional reputation of the consultant and previous performance, inclusion of local firms and experts, understanding of the terms of reference, plan and methodology proposed and qualifications of experts and experience in the field.*

One of the respondents argued that if the procurement would require seeing the design proposal rather than writing a technical proposal and if the selection criteria would focus on SDC practices, then consultants would focus on good designs.

*“Our procurement system is focused on looking for a person who will do the design and not the design itself. We prepare an Expression of Interest, Request for Proposal and all that, and at the end we get designers with the best qualification and once he is awarded the work, he has no other motivation for producing the best design because he already got the job. And many times they have to tender low in order to win the project. Once he gets a job, he will do it but not to the highest standard. But if we were to opt for architectural competition, even if to the level of design idea, we will get good designs, I am sure we would get much better buildings. So competition for a good design is not there, there is no way we can get sustainable designs with the existing procurement system ... it is affecting our industry negatively”. (Registrar, AQRB interviewed on 16<sup>th</sup> January 2014, Dar es Salaam.)*

Lack of motivation for consultants to deliver a good design using the current procurement system in Tanzania is seen by many respondents as a challenge for mainstreaming the practice of SDC. However, the above respondent also pointed out that the procurement system can create an opportunity for mainstreaming sustainability in the construction industry, if the principles are clearly stipulated in the

guidelines for the selection of consultants or if a competition of design ideas becomes the criteria for the selection of consultants.

#### 7.4.6 Influx of Foreign Investors

An influx of foreign investors in the Tanzanian construction industry is revealed in some of policy and managerial responses as a challenge for mainstreaming SDC practices. In the construction industry, new technology (for Tanzania but outdated in their countries) is brought in by foreign investors and implemented in the country as aid or through private investment where the principles of SDC do not feature anywhere in the project. One respondent describing a lack of quality control on what is imported in the country narrated this:

*“The influx of Chinese and other people from outside brings technology that is outdated and because they found regulations in our country are not that tight, so they implement their construction projects very quickly and go”* (Registrar of the Contractors’ Registration Board (CRB), interviewed in Dar es Salaam on 20<sup>th</sup> November 2013, translated from Swahili).

Outdated technologies brought in by foreign investors, including contractors, is seen as a challenge by many respondents. Some respondents added that foreign investors come to do business in the Tanzania construction industry, after successfully fulfilling their intention, they leave structures/buildings which become a burden to the users due to high energy consumption and because they are expensive to maintain. One of the respondents narrated this when he was sharing his experience with the maintenance of the buildings by a foreign investor in Dar es Salaam.

*“If you use purely imported materials and technology, after a few days one thing goes off and you cannot replace it. We have a very good example of the airport building. They first used bulbs from France, when they went off*

*they could not be replaced, so we had to change the whole system ...”* (An architect/ retired lecturer/ director of an architecture firm in Dar es Salaam, interviewed in Dar es Salaam on 11<sup>th</sup> October 2013.)

This example from the respondent implies that in the construction industry foreign investors can implement what they think is appropriate without looking at the level of technology in the country. Meaning that there is a lack of scrutiny, awareness, and clear guidelines of what is to be imported and invested in the construction industry by investors. In the end, with the influx of foreign investors and contractors the industry is becoming a dumping site for outdated technologies and equipment.

Expert interviews with respondents revealed more challenges in the implementation of SDC practices in urban Tanzania. These include a lack of professional ethical conduct, developers/clients demands, corruption and politicians’ meddling in professional work.

Moreover, ignorance by decision makers, lack of transparency and coordination in decision making, developers’ demands, corruption and the construction industry being not open to new ideas, were brought up in the focus group discussions and held as factors hindering the adoption of SDC practices in Urban Tanzania.

## **7.5 Conclusion**

This chapter uncovered factors hindering the adoption of SDC practices in urban Tanzania. It first described stakeholders’ perceptions of the office building architectural trends in urban Tanzania, which were characterized as glass and profit oriented architecture. A number of factors influencing the architectural trends were discussed in this chapter. These factors include the lack of a national building act and

regulations, developers and designers mind sets and egos, the influence of material suppliers, architectural design software and rubber stamping of imported designs by local designers. The lack of a building act and regulations in Tanzania to give guidance on what is accepted by the law to be built in urban Tanzania, exposes buildings to fashion trends that may not be appropriate for the climate and economy of the country. The issue of abiding by policies, rules and regulations in place is another challenge in the construction industry.

Furthermore, factors revealed imply a lack of knowledge and education on both glass as a building material and the use of architectural design software as a tool to assist in design. Rubber stamping of imported designs by local designers as mentioned by policy and operational stakeholders suggests a lack of ethics among the designers. Professional regulations do not allow the practice of rubber stamping imported drawings. AQRB practice notes number 12 stipulates that *“where the developers use standard drawings prepared outside the country, the drawings must be certified by an architect registered in Tanzania, as to conform to local conditions and standards ...”* This implies that if the developer can get a local architect to certify the drawing produced outside the country, he or she is on the safe side. For some architects in Tanzania who would like to take shortcuts despite their professional responsibilities, this practice means they are not participating in the design process. Both architects and developers have recognized this loophole and take advantage of it. As such the trend of rubber stamping of imported drawings continues in practice.

This chapter also uncovered challenges for the adoption of SDC practices in urban Tanzania including a lack of awareness, technical knowledge deficit, lack of adequate policies, demands from developers/clients, perceptions of investment costs, changing the procurement process for consultants, an influx of foreign investors, corruption and meddling of politicians in professional work.

Interestingly, from the findings it appears that policy, managerial and operational respondents have similar opinions on the challenges of adopting SDC practices in urban Tanzania. For example, most respondents from both policy, managerial and operational stakeholders agree that the main challenge is a lack of awareness of SDC in the Tanzanian construction industry.

However, there are also notable differences among stakeholders' suggestions on the challenges of adopting SDC practices in Tanzania. For example, operational stakeholders do not agree that corruption and the influx of foreign investors is a challenge to SDC practices in Tanzania. And policy stakeholders do not agree with other categories that politicians meddling in professional work is a challenge to the application of SDC. This implies that despite the minor differences noted on the challenges of SDC practices in urban Tanzania, all three categories show agreement on most of the factors discussed above.

## **8 EMERGING ISSUES, CONCLUSION AND RECOMMENDATIONS**

This chapter brings to a conclusion the study on factors hindering the adoption of sustainable design and construction (SDC) in urban Tanzania. After giving a summary of the study, reflections are made on the key findings that add to the current debate on why SDC is not implemented in the construction industry in urban Tanzania and the implication of this for other developing countries. This chapter concludes by making recommendations for research and practice of SDC in Tanzania.

### **8.1 Summary of the Study**

This study adopted a case study approach with a combined research strategy to examine the factors hindering the adoption of SDC in urban Tanzania. Qualitative and quantitative methods were used to investigate in-depth stakeholders' understandings of SDC, reasons for current office building architectural trends and the factors hindering the adoption of SDC in urban Tanzania. Empirical evidence revealed a minimal understanding of the concept of SDC among key construction industry stakeholders. Findings also revealed there is no clear and established meaning of SDC in the construction industry in Tanzania.

One of the compelling findings of this study is the reasons behind the current architectural trend of energy intensive glass office buildings. The reasons include: lack of building policies and laws; influence of building materials suppliers and investors primarily interested in maximizing short term profits; improper procurement systems for consultant work; a lack of structured training programs on SDC and evaluation methods.

### **8.2 Synthesis and Reflection on Key Emerging Issues at Policy, Managerial and Operational Levels**

### 8.2.1 At Policy Level

The key policy guiding the Tanzania construction industry is the Construction Industry Policy of 2003. The policy covers broad activities in the construction industry but buildings are not given enough attention for SDC to be adopted and implemented. SDC is vaguely referred to in the construction policy in the cross-cutting issues section. Sustainability is perceived of in terms of only being environmentally friendly by the construction policy, which is a deficiency in the policy and there are no building regulations in place to support SDC. In a normal practice, policies must be followed by the preparation of laws and regulations as a mechanism to implement the policies. But in the Tanzania construction industry, in terms of buildings, this is not the case. The absence of building laws and regulations to guide design and construction activities makes it difficult, if not impossible, to enforce what is stipulated in the construction policy. Buildings law details what should or should not go in the building design and construction. For example, the Kenya building code of 2009 stipulates measures in the design, construction techniques and building materials selection in favor of SDC practices. Whether existing building policies in Kenya and other countries are working in terms of guiding the construction industry towards SDC practices is arguable. But the point here is, a building policy and laws provides a forum for stipulating measures for SDC practices for all stakeholders to abide to, and the absence of it in Tanzania is a lost opportunity for mainstreaming SDC practices in Tanzania.

Although the Construction Industry Policy of 2003 ostensibly supports the adoption of environmentally friendly SDC practices, the policy lacks a clear definition of SDC to support its implementation by different construction industry stakeholders. The lack of a proper standardized meaning of SDC among stakeholders was noted in the empirical findings where stakeholders expressed their own different meanings of the term. These different meanings of SDC included: low cost design and construction, environmental friendly design and construction, efficient and effective design and construction, durability, and meeting clients' needs. The lack of a clear meaning of

SDC is also reflected in the laws regulating professional activities in the construction industry. Currently, the adoption of SDC by professionals in the construction industry is optional. Meaning that, it depends on how professionals choose to translate SDC practices within their professional regulations. Hence, the lack of a clear and holistic meaning of SDC in the national professional guidelines contributes a great deal to the lack of implementation of SDC in Tanzania.

There is a lack of coordination of cross cutting issues related to SDC in policies dealing energy, water, and environmental management. SDC, where environmental, social and economic issues are the key aggregates, incorporates a number of elements including water conservation and energy efficiency. In order to implement SDC practices in the construction industry, there is a need to pay attention to what is stipulated in policies dealing with other areas like energy and water. Provisions from other policies need to inform and be in line with the construction industry policy, its laws and practices for SDC practices to be achieved. This is lacking.

Higher learning and research institutions such as universities and research agencies, as policy stakeholders, are key stakeholders who not only influence policy formation through research but also participate in their implementation. Universities are crucial in promoting SDC practices in the country by creating awareness and providing practical knowledge on SDC. But the teaching curriculum for training architects, offers no courses on SDC concepts. Thus, graduates leave the university without a strong foundation in SDC practices and sometimes do not have an awareness of the concept of SDC at all. At the same time the importance of policy direction is not given the required attention it deserves in the training institutions to support SDC practices in the country. Moreover, research on sustainability in the construction industry has not been given enough attention. The lack of sensitivity to SDC in research is also reflected in the national research priority areas where agriculture, health, industrial sector, energy production and ICT are given more emphasis.

Scientific knowledge is the basis for actors to influence policies as well as curriculum development.

### 8.2.2 At Managerial Level

This study uncovered a low level of awareness and practical understanding of SDC among stakeholders in the construction industry particularly among managerial stakeholders (LGA officials, urban planners, building developers, and building users). In particular, LGA officials possessed the lowest level of awareness and understanding of SDC. The low level of awareness of SDC was not only empirically evidenced in expert interviews and questionnaire survey results, but also in the procedures for issuing buildings permits by the municipal councils, which do not support SDC practices.

Building developers, owners and users are among the driving forces for the current unsustainable architectural trends in urban Tanzania. Some developers are competing to show their wealth, strength and status using their buildings. The quest to satisfy their egos goes to the extent of importing design drawings from overseas for buildings to be built in Tanzania. Some developers feel this is a normal practice. This finding is in line with the current debate in developing countries, that many of the modern buildings and settlements in developing regions reflect an uncritical repetition of conventional European buildings with the belief that they symbolize wealth and progress. Developers' competitions to satisfy their ego is translated as having a colonized mind set, where foreign ways of life and imported things are considered superior. Interestingly, this is also seen in the way people dress, eat, speak and think. Importing designs from overseas is happening in Tanzania not only because of the absence building law and guidelines for SDC practices to ensure standards are met but also because of the lack of a right mind set towards sustainability. But again, the lack of awareness and understanding of the benefits of SDC among developers contributes a great deal to the unhealthy competition among building developers. Since developers are the paying clients, some designers are driven by the needs of their

clients. This is where the tendency of developers dominating the industry and architects rubber stamping drawings comes in.

Research findings indicate that the right attitude towards sustainability on efficient use of resources among building users is lacking. For example, there is a lack of concern for resource conservation as lights are left on during the day or when no one is using the room; windows are left open when the air conditioning is on; and pipes leaking water in bathrooms and kitchenettes in offices are not fixed. Unreliable availability of resources like electricity and water, high cost of these services and the level of poverty in Tanzania are the motivating factors for conserving the little that is available. However, the perception and practice in public buildings shows a minimum concern towards conservation. Sensitivity on conservation of resources is key to achieving SDC practices. In developed countries, conservation of resources in buildings is taken care of by automation technology in smart or intelligent buildings, for instance. But with the low level of technology and high cost of investing in the same in the Tanzanian context.

### 8.2.3 Operational Level

At the operational level stakeholders are expected to produce design and construction products according to their aspirations, the laws and regulations governing their practices and according to urban development conditions set by urban managers and policies. However, in terms of adopting SDC concepts, operational stakeholders are left to decide by themselves. This also depends on the awareness and understanding of the benefits of SDC by the designers. Laws governing professional activities, procedures for building permits and procedures for appointing and selection of consultants and contractors (for public funded projects) using PPA are all silent on the issue of SDC. Although policy implementation and law enforcement is a challenge in Tanzania, not only in the construction industry, the silence of laws on critical issues like SDC contributes to the lack of adopting SDC in urban Tanzania.

The lack of ethics and accountability among professionals in Tanzania also hinders the adoption of SDC. Professionals have the duty to advise their clients, but professionals are willing to take shortcuts in doing their work, including in their advisory role. They are willing to rubber stamp the work done by overseas professionals and to let contractors use sub-standard materials by not doing proper site supervision as required by their professional by-laws. Professional ethics stress “doing the right thing”. Doing the right thing includes doing justice to the clients, to the environment, culture and economy while following work ethics; that is essential for SDC. “Doing the right thing” is also making sure designs and building take into account climate, context, and budget, as taught in architecture schools. Nonetheless some local designers are focusing on survival and getting paid (a little) for not “doing the right thing”. The trend of rubber stamping design projects without providing any design input by local architects is alarming because the designs are not following basic design principles to cope with the climate and local conditions. This is also translated as some form of corruption in the professional practice, where architects are willing to be paid less (or more) to rubber stamp drawings and allow sub-standards materials to be used in construction.

### **8.3 Conclusion**

The study was undertaken to uncover factors hindering the adoption of SDC in urban Tanzania. The study has empirically revealed a low level of awareness and understandings of the concept of SDC among key stakeholders in the construction industry. The study also revealed a number of factors hindering the adoption of SDC practices at the policy, managerial and operational levels. One of the key factors uncovered by this study, which cuts across all the three categories of stakeholders, is the lack of awareness and understanding of the concept of SDC. Other factors include: the absence of building laws and guidelines, lack of formal training on SDC in higher learning institutions, perceptions of higher investment costs, improper procurement methods, and demands from developers, investors wanting quick returns and the influence of building material suppliers.

In regard to the second and third research question, which aimed at finding out the most important stakeholders in regard to influence on the application of SDC and their understanding of SDC, the most important stakeholders from the three categories are; training institutions (policy), local governments (managerial) and architects (operational). However, in terms of their understanding of SDC, all possessed a low level of understanding with the lowest being the local government officials. The study further revealed that the low level of understandings of SDC among key stakeholders is a reflection of the absence of SDC concepts in the teaching curriculum in higher leaning institutions, in the procedures for approving designs for building permits, in the laws governing professional activities in the construction industry and in the procedures for the employment of operational stakeholders to undertake the work.

In terms of familiarity of SDC, the study noted that respondents who were most familiar with the SDC are the young generation (35 -45 years) who are relatively new in the construction industry and are yet to reach the decision making positions to influence decisions towards application of SDC practices. This age gap indicates positive expectations for the application of SDC in the near future.

One important observation is the positive efforts made by international organizations like UN-Habitat and UNEP; and the American Government through the Power Africa Project; and the establishment of TZGBC. These initiatives, although focusing on one or two aspects of the sustainability concept, make a positive contribution and give direction for SDC practices in the country. However, the mind-set and then the legal mechanisms to enforce the recommendations offered by these initiatives are lacking. For example, recommendations from the TZGBC are difficult to implement from the legal standpoint because they are currently not accommodated in the procedures for issuing building permit by the LGAs. Therefore, the lack harmonizing efforts from different initiatives delays the adoption of SDC practices in Tanzania.

#### **8.4 Contribution to the Debate**

Lack of awareness, knowledge and expertise on SDC among other factors were noted in a number of recent studies in Africa, including Djokoto, Dadzie & Abadio (2014) in Ghana, Hoffman & Cloete (2014) in South Africa and Baloi (2003) in Mozambique. These factors, however, are not adequate in explaining the challenges in adopting SDC in Africa. There is evidence where awareness and knowledge on SDC has increased through world and African congresses of architects over the years, but practice did not change. To better understand the challenges of adopting SDC in Africa, one needs to also look into why things are happening the way they are happening. The influence of building materials suppliers, designers and developers' mindset, investors seeking quick returns and rubber stamping of imported designs are some of the factors identified. In addition to the factors hindering SDC in developing countries revealed by previous studies, this study identified that an improper procurement system for consultant works, lack of professionalism, lack of guidelines and political interference with technical work matters are also factors hindering SDC practices. Additional factors hindering SDC identified by this study are improper procurement system for consultants work and lack of building guidelines. Some of these factors, for example improper procurement system for consultants work or the lack of building guidelines may be specific to Tanzanian context, thus limiting generalization to other developing countries.

In terms of methodology, this study considered an overall population of policy, managerial and operational actors in the construction industry, using combined research strategies (qualitative and quantitative). Another contribution to the debate made by this study is suggesting potential areas in the institutional set up where SDC can be introduced. Professional registration acts, the public procurement procedures used in Tanzania and procedures for issuing building permits are the areas identified by this study.

## **8.5 Recommendations for Scientific Research Community**

In order to encourage scientific research in the area of SDC, it needs to be prioritized in the national research and development policy. This is lacking in the current national research and development policy of 2010. The Commission for Science and Technology (COSTECH) as the main coordinator of research priority areas in the country and as a link between research institutes, individuals, policy makers and end users of research results needs to put emphasis on SDC, especially in the provision of grants, technical support and links with other institutions. The emphasis on SDC in the research and development policy will provide a platform to base a research priority and funding, which will encourage more research on SDC. The study further recommends that the government, through relevant ministries and COSTECH, establish a SDC research dissemination mechanism that will ensure results are utilized in the construction industry for the development of the built environment in a sustainable manner.

## **8.6 Recommendations for Further Research**

The major purpose of this study was to make a contribution to the ongoing debate on sustainability in developing countries by uncovering the factors hindering the adoption of SDC practices in Tanzania. While undertaking this study new research areas emerged. Therefore, future research could include:

- i) The identification of the measures and assessment criteria for SDC practices in the urban Tanzanian context.
- ii) Analyse cost implications (monetary value) for SDC practices in the Tanzania context in order to build a strong foundation to promote SDC.

- iii) A detailed analysis of buildings in terms of resource use like energy and water in to order to create a foundation for establishing SDC assessment criteria in urban Tanzania.
- iv) Identification of the effectiveness of strategies to promote the application of SDC in urban Tanzania using empirical data.

## **8.7 Recommendations for Practice**

Based on the empirical findings and reflections on key emerging issues, the study makes the following recommendations to policy makers, urban managers and operational stakeholders to promote the practice of SDC in urban Tanzania.

The government of Tanzania, through the Ministry of Works, should establish a clear legal meaning of SDC so that stakeholders will share a holistic understanding of the concept facilitating the creation of a common goal of promoting sustainability in the construction industry. An inclusive policy formulation process is likely to provide room for the key stakeholders to dialogue on the appropriate meaning of sustainability and use that to define a criteria for SDC in the context of urban Tanzania.

Academic institutions need to invest in and carry out structured training on the concept of SDC for construction industry stakeholders to acquire a stronger practical understanding. Training can be emphasized at the universities, and using simple language and concrete examples wherever possible. Students can be taught by using case studies to get exposure to the successful applications of sustainable design and construction principles. Once future stakeholders are trained and become conversant, they will make a big impact in the industry, even without having policies and laws in place. Further, it is recommended that, knowledge on SDC practices be introduced at the grass root level. Because a basic understanding and the right attitude towards

sustainability in everyday life needs to be taught and people need to be socialized starting at childhood.

Professional associations and regulatory bodies should endeavor to create awareness and understanding of the benefits of SDC practices among construction industry professionals and the public at large. This can be done by using different forums where experts share success stories and through the use of media to reach a wider population. It is important to create awareness among all stakeholders, including the public. By doing so, all stakeholders will be able to jointly lobby the government for change in favor of SDC in the construction industry.

Professional regulatory bodies and professional associations should enforce ethical conduct in the construction industry. The aim is to stress strategies that can make professionals take their work responsibilities seriously, including advising their clients responsibly. Ethical conduct can be enforced by imposing disciplinary actions, renewing, and revoking licenses. These measures can also be used to encourage professionals to acquire knowledge on SDC through their continuing professional development programs.

The Ministry of Works must establish a clear building policy and legislation to promote and mainstream SDC practices. In emphasizing the advantages of having a building policy and laws to mainstream SDC practices in Tanzania, the central government and policy need to play a major role of coordinating individual professional efforts by creating guidelines that cut across all professional fields in the building industry. The central government needs to provide incentives to implement the principles of SDC in their practice. Incentives can be in terms of tax exemptions for materials and equipment, like photovoltaic panels, waste water filtration equipment, and other materials that support the practices of sustainable design and construction.

Local Governments' Authorities, through municipal councils in urban centers, should make SDC practices a demand. This can be done by introducing SDC assessment criteria in the procedures for scrutinizing building designs for the purpose of issuing building permits. Further, the Public Procurement Regulatory Authority (PPRA), through the procedures for the employment of consultants and contractors for public funded projects, should make SDC practices a demand. This can be done by introducing a SDC track record as an assessment criterion.

Promoting sustainability must be made a political agenda. Once awareness is created among the politicians, and there is a political will, policies and laws will be established.



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## APPENDICES

### Appendix I: Questionnaire Survey Used

#### QUESTIONNAIRES FOR ARCHITECTS, ENGINEERS, QUANTITY SURVEYORS AND CONTRACTORS (Operational Stakeholders)

##### Introduction:

*I want to thank you for your willingness to participate in this study.*

*My name is Victoria Marwa Heilman. I am a doctoral candidate at the University of Stuttgart, Institute of Design and Construction, Germany. I am conducting this study to learn more about how key stakeholders of the built environment understand the concept of Sustainable Design and Construction. The purpose of this research is to see if there is an opportunity to enhance the practice of sustainable design and construction in developing countries, and in particular Urban Tanzania.*

*The objective of this questionnaire is to get your perception, thoughts and feelings about architectural trends for office buildings in Dar es Salaam, and also to get your suggestions in regard to how designs and construction of new office buildings can be made more sustainable.*

*Your participation in this study is highly appreciated. The data collected will be strictly used for the purpose of this study only. I will keep your comments confidential and your names will not be associated with my final report.*

*I: General information of the respondent:*

Name: (Optional).....

Age .....

Gender:  Female  Male

1. Your formal education level.

1) Diploma 2) Graduate Diploma 3) Bachelor degree 4) Master degree 5) PhD

2. Years you have been actively working in the profession: .....

3. Which sector are you working with?

1) Government 2) Private 3) Parastatal 4) Academic 5) Other.....

4. What is your position in the firm/ government office: .....

5. Your role in the construction industry

1) Architect 2) Engineer 3) Quantity Surveyor 4) Contractor

*II: Perceptions of urban architectural trends of new office buildings in Dar es Salaam.*

*(Built between 2005 and 2013)*

6. How would you describe current urban architectural trends of office buildings in Dar es Salaam?

1) Glass architecture 2) Modern architecture 3) Sustainable architecture  
4) European architecture 5) Environmental friendly architecture 6) Other.....

7. What do you think are the factors influencing the current architectural trends of office buildings in Dar es Salaam?

1) Client's demands 2) Copying from western countries 3) less maintenance cost  
4) Fashion trend for Dar es Salaam 5) Architectural design software 6) other.....

8. How do you feel when walking in the streets in the city center during the day?

(Please tick on how you experience the built environment). As many as you can assess.

Comfortable  Too hot  shady  Glare  
 Congested  Noisy  Other.....

9. Do you consider new office buildings in Dar es Salaam to be energy efficient?

1) Yes 2) to some extent 3) Not at all 4) I don't know

*III: Understanding of the concept of sustainable design and construction.*

10. Are you familiar with the term "sustainable design and construction"?

1) Very familiar 2) Slightly familiar 3) not familiar

11. If familiar, what does “sustainable design and construction” mean to you?
- 1) Environmental friendly design and construction
  - 2) Low cost design and construction
  - 3) Environmental, cultural and economical responsive design and construction
  - 4) Modern, Innovative and cutting edge design and construction
  - 5) Traditional design and construction
12. If not familiar, have you heard the term “green design and construction”?
- Yes  No
13. If yes, what does “green design and construction” mean to you?
- 1) Environmental friendly design and construction
  - 2) Low costly design and construction
  - 3) Environmental, cultural and economical responsive design
  - 4) Modern, Innovative and cutting edge design and construction
  - 5) Traditional design and construction
14. How important is the concept of sustainable design and construction to urban development in Tanzania?
- 1) Not important      2) Slightly important      3) Very important
15. Please rank these elements of sustainable design and construction according to their importance to urban development in Tanzania. Please use 1= Not important, 2 = slightly important and 3 = Most important
- |  |   |
|--|---|
| <input type="checkbox"/> Energy efficiency                           | <input type="checkbox"/> Design with respect to the climate |
| <input type="checkbox"/> Use of locally available building materials | <input type="checkbox"/> Use of renewable sources of energy |
| <input type="checkbox"/> Design with respect to building users       | <input type="checkbox"/> Minimize use of resources          |
| <input type="checkbox"/> Indoor air quality                          | <input type="checkbox"/> Water conservation                 |
16. What considerations do you think are important than sustainable design and construction for office buildings design and construction in Dar es Salaam? Please use 1= Not important, 2 = slightly important and 3 = Most important.

- |  |   |
|--|---|
| <input type="checkbox"/> Prestige of the client                        | <input type="checkbox"/> Cultural heritage            |
| <input type="checkbox"/> Cutting edge design and innovation            | <input type="checkbox"/> Minimizing construction cost |
| <input type="checkbox"/> Maximizing square footage for maximizing rent | <input type="checkbox"/> Maximizing design cost       |

17. Are you aware of any policies guiding sustainable design and construction in urban Tanzania?
- 1) Not aware                      2) aware                                      3) Very aware

*IV: Factor hindering the implementation of the sustainable design and construction in urban Tanzania.*

18. In your opinion, does the construction industry implement the concepts of sustainable design and construction in Dar es Salaam?
- 1) Not at all                      2) to a certain extent                      3) Yes

19. If not at all, do you think the construction industry should implement sustainable design and construction concepts?
- Yes     No

20. Who do you think is the most important stakeholder with the most influence over the implementation of sustainable design and construction in Urban Tanzania? Please use 1= Not important, 2 = Slightly important, 3 = Most important.

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Architect             | <input type="checkbox"/> Engineer            | <input type="checkbox"/> Quantity Surveyor           |
| <input type="checkbox"/> Contractor            | <input type="checkbox"/> Building user       | <input type="checkbox"/> Developer/Building owner    |
| <input type="checkbox"/> Urban Planner         | <input type="checkbox"/> Policy makers       | <input type="checkbox"/> Municipal/ local government |
| <input type="checkbox"/> Training Institutions | <input type="checkbox"/> Central governments |  |

21. What do you think is the biggest challenge in the implementation of sustainable design and construction concepts in Urban Tanzania?
- 1) Lack of awareness among stakeholders
- 2) Lack of adequate policies
- 3) Lack of technology and technical knowhow
- 5) Demands of the client/ developers
- 6) Other.....

22. To what extent are you aware of the monthly cost of electricity for air conditioning and lighting incurred by building users in your office buildings projects?

- 1) Not Aware      2) Aware      3) Very aware

23. To what extent are you aware of the monthly cost of water incurred by building users in your office buildings projects?

- 1) Not Aware      2) Aware      3) Very aware

24. What are the sources of water used in your office buildings in Dar es Salaam?

(Please tick what you have used in the buildings you designed/ built)

- |  |  |
|--|--|
| <input type="checkbox"/> Municipal supply (DAWASCO)          | <input type="checkbox"/> Rain water harvesting |
| <input type="checkbox"/> Waste water treatment and recycling | <input type="checkbox"/> Water vendor          |
| <input type="checkbox"/> Other sources.....                  |  |

25. What are the sources of electricity used in your office buildings in dare s Salaam?

(Please tick what you have used in the buildings you designed/ built)

- |  |   |
|--|---|
| <input type="checkbox"/> Electric Supply Company (TANESCO) | <input type="checkbox"/> Solar              |
| <input type="checkbox"/> Wind                              | <input type="checkbox"/> Diesel Generator   |
| <input type="checkbox"/> Biomass                           | <input type="checkbox"/> Other sources..... |

*VII: Knowledge that may guide in adopting the concepts of sustainable design and construction.*

26. How do you think the construction industry should promote sustainable design and construction in Tanzania?

.....

.....

.....

.....

27. In your opinion, will the future architectural trends adopt to sustainable design and construction?

- Yes     No

Please give reasons:

.....  
.....  
.....

28. Could you please list at least three office buildings in Dar es Salaam, which in your opinion adopted sustainable design and construction principles?

1. ....
2. ....
3. ....

**THANK YOU VERY MUCH FOR YOUR PARTICIPATION.**

## Appendix II: Expert Interview and Focus Group Discussion Guide

### PROMOTING SUSTAINABILITY IN AFRICAN CITIES:

#### Understanding and Mainstreaming Sustainable Design and Construction in Urban

#### Tanzania: Learning from Dar es Salaam, Tanzania

#### Guiding Questions:

1. Could you explain what the term 'sustainable design and construction' mean to you?

*Probe:*

- *Do you think the concept of sustainable design and construction is important to Tanzania?*
- *In your opinion, does the construction industry implement the concepts of sustainable design and construction in Dar es Salaam?*

2. How would you describe current urban architectural trends of office buildings in Dar es Salaam?

*Probes:*

- *What do you think are the factors influencing the current architectural trends of office buildings in Dar es Salaam?*
- *What do you like and dislike most about the architecture of new office buildings in Dar es Salaam?*
- *What is your opinion about using glass as an exterior wall in office buildings in Dar es Salaam?*

3. What do you believe are the barriers preventing the adoption of sustainable design and construction concepts in Tanzania?

*Probes:*

- *Do we have any policies to promote sustainable design and construction in urban Tanzania?*

- *Who do you think is the most important stakeholder with the most influence over the contents and the implementation of policies regulating the construction industry?*
4. What do you believe are the most effective strategies for the implementation of sustainable design and construction in Tanzania?
  5. In your own capacity, based on your role in the construction industry, do you implement the concepts of sustainability in your designs?

*Probes:*

- *What problems do you encounter when implementing sustainable design and construction concept?*
  - *What elements of sustainability do you consider in your designs?*
  - *Would you suggest to your clients/other consultants to use energy efficiency and water conservation techniques in their buildings?*
6. (THIS QUESTION CHANGES BASED ON THE INTERVIEWEE INSTITUTION)  
In the school of architecture and Design, how important is the concept of sustainable design and construction is in the teaching programme?
- Probes:*
- *Is the concept of sustainable design and construction taught to the students?*
  - *Is it reflected in the teaching curriculum?*
7. What is your opinion, will the future architectural trends adapt to sustainable design and construction? Why? Why not?
  8. Are there any other thoughts that you would like to share?

*Thank you very much for your participation. I appreciate your time and input into my dissertation.*

THANK YOU.

### Appendix III: General Background of the Questionnaire Respondents

No	Background Information	Operational Stakeholders		Policy Stakeholders		Managerial Stakeholders		All
		Freq.	%	Freq.	%	Freq.	%	Freq.
1	Age							
	18 - 25	3	2.05	3	9.68	-	-	6
	26 - 35	51	34.93	2	6.45	10	26.32	63
	36 - 45	48	32.88	16	51.61	15	39.47	79
	46 - 55	31	21.23	8	25.81	9	23.68	48
	56 - 65	13	8.90	2	6.45	4	10.53	19
2	Gender							
	Female	30	16.95	14	38.89	4	8.89	48
	Male	147	83.05	22	61.11	45	91.11	214
3	Education							
	Diploma	4	2.22	-	-	2	4.44	6
	Grad. Dip.	17	9.44	5	13.89	1	2.22	23
	Bachelor	78	43.33	17	47.22	13	28.89	108
	Master	70	38.89	14	38.89	22	48.89	106
	Doctorate	11	6.11	-	-	7	15.56	18
4	Work experience							
	1 - 10	92	53.80	15	44.12	13	33.33	120
	11 - 20	40	23.39	10	29.41	18	46.15	68
	21 - 30	31	18.13	8	23.53	2	5.13	41
	31 - 40	7	4.09	1	2.94	6	15.38	14
	41 - 50	1	0.58	-	-	-	-	1

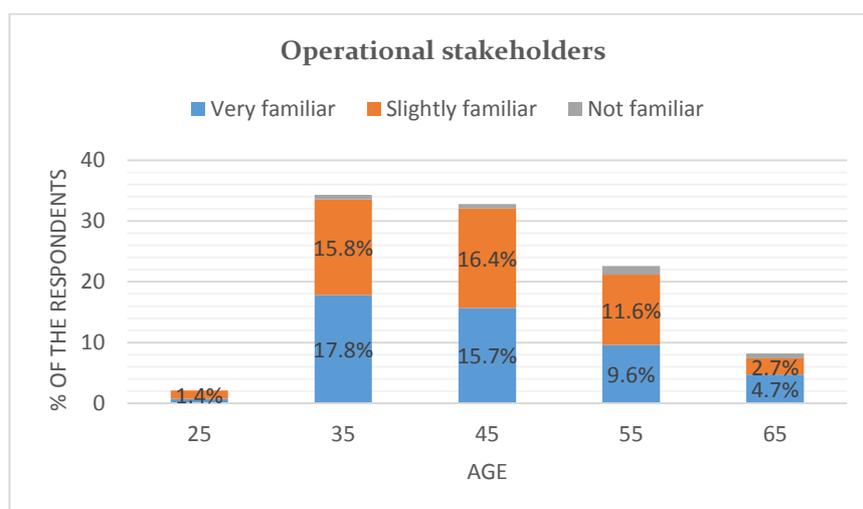
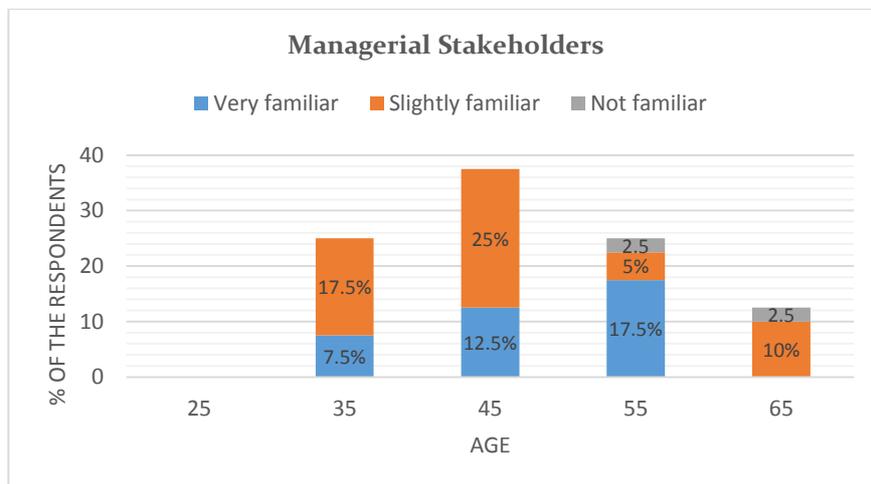
## Appendix IV: Sample of Expert Interview Analysis

Summary of factors influencing the architectural trends of office buildings in urban Tanzania.

	Factors influencing the architectural trends	% of respondents	Categories of stakeholders		
			Policy	Operational	Managerial
1	Durable, maintenance free and easy to work with	13%		✓	✓
	Glass considered maintenance free Easy material to work with Fast in construction				
2	Influence of building material suppliers	8%			✓
	Driven by suppliers and manufacturers Glass is available material in the market				
3	Designers and developers mind set and egos	31%	✓	✓	✓
	Glass considered beautiful Developers demand Clients influence/demand Glass buildings show status and power Fashion trend				
4	Rubber stamping of imported designs by local designers	25%	✓		✓
	Architects and engineer focus on survival Lazy affair by designers Consultants' shortcuts Copying from outside Old fashion service engineers Architects do not devote on their work Lack of appreciation of local consultants and construction services Actors lazy to learn				

5	Lack of building regulations	20%	✓	✓	✓
	Lack of policies and laws Poor coordination among city fathers Ignorance of policy makers No guidelines Urban planning not a priority in Tanzania				
6	Architectural design software	3%			✓
	Training problem				
	Not conversant with design software				
	Technology advancement				

## Appendix V: Familiarity of SDC in Relation to Age Group



Source: Questionnaire survey, 2013-2014

## **Appendix VI: Abstract of the Published Paper**

Abstract of the Published Paper in the 9<sup>th</sup> Built Environment Conference Proceedings.  
Durban, South Africa, August 2015.

**ASOCSA2015- 010**

# **Stakeholder Conceptualizations of Sustainable Design and Construction in Tanzania**

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Institute for Design and Construction (IEK), Faculty of Architecture and Planning,  
University of Stuttgart, Keplerstr 11, 70174, Stuttgart, Germany, +49 1577 595 8801

### **ABSTRACT**

#### **Purpose of this paper**

This paper focuses on the understandings of sustainable design and construction among key stakeholders in the construction industry in Tanzania. This paper offers empirical evidence regarding different conceptualizations of sustainable design and construction among policy, managerial and operational stakeholders in Tanzania and possible explanations for their understandings.

#### **Methodology**

Data was obtained through expert interviews, a questionnaire survey, and literature review of previous studies on the understandings of sustainable design and construction in developing countries. Data was analysed using SPSS Statistics 20, Stata SE 12 and a qualitative content analysis.

#### **Findings**

Important differences exist in the conceptualization of sustainable design and construction among key actors in the construction industry and there is a lack of practical knowledge, which hinders sustainable design practices. The paper concludes by suggesting that the Government, academic institutions and professional associations must make a greater effort to establish a clear meaning and create more awareness for sustainable design and construction to be mainstreamed in the construction industry in Tanzania.

#### **Originality/value**

The paper as part of the ongoing doctorate research contributes to the mainstream of sustainable design and construction practices in developing countries. It is a step in engaging major stakeholders in the building construction industry in debates about the meaning of sustainable design and construction and what can be done to achieve a sustainable built environment in developing countries.

#### **Keywords:**

Construction, stakeholders, sustainable design, Tanzania.

## Appendix VII: Research Permits

**KINONDONI MUNICIPAL COUNCIL**  
ALL CORRESPONDENCES TO BE ADDRESSED TO THE MUNICIPAL DIRECTOR

Tel: 2170173  
Fax: 2172606

In reply please quote:  
Ref. KMC/F.6/5



MUNICIPAL DIRECTOR  
KINONDONI MUNICIPAL COUNCIL  
P. O. BOX 31902  
DAR ES SALAAM

Date 30/12/2013

Victoria Marwa Heilman  
Ardhi University,  
P.O.Box 35176,  
DAR ES SALAAM.

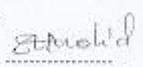
**RE: RESEARCH PERMIT**

Refer to the above heading.

I am pleased to inform you that your above request has been considered by the Municipal Director, and has offered you a place for Collect Data project.

Upon receipt of this letter, please report to the **Municipal Land Officer** for commencement of your reseach.

Hoping to see you soon.

  
S.H. Mohamed  
For: **THE MUNICIPAL DIRECTOR**  
KINONDONI

MUNICIPAL DIRECTOR  
KINONDONI MUNICIPAL COUNCIL  
DAR-ES-SALAAM

Copy: Deputy Vice Chancellor,  
Ardhi University,  
P.O. Box 35176,  
DAR ES SALAAM.

*FORWARDED TO MUNICIPAL ENGINEER*  
*- Municipal ARCHIVES*  
*- Municipal Planning*  
*- Quantity SURVEYOR*

*Mh*  
*23/09/10*

## HALMASHAURI YA MANISPAA YA ILALA

BARUA ZOTE ZIPELEKWE KWA MKURUGENZI WA MANISPAA

S.L.P. Na. 20950

SIMU NA. 2128800  
2128805  
FAX NO. 2121486



Ofisi ya Mkurugenzi  
Manispaa Ilala

Kumb. Na. IMC/ AR.6/26

10/12/2013

Mhandisi wa Ujenzi,

Afisa Ardhi,  
Halmashauri ya Manispaa ya Ilala,

**YAH: KUMTAMBULISHA VICTORIA MARWA HEILMAN**

Mtajwa hapo juu ni Mwanafunzi wa Chuo Kikuu cha Stuttgart - Ujerumani ameruhusiwa kufanya Utafiti juu ya **"USANIFU MAJENGO NA UJENZI ENDELEVU"** kuanzia Decemba - Machi, 2014.

Tafadhali mpatie ushirikiano wa kutosha ili aweze kufanikisha utafiti

Nakutakia kazi njema.

R. Muna

**Kny: MKURUGENZI WA HALMASHAURI  
MANISPAA YA ILALA**

For: MUNICIPAL DIRECTOR  
ILALA MUNICIPAL COUNCIL

## Appendix VII: Energy Consumption of Office Buildings in Dar es Salaam



"Tunayaangaza Maisha Yako" **TANESCO** "We light Up Your Life"

**SHIRIKA LA UMEME TANZANIA  
TANZANIA ELECTRIC SUPPLY COMPANY LIMITED**

Ubungo Head Office, "Umeme Park", P.O. Box 9024, Dar Es Salaam, Tanzania, Tel: +255 22 2451130/9. Fax: +255 22 2452026

Our Ref: SMSM/MLPU/GEN Date: 17<sup>th</sup> June, 2014

Ms. Victoria Marwa Heilman,  
**DAR ES SALAAM**

**RE: DATA FOR PhD RESEARCH**

Refer to your introduction letter with reference ARU/P.1020 dated 24<sup>th</sup> April, 2014 regarding request of data for your research.

We hereby provide you with below data as requested. We strongly recommend that these data should be used for research purpose only not otherwise.

No.	Consumer Code	kWh		
		SEP'13	OCT'13	NOV'13
1	NBC HEAD OFFICE	47,530	50,693	41,307
2	TANZANIA BUILDING AGENCY	2,804	3,825	3,735
3	CRDB HOLLAND HOUSE BRANCH	14,150	15,198	16,581
4	TANZANIA POSTA - AZIKIWE	34,501	38,480	41,352
5	TRA SAMORA	9,492	11,528	10,856
6	ILO	15,830	17,686	19,238
7	NMB BANK HOUSE	49,763	54,119	53,297
8	Nation Insurance Corp .Life House	19,580	22,862	24,809
9	MINISTRY OF LAND SETTLEMENT	37,160	39,432	46,260
10	MINISTRY OF ENERGY AND MINERALS	59,132	68,723	69,354
11	OCEAN ROAD CANCER INSTITUTE	27,141	33,095	36,347
12	NSSF WATER FRONT	128,450	135,570	122,960
13	PSPF TOWER	523,380	576,290	630,690
14	ATC	48,585	54,271	53,176
15	BOT	1,390,260	1,432,500	1,366,260
16	BAKHRESSA FOOD KIPAWA	537,800	96,438	91,982
17	PARASTATAL PENSION FUND(PPF)	96,614	128,136	126,814
18	HAILY PLAZA	82,277	79,686	78,887
19	EXIM HOUSE	98,845	110,909	113,433
20	INTERNATIONAL HOUSE	172,722	182,813	184,710
21	NBC CITY DRIVE	215,878	236,799	213,073
22	UHURU HEIGHT	71,810	89,310	100,940
23	VIVA TOWER	94,220	100,620	105,330
24	IT PLAZA	43,871	61,764	89,506

Yours Faithfully,

**FOR: TANZANIA ELECTRIC SUPPLY COMPANY LIMITED**

  
Eng. Nicholas S. M. Kamoleka,  
**FOR: MANAGING DIRECTOR**  
NSMK/ors

## Appendix VIII: List of Expert Interviews Respondents

S/N	Position	Institution	Date of Interview
1	Engineer – Sustainable Energy	Ministry of Energy	08.10.2013
2	Architect/Director/lecturer	Arqes Africa	09.10.2013
3	Quantity Surveyor/ Lecturer/Director	Ardhi University/ Build Consult Ltd.	10.10.2013
4	Municipal Architect	Ilala Municipal	11.10.2013
5	Architect/Retired Lecturer/ Director	Ardhi University/ EZM Associates	11.10.2013
6	Director of property Development and Maintenance	National Housing Corporation	25.10.2013
7	Head Engineering	National Construction Council	28.10.2013
8	Chief Architect	National Housing Corporation	29.10.2013
9	Chief Engineer	National Housing Corporation	29.10.2013
10	Municipal Architect	Temeke Municipal Council	30.10.2013
11	Training Officer	Engineers Registration Board	30.10.2013
12	Municipal Town Planner	Temeke Municipal Council	31.10.2013
13	Municipal Engineer	Temeke Municipal Council	31.10.2013
14	National Officer for Tanzania	UNEP	12.11.2013
15	Retired Chartered Architect	Antoni Almeida	17.11.2013
16	Foreign Architect	John Kelly	19.11.2013
17	Registrar	Contractors Registration Board	20.11. 2013
18	Assistant registrar	Contractors Registration Board	20.11.2013
19	Retired Architect	Beda Amuli Associates	21.11.2013
20	Project Coordinator –Green Buildings program	UN- Habitat, Tanzania	21.11.2013
21	Project Manager – green Buildings Programe	UN- Habitat, Tanzania	21.11.2013
22	Training Officer/Quantity Surveyor	Architects and Quantity Surveyors Board	22.11.2013
23	Asst. Registrar	Architects and Quantity Surveyors Board	26.11.2013
24	Training Officer/Architect	Architects and Quantity Surveyors Board	26.11.2013
25	Architect/Lecturer/ Director	Ardhi University/Afri Arch Consult	26.11.2013
26	President	Architects Association of Tanzania	28.11.2013
27	Training Officer	Contractors Registration Board	30.11.2013

28	City Planner	Dar es Salaam City Council	03.12.2013
29	City Architect	Dar es Salaam City Council	10.12.2013
30	City Quantity Surveyor	Dar es Salaam City Council	10.12.2013
31	Urban Planner/Senior Lecturer	Ardhi University	13.01.2014
32	Dean School of Architecture and Design	Ardhi University	13.01.2014
33	Former Dean School of Architecture and Design	Ardhi University	15.01.2014
34	Registrar	Architects and Quantity Surveyors Board	16.01.2014
35	Head of Department	Architecture- Ardhi University	17.01.2014
36	Lecturer/Urban Planner	Ardhi University	20.01.2014
37	Architect/Director	Tharani Associates	27.01.2014
38	Municipal Architect	Kinondoni Municipal	22.04.2014
39	Municipal Engineer	Kinondoni Municipal	28.04.2014
40	CEO	National Construction Council	30.04.2014
41	Service Engineer/Director	ML Engineering Consultancy	31.04.2014
42	Foreign Architect	Antoni Folkers	22.06.2014

**Appendix IX: List of Participants in the Focus Group Discussion Held at the  
National Housing Corporation Head Office on 29.11.2013**

<b>S/N</b>	<b>Name</b>	<b>Position</b>
1	Robert Kintu	Architect
2	Margret Ezekiel	Senior Quantity Surveyor
3	Daud Kilonzo	Architect
4	Samwel Tangale	Engineer

**Appendix X: List of Participants in the Focus Group Discussion Held at Ardhi  
University on 30.04.2014**

<b>S/N</b>	<b>Name</b>	<b>Position</b>
1	Aisha Muhali	Student
2	Bujiku Nelson	Student
3	Baitwa Flora	Student
4	Lark Joseph K.	Student
5	Seng'enge Zena	Student
6	Dr. Shubira Kalugila	Lecturer
7	Tesha Gasper Denis	Assistant Lecturer
8	Mercy Byera	Tutorial Assistant
9	Modest Maurus	Assistant Lecturer
10	Chondo Stanley	Student
11	Lukuwi John	Student
12	Liki Halidi Y.	Student

