

CASLE 2018



C·A·S·L·E



**Developing a sustainable professionalism in surveying &
relevant education in the Commonwealth**

**29th November – 1st December 2018
Lusaka – Zambia**

Editors

Dr Patrick Manu

Mr Anthony Westcott

Dr Abdul-Majeed Mahamadu

Professor Dr Alan Spedding

Papers of the [Commonwealth Association of Surveying and Land Economy \(CASLE\)](#) Conference 2018 jointly organised with Surveyors Institute of Zambia (SIZ).

First published 2018 (Amended: January 2019)

ISBN: 978-0-9564147-7-9

Published by

Commonwealth Association of Surveying and Economy (CASLE)
Faculty of Environment & Technology
University of the West of England
Bristol BS16 1QY
Tel: +44 (0) 117 328 3036
Email: susan.spedding@uwe.ac.uk

© Copyright for papers in this proceeding belongs to the authors of the papers.

Correspondence

All correspondence relating to the CASLE Conference should be addressed to:

Mrs Susan Spedding (CASLE Secretary General)
Faculty of Environment & Technology
University of the West of England
Bristol BS16 1QY
Tel: +44 (0) 117 328 3036
Email: susan.spedding@uwe.ac.uk

CASLE Declaration

All the papers in this proceeding have been through a peer review process involving screening of abstracts, review of papers, reporting of review comments to authors, amendments of papers by authors, and re-evaluation of the amended papers to ensure the quality of the papers.

FOREWORD

Foreword by the CASLE Secretary-General, Mrs. Susan Spedding

CASLE was founded in 1969 as a federation of independent professional societies involved in surveying and land economy in Commonwealth countries, and currently, CASLE has member societies in over 30 Commonwealth countries and correspondents in many other countries.

The Surveyors Institute of Zambia (SIZ) and several surveying professional bodies in sub-Saharan Africa have been members of CASLE for some years, and have made a welcome contribution to CASLE.

The formation of CASLE was inspired by the Commonwealth Foundation, with a promise of financial support to aid the development of skills in surveying and land economy, specifically to foster the development of the profession in all Commonwealth countries. This includes appropriate facilities and standards of education, the development of professional techniques and practices, technology transfer, and dialogue between member societies and national governments.

In 2012 The Commonwealth Foundation withdrew core and activity grants from Commonwealth Societies like CASLE, and we have had to find other sources of income in order to implement our programmes of activities. Currently, CASLE derives income from the subscriptions of its members and sponsorship, whilst its officers serve in an honorary capacity.

CASLE has achieved accredited 'Special Consultative Status' with the Economic and Social Council of the United Nations (ECOSOC) and is closely involved in many aspects of implementation of the Habitat Agenda. CASLE also works closely with other Commonwealth associations in cognate fields, participates in UN-Habitat meetings and is a partner of the Global Land Tool Network (GLTN). CASLE has established its own Land Administration Group, and also takes part in pre-CHOGM events.

In implementing the Habitat Agenda, the issues of particular relevance to us are:

- (a) access to land and legal security of tenure
- (b) pro-poor housing and livelihoods
- (c) improvement of the enabling framework
- (d) sustainable development goals
- (e) promotion of partnerships focused on resources, relief of poverty and securing finance for sustainable development.

The application of all of these is central to the management of natural resources, and the ever-demanding challenge of climate change and we must develop a sustainable professionalism in surveying and relevant education in the Commonwealth to cope with

these challenges – all of which are included in the theme of this regional and international conference.

I wish to thank the following for their support and assistance:

- Members of SIZ
- The Local Organising Committee in Lusaka
- Members of the CASLE Conferences Scientific Committee
- CASLE Management Board and Task Force
- Trustees of the Aubrey Barker Fund

Professor Dr Alan Spedding and I are very pleased that we are able to participate in this conference and we wish to thank the members of the Surveyors Institute of Zambia for setting up the conference in Lusaka and for making it possible for us to attend.

Susan M Spedding (Mrs)
CASLE Secretary-General

Foreword by the CASLE President, Mr Joseph Olusegun Ajanlekoko

It is three years since I was elected President of CASLE at the 13th General Assembly in Takoradi, Ghana, in March 2015. Prior to the General Assembly, CASLE in collaboration with the Ghana Institution of Surveyors (GhIS) held a very successful conference attended by over 450 delegates. Since then CASLE has collaborated with member associations in successful events in Abuja, Nigeria in 2016 and Dar es Salaam, Tanzania in 2017.

My close involvement with CASLE strengthened in 1998 when I attended the Commonwealth Heads of Government Meeting (CHOGM) in Edinburgh, UK and I have since participated in many conferences and nearly all General Assemblies. During my first year of office as President, I was invited to attend a reception at St James's Palace, London where I had the honour to meet Her Majesty The Queen. In November 2015, I represented CASLE at the Commonwealth Heads of Government Meeting in Malta where I was accredited to the Commonwealth Business Forum.

This conference in Lusaka, Zambia is a follow-up to the conferences in Takoradi (2015), Abuja (2016) and Dar es Salaam (2017) and I am very pleased that Mr James Dadson, CASLE Africa President, Mrs Susan Spedding, Secretary General, Professor Dr Alan Spedding, Past President, and other CASLE officials will also be representing CASLE.

The conference is therefore an affirmation of the CASLE Management Board's interest in ensuring that member bodies and its members are afforded the opportunity of benefitting from the expertise and knowledge warehoused by CASLE for their professional development in addition to the networking opportunities that are provided within the conference. We shall continue to pursue this programme in all Commonwealth regional groupings throughout the tenure of this leadership.

It gives me great pleasure to welcome everyone to the conference and to wish you all a very enjoyable and rewarding experience.

CASLE President

Mr Joseph Olusegun Ajanlekoko

CASLE President

ACKNOWLEDGEMENTS

The CASLE Secretary General and President would like to express their gratitude for the contribution of the following individuals, organisations and committees:

- The Surveyors Institute of Zambia (SIZ).
- Professor Paul Olomolaiye, University of the West of England.
- Royal Institution of Chartered Surveyors.
- The conference local organising committee.
- The conference scientific committee.
- Keynote speakers and presenters.
- The CASLE Management Board and members of the Task Force.
- Trustees of the Aubrey Barker Fund

CASLE 2018 CONFERENCE SCIENTIFIC COMMITTEE

Mr Anthony Westcott	CASLE, United Kingdom.
Professor Dr Alan Spedding	CASLE, United Kingdom.
Mr James Dadson	CASLE, Ghana.
Dr Patrick Manu	The University of Manchester, United Kingdom.
Dr Abdul-Majeed Mahamadu	University of the West of England, United Kingdom.
Ms Millicent Asah-Kissiedu	University of the West of England, United Kingdom.
Associate Professor Antoni Moore	University of Otago, New Zealand.
Dr Benjamin Ekemode	Obafemi Awolowo University, Nigeria.
Dr Solomon Bababtunde	Obafemi Awolowo University, Nigeria.
Professor Johnson Kampamba	University of Botswana, Botswana.
Dr Yusuf Opaluwa	Federal University of Technology, Minna, Nigeria.
Prof Timothy Idowu	Federal University of Technology, Minna, Nigeria.
Mr Lucky Kabanga	University of Cape Town, South Africa.
Professor Olubola Babalola	Obafemi Awolowo University, Nigeria.
Mr Nelta Mosimanegape	Tempest Gold (Pty) Ltd, Botswana.
Professor Ephraim Kabunda Munshifwa	Copperbelt University, Zambia.
Mrs Amina Dienye	Rivers State University, Nigeria.
Mr Oluibukun Ajayi	Federal University of Technology, Minna, Nigeria.
Dr Oluwole Daramola	Obafemi Awolowo University, Nigeria.

TABLE OF CONTENTS

PROPERTY & URBAN MANAGEMENT.....	1
THE IMPACT OF UNLICENSED INDIVIDUALS ON THE PROPERTY INDUSTRY IN BOTSWANA - <i>Neltah Tshepiso Mosimanegape</i>	2
VALUE CAPTURE IN SUPPORT OF LAND TRANSPORT INFRASTRUCTURE IN ZAMBIA - <i>Ephraim Kabunda Munshifwa, Anthony Mushinge And Natasha Kalunga</i>	11
EXPROPRIATION, COMPENSATION AND IMPOVERISHMENT OF PROJECT AFFECTED PEOPLE: CASE OF MOMBERA PUBLIC UNIVERSITY PROJECT IN MALAWI - <i>Lucky Kabanga And Many M Mooya</i>	22
AN ASSESSMENT OF PRINCIPLES OF EQUITY AND FAIRNESS IN RATING VALUATION PRACTICES IN BOTSWANA: GABORONE VALUATION ROLL 2008 - <i>Johnson Kampamba, Aloysius Clemence Mosha, Aderemi Yankeen Adeyemi And Andy Letlotlo Sekeinyana</i>	33
THE INTERFACE BETWEEN THE PLANNING SYSTEM AND HOUSING DEVELOPMENT: IDENTIFYING GAPS IN THE LITERATURE - <i>Elizabeth Mirika Musvoto And Many Mainza Mooya</i>	44
AN EVALUATION OF THE RELEVANCE OF CURRENT TRADITIONAL LEASES IN COMMERCIAL PROPERTIES AS COMPARED TO GREEN LEASES - <i>Johnson Kampamba, Simon Kachepa, Milidzani Majingo And Abednico Wadingalo</i>	54
RESILIENCE THINKING IN SUPPORT OF SUSTAINABLE SMART CITIES - <i>Edward Kurwakumire, Trevor Mapurisa And Shelter Kuzhazha</i>	65
A COMPARATIVE ANALYSIS OF ACADEMIC PERFORMANCE OF REAL ESTATE AND LAND MANAGEMENT STUDENTS' FROM PRIVATE AND GOVERNMENT SECONDARY SCHOOLS ENROLLED IN UNIVERSITY OF BOTSWANA - <i>Johnson Kampamba And Beldah Dimpho Sankoloba</i>	75
CONSTRUCTION.....	85
AN ANALYSIS OF THE GREEN BUILDING CONCEPT AS A BUSINESS CASE IN BOTSWANA - <i>Johnson Kampamba, Milidzani Majingo, Simon Kachepa And Banyaditse Mogale</i>	86
AN ANALYSIS OF THE GREEN CONCEPT IN THE BUILT ENVIRONMENT IN GABORONE, BOTSWANA - <i>Johnson Kampamba, Simon Kachepa, Milidzani Majingo And Nancy Fifing</i>	97
SUSTAINABILITY ANALYSIS OF ROAD CONSTRUCTION PROJECTS IN KIGALI CITY-RWANDA - <i>David Nkurunziza And Augustin Faraja Irumva</i>	107
FACTORS INHIBITING THE USE OF INFRASTRUCTURE BONDS FOR PUBLIC INFRASTRUCTURE DEVELOPMENT IN THE ZAMBIAN CONSTRUCTION	

INDUSTRY - <i>Chipozya Tembo-Silungwe, Josephine Mutwale-Ziko And Rex Andrea Fernado</i>	118
APPLICATION OF VALUE ENGINEERING SERVICES IN THE MALAWI CONSTRUCTION INDUSTRY- <i>George Mwakasungula And Peter Mbewe</i>	128
ASSESSING THE NEED FOR CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL SUSTAINABILITY ANJIBA LAMPTEY - <i>Puddicombe D. And Benjamin Amadi Woke</i>	138
LAND SURVEYING AND MANAGEMENT	149
AN ANALYSIS OF CAUSES OF CONFLICTS ON STATE LAND IN ZAMBIA: EVIDENCE FROM THE CITY OF LUSAKA - <i>Anthony Mushingi, Ephraim Kabunda Munshifwa And Hastings Shamaoma</i>	150
ANALYSIS OF FLOOD PLAIN FOR SUSTAINABLE FLOOD DISASTER MANAGEMENT USING REMOTE SENSING - <i>Jeremiah Uriah, Amina Dienye And James Ogaluzo</i>	160
MONITORING WETLAND DEPLETION (IN PORT HARCOURT, NIGERIA) USING SATELLITE IMAGERY - <i>Amina Dienye, Dagogo Fubara And Godwill Pepple</i>	172
GOVERNANCE OF TENURE: KEY TO SUSTAINABLE LAND ADMINISTRATION IN NIGERIA - <i>Amina Dienye, Godwill Pepple And James Ogaluzo</i>	183
FIT - FOR - PURPOSE CADASTRE: DEVELOPMENT OF A GEOSPATIAL INFORMATION SOFTWARE FOR DIGITAL LAND ADMINISTRATION - <i>Oluibukun Gbenga Ajayi, Omoware Oluseun Bolarinwa, Joseph Olayemi Odumosu, And Abdullahi Ahmed Kuta</i>	190
GEOSPATIAL DETERMINATION OF PATTERNS OF ACCESSIBILITY TO HEALTHCARE FACILITIES IN OSUN STATE, NIGERIA - <i>Joseph Tunde Fadahunsi</i>	202

PROPERTY & URBAN MANAGEMENT

THE IMPACT OF UNLICENSED INDIVIDUALS ON THE PROPERTY INDUSTRY IN BOTSWANA

Neltah Tshepiso Mosimanegape¹

1 Real Estate Agent, Botswana

The growth of the Botswana property industry is evident by the increasing number of property professionals registered by the Real Estate Institute of Botswana (REIB) and the Real Estate Advisory Council (REAC) on a yearly basis. However, with the growth of the industry comes unsolicited individuals practicing as real estate professionals; particularly real estate agents. REIB and REAC are facing a challenge of regulating the industry, protecting the credibility of existing professionals and averting unlicensed individuals from practicing. This research paper examines the impact of unlicensed individuals (i.e. ‘fly by nights’) on the Botswana property industry, stakeholders and the economy at large. This was achieved by interviewing relevant representatives of REAC and REIB to ascertain what steps they take to prevent and handle such cases; and their success rate in doing so. The study also includes the participation of twelve real estate professionals through a questionnaire, on how bogus agents have impacted their profession. A ‘fly by night’ was interviewed to discover how easy it is for them to practice and the loopholes that exist in Botswana’s real estate regulatory system that they have taken advantage of. Finally, an individual who has engaged unlicensed agents shared his experience. It was concluded that the current structures in place to control the infiltration of ‘fly by nights’ in Botswana’s real estate industry are highly inefficient and easily allow unlicensed agents to operate due to the various loopholes during the property transaction process. Stringent gate-keeping controls must be placed at every single stage during the transaction process. This will require the formation of stronger stakeholder relations with solid strategic policies. REAC needs to take a much stronger stance towards unlicensed agents and not only warn offenders but should follow through the Real Estate Professionals Act by prosecuting offenders.

Keywords: Botswana, REIB, REAC, Unlicensed agents, ‘Fly by nights’.

INTRODUCTION

Botswana’s real estate industry has seen an increase in registered professionals since the formation of the Real Estate Institute of Botswana (REIB) and the Real Estate Advisory Council (REAC), a statutory body with the mandate to implement the Real Estate Professionals Act (Madibana, 2010), in 2002 and 1994 respectively. With the boom of any industry comes the infiltration of rogue professionals looking to capture a share of the market; this is due to the increase in demand for services. The real estate industry is no exception. Illegal agents in Botswana are parties which operate as real estate agents yet are not licensed by the regulatory bodies, REIB and REAC. These unlawful operations have brought the industry into disrepute and compromised the integrity of lawful agents.

¹ info@tempestgoldbw.com

From a glance, the impact of ‘fly by nights’ on the industry is a negative one; but to what extent? How do the transactions that take place through bogus agents affect the economy of Botswana? For individuals engaging illegal agents²⁵, what risks do they put themselves in? Finally, how do ‘fly by nights’ damage the industry and are the current measures put in place by REIB and REAC sufficient enough to curb such practices?

The lack of documented research papers on the proliferation of illegal agents in Botswana, prompted this research. Also, the increasingly alarming number of ‘fly by nights’ practicing in the country, especially those advertising their services on social media platforms without fear of prosecution, resulted in the need to investigate whether there are loopholes in the regulations and protection of the real estate industry and its professionals.

The establishment of REIB in the 1990s was a response to a land scandal in Mogoditshane, located in the greater Gaborone area. This resulted in the escalation of ‘fly by night’ property agencies which saw many individuals swindled of large sums of money (Reporter, 2006). The comparatively sparse research of the impact of unregistered agents on the real estate industry has left a lot of room for further research. Most of the research conducted in Botswana focuses mainly on the infrastructural development of the country from a government policy perspective (Briceño-Garmendia & Pushak, 2011). The only traceable information addressing ‘unregistered agents’ in Botswana includes a blog entry on a real estate company’s website (Maikano, 2015), and statements released by a REIB Representative (Sunday Standard, 2006). Although fairly dated, these two sources do admit that, indeed there is a problem; but a thorough procedure on the steps taken by the relevant stakeholders is not thoroughly addressed nor is the extent which it affects the industry investigated.

Unlicensed agents: a challenge in property markets worldwide

Botswana has been rated by the Africa Investment Index 2016 as the most attractive investment destination in Africa (Global Property Guide, 2017). With the vast opportunities in property investment comes the demand for property agents to facilitate transactions. However, it also opens the door for rogue agents to want to claim a piece of the pie. The challenge of illegal estate agents is not only confined to Botswana as it appears to be universally experienced. For instance, in 2017 the Estate Agency Affairs Board (EAAB) in South Africa reported that there were about 50,000 unlicensed agents practicing in their country (Property Professional, 2017). While in China, the challenge of ‘fly-by-nights’ continues to harm the country’s real estate industry (Vellusamy, 2017). Malaysia also laments the spike in illegally practicing real estate agents which also, seem to be on the rise (The Sun Daily, 2016).

The above are just a few examples of the extent of ‘fly by nights’ in different countries from the perspective of regulatory bodies. However, there is still a lack of scientific research which delves deeper into how ‘fly by nights’ easily practice, face little to no prosecution and the extent to which they harm a country’s economy.

RESEARCH METHODOLOGY

Participants

This study has been carried out to find remedial actions to curbing illegally operating agents. Through conducting a written interview with an unregistered agent, an understanding of what makes it easy for them to trade illegally rather than gaining registration with REIB and REAC became more understood. A group of twelve (12) estate agents registered with REIB and REAC participated in the study through an online questionnaire to protect their privacy and also in order to ascertain to what extent unlicensed agents hurt their personal businesses. The respondents were sampled from about 50 licensed members of REIB. These are agents that had previously expressed concern on the effects of the proliferation of unregistered agents had on the Botswana real estate agent. Strategies being put in place by the regulatory bodies, REIB and REAC were also critiqued. The result of the questionnaire section of the research are presented as a poll presented in a pie chart. Whereas the interview results were dissected and interpreted according to the results.

FINDINGS AND DISCUSSION

REAC and the real estate legislation of Botswana

As the problem of bogus agent only seem to be escalating, are regulatory bodies actually doing enough to mitigate the situation? Why is it difficult to prosecute such agents? These are questions that were answered in this study. REAC is the overseeing body of real estate practices in Botswana and ensures that only registered professionals are licensed to practice in the real estate field (REAC, n.d.). Under the Real Estate Professionals Act 18, 2003, Part VI (General ss 36) a person who is not a registered professional under this Act, shall not- (a) perform the work of a real estate professional for gain; (b) practice, carry on business or take up employment as a real estate professional; (c) use or display any signboard, card or other device representing or implying that he is a registered professional; (d) undertake for any fee, commission, reward or any other consideration, the work or duties of a registered professional; (e) be entitled to recover in court, any fee, charge or remuneration for any professional advice or services rendered as a real estate professional; or (f) practice or carry on business using the style or title "real estate professional", "property valuer", "estate agent", "property manager" or "property auctioneer" or such other style or title as the Council may determine to be understood as representing a registered professional (Government of Botswana Laws, n.d.). The penalty for any individual contravening the above Acts is deemed to have committed an offence and is liable to a fine not exceeding P50,000 or to imprisonment for a term not exceeding three years, or to both (Government of Botswana Laws, n.d.). Michael Tumagole, who is the current REAC Registrar, feels that the fine and jail time is adequate punishment for unregistered agents. Apparently, the REAC Office receive ten to fifteen reports on 'fly-by-nights' monthly (Tumagole, 2018). With these frequent reports no parties have been prosecuted as REAC's approach 'is more to educate them'. According to Tumagole (2018) the Council undertakes educational drives with real estate agents and the public through print media, radio, television, council meetings as well as social media platforms to sensitize the public on the dangers of using unlicensed agents. The illusiveness of unlicensed agents by REAC makes it very challenging to identify them; especially in the digital age of social media platforms. The REAC also requires

adequate funding from the Government of Botswana to perform their mandate effectively; this is a sentiment shared by the REAC Chairperson (Mooketsi, 2018) who has stated that the understaffing of their office and budgetary constraints affect their performance when addressing the challenge of ‘fly-by-nights’. Mooketsi (2018) also expressed that the biggest challenge and threat facing the real estate industry and the integrity of the industry is ‘fly-by-nights’. The issue of illegal agents requires collaborative efforts from stakeholders. REAC has already engaged the Financial Intelligence Agency (FIA), Botswana Unified Revenue Service (BURS), Botswana Police Service (BPS), Bank of Botswana (BOB), Deeds Registry, Botswana Housing Corporation (BHC) and Companies and Intellectual Property Authority (CIPA). The strategies put in place with these stakeholders were not divulged.

REIB’s Approach to illegally operating agents

Unlike the Real Estate Advisory Council which oversees the practices of real estate professionals in Botswana through policy drafting of legal framework (The Real Estate Institute of Botswana Orientation 2015, 2015), the Real Estate Institute of Botswana is mandated to ‘promote and encourage high standards of professional practice in relation to property valuation, estate agency, property management, property auctioneering and related activities by preventing illegal, dishonorable, improper and objectionable practices by members’ amongst others (Real Estate Institute of Botswana, 2011). The roles of the two organizations may overlap as it is in the interest of both parties to protect the integrity of real estate professions (Maje, 2018).

Members of the public appear to engage ‘fly by nights’ due to a lack of knowledge of the Real Estate Professionals Act of Botswana. REIB is also concerned about the ill-advice disseminated to clients by illegal agents, charging of exorbitant commission fees as well as fraudulent ways in which they swindle money from unsuspecting parties. The image of real estate agents has certainly been tainted by unlicensed agents; some parties would rather not deal with any agent, whether licensed or not due to their past experiences with illegal agents. Contrary to REAC’s statements, REIB does not believe that the imposition of a maximum fine of P50,000 and/or three years jail time for offending parties contravening Section 36 of the Real Estate Professionals Act (Government of Botswana, n.d.) is enough punishment. REIB is employing a similar approach to REAC to mitigate this situation by collaborating with stakeholders involved in transacting real estate. For instance, agents should be required to produce their REIB and REAC registration certificates at the land board offices, Deeds Registry amongst others before any transfers and/or transactions are made (Maje, 2018).

Effects of ‘fly by nights’ on licensed agents

The effects of ‘fly by nights’ directly affect the business of estate agents. To gain an understanding of the extent to which licensed agents are affected, this study encompasses questionnaire results from 12 registered agents. The majority of participants of the study have been practicing for over 5 years. An astounding 91.7%, which is 11 out of the 12 participants feel that ‘fly by nights’ have affected their practices to a significant extent. Even with this significant percentage, close to half which is 5 out of the 12 participants have not reported illegal agents they are aware of. The consensus is that the authorities, overseeing and regulating bodies are not pro-

active in mitigating the problem. Participants also feel that no resolution will be reached as illegal agents are always let off with a mere warning and do not face prosecution as per Clause 26 of the Real Estate Act. Many of the participants (91.7%), which is a total out 11 out of the 12 participants, also feel that REIB and REAC are not doing enough to curb the challenges facing the real estate industry due to ‘fly by nights’, while half of the participants, which is a total of 6 individuals, support the imposed fine charge and jail time.

The bigger picture: How do ‘fly by nights’ affect the economy?

The direct effects of ‘fly by nights’ transcends registered professionals and the real estate industry; it also compromises the economy of the country. Figure 2 below shows that the finance, real estate and business services sectors contributed 15.2% towards the GDP of Botswana (Honde & Abraha, 2015), ranking in the top 5 of highest contributors. In 2015, the real value added of the Finance and Business Services was partly due to a 6.2 per cent rise in the real estate sector (Statistics Botswana, 2017).

The contributions of real estate services towards the GDP do not consider transactions conducted through rogue agents for some of the following reasons; firstly, illegal agents do not typically register their companies with the Companies and Intellectual Property Authority (CIPA), therefore are not registered with the Botswana Unified Revenue Service (BURS). Therefore, transactions pertaining the trading of properties remain unaccounted for and tax is not collected. Secondly, unlicensed agents do not charge according to the ‘fees scales’ set by the Real Estate Act (Mooketsi, 2018). Another threat to the real estate industry of Botswana, is foreign agents practicing in Botswana. To put this into perspective, agents from neighbouring countries list properties in Botswana to their clientele in their respective countries. Successful transactions are carried out in the latter economies, which only enrich their GDP and do not contribute at all to the economy of Botswana. Unfortunately, statistics on the extent on such dubious transactions are difficult to collect.

To what extent do fly-by-nights affect your practice as a registered agent?

Have you reported any fly-by-nights to the relevant authorities? (REIB and REAC)?

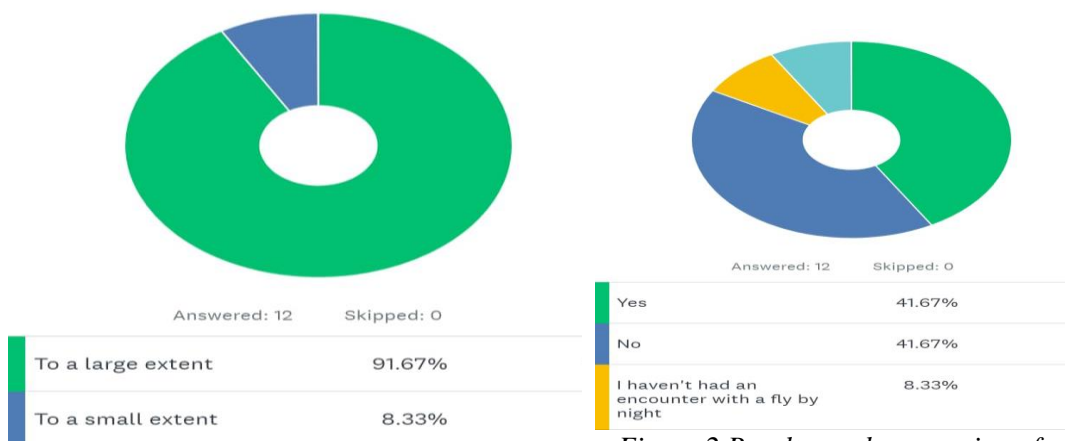
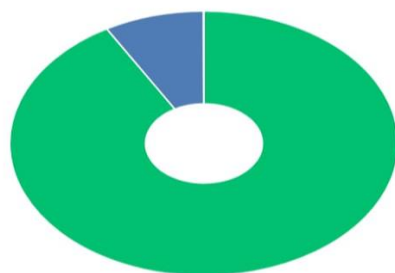


Figure 2 Results on the reporting of illegal agents

Figure 1 Effect of 'fly-by-nights' on registered agents

Do you feel REIB and REAC are doing enough to curb the problem of fly-by-nights?

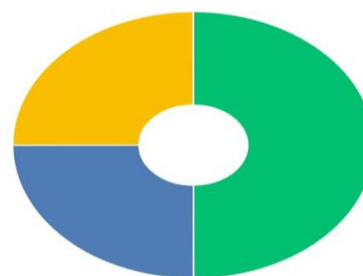


Answered: 12 Skipped: 0

To a large extent	91.67%
To a small extent	8.33%

Figure 3 Results on whether REIB and REAC are doing enough to curb the problem of 'fly-by-nights'

If found guilty, fly-by-nights can be liable for a fine not exceeding P50,000 or to imprisonment for a term not exceeding 3 years. Do you think this is enough punishment?



Answered: 12 Skipped: 0

Yes	50%
No	25%
Comment	25%

Figure 4 Results on whether the prosecution charges are enough

Table 1: The contribution of real estate on the GDP of Botswana

	2009	2013
Agriculture, forestry, fishing & hunting	3.3	2.6
of which fishing
Mining and quarrying	15.9	24.5
of which oil
Manufacturing	7.4	5.7
Electricity, gas and water	0.5	-0.2
Construction	7.1	6.9
Wholesale & retail trade; repair of vehicles household goods; Restaurants and hotels	17.6	16.3
of which hotels and restaurants
Transport, storage and communication	6.3	6.0
Finance, real estate and business services	15.3	15.2
Public administration and defence	19.4	16.3
Other services	7.2	6.6
Gross domestic product at basic prices / factor cost	100.0	100.0

Source: Data from domestic authorities

The ease of operating as an illegal agent

The participation of a illegal agent on condition of anonymity gives insight on the ease of operating as an unlicensed agent in Botswana. James Keteng*, who has been 'practicing' for close to a year, has not been reported to authorities as he mainly

practices as an agent through helping family and friends trade their properties. He has gained the trust of parties that engage him by compiling with the Real Estate Professionals Act, which he is well-versed with. According to this ‘fly by night’, the procedures put in place to curb their practices are adequate but lack efficiency and effectiveness. For instance, Keteng raised a widespread practice of real estate companies hiring individuals (e.g. an accountant) who are not registered agents to carry out the company’s real estate work. Such practices from big companies make smaller individuals feel it is acceptable to practice without being duly registered.

As an unregistered agent, Keteng feels that threats of prosecution from authorities do not stop them from illegally practicing as ‘the process of being held accountable is too long’ (Keteng, 2018). This is a sentiment shared by a property buyer, Chris Albert* who has engaged an unregistered agent before, “There are no high profile cases in which an unregistered agent has been charged under the Act and found guilty and received a harsh sentence” (Albert, 2018). This brings us back to REAC’s admission of no illegal agents ever being prosecuted but only getting off with a warning (Mooketsi, 2018).

The wide audience that social media reaches and the impossibility of preventing ‘fly by nights’ to advertise their listings is perhaps one of the biggest contribution to the rise of rogue agents. Most rogue agents deal with lower end properties, possess more enthusiasm and knowledge in transacting lower to middle class properties; a huge market of theirs as Botswana is a middle-income country (Cross Border Road Transport Agency, 2018).

Contrary to what REIB and REAC believe, Albert is not aware of the negative effects of ‘fly by nights’ on the economy and is actually of the view that these illegal operations actually put a lot of individuals out of poverty and allow them to make a decent living, albeit illegally (Albert, 2018).

Loopholes in the Brokerage process

From the research conducted, the lack of collaborative efforts and gate-keeping throughout the property transaction process from real estate stakeholders result in loopholes being taken advantage of. Illegal agents have formed syndicates within themselves and key stakeholders such as land board authorities and conveyancers for the property transfer process. According to Albert, illegal agents steer their potential clients to certain lawyers, whom they work in collusion with and charge more than the stipulated commissions by the REAC fees scale (Albert, 2018).

RECOMMENDATIONS

Both REIB and REAC have publicly declared their determination to curb illegal agents, but to date, no tangible action on their strategy during and after implementation have been reported publicly. Even though public awareness has been taken, REIB and REAC need to strategically employ gate-keeping methods at key stages within the transaction process. The Government of Botswana needs to

adequately fund REAC to be able to engage the necessary capacity of manpower and resources. The employment of ‘Know Your Customer’ KYC processes, which are used by banks to identify and understand their customers better as well as combat the possibility of fraud and money laundering (Bankers Association of Namibia, 2018). Introducing a standard KYC form with input from organizations such as FIA and BURS for estate agents and would ensure that only registered professionals are able to practice as well as identify sources of income used to purchase properties (Palai, 2018). A complete and up to date database of all real estate professionals should be generated; one that can allow users to simply run a background check on the real estate professionals.

Further research should be undertaken on the strategic policies and formation of Memorandum of Agreements (MOUs) with relevant stakeholders to build in measures and implementation steps and monitor results regularly (Ong, 2015)

CONCLUSIONS

Addressing unlicensed individuals from practicing as estate agents in Botswana requires the collective efforts of all stakeholders involved. The awareness of ‘fly by nights’ is clearly visible, but with REAC not taking legal action towards such parties the problem will only escalate and harm the industry and economy, further as a whole.

ACKNOWLEDGEMENTS

I wish to thank the Real Estate Institute of Botswana and the Real Estate Advisory Council representatives for their participation in this research by providing their organization’s strategies.

REFERENCES

- Albert, C., 2018. The Impact Of Unlicensed Individuals On The Property Industry In Botswana [Interview] (16 August 2018).
- Briceño-Garmendia, C. & Pushak, N., 2011. World Bank Group. [Online] Available at: <https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5887>[Accessed 18th August 2018]
- Cross Border Road Transport Agency, 2018. Cross Border Road Transport Agency. [Online] Available at: <http://www.cbrta.co.za/wp-content/uploads/2018-03-26-Botswana%20Profile%20FINAL.pdf> [Accessed 31 August 2018].
- Global Property Guide, 2017. Global Property Guide. [Online] Available at: <https://www.globalpropertyguide.com/Africa/Botswana>
- Government of Botswana Laws, n.d. REAC. [Online] Available at: http://www.reac.co.bw/common_up/reac/files/Real%20Estate%20Act.pdf [Accessed 26th August 2018]
- Government of Botswana, n.d. elaws. [Online] Available at: www.elaws.gov.bw/sub_export.php?id=910 [Accessed 26th August 2018]

- Honde, G. J. & Abraha, F. G., 2015. UNDP. [Online]
Available at:
<http://www.bw.undp.org/content/dam/botswana/docs/Publications/Botswana%20s%20GDP%202015.pdf> [Accessed 17th August 2018]
- Keteng, J., 2018. The Impact Of Unlicensed Individuals On The Property Industry In Botswana [Interview] [Accessed 20th August 2018).
- Madibana, K., 2010. Sunday Standard. [Online]
Available at: <http://www.sundaystandard.info/real-estate-institute-strives-promote-professional-standards> [Accessed 19th August 2018]
- Maikano, N., 2015. Maison Properties. [Online]
Available at: <http://maisonprop.com/the-issue-of-fly-by-nights-in-botswana/>[Accessed 15th August 2018]
- Maje, M. C., 2018. Talking fly-by-nights [Interview] (16 August 2018).
- Mooketsi, M., 2018. The Impact Of Unlicensed Individuals On The Property Industry In Botswana [Interview] (04 July 2018).
- Ong, C., 2015. Envisio. [Online]
Available at: <https://www.envisio.com/blog/benefits-of-strategic-planning> [Accessed 22 August 2018].
- Property Professional, 2017. Property Professional. [Online]
Available at: <http://propertyprofessional.co.za/50-000-illegal-agents-operating-says-eaab/>[Accessed 22th August 2018]
- REAC, n.d. REAC. [Online]
Available at: <http://www.reac.co.bw/reac-content/id/4/about-us/>[Accessed 18th August 2018]
- Real Estate Institute of Botswana, 2011. Real Estate Institute of Botswana. [Online]
Available at: <http://www.reibonline.co.bw/rei-content.php?cid=2>[Accessed 18th August 2018]
- Reporter, S. S., 2006. Sunday Standard. [Online]
Available at: <http://www.sundaystandard.info/mooketsi-attacks-rogue-real-estate-companies>[Accessed 15th August 2018]
- Statistics Botswana, 2017. Gross Domestic Product, Gaborone: Statistics Botswana.
- Sunday Standard, 2006. Sunday Standard. [Online]
Available at: <http://www.sundaystandard.info/mooketsi-attacks-rogue-real-estate-companies>[Accessed 15th August 2018]
- The Real Estate Institute of Botswana Orientation 2015. 2015. [Film] Directed by Modiredi Maruping. s.l.: s.n.
- The Sun Daily, 2016. The Sun Daily. [Online]
Available at: <http://www.thesundaily.my/news/1832513>[Accessed 22th August 2018]
- Tumagole, M., 2018. The Impact of fly-by-nights on the real estate industry in Botswana [Interview] (27 August 2018).
- Vellusamy, Y., 2017. Star Property. [Online]
Available at: <http://www.starproperty.my/index.php/articles/property-news/beware-of-illegal-property-agents/>[Accessed 14th August 2018]

END

VALUE CAPTURE IN SUPPORT OF LAND TRANSPORT INFRASTRUCTURE IN ZAMBIA

Ephraim Kabunda Munshifwa¹, Anthony Mushingwa² and Natasha Kalunga³

1 Copperbelt University

2 Copperbelt University

3 Copperbelt University

This paper examined the concept of land value capture in relation to financing of land transport infrastructure in Zambian cities. In recent years, Zambia has borrowed massively to fund road infrastructure around the country with the current foreign debt estimated to be about US\$8 billion. Unable to continue borrowing from the traditional partners, such as the World Bank and International Monetary Fund (IMF), the country has opted for alternative sources from China; often attached to specific infrastructural development. A number of studies link land transport infrastructure development to improved property values; hence it is argued that this additional increase in private property values should be taxed by government. However for Zambia, this raises three interrelated questions: firstly, what types of investments do local authorities undertake and how do these compare with those envisaged within the land value capture concept? Secondly, how can this increase in private property values be identified and measured? Thirdly, how much knowledge do local authorities have on this concept and its mechanisms? This study used the seven local authorities in the Copperbelt Province (i.e. Chililabombwe, Chingola, Kalulushi, Kitwe, Luanshya, Mufulira and Ndola) to answer these questions. Data was collected through questionnaires and interviews with local government officials. The study found that local authorities in Zambia have a number of challenges in adopting the value capture concept, these include: low value of infrastructure developed, measurement of value increment and limited knowledge on the concept by would-be implementers.

Keywords: Value capture, land transport, infrastructure, property values, Zambia

INTRODUCTION

Zambia has in the recent past borrowed massively to fund various infrastructural projects around the country. This has contributed to the current increase in indebtedness from US\$1.9 billion (8.4% of Gross Domestic Product [GDP]) in 2011 to US\$8 billion (36.5% of GDP) at the end of 2016 (World Bank, 2017). Many fear that this increase in debt is unsustainable and risks the country plunging in a “debt trap” and return to the days of Highly Indebted Poor Countries (HIPC). The recent failure to acquire a US\$1 billion facility from the International Monetary Fund (IMF) has been cited as one indication of the nervousness of international financial institutions on Zambia's debt. The alternative has been contracting of huge debts from China, often attached to specific public development. A large percentage of these borrowed funds have ended in road infrastructure. For instance, US\$310 million out of

1 ephraim.munshifwa@cbu.ac.zm

2 anthony.mushingwa@cbu.ac.zm

3 natashakalunga@gmail.com

the first US\$750 million Eurobond money was used on roads, US\$218 million from the second US\$1 billion and US\$400 million from the third US\$1,250 million (World Bank, 2017). The Zambian government has recently given out a new contract for the construction of the Lusaka-Ndola dual carriage (total of 812 kilometres) which is estimated to cost US\$1,250 billion; that is, US\$1.2 million per kilometre (Government of the Republic of Zambia, 2018). Debates have already raged on how unsustainable such borrowing is.

In a number of countries, mechanisms within the land value capture concept have been used to raise funds to finance the development of road infrastructure. In fact a number of studies (see Debrezion et al 2011; Peterson, 2009; Vadali, 2014; Chapman, 2017) have linked public investments to increased property values. Thus this paper examined this concept in relation to financing transport infrastructure in Zambia. In doing so, three interrelated questions were answered: firstly, what types of investments do local authorities undertake and how do these compare with those envisaged within the land value capture concept? Secondly, how can this increase in private property values due to public investment be identified and measured? Thirdly, how much knowledge do local authorities have on this concept and its mechanisms? This study used the seven local authorities comprised Chililabombwe, Chingola, Kalulushi, Kitwe, Luanshya, Mufulira and Ndola in the Copperbelt Province to answer these three research questions.

VALUE CAPTURE AND LAND TRANSPORT INFRASTRUCTURE: A LITERATURE REVIEW

Value capture mechanisms have been used in a number of countries to raise funds for intercity and local infrastructure (see Debrezion et al 2011; Casey, 2011; Ma et al., 2013; Vadali, 2014; Xu, 2015; Chapman, 2017). These mechanisms include an array of instruments such as: in-kind contributions, negotiations and voluntary contributions, sales of development rights, public land leasing, land acquisition and resale, land sales, impact fees and development charges, property taxes, property tax surcharges, tax increment financing (TIF), betterment levies/taxes and other similar taxes and levies (Peterson, 2009; McGaffin et al., 2016). A number of arguments though still exist on what the term really means. For instance Vadali (2014) argues that value capture is an open-ended term with various definitions, however the basic essence of the concept is the “capturing [of] value increments created by public investments in infrastructure” (Ingram and Hong, 2012, p. 3).

A detailed review of some of these studies shades more insight on the concept. For instance Debrezion et al (2011) used a hedonic pricing model on sales data from three metropolitan areas in the Netherlands (Amsterdam, Rotterdam and Enschede) to analyze the effect of railway accessibility on house prices. The methodology involved the measurement of accessibility in relation to both the distance to a railway station and an index of quality of railway services provided at the station. In each city two railway stations were considered, the nearest railway station and the most frequently chosen railway station. Using data from Dutch residential transactions from 1996 to 2001, the study concluded that residential values were influenced more by the most frequently used railways station and not just the nearness of a house to a station.

Similarly, Ma et al (2013) investigated the effect of rail transit on property values in Beijing, China. The methodology involved collecting data on apartment homes sold in the Beijing metropolitan area during 2011. Using hedonic price modelling, price premiums or discounts associated with proximity to transit stations

were estimated. Overall, the study found that properties nearer the rail transits had on average higher prices by 5%. The study also found that station-proximity effects increase both in magnitude and spatial extent as stations moved further away from the city centre. The conclusion was that rail-transit investment in Beijing would reshape its urban spatial structure, thus local governments in China should consider a rail + property development model as a future financing solution for rail-transit investment.

Carter and Farkas (2003) examined the effects of thoroughfares on residential and commercial property in Baltimore, USA. The study hypothesized that apartment real estate prices will decrease with distance from the centre of the City of Baltimore and also with distance from the radial thoroughfares within the Baltimore Metropolitan area. Neelawala et al (2013) also obtained similar results from a study which focused on the impact of major roads on property values in Brisbane, Australia. Casey (2011) is another study which examined the effect of a highway, the Superstition Freeway (US60) corridor in metropolitan Phoenix (USA), to assess the distributional effects of the freeway. Other studies (such as Roukouni and Medda, 2012), although investigating the effect of public investments on property values, have also put emphasis on instruments used to capture that value. For example, Roukouni and Medda (2012) evaluated the Business Rate Supplement (BRS) as used by the Greater London Authority to capture value from a £14.8 billion rail project. The Authority hoped to raise £4.1 billion for this project through BRS. Roukouni and Medda (2012) and Doherty (2004) have debated the merits and demerits of Accessibility Increment Contribution (AIC); which is an embodiment of all the fiscal contributions for increments in land values as a result of accessibility. Further, some studies have focused on other instruments for value capture, such as Anderson (2012) on public leasing, Sanyal and Deuskar (2012) on town planning schemes, Walters (2012) on property taxes and Wolf-Power (2012) on community benefit agreements.

The general conclusion from empirical literature is that the claim by the public sector on the value increment resulting from its action is a legitimate one. But as also noted by Chapman (2017), an increase in broad-based taxes should always take cognisance of both political and economic factors; hence the need to look to new funding methods. Furthermore the literature recognises a number of door-step conditions or success factors which are needed in order to implement a land capture instrument, these included demographic and economic conditions, systematic master planning for long term development, good collaboration and institutional settings (Xu, 2015).

CASE REVIEWS

Hong Kong Mass Transit Railway Corporation (MTRC), China

A case study on Hong Kong's Mass Transit Railway is instructive on how land value capture mechanisms have been used to finance public transport system in a city (Verougstraete and Zeng, 2014). This study showed a step by step use of a "joint development model"; which is a "type of public-private partnership where a public entity collaborates with private developers on infrastructure projects, such as real estate properties, with both entities sharing risk, cost and profit" (Verougstraete and Zeng, 2014, p. 1). This process requires at least four important steps: planning, obtaining various permissions, implementation of developments and capturing the value increment through profit sharing agreements. Thus the main strategy of this model is to develop property along the railway line, which for Hong Kong MTRC

resulted in housing price premiums ranging from 5% to 17% for units in proximity to railway.

Upgrade of local roads in three Minnesota counties, USA

The Minnesota study focused on three counties, Hennepin County (population 1.1 million), Olmsted County (population 125, 000) and Jackson County (population 11,000) (Iacono and Levinson (2009)). The study selected projects with a total construction cost of over US\$10 million for the purpose of evaluating the effect of upgraded local roads on property values. These counties were selected on the basis of major highway construction projects in Hennepin, a six lane major arterial highway in Olmsted and the expansion of the Minnesota Truck Highway from two to four lanes. Revenue data on sale transactions on residential and commercial property from 1999 to 2007 were used. Data also included structural, locational and building attributes/characteristics. The hedonic regression model was used to analyse the effect of road network improvements on property values. Results showed that in Hennepin the upgraded highway was associated with a reduction in sales prices while in Jackson no effect was revealed due to the upgraded highway. However results for Olmsted showed that prices were 0.5% to 2% higher for houses within 1 mile of the upgraded highway (Iacono and Levinson, 2009). The case showed that the amount invested is also cardinal in order to make an impact on property values

Transport interchanges in Johannesburg and Cape Town, South Africa

McGaffin (2011) presented a case of three transport interchanges in South Africa, namely Mooki Street Interchange in Soweto (Johannesburg), Kuyasa Metrorail Station in Khayelitsha (Cape Town) and proposed Diepsloot Highway Interchange in Johannesburg, which are of interest to this study. In this study McGaffin (2011) explored the use of value capture mechanisms in South Africa using the residual valuation model as an alternative to hedonic pricing. The Mooki Street interchange was assessed to have a potential to accommodate 811 housing units and 7000m² retail space while the Kuyasa Metrorail Station was projected to accommodate 2500 housing units and 19,000m² retail space developments around it (McGaffin, 2011). The Diepsloot Highway interchange was estimated to have a potential for 43,000m² retail, 33,000m² office and 75,000m² industrial spaces (McGaffin, 2011).

Using the residual method, the study estimated the value of the land with the interchange at Mooki Street to be approximately R600/m² as compared to land without interchange of R425/m² (single residential). For Kuyasa Metrorail Station land value was approximately R394/m² for single residential compared to R230 without the interchange. Land value with the Diepsloot interchange was estimated at R2,200/m² compared to R2,725/m² (retail), R2,580/m² (office) and R1,424 (industrial) within the interchange. McGaffin (2011) argued that the point of these three case studies was to show the application of an alternative method of measuring value increment.

This study showed four important steps in the execution of a project with value creating potential, which are:

- a) site analysis - Involves analysis of the history of the site, size, location layout, infrastructure provision, existing and future developments, demographics and current land uses
- b) Market analysis - Based on availability of land, infrastructure, development rights, market demand.

- c) Residual calculations - Based on development scenarios, residual value estimated
- d) Value capture - Design of a value capturing instrument

Lessons from the case reviews

A number of lessons can be gleaned for the cases reviewed. Firstly, types of investments for value capture purposes are varied and can be configured differently in different environments. For instance, the Hong Kong case showed a complete transit railway network (Verougstraete and Zeng, 2014); the USA case was on upgrading of local existing roads (Iacono and Levinson (2009); and the South African case was on road interchanges (McGaffin, 2011). Therefore a local authority should be able to conceptualise their own investments while understanding how such investments would lead to improvement of value on private property hence creating an opportunity for raising local revenue; the Hong Kong case outlined how such projects can be perceived from inception (as shown in Verougstraete and Zeng, 2014). The second lesson was that these developments are often large-scale multi-million dollar projects. For instance the Minnesota case showed that even when the public investment is upgrading of existing local roads, these works are often substantial (in this case over USD10 million). Small everyday routine maintenance activities often create challenges for perceiving the value increment.

CONCEPTUAL AND RESEARCH METHODOLOGY ISSUES

Conceptual framework

A review of theoretical and empirical shows that an ideal land-value capture project would take a cyclical form (McGaffin et al., 2016), that is: commences with public investment or re-investment; realisation of value created, also referred to as “value increment”; calculation of value increment due to public investment; and, capturing of part of that value through various instruments (e.g. tax, levy, etc.) and ends with re-investing of proceeds. These steps are illustrated in Figure 1.

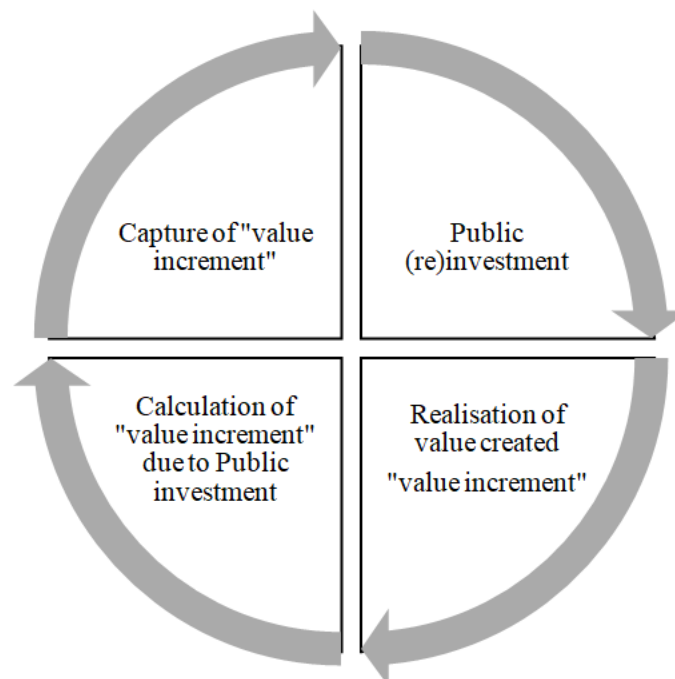


Figure 1: Cyclical nature of a value capture projects (Adapted from McGaffin et al., 2016)

Copperbelt Towns and Cities

The Copperbelt Province has seven (7) urban towns and cities, namely: Kitwe (population 517,543), Ndola (population 451,246), Luanshya (population 156,059) Mufulira (population 125,336), Kalulushi (population 162,889), Chililabombwe (population 91,833) and Chingola (population 216,626); a total population of (Central Statistical Office, 2012). The Province has three other rural towns, Masaiti, Lufwanyama and Mpongwe, which were not included in this study.

RESEARCH DESIGN

The methodological approach for land value capture studies is often hedonic pricing model on transaction prices. However, this study did not go that far; hence should be considered as an initial step to understanding the domestication of the value capture concept in the Zambian environment. It used data from secondary sources and primary data through questionnaires and interviews with local government officials. In-depth interviews with local authorities' officials were conducted in all the seven urban towns in the Copperbelt Province. The study targeted directors of departments at each Council. Each Council has six technical directors, giving a total of 42 directors in the seven Councils in the Copperbelt Province. However the interest of the study was with directors involved either in the financing or the construction of infrastructure, hence seven Directors of Finance and three Directors of Engineering were interviewed. Identity numbers are used in this paper to keep the anonymity of interviewees.

RESULTS AND DISCUSSION

This paper examined the concept of land value capture in relation to financing of transport infrastructure, specifically in the seven towns and cities in Copperbelt Province. Data is presented under the four conceptual categories, that is; public investments, realisation of value, value increment and value capture mechanisms.

Types of public investments

Literature reviewed (see Iacono and Levinson, 2009; McGaffin, 2011; Verougstraete and Zeng, 2014) pointed to railway, roads highways and interchanges as suitable public investments for value capture initiatives. Thus the entry point was to understand the types of investments commonly undertaken by local authorities in Zambia. Table 1 shows that township roads, market shelters, drainage and recreational facilities are the most common activities.

Table 1: Major infrastructural services provided by local authorities

Name of Council	Township roads	Market shelters	Drainage	Recreation facilities
Chingola	✓	✓	✓	
Mufulira	✓	✓	✓	
Kitwe	✓	✓	✓	✓
Ndola	✓	✓	✓	✓
Luanshya	✓	✓	✓	✓
Kalulushi	✓	✓	✓	✓
Chililabombwe	✓	✓	✓	

Source: Field survey (2017)

During interviews at Chililabombwe Municipal Council, Interviewee 1 alluded to the fact that: *“local authorities do not deal in big capital projects because these have been taken up by private organisations such like Road Development Agency, Mulonga Water and Sewerage and other similar companies. Therefore as a Council we only deal in small projects like mending of potholes, bridges etc.”* (ChMC, March 2017). This was confirmed by Interviewee 2 from Chingola Municipal Council who stated that *“local authorities do not deal in big projects that can enhance the value of property because such big projects have been taken up by central government* (CMC, March 2017).

Historical literature (see Chitonge, 2011) show that post-1990, government embarked on a privatisation programme which saw the transfer of a number of functions from local authorities to newly formed State Owned Enterprises (SOEs) and other quasi-government organisation. This saw the birth of organisations such as National Road Fund Agency, Road Development Agency, Road Transport and Safety Agency and a number of commercial utilities (such Kafubu Water, Mulonga Water, Lusaka Water, Lukanga Water, etc). This then left local major public investments, such as those envisaged under the land value mechanisms outside the local authorities' jurisdiction.

It was however important to investigate how these developments are currently financed. The study found that property tax (commonly known as rates) was one of the major sources of income for the local authorities. Funding problems are further compounded by the poor collection record of Councils. For instance, of the seven local authorities in the Copperbelt Province, only one collects over 80% of funds due to them annually. In many cases, at least 40% of revenue remained uncollected with only Chingola having the lowest at 15%. A number of reasons were given for this poor record in revenue collection. For instance, Interviewee 2 from Chingola Municipal Council noted that: *“Councils do not generate as much as they can from the current sources of revenue due to political interference, exemption of certain properties from paying rates and people's unwillingness to pay rates”* (CMC, March, 2017).

Despite these low revenue collection levels, councils as local government are still inundated with a number of responsibilities to ensure that towns and cities function. One of their heaviest responsibilities is maintenance of infrastructure such as road. Thus from the limited funds collected, local authorities also have to budget for road maintenance. The study revealed that very little money is allocated for this function. For instance Interviewee 3 at Luanshya Town Council explained that: *“... the 20% of funds allocated towards infrastructure provision is not enough and should be increased in order for us as a council to support infrastructure development”* (LMC, March, 2017). Interviewee 4 from Kalulushi Municipal Council also pointed out that *“the 40% allocated towards infrastructure is not enough to support infrastructure development; it does not meet the required budget because the costs involved are too high”* (KMC, March 2017). Interviewee 1 from Chililabombwe Municipal Council concurred and further noted that the *“percentage allocated towards infrastructure provision should be increased in order for us as a council to provide infrastructural services”* (ChMC, March 2017).

The study noted that the type of infrastructure funded by local authorities through their annual budgets was different from that envisaged within the value capture mechanism. Literature (see Iacono and Levinson, 2009; McGaffin, 2011; Verougstraete and Zeng, 2014) revealed that infrastructural developments which lend

themselves to the application of land value capture mechanisms are often large and of high value such as transit highways or railways as shown by Hong Kong, Tokyo and Atlanta. The little revenue available to local authorities and the scale of projects undertaken poses adaptation challenges for value capture mechanisms.

Realisation of value

It was important at this stage to understand how well the concept of land value capture was known by local government officials; since the absence of knowledge on the concept makes it difficult to realise or identify value created through public investments. It was clear that many officials had no knowledge on the concept. For instance response from Interviewee 1 from Chililabombwe Municipal Council was that: *“I do not know about the concept of land value capture concept”* (ChMC, March 2017). After explaining what the concept was about, the official then noted that *“it is a very good concept that can be used as an alternative source of revenue to increase our financial base but the only problem would be the implementation of the concept and how the public would receive it”* (ChMC, March 2017).

Interviewee 2 from Chingola Municipal Council gave a similar response stating that *“if implemented, yes it is a good concept. But how to implement it is where the problem is because we are adopting a concept from other developed nations; therefore we need to be mindful of the political interference, how it is going to be welcomed by the politicians because they play a huge role when it comes to implementation”* (CMC, March 2017). Similar sentiments were expressed by interviewees from Kitwe, Ndola, Mufulira, Luanshya and Kalulushi.

Measuring value increment

The dominant method in the literature for measuring value increment within the value capture instrument is the use of hedonic pricing model (see Debrezion et al 2011; McGaffin et al., 2016; Chapman, 2017); although McGaffin (2011) demonstrated the use of the residual method as an alternative. This requires that transaction prices are regressed against specific factors including the development of a new railway or highway. This approach is data intensive. Interviews with local authority officials from various local authorities in the Copperbelt Province already showed absence of knowledge on the concept; hence posing challenges on the identification or realisation of the value increment from public investments. Even after explaining the concept, many doubted how a new concept with even more demanding requirements on data than the current rating valuation system could be implemented.

Capture of value increment

A number of land-based financing mechanisms are already being used by most local authorities in Zambia; these include property tax (rates), plot premiums and rental income (from few commercial properties still owned by Councils). However the major single source of council revenue is property tax. Literature reviewed showed an array of instruments available for value capture, these included: in-kind contributions, negotiations and voluntary contributions, sales of development rights, public land leasing, land acquisition and resale, land sales, impact fees and development charges, property taxes, property tax surcharges, tax increment financing (TIF), betterment levies/taxes and other similar taxes and levies (McGaffin et al., 2016).

The assessment of property tax in Zambia is governed by the 1999 Rating Act. It is based on the market value of the property at a specified value date. The rate (percentage of the tax levied on the value of a property) determines the amount of tax levied on any given property. The rate or levy to be charged is often fixed after the valuation roll is approved. According to Interviewee 1 from Chililabombwe Municipal Council, every valuation roll comes with an approved rate before implementation. Upon receiving a new roll, it is a requirement of the Rating Act that the local authority proposes a rate to be levied after the roll becomes effective. This is subjected to public consultation through advertisements and notices delivered to leaseholders. Leaseholders are then called upon to object to the valuations and proposed rates and are heard by the Rating Valuation Tribunal, which is the body responsible for approving/disapproving valuation rolls and accompanying rate levies.

Interviewee 2 from Chingola Municipal Council explained the details stating that: *“rate levies are determined using the council budget; that is, the council looks at how much they need to raise from the other sources of revenue that they have, and then get the budget deficit which is only covered by rates. Before arriving at a proposed rate levy, the local authority considers the expected expenditure for a particular year. The council then estimates how much is expected to be raised from other revenue sources apart from rates. The difference between the expected expenditure and revenue from other sources indicates what should be raised from property tax. The council will then take this remaining shortfall as a percentage of the total value of the property appearing on a roll to come up with a proposed rate”* (CMC, March 2017). This process was confirmed with the rest of interviewees from other local authorities.

It could be argued that the tax levied under the Rating Act is sufficient to capture any value which could have arisen from the date of the previous valuation to the current one. In fact the Rating Act provides for supplementary valuation in between the main valuation to capture new properties developed in the interim. While technically the increased value from public investment will be captured by property tax, the target of this instrument is not on the specific increment due to public investment. In an environment with limited data to desegregate this increment, property tax then is thought to work as a proxy.

CONCLUSION AND RECOMMENDATIONS

A number of factors determine the successful implementation of a value capture initiative, among them population density, intensified use of public transport, value of public investment and level of development of measuring instruments. However, this paper also showed that Zambia also needs to deal with the basic issues such as acquisition of knowledge by would be implementers who showed very little awareness of the vast options in land-based or value capture finance mechanisms. Traditional land-based financing mechanisms continue to be property taxes and plot premiums. The “how” part of implementing the value capture concept was encountered at various stages. The most readily available method in valuation for integrating the various influences on value is the hedonic pricing approach; however its application in the Zambian context poses serious challenges due to data unavailability.

REFERENCES

- Anderson, J.E. 2012 Collecting land value through public land leasing. In: Ingram, K. and Hong, Y (eds.) Value capture and land policies. Cambridge, Massachusetts: Lincoln Institute of Land Policy

- Carter, C.C. and Farkas, Z.A. 2003 Effects of thoroughfares on residential and commercial values in two cities. State Highway Administration Research Report, Maryland Department of Transportation/ Morgan State University.
- Casey, J. 2011 Impact of highways on property values: Case study of the Superstition Freeway Corridor. Phoenix: Arizona Department of Transportation.
- Central Statistical Office (2012) 2010 Census of Population and Housing – Preliminary Population Figures. Lusaka: Central Statistical Office.
- Chapman, J. 2017 Value capture taxation as an infrastructure funding technique. *Public works Management and Policy*, 22(1), pp. 31-37.
- Chitonge, 2011 A Decade of Implementing Water Services Reform in Zambia: Review of Outcomes, Challenges and Opportunities. *Water Alternatives* 4(3), pp. 1-22.
- Debrezion, G., Pels, E. and Rietveld, P. 2011. The impact of rail transport on real estate prices: An empirical analysis of the Dutch housing market. *Urban Studies*, 48 (5), pp. 997 - 1015.
- Doherty, M. 2004 Funding public transport development through land value capture programs. Available online at www.cooperative-individualism.org/doherty-matthew_funding-public-transport-development-through-land-value-capture-programs-2004.pdf [15 August, 2018].
- Government of the Republic of Zambia (GRZ). 2018. Ministerial Statement on the Lusaka/Ndola dual carriageway project given by Hon. Minister of Housing and Infrastructure Development Mr Chitotela. Lusaka: Zambian Parliament.
- Ingram, K. and Hong, Y. 2012 Introduction. In: Ingram, K. & Hong, Y (eds.) *Value capture and land policies*. Cambridge, Massachusetts: Lincoln Institute of Land Policy.
- Iacono, M. and Levinson, D. 2009 The economic impact of upgrading roads. Minnesota Department of Transportation.
- Ma, L., Ye, R. and Titheridge, H. 2013 The impact of rail transit and BRT on property values: Evidence from Beijing. *Proceedings of the 13th World Conference on Transport Research*, 15-18 July, Rio de Janeiro, Brazil. Available online at <http://discovery.ucl.ac.uk/id/eprint/1414446> [assessed 10 June, 2018].
- McGaffin, R. 2011 Value creation? Value capture? An assessment of three different types of transport interchanges. *Proceedings of the 30th Southern African Transport Conference (SATC2011)*, 11-14 July, Pretoria, South Africa. ISBN 978-1-920017-51-4.
- McGaffin, R., Kirova, M., Viruly, F. and Michell, K. 2016 *Value Capture in South Africa - A way to overcome urban management challenges and unlock development opportunities?* UCT-Nedbank Urban Real Estate Research Unit.
- Neelawala P., Wilson, C. and Robinson, T. 2013. Impacts of major roads on property values: An analysis of an existing and a proposed road corridor project. Queensland University of Technology. Available online at https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=ACE10&paper_id=190 [accessed 15February, 2017].
- Roukouni, A. and Medda, F. 2012 Evaluation of value capture mechanisms as funding source for urban transport: the case of London's Crossrail. *Procedia - Social and Behavioural Sciences*, 48, pp. 2393 - 2404.
- Sanyal, B. and Deuskar, C. 2012 A better way to grow? Town Planning Schemes as a hybrid land readjustment process in Ahmedabad, India. In: Ingram, K. & Hong, Y (eds.) *Value capture and land policies*. Cambridge, Massachusetts: Lincoln Institute of Land Policy.

- Vadali, S. R. 2014. Using the economic value created by transportation to fund transportation (NCHRP Synthesis 459). Washington, DC: Transportation Research Board.
- Verougstraete, M. and Zeng, H. 2014 Land Value Capture Mechanism: The Case of the Hong Kong Mass Transit Railway.
- Walters, L.C. 2012. Land value capture in Policy and Practice. Available online at www.landandpoverty.com/agenda/pdfs/paper.walters_full_paper.pdf [accessed 26 May 2015].
- Wolf-Power, L. 2012 Community Benefits Agreements in a Value Capture Context. In: Ingram, K. and Hong, Y (eds.) Value capture and land policies. Cambridge, Massachusetts: Lincoln Institute of Land Policy
- World Bank 2017 Zambia Economic Brief: How Zambia can borrow without sorrow. Washington D.C.: World Bank
- Xu, Y. 2015. Under what circumstances will land value capture work to finance public transit? Based on case studies of Hong Kong, Tokyo and New York City. Unpublished MSc Thesis. Columbia University.

END

EXPROPRIATION, COMPENSATION AND IMPOVERISHMENT OF PROJECT AFFECTED PEOPLE: CASE OF MOMBERA PUBLIC UNIVERSITY PROJECT IN MALAWI

Lucky Kabanga¹ and Manya M Mooya²

1 Construction Economics and Management Department, University of Cape Town, South Africa.

2 Construction Economics and Management Department, University of Cape Town, South Africa.

Compensation for expropriation in Malawi aims at restoring affected people to a similar status as before expropriation and prevent them from becoming poor. Ironically, most people affected by expropriation of customary land for public projects wholly funded by Malawi Government have become poorer than before. By using the case of Mombera Public University Project in Mzimba District, northern Malawi, this paper analyses the factors and challenges impeding achievement of adequate compensation to people affected by development projects. The analysis concludes that the number of losses compensated, and amounts paid contribute to inadequate compensation and impoverishment of project affected people.

Key words: Customary property rights, Expropriation, Impoverishment, Inadequate compensation, Malawi

INTRODUCTION

Compensation, generally aims at restoring expropriation affected people to a similar status as before (Barnes, 2014), while Denyer-Green (2014) emphasises that principally, expropriation without compensation may be unacceptable. Yet, even where expropriated people are compensated and relocated, poverty remains a central and persistent risk to their future livelihoods (Cernea, 1997). In India, about 75% of an estimated 20 million people expropriated and relocated over four decades since the 1950's have been impoverished due to inadequate compensation (as quoted in Cernea, 1997, p. 1569). Similarly, in Nigeria, Kakulu (2008, p. 174) asserts that inadequate compensation for expropriation of customary land in the Niger Delta region has contributed to underlying poverty, thereby heightening people's resistance to expropriation. Further, Akujuru and Ruddock (2014, p. 109) emphasise that compensation for expropriation in the Niger Delta region is inadequate because of the use of pre-determined valuation rates and omission of cultural and social losses in the compensation quantum, thereby contributing to poorer livelihoods of expropriatees. Witter and Satterfield (2014), using the case of Limpopo National Park Project in Mozambique, established that conventional compensation assessment techniques ignore many important losses such as decision-making authority for owning land and ancestral identity and social belonging linked to gravesites of their relatives, among others, thus making affected people destitute. The contribution of inadequate compensation to impoverishment of affected people, socio-economic disruptions and other inconveniences has also been an issue in several projects in Tanzania as people

¹ kabangalucky@gmail.com

² Manya.Mooya@uct.ac.za

resist expropriation of their customary land because of poor livelihoods after relocation (Kusiluka et al., 2011; Msangi, 2011). As Cernea (2004) contends, poverty becomes a persistent risk for expropriatees because most of them are already relatively poor, and the loss of their land and other assets and resources on which their livelihoods depend, worsens the situation, as also observed in several African countries by Cotula et al. (2009). Broadly, as Cernea (2008, p. 1569) emphasises, most expropriatees become landless, jobless, homeless, food insecure and lose access to common property resources, which are compounded by community disarticulation.

In 2014, Malawi Government expropriated 432 Ha of customary land in Mzimba District for Mombera Public University Project, situated about 12 kilometres south of Mzimba District headquarters and about 110 kilometres south west of Mzuzu City, northern Malawi. The project aims to contribute towards improved capacity of highly skilled workforce in Malawi by increasing access to higher education, while simultaneously achieving integrated rural development goals through employment (Malawi Government, 2012, pp. 88-89). In Malawi, any expropriation requires compensation that appropriately covers expropriatory losses to restore project affected people (PAPs) and not impoverish them (Malawi Government, 1994, 2002). Using Mombera Public University Project, the study analyses the factors and challenges impeding compensation appropriate to restore PAPs, thereby showing how expropriation and compensation worsen affected people's livelihoods.

The paper has six sections. Section two discusses property rights obtaining in the project area while section three discusses compensation requirements in Malawi. Research methodology is addressed in section four while section five discusses the study findings, before section six concludes the study.

PROPERTY RIGHTS IN MOMBERA PROJECT AREA

Malawi has customary, private, and public property classes. Customary tenure is grounded in customary norms, enforced by social pressure and normally unwritten. Such tenure dominates in Malawi at about 80% (National Statistical Office, 2011) and remains essential to cultural identity and social organisation (Malawi Government, 2002). It is reducible to ownership of specific rights by individuals, families and communities (Malawi Government, 2002). Customary tenure is transferable through inheritance following matrilineal or patrilineal practices (Tschirhart et al., 2016), allocation by chiefs (Chipeta, 1971) and direct exchanges under customary institutions (Takane, 2008), which mostly go unrecorded. For Mombera University Project, 17 households and their community lost 432 Ha of customary land to government, which was used for housing, farming, community-managed natural and manmade forest, grazing, dambo gardening, and many other benefits. Our analysis indicates that about 94% of the 17 respondent PAPs inherited land from their parents while only one (6%), was freely allocated by a customary owner. When such land is expropriated, what are the compensation requirements?

COMPENSATION REQUIREMENTS IN MALAWI

Compensation aspiration and coverage

In Malawi, any expropriated person is entitled to compensation that appropriately restores them (Malawi Government, 1994, 2002, 2016). Essentially, this compensation principle aspires to fully indemnify all relevant expropriatory losses (Kabanga and Mooya, 2017, p. 20), and compensation must equal actual losses suffered, and not more or less (Barnes, 2014, p. 86). Typically, such compensation covers market value of land taken, loss in value of retained land concerning severance and injurious affection, disturbance and solatium (Consolatory allowance), and/or special value (Denyer-Green, 2014; Kabanga and Mooya, 2017). Severance is value loss in remaining land in partial takings while injurious affection is value decrease in remaining land pertaining to proposed projects (Barnes, 2014).

Compensation assessment basis and methods

Principally, market value, which is the estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion (International Valuation Standards Council, 2017, paragraph 30), measures compensation in Malawi (Malawi Government, 1971, 2002, 2016). Similarly, the Malawi National Land Policy considers market value as an amount generated through the interaction of demand and supply of properties, in an open market (Malawi Government, 2002). Seemingly, market value achieves fair and efficient expropriation, as expropriated persons get adequate compensation to replace lost property (Baum et al., 2008). Severance and injurious affection are similarly based on market or rental value. Ironically, Kelly (2006, p. 6) contends that market value ignores some real aspects of property, like sentimental attachment and family value (Kaufman, 2010, p. 86), and fails to determine owner's true value of the property. This observation resonates with findings of other researchers including Alemu (2013) in Ethiopia, Kakulu (2008) in Nigeria, Kusiluka et al. (2011) in Tanzania, Witter and Satterfield (2014) in Mozambique, and Small and Sheehan (2008) in Australia. Thus, market value does not always equal owner's actual loss and insufficiently indemnifies loss of property. Commonly, comparison, income, and cost methods, which rely on market data, compute market values (Scarrett, 2008). In Malawi, these methods are employed as necessary, including spot valuation, despite the Lands Acquisition Act (1971) and even the newly promulgated Lands Acquisition and Compensation Act (2016) not outlining any valuation methods for compensation assessment purposes.

Crops are assessed using government gazetted prices per yield (or kg) per hectare, while fruit trees are assessed based on their estimated annual incomes for their entire productive lifespan. For non-fruit and indigenous trees, gazetted prices per cubic metre are used (Malawi Government, 2010). Disturbance allowances are based on financial calculation and includes profit/income and business losses; costs for finding alternative accommodation or land, relocation and transport, removal expenses, legal and valuation services, among others (Baum et al., 2008, p. 299). Solatium is given as a lump sum or percentage of compensation sums (Baum et al., 2008). Special value depends on personal attachment and benefits of property to owners besides market

value (Keon-Cohen, 2002), and it is based on a percentage or agreed upon by the parties (Fortes, 2005). Essentially, the Malawi compensation principle is the basis for analysing the factors and challenges impeding desired compensation, and hence the ‘make-whole-again’ principle for Mombera PAPs.

METHODOLOGY

The study used face-to-face interviews and focus group discussions with semi-structured questions to collect primary data from respondents selected purposefully, and all seventeen households (Respondents 8-24) relocated from Mombera Public University project site were involved. Other respondents included Regional Commissioner for Lands (North, Respondent 6), one government lands officer (north, Respondent 2), two government valuation officers (north, Respondents 1 and 4), one district lands officer (Respondent 25) at Mzimba (M’mbelwa) District Council, one group village headman (Respondent 5), one village headman for the affected community (Respondent 8), and chairman for Mzimba Heritage Association (Respondent 26). Gathered data was triangulated by asking similar questions to all respective respondents. Additionally, secondary data was collected from various legal documents including the Constitution of Malawi (1994), Lands Acquisition Acts (1971 and 2016) and others, academic literature, journals, and other documents. Most of these sources were obtained from the internet while some were collected from various government offices. Collected data was then subjected to content analysis (Kumar, 2014; Yin, 2018) and thematically classified into asset ownership by PAPs, compensation coverage, compensation assessment, compensation adequacy and compensation challenges. Finally, the data was analysed and aggregated into study findings.

FINDINGS AND DISCUSSION

Assets owned by PAPs and expropriated

All seventeen respondent PAPs owned customary land in different sizes and assorted buildings like houses, kitchens, and kraals for livestock such as goats; native trees (100%); various crops and fruit trees (88%) like mangoes; planted trees (41%) like blue gums; five (29%) had special assets like graves of their relatives; and other rights and benefits related to natural resources in their neighbourhood, including community-managed natural and man-made forests. Additionally, the affected people had social and cultural assets and values such as societal benefits, relationships, and places of worship, among others. All immovable assets were expropriated while movables like goats were not.

Compensation coverage and assessment

Customary land was not compensated as government claimed ownership rights and expected the group village headman to provide resettlement land (Respondent 6, 7 October 2016). Contrariwise, Respondent 26 (12 October 2016) considers customary land as the first property that every human being is introduced to when born, and that it has multiple possessors as emphatically stated in the following extract:

'My understanding or context, land is the first property that each and every one possesses. First property, why first property? It is because when you are just born, anything that you are introduced to the world is around your area. You know water, water is coming from our own river, you have eaten food, there is firewood it has come from our area, you have green maize from our garden, ... And there is no other property that we say, 'this is our property'. ... So that is property number one. And this property number one has got the interest of the ancestors, interest of the dead, interest of the living and interest of the unborn. Very, very precious property.'

Ironically, there is no law that clearly stipulates that customary land is public property and non-compensable in Malawi. Thus, failure of the group village headman to allocate relocation land since 2014 and non-compensation of land deprived Mombera PAPs money to replace the lost land, thereby making them landless, and confirming Cernea (2008's) findings. According to a senior government valuer, free customary land to resettle expropriated people is very scarce nowadays, forcing government to compensate customary land in some cases based on the 2002 National Land Policy. Paradoxically, government took customary land in the Mombera project without either monetary compensation or replacement land, thus disturbing and extinguishing farming and many land-based economic activities like vegetable or dambo farming, and impoverishing Mombera PAPs. Respondent 10's (7 October 2016) sentiments highlights that:

'... Because on this land, we had planted so many crops The land is very important to us. We get our needs from the land. We have never starved but today, we will be in hunger. We will die due to hunger where we are going.'

Consequently, PAPs acquired replacement land for housing using own resources and rent farmland annually. Generally, and as Chinsinga (2017, p. 512) argues, this is land grabbing by government. Equally, severance and injurious affection, which are related to land value, were uncompensated. These land-related non-compensations contributed to inadequate compensation, landlessness, and impoverishment of Mombera PAPs, thereby confirming what Cernea (2008), Cotula et al. (2009), and others established in other studies elsewhere.

Buildings: All 17 respondent PAPs confirmed being compensated for structures that they owned at the project site. However, 16 of them (94%) perceived the compensation as very low with Respondent 8 (7 October 2016) epitomising that:

'... We compared prices of things when you sale. For example, if you are given K300,000.00, to hire someone to mould bricks, burn them, transport them to where you need them, buying firewood, then you see that these structures are incomplete because the money is inadequate. We were staying in grass-thatched houses but good ones!'

Further, PAPs wondered how assessors determined building values without consulting owners who knew the worth of their structures. For example, Respondent 23 got K1,341,000.00 but expected K5,000,000.00 as appropriate compensation.

Consequently, during a focus group discussion on 7 October 2016, Respondent 9 wondered as follows:

'What is confusing is that we are owners of the assets and why did government dictate prices and not ask ourselves [Laughter]? Aaaah? That is why we think that on the other hand, they [government] favoured themselves by giving us lower compensation amounts.'

It is thus a common complaint that compensation paid to affected people was unsatisfactory. As Kakulu (2008) established in a study in the Niger Delta in Nigeria, complaints against inadequate compensation for customary properties are common, as some losses or materials are ignored as they do not conform to market value standards (Kaufman, 2010), while others believe that government favours itself as both the taker and assessor of losses suffered as highlighted in the preceding quote. This echoes what Kusiluka et al. (2011) and Msangi (2011) established in their separate studies in Tanzania. Ironically, Respondent 20 was satisfied with compensation received as the structures were of rudimentary materials.

Per government valuer, a comparison approach assessed compensation amounts for buildings that seemed exchangeable using available market or compensation data, while cost approach assessed rarely exchangeable or special buildings. For the cost technique, calculation of cost estimates required costs of building materials or similar, newly completed buildings, information on professional and labour costs. For example, a granary of wooden poles, woven bamboos, earth floors and thatched roof got K10,000.00 (about US\$13.33 at US\$1.00 = MK750.00) using the cost approach. Yet, the valuer failed to explicitly explain how this value was determined. Further, itemising the K10,000.00 into cost of materials like poles, bamboos, and grass; material transportation; labour costs for weavers; and depreciation, if any, is hard. Considering itemised materials and activities to construct a granary, generally shows that K10,000.00 is inadequate, as Respondent 24 (7 October 2016) underscored that the whole compensation process is awkward because it does not satisfy an expropriation affected person. According to Kusiluka et al. (2011, p. 69), affected people who participated in their research in Tanzania attributed lower compensation sums to unilateral imposition of values on lost assets by government assessors without consulting owners. This was also highlighted by Kakulu (2008) in her study in Nigeria.

Furthermore, as customary tenure dominates in the project area, a formal property market and hence market evidence lack, thus challenging credible market value assessments. Likewise, market data sourced from urban markets relate mostly to private property, and was technically unfit to support compensation assessment for customary properties, as the properties have different value schemes (Small and Sheehan, 2008). Also, other compensation data used by assessors lacked in many aspects as it was untested in the market (Baum et al., 2008). Still more, market value disregarded many invisible losses like sense of belonging and many other benefits from land-based resources such as wild fruits, honey, and medicines among others (Witter and Satterfield, 2014), as it is hard to establish definite bundles for customary

land rights. These factors contributed to partial compensation and hence incomplete restoration of Mombera PAPs.

Crops, fruit and non-fruit trees: Annual crops were not compensated as PAPs were told to harvest them. For fruit trees, 16 of the 17 respondent PAPs (about 94%), were compensated while 6% was not. Compensation amount was the unit price per tree multiplied by quantities lost, leaving out productive capacity and income lost over the lifespan of the fruit trees, as gazetted in 2010 (Malawi Government, 2010). For example, a mango tree got K10,000.00, while its gazetted income loss is K1,500.00 annually, totalling K45,000.00 over its full productive lifespan of 30 years (Malawi Government, 2010). Thus, for each productive mango tree, PAPs were heavily undercompensated as they lost about 78% of compensation.

For planted trees, it is confusing as some PAPs indicated being compensated while others said they were not, reflecting poor information sharing and sensitisation by government. Similarly, the community-managed blue gum forest was not compensated. Compensation for planted trees is the product of price per cubic metre of trees lost. For Mombera, compensation was the product of trees lost against price per tree dictated by government. An example is gmelina trees valued at K1,000.00 each, against the gazetted K10,000.00 per cubic metre, contributing to lower compensation. Native trees on PAPs' land or community-managed forests were not compensated, as government considered them public assets. Yet, no law in Malawi stops compensation for natural trees. As articulated during a focus group discussion on 7 October 2016, tree and forest losses deprived Mombera PAPs of various benefits like firewood, building poles, wild foods, medicine, and income among others. Essentially, most compensable biological assets were omitted, thus obtaining lower compensation and contributing to poorer livelihoods for PAPs. Non-compensation of some permanent biological assets reflects what Kusiluka et al. (2011) and Kakulu (2008) also established in their studies in Tanzania and Nigeria respectively.

Special assets like graves are emotive matters where affected people claim some kind of special linkages to them and consequential benefits. Because of their nature, special assets compensation is challenging (Keogh, 2003; Witter and Satterfield, 2014). For Mombera, five of the 17 respondents (about 29%) had graves in the project site and four were compensated (about 24%) while the other was not. On this, Respondent 8 stated that government assessors only counted those graves they easily saw and left many since owners were not consulted.

Contrariwise, government compensation list showed that seven of the 17 respondent PAPs (about 41%), had graves and that they were compensated. However, confusion over compensation for graves is further compounded by strong and emotive claims that most graves were omitted. Consequently, Respondent 24 (7 October 2016) emphasised that graves are a strong evidence of one's claim to land and all factors regarding compensation must be duly addressed to avoid future claim-backs of the land.

The cost approach assessed graves using data obtained from PAPs and local elders. The government valuer (Respondent 1), explained that local elders were consulted on protocols for graves and costs to put a tombstone or pave a grave. However, the valuer admitted that the data providers were uncertain of total costs per grave as labour is contributed by themselves except when they need professional artisans, and that no records are kept. Technically, this data was untested in markets (non-market) and subjective. Using available data, unpaved graves (earth) were valued at K120,000.00 (about USD 160.00) and K350,000.00 (about USD 467.00) for paved ones. It is hard to treat these amounts as fair since land values for each grave and factors considered were not indicated. It is unsurprising that the valuer guesstimated the values and that PAPs were unhappy with them. This finding agrees with other findings by Kabanga and Mooya (2017), Small and Sheehan (2008), Witter and Satterfield (2014) and others, that loss of social identity, status, sense of belonging and authority/ownership over resources emanating from ancestral linkages to graves is never considered in compensation, thereby contributing to inadequate compensation and dissatisfaction.

Other special/invisible losses that PAPs suffered in Mombera project include decision-making powers for owning land, ownership and attachment to natural resources and their benefits like medicines, and a sense of belonging among others. As Witter and Satterfield (2014) contend, these losses were not compensated as they are mostly invisible to assessors. Additionally, no consolatory allowance (solatium) was paid to Mombera PAPs.

Compensation adequacy

Generally, compensation to Mombera PAPs omitted land, disturbance, consolation and other special and intangible losses. Considering that government pays K500,000.00 per Ha for rural land and that one PAP purportedly lost 20 Ha, this loss translates to K10,000,000.00 on land only. Theoretically, as total land taken is 432 Ha, then PAPs and their community lost K216,000,000.00, which equals USD288,000.00 (USD1.00 = K750,000.00). Further, use of outdated and lower prices for the various physical and biological assets led to unfairly low compensation, as also established in several other studies (Kakulu, 2008; Kusiluka et al., 2011; Msangi, 2011). Omission of many other intangible losses and native trees, and reduction of original compensation sums, contributed to insufficient compensation. Several PAPs complained that verified compensation was reduced without any logical explanation offered. Likewise, disturbance allowance for transport and removal expenses, and costs for finding alternative land were not paid to PAPs. Thus, it is unsurprising that all 17 respondent PAPs rated compensation as inadequate, as emphasised by Respondent 10 (7 October 2016):

‘There were many things happening on that land. We farmed there. When we moved out, government did not even help us because money is not durable. We needed transport to take us to where they will resettle us. Here, they only talked of compensation for crops. What about our land? The investment put in clearing the land? Did we clear those lands without any money? If someone had four acres, did they just get cleared on their own? There are many expenses that one incurred to make the land usable. Uprooting shoots and trees on four acres is not a joke. At the dimba [dambo garden], how can you count sugarcane and their suckers as they sprout? What about the bananas? Mangoes and others? So, we received that

small amount, yet we had a lot of assets and crops that side. We were not satisfied with the way things happened.'

The above quotation concisely summarises the frustration that Mombera PAPs are going through almost four years after being expropriated and compensated for their losses. As stated elsewhere, the whole compensation process is awkward as it led to inadequate compensation that essentially impoverished affected people. This finding supports findings in other empirical studies in other countries, as established by numerous researchers including Ambaye (2013), Msangi (2011), Kabanga and Mooya (2017), Kakulu (2008), Kaufman (2010), and Larbi (2008), among many others.

CONCLUSION AND RECOMMENDATIONS

The current compensation principle in Malawi aspires to restore expropriation affected people to their previous position by compensating appropriately for land losses including severance and injurious affection, disturbances, consolation and special values. Selective compensation covering only landed improvements, fruit and planted non-fruit trees and graves in some cases; omitting land, disturbances, consolation, and various invisible losses, thwarts this aspiration, and leads to compensation that is inappropriate to losses suffered, thus partially restoring Mombera PAPs and demoting them into lower economic levels and impoverishment, including persistent hunger.

It is thus recommended that government must provide full compensation as provided in the constitution to avert impoverishing project affected people. Further, the study recommends that more studies on how compensation for customary land expropriation is done be conducted to decisively address the issues raised in this study.

REFERENCES

- Akujuru, V. A. and Ruddock, L. (2014). The Determination of Compensation Payable in the Niger Delta for Compulsory Acquisition and the Need for a Sustainable Practice. *Journal of Sustainable Development in Africa*, 16(2), 102-114.
- Alemu, B. Y. (2013). *Expropriation, Valuation and Compensation in Ethiopia*. (PhD), Royal Institute of Technology (KTH), School of Architecture and the Built environment, SE-10044 Stockholm, Sweden.
- Ambaye, D. W. (2013). *Land Rights and Expropriation in Ethiopia*. (PhD), Royal Institute of Technology (KTH), Stockholm, Sweden.
- Barnes, M. (2014). *The Law of Compulsory Purchase and Compensation*: Hart Publishing Ltd, Oxford, U K.
- Baum, A., Sams, G., Ellis, J., Hampson, C., and Stevens, D. (2008). *Statutory valuations*: Taylor & Francis.
- Cernea, M. (1997). The risks and reconstruction model for resettling displaced populations. *World Development*, 25(10), 1569-1587.
- Cernea, M. (2004). *Social impacts and social risks in hydropower programs: Preemptive planning and counter-risk measures*. Paper presented at the Keynote address: Session on social aspects of hydropower development. United Nations Symposium on Hydropower and Sustainable Development Beijing, China.

- Cernea, M. (2008). Compensation and benefit sharing: Why resettlement policies and practices must be reformed. *Water Science and Engineering*, 1(1), 89-120.
- Chinsinga, B. (2017). The Green Belt Initiative, Politics and Sugar Production in Malawi. *Journal of Southern African Studies*, 43(3), 501-515.
doi:10.1080/03057070.2016.1211401
- Chipeta, W. (1971). Land tenure and problems in Malawi. *The Society of Malawi Journal*, 25-34.
- Cotula, L., Vermeulen, S., Leonard, R., and Keeley, J. (2009). *Land grab or development opportunity?: agricultural investment and international land deals in Africa*: Iied.
- Denyer-Green, B. (2014). *Compulsory Purchase and Compensation* (10 ed.). London and New York: Routledge.
- Fortes, R. (2005). *Compensation models for native title*. Paper presented at the eleventh annual conference of the Pacific Rim Real Estate Society, Melbourne, Australia.
- International Valuation Standards Council. (2017). *International Valuation Standards*. London, UK: International Valuation Standards Council.
- Kabanga, L. and Mooya, M. M. (2017). *Compensation Theories and Expropriation of Customary Property Rights: A Critical Review*. Paper presented at the Commonwealth Association of Surveying and Land Economy (CASLE) Conference 2017, Dar es Salaam, Tanzania.
- Kakulu, I. I. (2008). *An Analysis of Processes and Methods in Compulsory Land Acquisition and Compensation in Nigeria*. (PhD), Reading, United Kingdom.
- Kaufman, W. (2010). How fair is market value? An appraiser's report of the temptations, deficiencies, and distortions in the condemnation process. In B. L. Benson (Ed.), *Property rights: eminent domain and regulatory takings re-examined* (pp. 77-87). New York, USA: Palgrave Macmillan.
- Kelly, D. B. (2006). The "Public Use" Requirement in Eminent Domain Law: A Rationale Based on Secret Purchases and Private Influence. *Cornell Law Review*, 92(1), 1-66.
- Keogh, J. (2003). *The "Special Value" of Land in Compulsory Acquisition Cases. A summary of the legal approaches to a contentious issue in valuation practice*. Paper presented at the Pacific Rim Real Estate Society Ninth Annual Conference 19 - 22nd January 2003, Brisbane, Australia.
- Keon-Cohen, B. (2002). Compensation and Compulsory Acquisition Under the Native Title Act 1993. *Monash University Law Review*, 28(1), 17-58.
- Kumar, R. (2014). *Research Methodology: A step-by-step guide for beginners* (4 ed.): SAGE Publications Limited, London, United Kingdom.
- Kusiluka, M. M., Kongela, S., Kusiluka, M. A., Karimuribo, E. D., and Kusiluka, L. J. M. (2011). The negative impact of land acquisition on indigenous communities' livelihood and environment in Tanzania. *Habitat International*, 35, 66-73.
doi:10.1016/j.habitatint.2010.03.001
- Larbi, W. O. (2008). *Compulsory Land Acquisition and Compensation in Ghana: Searching for Alternative Policies and Strategies*. Paper presented at the FIG/FAO/CNG International Seminar on State and Public Sector Land Management Verona, Italy, .
- Malawi Government. (1971). *Lands Acquisition Act, 1971*. Zomba, Malawi: Government Press.
- Malawi Government. (1994). *The Constitution of the Republic of Malawi*. Lilongwe, Malawi: Malawi.

- Malawi Government. (2002). *Malawi National Land Policy*. Lilongwe, Malawi: Malawi.
- Malawi Government. (2010). *Floresty Act, 2010*. Lilongwe, Malawi.
- Malawi Government. (2012). *Malawi Growth and Development Strategy II 2011-2016*. Lilongwe, Malawi.
- Malawi Government. (2016). *Lands Acquisition and Compensation Act 2016*. Lilongwe, Malawi: Malawi Government.
- Msangi, D. E. (2011). *Land Acquisition for Urban Expansion: Process and Impacts on Livelihoods of Peri Urban Households, Dar es Salaam, Tanzania*. Urban and Rural Development Department, Swedish University of Agricultural Sciences, Uppsala, Sweden.
- National Statistical Office. (2011). *Statistical Yearbook 2011*. National Statistical Office, Zomba, Malawi: National Statistical Office, Zomba, Malawi.
- Scarrett, D. (2008). *Property valuation: The five methods*: Routledge.
- Small, G. and Sheehan, J. (2008). The metaphysics of Indigenous ownership: Why Indigenous ownership is incomparable to Western conceptions of property value *Indigenous Peoples and Real Estate Valuation* (pp. 103-119): Springer.
- Takane, T. (2008). Customary Land Tenure, Inheritance Rules, and Smallholder Farmers in Malawi*. *Journal of Southern African Studies*, 34(2), 269-291.
- Tschirhart, N., Kabanga, L., and Nichols, S. (2016). The convergence of HIV/AIDS and customary tenure on women's access to land in rural Malawi. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 12(1), 134-146. doi:10.1080/17290376.2015.1124049
- Witter, R. and Satterfield, T. (2014). Invisible losses and the logics of resettlement compensation. *Conservation biology*, 28(5), 1394-1402.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6 ed.). Los Angeles, USA: Sage publications.

END

AN ASSESSMENT OF PRINCIPLES OF EQUITY AND FAIRNESS IN RATING VALUATION PRACTICES IN BOTSWANA: GABORONE VALUATION ROLL 2008

Johnson Kampamba¹, Aloysius Clemence Mosh², Aderemi Yankeen Adeyemi³ and Andy Letlotlo Sekeinyana⁴

1 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

2 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

3 University of Botswana, Faculty of Engineering and Technology; Department of Civil Engineering

4 University of Botswana, Faculty of Engineering and Technology; Department of Civil Engineering

The study aimed at establishing if the principle of equity and fairness in assessment of value for property tax is considered in Botswana. The 2008 Gaborone Valuation Roll was used to assess horizontal and vertical equity by applying IAAO statistical tests. The taxpayers' views on the fairness and equality of the tax were obtained using a questionnaire. In order to assess equity, a ratio study was conducted using the sale values and assessed values where equity was determined using measures of appraisal level, central tendency and measures of uniformity. Horizontal and vertical equities are interrelated principles used to judge the fairness of the distribution of tax burden. Horizontal equity was tested using the COD (Coefficient of dispersion) while vertical equity was tested using PRD (Price related differential). Both tests revealed that there is no equity in property tax in Botswana. This was confirmed by the results from the questionnaire survey where the majority believed that there was no tax uniformity and consistency across and within neighbourhoods. The measures of central tendency and normal distribution tests were also applied, giving poor results. Horizontal equity of 62.67% was noted which was more than the recommended 15%. The vertical equity of 1.25 was noted as being outside the acceptable range of 0.98 to 1.03. This result implied that the assessment is not fair but regressive as was noted in the responses from respondents who were administered with the questionnaire. High valued properties are under assessed, lower valued properties are overvalued. The implications of these results are that rate payers will not be happy to pay different amounts of tax when the property size is the same which can result in dissatisfaction and unpaid bills as a result of higher rate of defaulters. Property assessors should be introduced to automated valuation systems which can get rid of such inconsistencies. Policy makers should consider a property tax reform which will introduce the concept of fairness, uniformity and equity.

Key words: property tax, vertical equity, horizontal equity, fairness, uniformity, Botswana.

1 kampambaj@mopipi.ub.bw

2 moshac@mopipi.ub.bw

3 adeyemiy@mopipi.ub.bw

4 andysekei@gmail.com

INTRODUCTION

Rating valuation assessment has become transparent worldwide (Allen, Dare, & Riegel, 2010; Allen & Dare, 2002; Birch, Smith, & Sunderman, 2004; De Cesare & Ruddock, 1997; Department of Taxation and Finance, 2014; Paglin & Fogarty, 1972) and is subject to audit in most jurisdictions in USA (Gloude-mans, 2002; Drew, 2017; IAAO, 2013). Unfortunately, in Africa, the audit process in rating valuation assessment has not been implemented. The consequence of lack of an auditing system in place is the unwillingness of ratepayers to pay the tax resulting in a higher default rate. This study explored the possibility of establishing fairness, uniformity and equity in assessed properties using the 2008 Gaborone Valuation Roll in Botswana as an auditing process. How can fairness, uniformity and equity be improved in the Botswana property tax system? The objectives of the study were: to measure horizontal equity using the coefficient of dispersion (COD); to determine vertical equity using the price related differential (PRD). The remaining sections of the article are divided into four sections, namely the background of the study, review of related previous studies, methodology, results, and conclusions. The next section discusses the background of property tax assessment.

BACKGROUND OF THE STUDY

The purpose of property tax is to offer a means which will provide a fair & equitable method for sharing the burden of delivering government services to property and property owners (Paparest, 2015). Plimmer (2010) highlights that property tax has long served means by which governments raise revenues to fund various projects and services. However, the property tax has never been a particularly popular revenue-generating mechanism for the citizens that bear its burden (Pleydell, 1949). Conversely when compared to other revenue generating streams, such as the income tax or the sales tax, property tax predominantly remains a preferred method of revenue generation for councils and municipalities. Paparest (2015) portrays that the reasons for this preference are three-fold: Firstly, the link between the tax and the provision of local services is relatively demonstrable; Secondly, the real property tax is a relatively stable funding source; and finally, the tax is imposed on an immobile tax base, making tax avoidance particularly difficult.

Paparest (2015) also signified that since property taxes are a local revenue-generating process, the property tax involves various stakeholders each with their own social, political, and economic agendas and for it to work and to continue to fund these critical services, (stakeholders) taxpayers, have to accept the notion, that the tax is serving its intended purpose and that the tax burden is being distributed equally. As a result, property tax administration systems often operate under the auspices of equity and efficiency (Gloude-mans, 2002; Quintos, 2015).

Benson & Schwartz (1997) impacts on this statement by adding that they are often a significant expense for the property owner and controversy rages fairly constantly both within the academic community and amongst the general public about property tax issues such as the level of property taxes, assessment and related valuation issues, progressivity or regressivity questions. According to Allen (2003) as long as property taxes exist, there have been concerns that it should be administered equitably since property tax equity has long been a controversial subject. This was further supported by Moore (2008) who stated that the concept of fair and uniform property taxation was one of the founding philosophies espoused by citizens of the United States during

the first century after its independence and nowadays it is difficult to say that the tax is fair and uniform in property taxation. Since assessment is the foundation of the property tax system, valuation becomes the root from which all other components of the property tax can be accurately evaluated. If the assessment process is less than adequate, the positive evaluation of all other elements of the tax is threatened. Low quality assessment will directly jeopardize its fairness. A lack of assessment uniformity can result in an inequitable tax burden among property owners, in turn diminish the ability to generate local revenues, and creates economic distortions within and among taxing jurisdictions (Alexander, 2012).

Because of the arguments, criticisms and labelling of property tax as a tax everyone loves to hate in as far as the administration of property tax is concerned. However, it is the most preferred form of revenue generation by the councils (Pleydell, 1949). The IAAO (1978) established the guidelines serving as a yardstick for the fair and equitable administration of property tax in order to deter incidences of non-payment due to negative perceptions of unfairness or inequity which bring the tax into disrepute (Plimmer & McCluskey, 2016). The IAAO established the standards for key ratio statistics relating aspects of valuation performance level and uniformity and these being value uniformity (COD and the PRD) and consistency (IAAO, 2010; IAAO, 2013). According to the Property Tax Manual (2016) the IAAO standards advocates that the COD determines the horizontal equity while the PRD examines the vertical equity (IAAO, 2013). Plimmer (2010) stresses that the COD should be between 0-15 percent whereas for the PRD should be between 0.98-1.03, in order for a tax system to be termed efficient and effective. Any tax administering jurisdiction is obliged to possess a tax system which upholds and conforms to both the COD and the PRD since these cannot be separated (Plimmer, 2010).

Henceforth the characteristics of a good tax are dependent on abiding by the standards highlighted above by the IAAO (IAAO, 2013). This section discussed the background of property tax assessment and the next section will dwell on the review of previous related studies.

Review of previous related studies

Previous researches about the subject have been conducted by various researchers in various countries (Adem & Kwateng, 2007; Alexander, 2012; Allen, Dare, & Riegel, 2010; Benson & Schwartz, 1997; Birch, Smith, & Sunderman, 2004; Birskyte, 2013; Carter, 2016; Cheng, 1976; Clapp, 1990; Cornia & Slade, 2006; Cornia & Slade, 2005; De Cesare, Claudia, & Ruddock, 1998; Elkis, 2006; Fogarty & Paglin, 1972; Gillespie & Meng, 1986; Hodge, 2013; Hodge, Skidmore, & McMillen, 2013; Muhammad, 2009) all advocating for an ideal property system, how to measure equity, what approaches, why those approaches and the justifications of the results.

These studies have established property tax equity/inequity using all the jurisdictions data in their countries, where their tone of list used is of more than one year. Majority of these researches were undertaken in developed countries where there is frequent rating using computer assisted mass appraisal (CAMA) in USA (Moore, 2008; Allen & Dare, 2002; Muhammad, 2009; Allen, 2003; Krupa, 2011; Hodge, Skidmore, & McMillen, 2013; Cornia & Slade, 2005; Birch, Smith, & Sunderman, 2004; Pierce, 2011; Department of Taxation and Finance, 2014; Payton, 2006; Sabella, 1973; Sirmans, Gatzlaff, & Macpherson, 2008; Netzer, 1973; Gomez, 2011). Two studies were conducted in Brazil where horizontal and vertical equity were measured (De Cesare, Claudia, & Ruddock, 1998; De Cesare & Ruddock, 1997; De Cesare &

Claudia, 1999). Two studies were conducted in the United Kingdom relating to assessment equity (Plimmer, 2010; Phyllis, Hardwick, & Miller, 2013). Only three studies were done in Ghana, Nigeria and Botswana which are not developed countries (Adem & Kwateng, 2007; Muhammad & Ishiaku, 2013; Kampamba, Svensson, & Leima, 2016; Kampamba, Moshia, Adeyemi, & Mooketsi, 2018; Munshifwa, et al., 2016). The observation is that much as so many studies have been conducted in the USA, very few studies have been conducted in the UK, ASIA, Australia, and Africa regarding assessment of uniformity and equity in the property tax assessment. This section looked at studies that have been conducted globally and regionally on assessment of equity on property tax. The next section will explore the principle of fairness and equity, theoretical understanding of the coefficient of dispersion (COD) and price related differential (PRD) as measures of horizontal and vertical equity in the property tax system.

Property tax fairness and equity

Clapp (1990) defines equity as the degree to which assessment bears a consistent relationship to market value for all properties at the assessment date. Alexander (2012) adds that equity in taxation as a just or fair distribution of the tax burden. IAAO (2010) emphasises that, for as long as there is any type of tax, there will be discussions of the fair distribution of the tax burden. To maximize fairness and understandability in a property tax system, assessments should be based on current market value of property. Moore (2008) elucidates that the concept of fair and uniform property taxation was one of the founding philosophies espoused by citizens of the United States during the first century after its independence. According to Plimmer & McCluskey (2016) within tax regimes ‘fairness and equity’ are generally recognised as: horizontal equity and vertical equity. Vertical equity can be manipulated so that the range of tax payable across the taxpayer spectrum is wide or narrow.

Theoretical explanation of the coefficient of dispersion (COD)

A study titled a new approach to the analysis of assessment equity was conducted by De Cesare and Ruddock (1998) was also found that properties were assessed on the median at only 34% of their sale prices. Therefore, the actual assessment level is much less than the desired level (60%) or the legal level (100%). The coefficient of dispersion of the median (COD) of assessed value to sale price ratio was almost 32%, indicating a low degree of assessment uniformity.

Department of Taxation and Finance (2014) carried out a brief study in 2013, assessing all property types from 550 assessing units. The study used the results from the 2013 market survey and applied the COD and the PRD. It was found out that among the sampled assessing units, approximately 41 percent had COD estimates for the entire assessment roll that satisfied the IAAO standards and approximately 74 percent of the State’s assessing units are indicated as having equitable assessment rolls.

COD can be referred to as the traditional measure of variation in A/S ratios for sets of sales data drawn from a specified time interval (De Cesare & Ruddock, 1997). It is interpreted as the average percentage difference of all property assessment ratios from the median assessment ratio (IAAO, 2010). Birch, Sunderman, & Smith (2004) explain that the purpose of the COD is to represent the average percentage deviation from the median ratio. This statistic measures the extent of assessment “error” observed among the assessment ratios (assessed value divided by market value) of the sample parcels (IAAO Research Committee, 2010). COD measures the extent to

which the assessment ratios from a given roll exhibit dispersion around a midpoint (Department of Taxation and Finance, 2014). Ideally all ratios within an assessing unit or within a property class should be the same, indicating perfectly uniform assessments.

The higher the COD, the greater the scattering of individual assessments around the jurisdictional average, which in turn, indicates a greater degree of horizontal inequity among properties. IAAO (2011) perceives COD as a subsequent and more advanced analysis is to measure equity across properties. The lower the COD, the more uniform the ratios within the property group. The COD is said to be acceptable if it's 15 or less. It has a minimum of 0 and the larger the COD implies increased inequity (Quintos, 2015). De Cesare & Ruddock (2003); Plimmer (2010); Minnesota Property Tax Manual (2016); Alexander (2012) portray that the COD measures whether appraisal districts are appraising properties at an equal percentage of market value.

A smaller COD value suggests greater uniformity, with COD = 0 showing perfect uniformity. Uniformity can be viewed spatially by plotting sales (rental) ratios on thematic maps. According to Property Tax Manual (2016) if the sales ratios are relatively close to the median and to themselves, relative over- and under- assessments are small. A high COD indicates that properties are being appraised at inconsistent percentages of market value.

Table 1 below depicts COD standards that are advocated by IAAO (2010; 2013)

Table 1: COD standards

Type of property	Specific	COD range
<ul style="list-style-type: none"> Single-family homes and condominiums 	<ul style="list-style-type: none"> Newer or fairly similar residences. Older or more heterogeneous areas 	<ul style="list-style-type: none"> 5 to 10 5 to 15
<ul style="list-style-type: none"> Income-producing properties 	<ul style="list-style-type: none"> Larger, urban areas In other areas 	<ul style="list-style-type: none"> 5 to 15 5 to 20
<ul style="list-style-type: none"> Vacant land 	<ul style="list-style-type: none"> Very large areas with active markets. In large to mid-size areas with slower development. Rural or seasonal recreation areas 	<ul style="list-style-type: none"> 5 to 15 5 to 20 5 to 25
<ul style="list-style-type: none"> Rural residential 	<ul style="list-style-type: none"> Seasonal and manufactured homes. Rural vacant land with little development 	<ul style="list-style-type: none"> 5 to 20 5 to 30

Source: (IAAO, 2013)

Property Tax Manual (2016) has highlighted the thumb rule for COD in Table 2 below:

Table 2 The COD thumb rule

Rating	Value
Excellent	0 to 10
Acceptable	11 to 19
Problem — poor uniformity	More than 20

The equation for computing the COD is as was captured by (Birskyte, 2013; Allen, Dare, & Riegel, 2010). The coefficient of dispersion equals the average absolute deviation of parcel assessment ratios from the median assessment ratio divided by the median and multiplied by 100. Equation 1 below is used to compute the COD.

$$COD \cong \left[\frac{\sum_{i=1}^n (A_i - M)}{n} \right] \left[\frac{1}{M} \right] [x100],$$

Where: A_i = assessment ratio for an individual property parcel,
 M = median assessment ratio for all parcels sampled, and
 N = number of parcels in the sample.

Source: (Birskyte, 2013; Allen, Dare, & Riegel, 2010).

Theoretical explanation of the price related differential (PRD)

This statistic is sometimes referred to as the index of regressivity (Gomez, 2011). Netzer (1973) highlights that the PRD is advocated by the IAAO Standard on ratio studies (IAAO 1990, 1999, 2007). This measure was introduced in 1957 by the U.S.A. Although there are statistical subtleties that can bias evaluation of price-related uniformity, several tests can provide useful information about the existence and extent of this type of bias (IAAO, 2013). The PRD provides a simple gauge of price-related bias. It is calculated by dividing the overall mean assessment-to-sales ratio of a jurisdiction by the sum of assessment divided by the sum of sale price (weighted average). The Department of Taxation and Finance (2014) describes PRD as a gauge used to determine if there is a bias on an assessment roll toward systematic over-assessment of either high- or low-value properties in comparison to the average property. The acceptable assessment practices will produce a PRD index between 0.98 and 1.03 which indicates that the assessment system is proportional (IAAO, 2014).

PRDs above 1.03 tend to indicate assessment regressivity, in which assessment ratios decline with price and if the PRD is less than 0.98, the assessment system is considered progressive. If the PRD is greater than 1.03, the assessment system is considered regressive (IAAO, 2014). The Property Tax Manual (2016) advocates that the general rule of thumb for a PRD is according to Table 3 below.

Table 3 PRD thumb rule

PRD level	Favours	Conclusion
0.98 to 1.03	Neutral	Acceptable – Low and high properties valued equally
Less than 0.98	Low value properties	Unacceptably progressive – high valued properties overvalued
More than 1.03	High value properties	Unacceptably regressive – high valued properties undervalued

Source: (The Property Tax Manual, 2016).

Having described all these, it is safe to define the PRD as an indication of the percentage by which assessment ratios change whenever values are doubled or halved.

The PRB can be sometimes used to assess vertical equity. Equation 2 below shows how to calculate the PRB.

$$\frac{(\text{Sales Ratio} - \text{Median Sales Ratio})}{\text{Median Sales Ratio}} = \beta_0 + \beta_1 \frac{\text{Log} \left(\frac{\frac{AV}{\text{Median}} + \frac{\text{Sale Price}}{2}}{2} \right)}{\text{Log}(2)} .$$

Source: (Department of Taxation and Finance 2014).

According to IAAO (1999) it is imperative to note that when samples are small or the weighted mean is heavily influenced by several extreme sales prices, the PRD may not be a reliable measure of vertical inequities and similarly when the samples are too large the PRD may be too insensitive to show small pockets where there is significant vertical inequity (Birch, 2004). The other critique is provided by Netzer (1973) stressing that even the IAAO is less than wholly supportive of this measure, stating that the PRD “provides only an indication, not a proof of appraisal bias “this therefore still leaves a gap for those in the profession trying to determine whether vertical equity exists.” This section has illustrated the theoretical understanding of the two independent variables being the COD and PRD and fair assessment as a dependent variable. The next section discusses the methodology that was used in collecting data for this study.

RESEARCH DESIGN AND METHODOLOGY

Sales data was obtained from the Deeds Registry Office and 2008 valuation roll for Gaborone City Council from Ministry of Local Government and Rural Development to test for the COD and PRD. A total of 8,125 properties were registered from 2006 up to 2008 and only 3,576 properties were used for analysis after taking out outliers and non-market transactions. A structured questionnaire was designed and administered to 100 ratepayers who were picked randomly from the valuation roll. Their responses were compared with what was obtained from the ratios for triangulation purposes. MS Excel was used to analyse the results. This section presented on how data was acquired and analysed. The next section presents the results of the study.

RESULTS AND DISCUSSION

Practically the COD should be between 0% and 15% for one to say that there is horizontal equity. The lower the COD, the more uniform the ratios within the property group, where a COD of 0% shows perfect horizontal equity uniformity (IAAO, 2013). From the results obtained, the COD has a value of 62.67%. This implies that a COD of a value 62.67% shows how far the average deviation is from the median. The COD is more than the acceptable range (more than 15%). A higher COD implies that there is greater scattering of individual assessments, which in turn, indicates a greater degree of horizontal inequity among properties. Additionally this high value of the COD implies that properties are being appraised at inconsistent percentages of market value. These results are similar to a number of studies that were conducted before (Birch, Sunderman, & Smith, 2004; Quintos, 2015; De Cesare & Ruddock, 2003; Plimmer, 2010; Minnesota Property Tax Manual, 2016; Alexander, 2012).

Ideally, appraisals should be neither regressive nor progressive but proportional where all properties are appraised at 100 percent of market value. Additionally a PRD of 1.00 indicates that no assessment bias exists between the low and high value properties i.e. there is vertical equity. The acceptable assessment practices will

produce a PRD index between 0.98 and 1.03, which indicates that the assessment system is proportional. From the results obtained, the PRD has a value of 1.25. This is a significant value, higher than the recommended maximum index (1.03). This indicates that high-value properties are under-appraised relative to low value properties (regressive) i.e. high valued properties are favoured. If the PRD was below 0.98 it would mean that there is a tendency for higher-valued properties to exhibit higher assessment ratios than lower-valued properties. The results in this study are consistent with what others have found in their study (IAAO, 1999; Birch, 2004; Netzer, 1973) but contrary to what (Quintos, 2015; Sirmans, Gatzlaff, & Macpherson, 2008) found. The reason could be attributed to the use of manual records and manual individual property assessment. Table 4 below is an illustration of the horizontal and vertical equity found in this study.

Table 4: Horizontal and vertical inequity evaluation

Approach	Tests	Result	General comment
COD (0-15%)	Horizontal equity	Horizontal inequity (62.67%)	Poor uniformity
PRD (0.98-1.03)	Vertical equity	Vertical inequity (1.25)	Poor uniformity

Source: Field survey

Based on the facts provided in Table 4 above, one can conclude that the principle of equity in property tax in Botswana tax is not observed. This was supported by the majority 60% of ratepayers who also noted that the tax assessment is not fair and uniform across the entire neighbourhood and within the neighbourhoods.

CONCLUSIONS AND RECOMMENDATIONS

Literature has extensively provided that property tax equity is centred on horizontal and vertical equity. The emphasis of these two concepts is to promote fairness across all tax payers since administration of tax must be uniform and consistent. From the results obtained from the tests, it is established that neither horizontal equity nor vertical equity exist in the administration of tax in Gaborone. Horizontal inequity has poor rating of 62.67 % (more than recommended standard of 15%). In this instance, it implies that properties are being appraised at inconsistent percentages of market value. That is to say, economically like properties do not bare the same tax burden.

Horizontal inequity may occur from unequal knowledge of market participants, unequal negotiating skills of buyers and sellers, spatial spill over and actions by officials to limit property tax increases. Examples of horizontal inequity include older homes being under assessed relative to newer homes, homes with views being over assessed, and houses with larger lots being under assessed. Vertical equity also has a poorly rating. From the results obtained it had a poor rating of 1.25. This is more than a recommended standard range of (0.98-1.03) (IAAO, 2013). This figure implies that the tax is regressive. Regressive here means that high-value properties are under-appraised and are relative to low-value properties. All property appraisals in the low value group are adjusted downward and high value property properties appraisals are increased sufficiently that both groups end with equalized A/S median ratios.

The implications of the results are that valuers have not been applying themselves when assessing properties for rating purposes. Ratepayers are dissatisfied as a result of the non-uniformity of values in similar properties leading to non-payment of the tax thus lowering the tax revenue of the council. Government should also look into the

issue of reforming the tax system so that an equitable assessment can be implemented. The contribution of this study is that using the theories of COD and PRD, this study has added new knowledge to the body of knowledge in the context of property tax assessment in Botswana. Property assessors should be introduced to automated valuation systems which can get rid of such inconsistencies. Policy makers should consider a property tax reform which will introduce the concept of fairness, uniformity and equity. Further research should consider the possibility of introducing automated mass valuation as they are fair and uniform when it comes to property assessment for tax purposes.

REFERENCES

- Adem, M. N., & Kwateng, O. A. (2007). Review of Real Property Tax Administration in Ghana. Master of Science Thesis. Royal Institute of Technology, Stockholm, Sweden. (381), 15-16.
- Alexander, P. (2012). An Equity Evaluation of the UK and US Tax Systems. Thesis. Bournemouth University, UK & U.S.A. *I of II*. Bournemouth University.
- Allen, M. T. (2003). Measuring Vertical Property Tax Inequity in Multifamily Property Markets. *Journal of Real Estate Research*, 25(2), 171-184.
- Allen, M. T., Dare, W. H., & Riegel, C. (2010). Vertical Inequity in the Tax Assessment of Lodging Properties. *International Journal of Hospitality Management*, 29(3), 363-367.
- Allen, T. M., & Dare, W. H. (2002). Identifying Determinants of Horizontal Property Tax Inequity: Evidence from Florida. *Journal of Real Estate Research*, 24(2), 153-164.
- Benson, E. D., & Schwartz, A. L. (1997). Vertical Equity in the Taxation of Single Family Homes. *Journal of Real Estate Research*, 14(7), 215-227.
- Birch, J. W., Smith, B. C., & Sunderman, M. A. (2004). Vertical Inequity in Property Taxation: A Neighbourhood Based Analysis. *Journal of Real Estate Finance and Economics*, 29(1), 71-78.
- Birskyte, L. (2013). Determinants of Property Assessment Uniformity. *Business Systems and Economics*, 3(2), 177-186.
- Carter, J. M. (2016). Methods for Determining Vertical Inequity in Mass Appraisal. *Fair and Equitable*. International Association of Assessing Officers.
- Cheng, P. L. (1976). Bias and Error Detection in Property Tax Administration. *Management Science*, 22(11), 1251-1252.
- Clapp, J. (1990). A New Test for Equitable Real Estate Tax Assessment. *Journal of Real Estate Finance and Economics*, 3(3), 233-249.
- Cornia, G. C., & Slade, B. A. (2005). Property Taxation of Multifamily Housing: An Empirical Analysis of Vertical and Horizontal Equity. *Journal of Real Estate Research*, 27(1), 17-46.
- Cornia, G. C., & Slade, B. A. (2006). Horizontal Inequity in the Property Taxation of Apartment, Industrial, Office and Retail Properties. *National Tax Journal*, 59(1), 33-55.
- De Cesare, C. M., & Ruddock, L. (1997). An Empirical Analysis of a Property Tax System: A Case Study from Brazil. (PhD Thesis). University of Salford: Salford, UK. *The International Conference on Assessment Administration*, 39-53.

- De Cesare, & Claudia, M. (1999). Challenges to Property Tax Administration in Porto Alegre, Brazil. *Land Lines*, 11(5).
- De Cesare, Claudia, M., & Ruddock, L. (1998). A New Approach to the Analysis of Assessment Equity. *Assessment Journal*, 5(2), 57-69.
- Department of Taxation and Finance, N. O. (2014). *Assessment Equity in New York: Results from the 2013 Market Value Survey*. Office of Tax Policy Analysis.
- Drew, S. J. (2017). *Residential Revaluation Summary Report: 2017 mass appraisal of all regions for 2018 property taxes*. Thurston: Thurston County.
- Elkis, D. (2006). Horizontal Equity as a Principle of Tax Theory. *Yale Law and Policy Review*, 24(1), 43-90.
- Gillespie, I., & Meng, R. (1986). Horizontal Equity And Property Taxation in Canada. *National Tax Journal*, 39(2), 221-228.
- Gloude-mans, R. J. (2002). *Assessment performance analysis of the 2003 Revaluation of residential properties and Condominiums*. District of Columbia: Office of Tax and Revenue.
- Gomez, J. D. (2011). Vertical Equity in Property Taxation: A Spatial Analysis of proposition 13 in San Diego, California.(Masters Thesis).Graduate College of the University of Illinois., *Thesis: Master of Urban Planning in Urban Planning*.
- Hodge, T. R. (2013). Not all Property Taxes are created equal: Iequality from Policy and Practice(Doctoral Dissertation).Michigan State University,Detroit, U.S.A . *Agricultural, Food, and Resource Economics* .
- Hodge, T. R., Skidmore, M., & McMillen, D. (2013). Assessment Inequity in a Declining Housing Market: The Case of Detroit. *Real Estate Economics*, 45(2), 237-258.
- IAAO. (1997). *Glossary for property appraisal and assessment*. Kansas City, USA: IAAO.
- IAAO. (1999). *Real estate valuation theory*. Kansas City, USA: IAAO.
- IAAO. (2007). *Standard on ratio studies*. Kansas City: IAAO.
- IAAO ,(2010). Standard on Property Tax Policy. *Standard on Property Tax Policy*.
- IAAO Research Committee, I. A. (2010). Assessed Value Cap Overview. *Journal of Property Tax Assessment & Administration*, 7(1).
- IAAO, I. A. (2013). Guidance on International Mass Appraisal and Related Tax Policy. (Draft 5.3).
- IAAO, I. A. (2014). Guidance on International Mass Appraisal and Related Tax Policy.
- Kampamba, J., Mosha, A. C., Adeyemi, A. Y., & Mooketsi, T. T. (2018). An assessment of the current local property tax system in Botswana. *Journal of Property Tax Assessment & Administration*, 15(1), 27-44.
- Kampamba, J., Svensson, A., & Leima, S. (2016). Comparative Analysis of Residential Property Tax Assessment in Botswana and Sweden. *International Journal of Current Research*, 8(3), 27899-27905.
- Krupa, O. (2011). An Ananalysis of Indiana Property Tax Reform: Equity and Cost Considerations. *104th Annual Conference Proceeding on Taxation and Minutes of the Annual Meeting of*, 104, 160-167.
- Moore, W. J. (2008). Property Tax Equity Implications of Assessment Capping and Homestead Exemptions for Owner-Occupied Single-Family Housing. *Journal of Property Tax Assessment & Administration*, 5(3), 37-72.

- Muhammad, D. (2009). Horizontal Inequality, Vertical Inequality and the District of Columbia's Property Assessment Cap. *100th Annual Conference on Taxation, 100*(100th Annual Conference on Taxation).
- Muhammad, M. S., & Ishiaku, B. (2013). An assessment of the prospects of property tax administration in Nigeria: a case study of Bauchi state board of internal revenue. *Property Tax and Administration, 59*(1), 15284-15289.
- Munshifwa, E. K., Jain, N., Kaunda, B. S., Masiba, L., Lungu, J., Chunda-Mwango, N., . . . Ngoma, W. (2016). Variances in rateable values in rating practice in Zambia: the role of mental models in value assessment. *Pacific Rim Property Research Journal, 1*-21. doi:10.1080/14445921.2016.1225151
- Netzer, D. (1973). National Tax Journal. *The Incidence of the Property Tax Revisited, 16*(4), 515-535.
- Paglin, M., & Fogarty, M. (1972). Equity and the Property tax: A new Conceptual Focus. *National Tax Journal, 25*(4), 557-565.
- Paparest, M. P. (2015). Understanding the Impact of the Property Tax Appeal Process on Assessment Uniformity: Procedures, Structures, and Outcomes.(PhD Thesis). Florida International University, Florida, U.S.A. 3-145. Florida International University.
- Payton, S. B. (2006). A Spatial Analytic Approach to Examining Property Tax Equity After Assessment Reform in Indiana. *The Journal of Regional Policy, 36*(2), 182-193.
- Phyllis , A., Hardwick, P., & Miller, A. (2013). Challenging the Conventional Wisdom on Optimal Taxation: An Equity Evaluation of UK and US Owner-Occupied Housing Taxation. *Edinburgh Conference 2013* (pp. 1-29). The Society of Legal Scholars.
- Pierce, B. J. (2011). Homeowner Preferences: The Equity and Revenue Effects of Proposed Changes in the Status Quo. *Journal of the American Taxation Association, 10*(2), 54-67.
- Pleydell, A. (1949). Equity in the Real Property taxation. *American Journal of Economics and Sociology, 9*(1), 31-34.
- Plimmer, F. (2010). Evidence on the Distributional Effects of Land Value Tax on Residential Households. *National tax Journal, 63*(1), 63-92.
- Plimmer, F., & McCluskey, W. J. (2016). Property Taxation for Developing Economies. *FIG Commission 9 – Valuation and the Management of Real Estate, 67*(1).
- Property Tax Manual, M. A. (2016). Property Sales Ratios. *General Property Tax Law*. Minnesota, United States of America.
- Quintos , C. (2015). Improving Assessment Equity in Mass Appraisal. *Journal of Property Tax Assessment & Administration, 11*(4), 53-62.
- Sabella, E. M. (1973). Equity and the Property Tax: A comment and an alternative Conceptual Framework. *National Tax Journal, 26*(4), 645-650.
- Sirmans, S. G., Gatzlaff, D. H., & Macpherson, D. A. (2008). Horizontal and Vertical Inequity in Real. *Journal of Real Estate Literature, 16*(2), 167-178.

END

THE INTERFACE BETWEEN THE PLANNING SYSTEM AND HOUSING DEVELOPMENT: IDENTIFYING GAPS IN THE LITERATURE

Elizabeth Mirika Musvoto¹ and Manya Mainza Mooya²

1 University of Cape Town

2 University of Cape Town

The White Paper on Housing of 1994 prioritised the needs of the poor, encouraged community participation and the involvement of the private sector to deliver one million houses in five years. While it incorporated the principles of spatial planning concepts such as compact cities, densification and unification of the urban fabric, it also focussed on issues of budgets, subsidies and other institutional arrangements as well as the land and planning issues as they impacted on the delivery of housing. Pre-1994, the role of planning was used to attain a different outcome in South Africa; a deeply segregated and dysfunctional urban form. Housing was located on the urban peripheries, far away from places of employment and other services. Post-1994, the new government inherited a housing backlog and initiated a massive housing delivery plan. However, the same apartheid plans were duplicated as the new government subsidised housing developments were located at the periphery of urban areas. This paper reviews the post-apartheid planning and housing literature and assesses how it has positioned itself in the link between planning and housing policy and the implementation of the vision in the White paper on housing. There is a general consensus in the intricate role of planning in achieving well located, compact and integrated settlements. However, policy and planning have not achieved the intended measures. This paper argues for a heterogeneous view of planning and the implementation of housing policy through the planning system should be explored further.

Keywords: Planning, Subsidised Housing, Housing Policy.

INTRODUCTION

Housing low income groups is a challenge not only faced by the South African government but by other developing countries across the world. The right to adequate housing has been guaranteed by the South African Constitution of 1996, thereby re-emphasizing the importance to house the previously disadvantaged and redressing the spatial legacy of apartheid as initially stated in the Restructuring and Development Programme (RDP) of 1994. In 1994, the ANC led government embarked on the RDP programme as a way of addressing the social, political and economic legacy of the apartheid era. The RDP was concerned about poor spatial planning in the past, which led to the poor being located far away from job opportunities and amenities (Atkins and Marais, 2006). The principles of the RDP were translated to the White Paper on Housing (1994), with the aim of creating viable, integrated settlements where households could access opportunities, facilities and services. This gave birth to various housing policies such as the Breaking New Ground Policy (2004) and

1 Lizmusvoto@gmail.com

2 Manya.mooya@uct.ac.za

Inclusionary Housing Policy (2007) (amongst others) that reintroduced and modified the ideas that emanated from the RDP and White Paper on housing.

In line with the provision of low income housing and according to Department of Housing (2004), the Breaking New Ground Policy of 2004 focussed on delivering sustainable and efficient human settlements by:

- Pursuing a more compact urban form through the introduction of fiscal incentives to promote the densification of targeted human settlements while introducing disincentives to sprawl;
 - Facilitating higher densities by investigating aspects of promoting densification such as planning guidelines, property taxation, zoning, subdivision, land swaps and consolidation as well as drafting a densification policy;
 - Mixed land use development through the introduction of residential development permits. Social housing developments will be encouraged through municipal redevelopment projects and urban development zone taxes; and
- Integrating land use and public transport planning, so as to ensure more diverse and responsive environments whilst reducing travelling distances.

During this period, the issues around urban integration re-emerged through the policy shifts and the “Ten Year Review” as highlighted in the 2004 State of the Nation Address. The ten-year review referred to the need to overcome spatial disjuncture between home and work, to increase residential densities, and to create more compact designs.

The resurgence of urban integration saw the birth of the Inclusionary Housing Policy which re-emphasized and modified the use of planning principles in housing delivery. Its aim was to achieve a more balanced outcome of the built environment creation in the direction of a more racially integrated and income inclusive residential environments (Tissington, 2011). The town planning component was introduced to ensure that the rapid housing delivery of affordable housing was set off using mandatory requirements and process of land use planning and development such as township establishment procedures, zoning and rezoning development approvals in return for incentives such as density bonuses, allowance for multi-storey units, some commercial rights and public investment in bulk and connector infrastructure.

According to Todes (2006), these changes in policy reflected a shift within the Department of housing from a focus on delivery to a greater emphasis on the quality of housing and the creation of sustainable human settlements. She further noted that the influence of the UN Habitat Agenda and its Local Agenda 21 played a role since government was required to report on the Habitat Agenda, thus subjecting the strengths and deficiencies of South African policies to international scrutiny. Besides, other researchers also found that the spatial form of South African cities was unsustainable, and the predominant form of low cost housing continued to defy the principles of compact cities (Watson, 2009; Rust et al., 2009). These characteristics were believed to be reversed through the planning system thereby introducing planning policies to support the prevalent discourse.

The Development Facilitation Act, 1995 (Act 67 of 1995) (DFA) introduced a new paradigm for planning and development by providing the basis for a coherent framework for land development according to a set of binding principles. The key principles of the DFA included: promoting equity, promoting efficiency, promoting

the public good, ensuring the good use of scarce resources and promoting the environment. The DFA was repealed in 2010 but its principles formed the core of all development applications. In 1997 the Department of Housing released the Urban Development Framework (UDF) as the main guideline for the implementation of the Habitat Agenda in South Africa. The UDF promotes greater integration and upliftment of under developed urban areas through housing and infrastructure provision, greater economic opportunities and well performing local institutions (Landman, 2004). In the UDF it is argued that 'spatial integration through sound urban planning, land transport and environmental management is critical to enhance the generative capacity and ease of access to socio-economic opportunities in our urban areas. This involves, less rigid zoning, more flexible planning mechanisms, promoting mixed land-use (co-locating residential, commercial and industrial areas) which will complement local economic development (Department of Housing, 1997).

The planning policies progressed with the White paper on Spatial Planning and Land Use Management of 2001 whose aim was to re-rationalise and integrate an existing plethora of planning laws and policies into one national system that will be applicable in every province. With its own principles it applauded integrated planning through integration of planning as well as an integration between different spheres of government and their respective roles (Landman, 2004). Left with no policy to guide development after the demise of the DFA in 2010, the Spatial Planning and Land Use Management Act, 2013 (Act 13 of 2013) (SPLUMA) was promulgated. The introduction of SPLUMA advocates for better integration and strengthens the link between spatial planning and land use management by bringing all aspects of land use planning under one uniform system and approach.

Most of the policies discussed above highlight the importance of planning, integration and compact city development in relation to housing development. This paper adopts a theoretical methodological approach as it presents a critique on the position of planning literature in relation to key concepts highlighted in the housing policies in a bid to identify the gaps in the literature. It will be presented in six sections. The second section defines the key concepts in the post-apartheid housing and planning policies. Section three is the theoretical perspective of planning. Section four discusses the position of planning in South Africa with reference to policy implementation. This is followed by the gaps in the literature in section five and conclusions in section six.

POST-APARTHEID PLANNING AND HOUSING CONCEPTS

The most recurring concepts in post-apartheid housing and planning policies are compact city and integration. In South Africa, the idea of compact cities developed along different lines from those that have been formulated internationally (Todes, 2003). Arguments in favour of compacting the South African city were first developed by academics such as Dewar (1984) and Dewar et al. (1979) but were taken up more broadly by anti-apartheid planners such as Watson (1995), Turok (1994) and the ANC led government after 1994. The compact city approach is most of all a spatial concept with the intention of intensifying the use of existing urban space as much as possible. According to Harrison (2003), the key concepts of the compact city approach include: increasing densities, containing sprawl, mixed use development and support for public transportation. Instruments to achieve these include: urban growth boundaries, infill development, and the designation of urban corridors, road pricing and strategic infrastructural investment.

Within the compact city approach, integration is a well referred to phenomenon. Though adopted in both the spatial planning and political circles, in the South African context, this was a call for integration of previously disadvantaged communities with the more well performing parts of the city (by placing new urban facilities within buffer strips and along the routes which had previously acted as dividers), a greater mix of land uses, higher densities, and the accommodation of the poor on well-located sites rather than on the urban edge (Watson, 2003). The DFA identified forms of integration most associated with planning as: integration between rural, urban and primeval landscapes, integration between elements of spatial structure, integration between land uses, integration of new development with old and integration of different classes. The term was further extended to what Pieterse (2003) identified as:

- Urban integration as glue for social investments which is concerned with the integration of different groups in various urban areas to allow for greater opportunities and vibrant communities;
- Urban integration as institutional rationale which refers to integration and coordinated efforts between different spheres of government and different government departments to ensure more effective provision of services and integrated planning;
- Economic integration encompasses greater accessibility to economic opportunities for all urban residents.

THEORETICAL PERSPECTIVE OF PLANNING IN SOUTH AFRICA

The historical evolution of the planning system in the South African context has been widely documented (Mabin, 1992; Harrison et al., 2003). According to Du Plessis (2013), the current form and structure of South African cities has been most profoundly influenced by the period Harrison et al. (2008) referred to as “high apartheid” from the late 1940s to the early 1970s, when influential planning policies and instruments such as the Group Areas Act were conceived and implemented. The main focus of spatial planning was on physical design of areas through guide plans and later structural plans (Todes et al., 2010). Most of the pre-apartheid concepts found their way into post-apartheid policies and approaches as planning continued to evolve (Du Plessis, 2013). This implies that the planning discipline is shaped by temporal priorities characteristic of each era. The results are felt in the way policies are implemented, thus having a ripple effect in the housing and property market.

According to Cheshire et al. (2002), planning systems set rules and guidelines that control the supply and location of land usable for a full set of legally defined purposes independently of price and so influence the level, location and pattern of activity. While spatial planning is concerned with coordinating and guiding land uses and linkages between them, to balance demands for development with the need to protect the environment and to achieve social and economic development objectives, land use management is a regulatory mechanism which aims to increase the efficiency of the use of land and to ensure greater equity in that use (Evans, 2004 in Whitehead, 2006). Berrisford and Kihato (2008) provide a useful way of locating land use management activities by suggesting that “the broad concept of planning has 2 parts: those activities that are geared towards shaping development over a period of time such as Integrated Development Plans, and those that implement strategic plans”. These monitoring and implementing instruments include various legal and regulatory mechanisms used to regulate land development and land uses, including zoning

schemes and these are known as land use management systems. Town Planning Schemes are used for the purposes of land use management on a daily basis, they provide the legal basis and definitions for rights to develop and use any parcel of land in a municipality according to the specified zonings. According to Beer et al. (2006), planning as a form of regulation has been seen to occupy an equivocal position with respect to housing affordability. Planning can be seen to restrict the supply of land for residential development and impose additional costs on developers, at the same time planning bonuses and similar tools are considered potentially valuable in meeting the housing needs of low-income households. Adams and Watkins (2002); Kim (2011) and Whitehead (2006), attested to the idea that planning constraints can impact on different groups of actors including developers, existing landowners and new purchasers since they lead to higher prices, densities, restrictions in the quantity of homes supplied and convergence in the type and design of homes.

However, this view on planning is from a welfare planning approach focussed on market failure and state intervention where planning is viewed from a homogeneous notion singling out its regulatory characteristics. According to Adams and Tiesdell (2010), the impact of spatial planning is direct in the property development market but indirect in the user and investment markets. This impact operates through three types of policy instruments, intended respectively to shape, regulate and stimulate.

Planning is characterised by a typology of planning tools namely: market shaping, market regulation, market stimulating and capacity building. Planning tools can be defined as policy actions or initiatives intended to affect the decision-making environment (and in turn the behaviour) of market actors and to achieve desirable societal objectives (Adams et al., 2005).

Plans (spatial development frameworks, land use plans) are identified as the main market shaping tools. The most important attribute of a plan is the provision of information (Adams et al., 2005). Thus, reducing uncertainty by providing information on the possibility of negative neighbourhood effects, indicating the government's intentions and information on regulatory policies (for example development densities, permitted and prohibited uses).

Market regulation tools affect decisions by restricting the set of choices available (i.e. by defining the boundaries of the actors' opportunity space) (Adams et al., 2005). They further stated that market regulation tools are generally operated by the state taking certain rights in land and making subsequent exercise of those rights subject to expressing permission. This follows that the initiation of every development requires a planning approval i.e. zoning, consent use). Alexander (2001) argues that strict regulation linked to relatively rigid statutory planning is best assurance of knowledge about development potential based on predictable and authoritative information.

Regulations put parameters and constrain a market actors' opportunity for space, thereby attracting development away from a certain location (Tiesdell and Allmendinger, 2005). The negative scenario created by regulations can be supplemented by market stimulation tools that seek to change the contours of that opportunity space, making some strategies more or less advantageous to market actors. Fiscal measures (subsidies and tax breaks) and direct or state action (provision of public infrastructure and the state's power to acquire land ownership of private land and through expropriation or purchase) are the main types of market stimulation and they affect the behaviour of market actors in how development is directed.

According to Du Plessis (2013), planning remains the key tool to move towards a more integrated, balanced and sustainable city by realising its limitations in terms of powerful market forces, vested interests in planning institutions, and the autonomous initiatives of the poor which makes rigid approaches simply unenforceable. Furthermore, more research has begun to recognise the broader scope of planning activity and has deconstructed the notion of it as a homogenous and regulatory activity, emphasising instead on the heterogeneous and temporal nature of planning (showing, inter alia, that land use regulation is merely one part of planning activity) and of land and property markets (e.g. Adams and Tiesdell, 2010; Adams et al., 2005).

THE POSITION OF PLANNING IN THE SOUTH AFRICAN HOUSING MARKET

The housing policies in South Africa have been embraced by different social groups in a bid to address various social challenges like crime. Despite the intended measures for creating integrated and equal communities, these policies have resulted in unintended outcomes and implementation strategies. One of the main issues that emanate from the interpretation of housing policies and planning as a market shaping tool is crime prevention through planning and design. Gated communities, in the form of enclosed neighbourhoods (which are enclosed neighbourhoods that have been closed in retrospect) and security villages (which are private developments) (Landman, 2003) have been the main response to crime in affluent areas. The main characteristics of gated communities are park closure, road closure, access-controlled areas through boom gates and security villages located on the urban periphery where large portions are available. Landman (2004) reviewed the policies relevant to the debate on gated communities (urban development policies, housing policies and crime prevention related policies) and assessed the implications of these policies for gated communities, as well as the implications of gated communities on the implementation of these policies, with a specific focus on integrated, sustainable and safer settlements in South Africa. She concluded that this response to high levels of crime and fear of crime results in a series of isolated fragmented neighbourhoods that restrict access and reduce socio-spatial integration. In this way the re-design of neighbourhoods for safety seriously threatens integrated spatial planning as promoted by all the policy documents discussed. Planning and development were guided by the DFA and the White Paper on Spatial Planning and Land-Use Management (2001) and now by the Spatial Planning and Land Use Management Act (2013) and neither of these mention, or make any reference to, “gated communities”, “road closures” or “neighbourhood enclosures”, or “security estates”. Instead, the Housing Act describes the nature and manner of residential settlement development and therefore expresses a view as to how land should be acquired for housing purposes, specifying that, as part of a municipality’s IDP and housing sector plan, land is identified and designated for housing development (Zille et al., 2008). This was a means to achieve its goal of integration.

The study by Rubin (2007) on the contemporary land use management systems and their operation at both policy and practical level illustrated the application of planning as a regulator. Using five Johannesburg case studies to respond to the criticism that the current land use management systems serve mainly to support the interests and amenity of property owners, rather than addressing the needs of the most vulnerable of our society whose exclusion from the land market maybe reinforced by regulative planning regimes. He concluded that if land use management is to be regarded as an important tool in restructuring our cities, then the way fundamental concepts are

regarded should be re-evaluated. The existing planning schemes, zonings and the cadastral system are in many ways exclusive of the needs of low-income households and communities and seem to result in the disempowerment and alienation of those that they intend to include and empower. Ovens et al. (2007) attested that what the land use management systems applied to the poor have in common is that they present a weak regulatory environment that is based on lower service levels; and a much weaker enforcement capacity of the state for land use management in poor neighbourhoods. Zack et al. (2007) further attested that while there may be pro-poor thinking apparent in some strategic plans, there is a cumbersome and difficult process to realize these into particular activities on the ground and limited ability to withstand the vigour of other development pressures. With regards to the supply of urban land, Kihato and Berrisford (2006) noted that strategic planning through the mechanism of Integrated Development Plans is restricted by administrative problems with land use management systems, as well as limited tools through which to translate strategic ideas in to day-to-day land use decisions; hampering the availability of well-located affordable land for socially driven land development. Oranje et al. (2010) investigated the perceptions and everyday experiences of developers and municipalities around urban land development and concluded that the general perception of the developers was the cost implications associated with bureaucratic delays and lack of capacity in municipalities.

The literature on government interventions articulates the role of planning as a market stimulant in housing development. Napier and Ntombela (2006) investigated the ways in which the state should intervene around urban land issues in order to improve access of poorer and excluded sectors of the South African society to land, housing and services. They assert that the lack of urban land readily available for development, the complexity of acquiring and correctly zoning land, and the strength of existing urban land interests have meant that state investment in housing has tended to be on the periphery of urban areas. In addressing this issue, they commended the introduction of the Urban Development Zone (UDZ) tax incentive which promotes inner city development within delineated urban development zones. According to Zille et al. (2008), the incentive facilitates that inner-city renewal by attracting private sector investment in construction, extensions, additions and refurbishment of buildings in designated Urban Development Zones. With the municipalities providing additional measures such as reduced property rates and local user charges, it also commits to the objective of processing all planning approvals within 90 days of approval. With commendable results in Johannesburg and Durban, Zille et al. (2008) highlights that urban development zone tax incentive has been highly effective in encouraging the private sector to carry out the government's aim of urban regeneration. If this is the case, then the private sector can be guided by the principle of incentives in assisting the government to achieve its development goals.

In South Africa, the government's policies presently offer incentives relevant to growth and transformation of the urban market. Zille et al. (2008) argue that market-compatible incentives are likely to be more effective in shifting market behaviour than government prescriptions. Highlighting the likely consequences of the Inclusionary Housing Policy, they acknowledge that it is too early to judge how effective the various incentives proposed to encourage developers to carry out such delivery would be in practice; however, based on the experience of UDZs, incentives would be a likely success story. Noteworthy is the call by the Breaking New Ground Policy for promoting densification and integration using a densification policy based on the

creative use of policy and planning instruments e.g. residential permits. Based on success stories in countries like Ireland and Malaysia, policies in support of densification have become an urgent matter. However, there are no incentives planned to facilitate the process. This implies that if incentives were introduced to encourage private developers to densify their properties in exchange for a tax rebate, then this would contribute towards the Government's housing goal. Attesting to this idea, Ovens et al in Charlton (2008) noted that the City of Johannesburg made some efforts to positively influence the property market by highlighting development opportunities in strategic areas and offering financial incentives. This happened through land identification, packaging and planning at Gautrain stations, strategic projects managed by the Johannesburg Development Agency as well as tax incentives offered in the Urban Development Zones. Despite the fact that this initiative targeted higher income residents rather than the poor, it is a clear example of how incentives could be used to attract development. If incentives have worked for higher income residents, it can be inferred that if implemented they can stimulate low income housing developments and promote integration and compact city development.

GAPS IN THE LITERATURE AND RECOMMENDATIONS FOR FURTHER RESEARCH

The studies highlighted above acknowledge the role of planning in housing delivery as set out in the White Paper on Housing. There is also great consensus on the unintended consequences of policy implementation and the use of planning tools in post-apartheid South Africa. Despite the fact that housing delivery is a multifaceted issue, the intricate role of planning in achieving a more compact urban form, facilitating higher densities and integrating land uses should be explored further in South Africa. It is clear how planning tools have been used to achieve gated communities (on the higher end of the market), but there is still ignorance on how planning tools have been used or can be used to facilitate the delivery of low income housing (on the lower end of the market).

Furthermore, viewing planning from a heterogeneous perspective (i.e. market shaping, market regulating and market stimulating) can give more insight on the implementation of housing policies. The link between the various guises of planning, the vision of compact cities and integration highlighted in the housing policy and how these have been translated into planning objectives and implemented in practice should be further addressed in a context specific study.

CONCLUSION

The aim of the paper is to evaluate how planning has been applied in the implementation of housing policies in post-apartheid South Africa. This paper argues that planning should be viewed in a holistic manner, taking into consideration all its characteristics in order to achieve the compact city and integration principles highlighted in housing policies. The implementation of housing policies through the planning system is complex and requires analysis of the institutional capacities to avoid unintended results.

REFERENCES

- Adams, D., Watkins, C. and White, M. (2005) *Planning, public policy and property markets*. United Kingdom: Blackwell Publishing.
- Adams, D. and Tiesdell, S. (2010) Planners as market actors: rethinking state-market relations in land and property. *Planning Theory and Practice*, 11(2), pp. 187-207.

- Adams, D. and Watkins, C. (2002) Greenfields, brownfield's and housing development: real estate issues. United Kingdom: Blackwell Publishing.
- Alexander, E.R. (2001) A transaction- cost theory of land use planning and development control: towards the institutional analysis of public planning. *Town Planning Review*, 72 (1), pp. 45-75.
- Beer, A., Kearins, B. and Pieters, H. (2007) Housing affordability and planning in Australia: The challenge of policy under neo-liberalism. *Housing Studies*, 22 (1), pp. 1-24.
- Berrisford, S., De Groot, D., Kihato, M., Marrengane, N., Mhlanga, Z and Van den Brink, R. (2008) In search of land and housing in the new South Africa: The case of Ethebalethu. World Bank working paper; no. 130. Washington DC: World Bank.
- Charlton, S. (2012) The state of land use management in South Africa. Second economy strategy: addressing inequality and economic marginalization. *Urban Landmark*. Available online at http://www.tips.org.za/files2E_Charlton_Landuse_April08.pdf [accessed 14 October 2016].
- Cheshire, P. and Sheppard, S. (2002) The welfare economics of land use planning. *Journal of Urban Economics*. 52, pp. 242-269.
- Dewar, D. (1984) Cities, poverty and development. Proceedings of the second Carnegie conference on poverty and development. Cape Town. South Africa.
- Dewar, D., Uytendogaardt, R., Hutton-Squire, M., Levy, C and Menidis, P. (1987) Housing: urbanism in Cape Town. Cape Town.
- Du Plessis, D. (2013) DOI 10.1007/s12132-013-9201-5 A critical reflection on urban spatial planning practices and outcomes in post-apartheid South Africa. *Urban Forum*.
- Harrison, P. (2003) Fragmentation and globalization as the new meta-narrative. In: Harrison, P., Huchzermeyer, M and Mayekiso, M. (Eds) *Confronting urban fragmentation: housing and urban development in a democratising society*. Cape Town: University of Cape Town University Press.
- Kihato, M. and Berrisford, S. (2006) Regulatory systems and making urban land markets work for the poor in South Africa. Paper commissioned by the Urban Landmark. Available at <http://www.urbanlandmark.org.za/archive> [accessed on 3 September 2015].
- Kim, J.H. (2011) Linking land use planning and regulation to economic development: a literature review. *Journal of Planning Literature*. 2 (1), pp.35-47.
- Landman, K. (2004) Gated communities in South Africa: a review of the relevant policies and their implications. Pretoria: CSIR Boutek.
- Landman, K. (2003) BOU/I 252 A national survey of gated communities in South Africa. Pretoria: CSIR Publication.
- Napier, M. and Ntombela, N. (2007) Towards effective state interventions to improve access by the poor to urban land markets. Pretoria: CSIR Publication.
- Ovens, W., Kitchen, F., Parnell, S and Williams, A. (2007) Land management and democratic governance in five South African metropolitan areas: overview report. Wits Centre for Urban and Environmental Studies.
- Pieterse, E. (2003) Unravelling the different meanings of integration: the urban development framework of the South African government. In: Harrison, P, Huchzermeyer, M & Mayekiso, M.(Eds) *Confronting fragmentation: housing and urban development in a democratising society*. Cape Town: Juta.

- Rubin, M. (2008) Land management and democratic governance in the city of Johannesburg: synthesis report. Wits Centre for Urban and Environmental Studies. Available at <http://www.planact.org.za/uploads.pdf> [accessed 15 June 2018].
- Rust, K., Zack, T and Napier, M. (2009) How a focus on market performance might help breaking new ground contribute towards poverty reduction and overcome the two economies divide. *Town and Regional Planning*. 54(1), pp. 51-56.
- Todes, A. (2003) Housing, integrated urban development and the compact city. In: Harrison, P., Huchzermeyer, M & Mayekiso, M (Eds). *Confronting fragmentation: housing and urban development in a democratising society*. Cape Town: Juta
- Todes, A. (2006) Urban spatial policy. In Pillay, U., Tomlinson, R and Du Toit, J. (Eds) *Democracy and delivery: urban policy in South Africa*. Cape Town: HSRC Press.
- Tissington, K. (2011) A resource guide to housing in South Africa 1994-2010: legislation, policy, programmes and practice. Social Economic Rights Institute of South Africa.
- Turok, I. (1994) Urban planning in the transition from apartheid, part 2. *Town Planning Review*. 65 (1), pp. 243-258.
- Turok, I., & Watson, V. (2001) Divergent development in South African cities: strategic challenges facing Cape Town. *Urban Forum*. 2(2), pp. 119–138.
- Watson, V. (2009) The planned city sweeps the poor away: urban planning and 21st century urbanisation. *Progress in Planning*. 72 (1), pp. 151–193.
- Watson, V. (2003) Conflicting rationalities: implications for planning theory and ethics. *Planning Theory and Practice*: 4 (4), pp. 395–408.
- Whitehead, C. (2006) Planning policies and affordable housing: England as a successful case study? *Housing Studies*. 22 (1), pp. 25-44.
- Zille, P., Viruly, F., Tomlinson, M., Hobden, T., Erasmus, M. (2008) The dynamics of the formal urban land market in South Africa. Paper commissioned by the Urban Landmark. Available at <http://www.urbanlandmark.org.za/research/x14.php> [accessed on 17 August 2016].

END

AN EVALUATION OF THE RELEVANCE OF CURRENT TRADITIONAL LEASES IN COMMERCIAL PROPERTIES AS COMPARED TO GREEN LEASES

Johnson Kampamba¹ Simon Kachepa² Milidzani Majingo³ and Abednico Wadingalo⁴

1 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

2 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

3 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

4 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

Sustainability in the built environment is key in a world where many leading organisations have started to using their workplaces to meet a range of financial drivers and securing competitive advantage. The lack of exploitation of this concept by the commercial property market in Botswana led to the formulation of the research question of this study. Could it be because the conventional leasing yield the maximum benefits or that what literature and other international policy makers are promoting is something sensational rather than statement of common truth? The purpose of this study was to provide an answer to whether traditional leases are more relevant as compared to green leases which can be adopted as an alternative sustainable management practice. In realizing the objectives, the study investigated and compared the performance of properties both under green leasing and traditional leasing by measuring the performance indicators. These performance indicators were operational costs, vacancy rates and utility cost per metre. From three office nodes of Gaborone purposively selected by the researcher, data was collected through the use of a questionnaire and was analysed using descriptive statistics and overall mean scores were utilized to present the findings. The analysis also indicated that the differences between traditional and green leases are insignificant to the performance therefore current leases are relevant to the commercial property market of Botswana. The implications of the results are that though green leases are sustainable, traditional leases are still relevant in Botswana thus it is difficult to switch to green leases. The study recommends policy change if green leases are to take effect.

Keywords: Green leases, traditional leases, sustainable development, green concept, Botswana

INTRODUCTION

Of late debate about sustainable development has been intense and the call for sustainability is the way to go (Collins, Junghans, & Haugen, 2016; James, 2013). Conferences and workshops have been held ranging from 1992 Agenda 21, Millennium Development Goals of 2000, Millennium summit and Rio de Janeiro, the new urban agenda and the current Sustainable Development Goals (Ratcliffe, Stubbs, & Keeping, 2009; United Nations, 2015;

1 kampambaj@mopipi.ub.bw

2 kachepas@mopipi.ub.bw

3 majingom@mopipi.ub.bw

4 anointedwadiengalo@gmail.com

Mudehwe, Chirisa, & Matamanda, 2016; United Nations, 2017). Much as there has been calls for sustainable development practices worldwide (United Nations, 2015; Mudehwe, Chirisa, & Matamanda, 2016; United Nations, 2017; Collins, Junghans, & Haugen, 2016; James, 2013; Ratcliffe, Stubbs, & Keeping, 2009), no study has been conducted to compare the performance of traditional leases against green leases in the commercial property market. Buildings are consumers of building related services such as water, energy and natural gas (Michael, 2008; Khasreen, Banfill, & Menzies, 2009; Janda, Bright, Patrick, Wilkinson, & Dixon, 2016; Gerarden, Newell, & Stavins, 2015). They also emit gases which lead to global warming (Janda, Bright, Patrick, Wilkinson, & Dixon, 2016; Khasreen, Banfill, & Menzies, 2009; Gerarden, Newell, & Stavins, 2015) which is a concern in as far as sustainable development goals are concerned. This study seeks to establish the difference in performance between traditional leases and green leases in commercial properties in Gaborone, Botswana. Which type of lease is more relevant in the Botswana commercial property market? The objectives of the study were:

- (1) to establish the extent to which green leases are common in Botswana;
- (2) to elucidate the difference between traditional leases and green leases; and
- (3) to identify factors that hinder the adoption of green leases in Botswana and to come up with measures that can help promote the adoption of green leases.

This report is arranged into five major sections, section one covers the introduction. The background and previous related studies are presented in section two. The section three describes the methodology that was used in addressing the research question and its objectives. Section four presents the results and analysis of the study and finally the conclusions are discussed in the last section. This section discussed the introduction and the justification for this research. The next section presents the brief background of the study and related literature that was reviewed.

BACKGROUND AND REVIEW OF LITERATURE

The first evidence of lease or rent dates back 2000 BC, from there the nineteenth century was marked by a significant increase in leasing activity, which was due to the increasing diversity of rented tools (Teodorescu, 2014). According to Bright and Roussac (2012) a lease defines the relationships between the landlords, tenants and operators of tenanted commercial office buildings. The purpose is to protect the interests of the landlord and tenant, as leases are held as the core reference point of this relationship. A lease can be defined as a contract by which one conveys real estate, equipment, or facilities for a specified term and for a specified rent. These contracts include provisions for operating, management and maintenance services (Adnan, Aman, Razali, & Daud, 2017). Shareena, Sipan, Sapri, Jalil, & Mohammad (2017) defines green building as a practice of increasing the efficiency with which buildings use resources, while at the same time reducing their impact on human health and the environment, throughout the building's life cycle. Similarly Mudehwe, Chirisa, & Matamanda (2016) defines green leasing to be a lease that focus on the sustainable practices by the landlord and tenant with the objective of eliminating the disincentives in a commercial lease to reduce energy, water and raw material consumption through the increased recycling as well as use of sustainable materials for tenant improvements.

However as Oberle & Sloboda (2010) indicates, typical commercial leases do a good job of allocating various obligations between the building owner and the tenants, but they seldom address environmental considerations beyond the basics of specifying which party is

responsible for payment of utilities. On the other hand Michael (2008) opined that many leases contemplate the unilateral installation of smart meters for electricity, whilst most do not contemplate similar smart metering for water and natural gas. He further indicated that few leases contemplate limiting waste production by the tenant, either in initial fit-out or in ongoing operations, but most leases do not obligate the landlord to recycle with multiple waste streams. As Gerarden, Newell and Stavins (2015) put it, failure of the leases to address environmental issues is significantly increasing, resulting in global energy consumption which is projected to grow 30-50 percent over the next 25 years. This will bring with it, in many countries, increased local air pollution, greenhouse gas emissions, and oil consumption which will further lead to higher energy prices (Gerarden, Newell and Stavins, 2015).

However Janda, Bright, Patrick, Wilkinson, & Dixon (2016) believes that reductions in emissions on the scale required to stabilize the global climate cannot be achieved without major change in the patterns of energy use across the entire building stock. Changes in these patterns lead to the need for sustainability. 'Green leases' are built on 'green' clauses within the lease which are designed to account for energy efficiency and other sustainability goals (Janda, Bright, Patrick, Wilkinson, & Dixon, 2016). A green lease has no fixed form, it provides a leasehold structure that will facilitate and support the property being used in an environmentally friendly and efficient way. This can relate to any or all of energy use, water management, waste disposal, travel plans and the use of sustainable materials (Bright & Roussac, 2012).

There is a growing consensus, particularly in developed nations that conventional leasing practices have become obsolete and unsustainable due to a number of challenges associated with them (Blustein, 2013). The challenges include the following:

- i. high vacancy levels;
- ii. high tenant turnover;
- iii. high running costs; and
- iv. low returns on investment (Blustein, 2013).

This, according to Blustein (2013) have led to an alternative sustainable measure in lease management called green leasing. In a study that was conducted in Zimbabwe it was found out that there are green envelope components which affects the performance of a building and its value while there are some which do not have an effect (Mudehwe, Chirisa, & Matamanda, 2016). However the broader perspectives focuses on matters such as building management, waste disposal, transport, catering and caretaking services that may have a 'green' element (Dixon, Bright, Axon, Janda, & Kolokotroni, 2012).

The potential value of implementing green leases and challenges in applying them has been studied in various studies (Mudehwe, Chirisa, & Matamanda, 2016; Adnan, Aman, Razali, & Daud, 2017; Wiley, Benefield, & Johnson, 2010; Collins, Junghans, & Haugen, 2016). Green leases are widely adopted and have significantly been incorporated in commercial properties with increase in participation by various stakeholders as they yield many benefits (Modu, Usman, Bulama, & Habib, 2014). However, Senn (2012) noted that the problem that needs to be researched comes from the lack of exploitation on green leases although they may have an influence on returns on investment in commercial properties.

Green leases vs Traditional leases

Literature indicate that there is no standard definition of what a green lease is, however there are several unstandardized meanings. According to Brooks (2008) a green lease seeks to remove disincentives in a commercial lease to reduce energy, water and raw material consumption, increased recycling, as well as the use of sustainable materials in tenant improvements, and encourages sustainable practices by both the landlord and the tenant.

A green lease is becoming known as a lease that seeks to reduce the environmental impact of commercial buildings, such as reducing the greenhouse gas emissions by reducing demand for fossil fuels through increased energy efficiency (Michael, 2008). Table 1 below highlights the clauses that are typically found in the two types of leases.

Table 1: Clauses common in both green and traditional lease

Clauses that are common both leases	Traditional leases	Green leases
Environment impact management plan	x	√
Sustainability statement plan	x	√
Data sharing statement	x	√
Outgoings statement	√	√
Assignment and subletting statement	√	√
Rent review statement	√	√
Repair and alteration statement	√	√

Source (Brookes, 2008; Bright & Dixie, 2014; Blustein, 2013)

Based on the comparative analysis in Table 2 below, it is clear that there a number of differences that exist between the two leases.

Table 2: Comparative summary of leases

Aspect	Green leasing	Conventional Leasing
Paradigm/ school of thought	▪ Green agenda	▪ Capitalism & free market economy
Business relationship	▪ Long term ▪ Business Partners with shared vision	▪ Short term ▪ Commercial partners with diverse vision
Tenant retention	▪ High tenant retention	▪ High tenant turnover
Environmental externalities	▪ Positive environmental externalities	▪ Negative environmental footprint
Outcomes	▪ Low carbon footprints ▪ Increased building occupancy ▪ Defined tenant/landlord responsibilities and obligations	▪ High carbon footprints ▪ High tenant turnover hence voids ▪ Exploitative contracts with win-lose outcomes
Operating costs and overheads	▪ Low operating costs	▪ High operating costs
Profitability	▪ Marginally higher profits levels	▪ Marginally lower profit levels

Source: (Mudehwe, Chirisa, & Matamanda, 2016; Brookes, 2008; Bright & Dixie, 2014; Blustein, 2013)

Factors which hinders the adoption of green leases

It is widely recognized that there are serious barriers and disincentives to the implementation of energy efficient measures in tenanted commercial space. Amongst the many barriers are; poor communication (Dixon, Bright, Axon, Janda, & Kolokotroni, 2012); financial disincentives and insufficient research (Kibert, 2016); cost of capital improvements (James, 2013); costs transferred to tenants as a barrier to adoption of the green leases (Sayce, Sundberg, Parnell, & Cowling, 2009); long pay back periods of some types of improvements; indifferent tenants; inability to pass through the current portion of amortized

landlord's capital costs; lack of skill or knowledge; no knowledge of an achievable target; no leadership, compulsion or incentive from government; no measurement systems in place to determine existing consumption; lack of capital; lack of building operational expertise; and/or restrictions in the lease (Brooks, 2008).

Benefits of green leasing

In return, a range of benefits are attributed to green buildings or associated with features common in green buildings. Owners, developers and occupiers may obtain benefits from the diverse range of subsidies and tax benefits. For tenants, these are related to reduced operating costs of the building (mainly associated with energy and other utility savings), improved productivity of the occupying business (associated with reduced staff turnover and absenteeism, *inter alia*), possible tax and other incentives and other competitive advantages linked to marketing and image benefits. Other benefits may include increased ability to recruit and retain employees, higher employee morale, fewer sick days, and increased employee productivity (Colleta, 2009; Blustein, 2013; Duncan, 2010). This section has looked at the background and previous related studies, benefits and factors hindering the adoption of green leases. The next section discusses how the data was obtained and analysed.

RESEARCH METHODOLOGY

The study was conducted in Gaborone's commercial property market by administering a questionnaire to tenants, landlords and property managers. A questionnaire was chosen because it has the ability to reach a larger number of respondents at least cost and within a shorter period of time. A questionnaire was administered to three office nodes in Gaborone namely, Central business district (CBD), Kgale Mews and Fairgrounds. Due to time constraints, 58 questionnaires were administered using simple random sampling techniques and stratified random sampling in the three zones. Only 46 filled questionnaires were returned translating into 79% response rate. This response rate was high and acceptable due to the collection strategy that was put in place. According to Johnson & Owens (2009) 40 to 60 per cent may generally be expected as an acceptable response rate range for written surveys. This could be attributed to a smaller sample size that was used. Table 3 below highlights the number of questionnaires that was distributed in the three zones.

Table 3: Study area analysis

Location	Questionnaires distributed	Total Questionnaires collected
CBD	23	17
Kgale Mews	18	14
Fairgrounds	17	15
Total	58	46

DATA PRESENTATION AND ANALYSIS

In prior sections the study discussed the literature that relates to the research topic and the methodology that was used to collect data. The objective of this section is to present and analyse the data that was collected from users of commercial office spaces.

Background information of the respondents

This section of the study presents background information of the tenants and owners in the three designated research areas of Gaborone (Fairgrounds' office park, Kgale mews and the CBD). A descriptive analysis was used to present the survey results on the background information of tenants and owners of these commercial office spaces. Table 4 below presents the results.

Table 4: Demographical data of respondents

Variables used to get demographical data	Frequency (n)	Percentage (%)
Gender of respondent		
Male	22	47.8
Female	24	52.2
	46	100%
Age range of the respondent		
21-31 years	23	50
32-42 years	20	43.5
42+ years	3	6.5
	46	100%
Occupation of the respondent		
Administration	10	21.7
Administration and finance	16	34.8
Any real estate field	14	30.4
Top management	6	13.1
	46	100%
Classification of space use		
Tenant	27	58.7
Owner	14	30.4
Owner's Agent	4	8.7
Others	1	2.2
	46	100%

Table 4 above shows responses from a sample of $n = 46$. The data shows that most of the respondent (52.2%) that participated in the study were Females. It is also clear that the majority (83.5%) of the respondents were in the age range of 21-42 years. Moreover the data reflects that the occupation of the majority of the respondents (86.9%) were in administration and finance, and real estate whereas only 13.1% were from Top Management. The majority of respondents (89.1%) were tenants and owners and the remaining (11.9%) were Owner's Agent and Others.

The extent to which green leases are common in Botswana

Respondents were asked to indicate the level of agreement using a five point Likert scale of 1 being strongly disagree (SD) and 5 being strongly agree (SA). In accordance with objective one, the question was formulated to determine the level of awareness of green leasing in the Botswana commercial property market. They were asked to indicate if green leasing is common in the commercial property market of Botswana as shown in Figure 1. The majority of respondents (50%) were neutral and the other 50% disagreed/strongly disagreed with the statement that green leases were common in the commercial property market of Botswana. This implies that they all disagreed with the statement that green leases are common in the commercial property market of Botswana. These results are not different from other studies (Brooks, 2008; Adnan, Aman, Razali, & Daud, 2017; Mudehwe, Chirisa, & Matamanda, 2016; Wiley, Benefield, & Johnson, 2010) that have been carried out before.

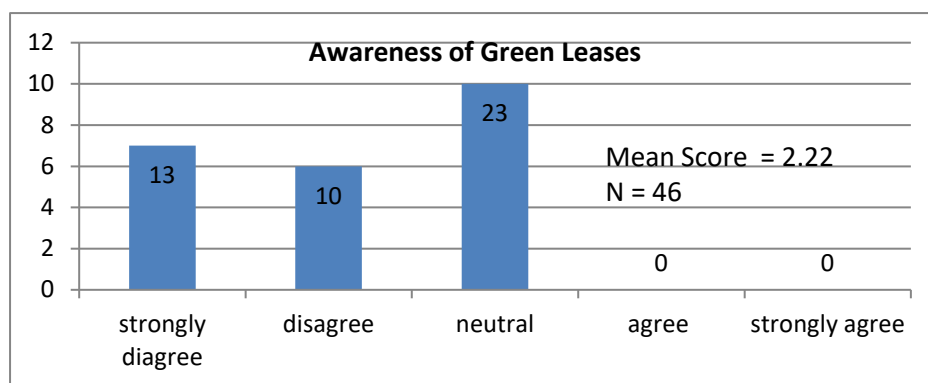


Figure 1: Awareness of green leases in the commercial property market

In addressing objective 2, which was to establish the difference between traditional leases and green leases and their significance to the performance of commercial properties. Respondents were asked to indicate the clauses that they have in their leases and indicate the type of lease that they have signed. Table 5 illustrates the clauses that are commonly used in the two leases.

Table 5: Clauses common in both green and traditional leases

Clauses that are common both leases	Traditional leases n = 41(89.1%)	Green leases n= 5 (10.9%)
Environment impact management plan	No	Yes
Sustainability statement plan	No	Yes
Data sharing statement	No	Yes
Outgoings statement	Yes	Yes
Assignment and subletting statement	Yes	Yes
Rent review statement	Yes	Yes
Repair and alteration statement	Yes	Yes

It was clear that the majority of the respondents (89.1%) have signed for a traditional lease and only 10.9% has signed for green lease. This finding is line with what Mudehwe, Chirisa, & Matamanda (2016) had noted in their study, where they said that there were very few green leases in the commercial property market in Zimbabwe. It is also noted that traditional leases did not have clauses pertaining to environment impact management plan, sustainability statement, and data sharing statement. The common clauses in the two leases were outgoings statement, assignment and subletting statement, rent review statement and repairs and alterations statement. From the results that were obtained, it was clear that they were consistent with findings in other studies (Brookes, 2008; Bright & Dixie, 2014; Blustein, 2013). These were further supported by what Mudehwe, Chirisa, & Matamanda (2016) had stated that the underlying foundations of any green lease are:

- v. structure of the rent and operating expenses;
- vi. building improvements that are initiated by the tenants;
- vii. adherence to the principles of sustainable development;
- viii. appropriate use and disposal of hazardous materials;
- ix. recycling; and
- x. environmental preservation and conservation plans.

Respondents were asked to indicate the sustainable features that were available in the buildings. Table 6 summarizes the responses to this question.

Table 6 Availability of sustainable features in the building

Variables asked	No	Yes	N	Percent
LED lighting	100.0%	0.0%	46	100.0%
Day lighting/occupancy sensors	92.3%	7.7%	46	100.0%
Maximised natural daylight	96.2%	3.8%	46	100.0%
Building automation system	92.3%	7.7%	46	100.0%
Storm water retention	92.3%	7.7%	46	100.0%
Low flow water fixtures	84.6%	15.4%	46	100.0%
On site renewable energy	92.3%	7.7%	46	100.0%
Use of drought resistant plants for landscaping	96.2%	3.8%	46	100.0%

It is clear from Table 6 that most of the sustainable features were not available in the buildings that were surveyed thus implying that green leases were far-fetched, an observation that was noted in previous similar studies (Mudehwe, Chirisa, & Matamanda, 2016; Brookes, 2008; Bright & Dixie, 2014; Blustein, 2013).

The next part was to discuss the performance indicators in the commercial office space.

Respondents were asked to indicate the operational expenses for the building that they were occupying. The majority of the respondents (67%) indicated that their expenses ranged from above 10% up to 30% and above, only 33% had operating expenses below 10%. This is an indication of an absence of sustainable property development and management practices. These expenses are not different from those that were found in previous studies (Brookes, 2008; Bright & Dixie, 2014; Blustein, 2013; Mudehwe, Chirisa, & Matamanda, 2016).

In addressing Objective 3, respondents were asked to identify factors that hinders the adoption of green leases in commercial properties using a five point Likert scale of 1 being not significant and 5 most significant. In evaluating the responses, the following scoring criteria was used. If $X < 1.49$ then the factor is 'Not Significant (NS)'; if $X \geq 1.5$ but ≤ 2.49 then the factor is 'Less Significant (LS)'; if $X \geq 2.5$ but ≤ 3.49 then the factor is 'Neutral (N)'; if $X \geq 3.5$ but ≤ 4.49 then the factor is 'Significant (S)'; if $X > 4.5$ then the factor is 'Very Significant (VS)'. Table 7 below is illustration of the results.

Table 7: Factors hindering the adoption of green leases

Variables	NS	LS	N	S	VS	MS	Total	Comments
Fear of rent increase	11.5	3.8	19.2	26.9	38.6	3.77	100	Significant
No measurement systems	33.3	8.3	16.2	20.8	20.8	2.87	100	Neutral
Lack of capital	7.7	11.5	11.5	26.9	42.3	3.84	100	Significant
Lack of operational expenses	29.2	0	12.5	37.5	20.8	3.21	100	Neutral
Lack of knowledge of achievable target	4.2	0	29.2	25	41	4.00	100	Significant
Lack of restrictions	33.3	12.5	29.2	20.8	4.2	2.75	100	Neutral
Long pay back periods	25.0	12.5	25.0	29.2	12.5	3.04	100	Neutral
Lack of government incentives	3.85	3.85	19.2	3.85	69.2	4.31	100	Significant

These factors were identified by both owners and tenants in the various areas where the survey was conducted. The most significant hindrance to adoption of green leasing was the lack of incentives by government (4.31), followed by lack of knowledge of achievable targets (4.00); lack of capital (3.84) and fear of rental increment (3.77). These results are in line with what Brooks (2008) had noted. On the contrary long payback periods may also be said to be a very significant factor although it does not have the highest frequency because it is a factor that may affect owners mostly as compared to tenants considering that there were very few owners who participated in the study when compared to tenants. Leadership by government appears to be the most significant hindrance to the green leasing adoption in Botswana together with the capital factor. This is in accordance with the view that Adnan, Aman, Razali, & Daud, (2017) hold that cost or financial aspects are the main barriers as compared to other barriers. They further elaborated that the challenge is that the initial incurred cost is perceived to be higher when compared to conventional practice. However this should not necessarily be the case as the reduction of energy consumption, reduction of water consumption and the use of recycled materials should be the driving force hoped to be achieved by both tenants and landlords.

In addressing Objective 4, to identify if any, the incentives that might help promote the adoption of green leases. For this objective the respondents were required to fill in an open ended question on what they considered could be done to encourage the adoption of green leasing in the commercial property market of Botswana. It is indicated that 54% of the respondents indicated that 'if there could be tax incentives for green leased properties many would adopt green leasing'. Other factors that were identified included lower rental rates (8%) and rent free periods (15%) and other incentives (23%) otherwise summarized as "others" in this study which included "Assistance programmes regulated by real estate councils"; "Government to set and monitor property owners' operational practices". Green leases are not commonly used in Botswana as most of the real estate market is not equipped on green leases.

CONCLUSIONS

The concept of green leasing has developed to be a global discipline in commercial property market and Botswana as a developing country should work towards adoption of green leasing as it yields many benefits which will lead to environmental, social, and economic benefits. The implications of the findings are that developers will continue to produce unsustainable buildings in Botswana if measures to adopt sustainability are not put in place.

Recommendations

The findings of this study have led to the following recommendations:

- Real estate industry experts should join forces with local real estate professional regulating bodies to create a central information resource such as intercompany page on sustainability;
- The government should create "sustainability" annual budget to fund innovation projects and provide government schemes to help stakeholders to commit to green practices in built environment;
- Considering the climatic condition of Botswana the government should set high standard criteria for issuing building permits in which the influence of solar energy, and wind have been taken into account when dealing commercial buildings;
- The government of Botswana should create a green building Council which will promote and regulate green practices;

- The Real Estate Institute of Botswana should carry out sustainability training programmes that will enhance knowledge about green leasing;
- Finally the study recommends that the academia indulge in more research so as to tackle the issue of lack of knowledge in sustainable development practices.

REFERENCES

- Adnan, Y. M., Aman, N. U., Razali, M. N., & Daud, M. N. (2017). The implementation of green lease practices for office building in Kuala Lumpur, Malaysia. *Property Management*, 35(3), 306-325. Retrieved from <https://doi.org/10.1108/PM-12-2015-0067> on 4/09/2017.
- Blustein, S. (2013). Commercial leases: a legal instrument to deliver higher productivity of green commercial buildings. *Queensland University of Technology*.
- Bright, S., & Dixie, H. (2014). Evidence of green leases in England and Wales. *International Journal of Law in the Built Environment*, Vol. 6 Iss, 6-20.
- Bright, S., & Roussac, C. A. (2012). Improving environmental performance through innovative commercial leasing; An Australian case study. *International Journal of Law in the Built Environment* Vol. 4 No. 1., 7-22.
- Brooks, S. M. (2008). Green Leases: The Next Step in Greening Commercial Buildings. *Real Property Association of Canada*, 1-25.
- Colleta, D. G. (2009). Green leasing: Implementing sustainability concepts in commercial leases. *Quarterly & Urban Development Journal*, 1st Quarter, 15-23.
- Collins, D., Junghans, A., & Haugen, T. (2016). Green leasing in theory and practice: A study focusing on the drivers and barriers for owners and tenants of commercial properties. *Centre for Real Estate and Facilities Management, Norwegian University of Science and Technology*, 1-12.
- Dixon, T. J., Bright, S. J., Axon, C. J., Janda, K. B., & Kolokotroni, M. (2012). Building communities: reducing energy use in tenanted commercial property. *Building Research & Information* 40(4), 461-472.
- Duncan, W. (2010). Green leases: becoming a Reality. *Australian Property Law Journal*, 19 (1):, 1-11.
- Gerarden, T., Newell, R., & Stavins, R. (2015). Deconstructing the energy efficiency gap: conceptual framework and evidence. *American Economic Review*, 105(5), 183-186. Retrieved from https://econpapers.repec.org/article/aeaarec/v_3a105_3ay_3a2015_3ai_3a5_3ap_3a183-86.htm on 5/8/2018.
- James, D. (2013). Greening the traditional commercial lease: Building a case for sustainable commercial real estate through economically profitable green leases. *Drake Law Review* 61, 884-911.
- Janda, K. B., Bright, S., Patrick, J., Wilkinson, S., & Dixon, T. J. (2016). The evolution of green leases: towards inter-organisational environmental governance. *Building Research & Information*, 44(5-6), 660-674.
- Johnson, T., & Owens, L. (2009). Survey Response Rate Reporting in the Professional Literature. *American Association for Public Opinion Research-Survey Research Methods*, 127-133.
- Khasreen, M. M., Banfill, P. F., & Menzies, C. (2009). Life cycle assessment and the environmental impact of buildings: a review. *Sustainability*, 1, 674-701. Retrieved from www.mdpi.com/2071-1050/1/3/674/pdf on 14/08/2017.
- Michael, B. S. (2008). Green Leases and Green Buildings. *Probate & Property*, 23-26.

- Modu, M., Usman, A., Bulama, K., & Habib, G. A. (2014). The Impact of BREEAM Building's Sustainability Rating Criteria on The Value of Private Housing in London. *International Journal of Basic and Applied Science*, 169-180.
- Mudehwe, R., Chirisa, I., & Matamanda, A. R. (2016). Green Leasing in Zimbabwe: Lessons from Harare's Commercial Property Market. *International Journal of Real Estate Studies, Volume 10*, 12-24.
- Oberle, K., & Sloboda, M., (2010). The importance of 'greening' your commercial lease. *Real Estate Issues*, 32-41.
- Ratcliffe, J., Stubbs, M., & Keeping, M. (2009). *Urban planning and real estate development* (3rd ed.). USA: Routledge.
- Senn, M. A. (2012). Negotiating Green Leases. *Real Estate Finance* , 3-9.
- Teodorescu, C. D. (2014). The Leasing – Evolutions and Trends. *Economic Insights – Trends and Challenges Vol.III (LXVI)*, 85-92.
- United Nations. (2015). *Transforming our world: the 2030 agenda for sustainable development*. New York: United Nations. Retrieved from <https://sustainabledevelopment.un.org/.../21252030%20Agenda%20for%20Sustainabl..on> 4/8/2018.
- United Nations. (2017). *Sustainable development goals report*. New York: United Nations. retrieved from sdgactioncampaign.org/wp.../07/TheSustainableDevelopmentGoalsReport2017.pdf on 4/08/2018.
- Wiley, J. A., Benefield, J. D., & Johnson, K. H. (2010). Green design and the market for commercial office space. *Journal of Real Estate Finance & Economics*, 44, 228-243.

END

RESILIENCE THINKING IN SUPPORT OF SUSTAINABLE SMART CITIES**Edward Kurwakumire¹, Trevor Mapurisa² and Shelter Kuzhazha³***1 Tshwane University of Technology, Geomatics Department, Pretoria, South Africa**2 Midlands State University, Surveying and Geomatics Department, Gweru, Zimbabwe**3 Monash University, Department of Geography and Environmental Science, Ruimsig, South Africa*

The world today faces many challenges from a spatial planning perspective. The world population is ever-increasing. This results in an increase in people dwelling in urban areas, while problems of poverty, slums, environmental degradation, unforeseen natural disasters and food security keep escalating. Successful local governance results in an improvement of the quality of life of the citizens. The planning in place should be citizen-centred while incorporating the needs of people with varying socio-economic and cultural attributes. Urban design happens on land, which is a limited and non-elastic resource and thus spatial planning and related activities should be executed in a sustainable manner. Cities face a wide array of external shocks such as natural disasters which local government officers need to mitigate or circumvent in order to make cities sustainable. Sustainability needs to be extended to all sectors of planning to ensure sustainable development. Spatial planning needs to be agile and respond to shocks, which is essentially the concept, presented in the resilience theory. Resilience enables cities and nations to survive external and unpredicted shocks. This study investigates the practical application of the resilience spatial planning, including the level and areas that it can be applied en route to achieving sustainability of cities. This paper develops a resilience-based framework as a step towards achieving sustainability in spatial planning. The findings of this study reflect that, while the resilience theory has strong theoretical grounding, its practical application is still ambiguous. However, there is potential to integrate different resilience aspects in spatial planning components to improve the disaster preparedness of cities and city sustainability. Resilience benefits from multiple systems that are integrated and with access to real time spatial and non-spatial data to improve the decision making and response capabilities. A conceptual model for sustainability is presented as UrbRes Version 1.0.

Keywords: Resilience, Spatial Planning, Sustainability.

INTRODUCTION

The world today demands spatial planning to be more people or citizen centric (Resch et al., 2016) as opposed to traditional planning (Gans, 1969) while addressing different, if not all aspects of sustainable development in support of current and generations yet to come. This is due to the vast array of problems that are being faced in nations and worldwide that include climate change, natural disasters (Carter et al., 2007; Sawada and Takasaki, 2017), food security (Tilman et al., 2002), deforestation and traffic congestion among others. The citizens should be at the heart of urban planning (Ecklu, 2015) as it is the spaces they live in that land administration experts design, rearrange and regenerate through spatial planning. This means that spatial planning should be citizen centric (Resch et al., 2016) which leads to social resilience (Ecklu, 2015) while at the same time it is informed by good governance principles (Feltynowski, 2015; Virtudes, 2016). This is achieved if local governments implement a citizen centred governance approach (Barnes et al., 2008). In order to ensure that citizens

1 KurwakumireE@tut.ac.za

2 mapurisatp@staff.msu.ac.za

3 shelter.kuzhazha@monash.edu

enjoy a good quality of life, factors that promote good social interaction should be included in the planning process (Khalil, 2012). Governments as a result, have been implementing electronic government (e-government) projects (King and Cotterill, 2007; Sharma et al., 2014) to better improve citizen participation (Haider et al., 2014; Kingston, 2002) in national activities and in enhancing service delivery (Gajendra et al., 2012; Kurwakumire et al., 2016). To further the e-government effort, transformational government (t-government) was introduced to improve delivery of government services to the public (King and Cotterill, 2007).

Common worldwide problems include the increasing probability in loss of fisheries, forests, and water resources (Ostrom, 2009) through unsustainable exploitation by mankind and uncontrollable ones existing in the form of natural disasters, such as floods, hurricanes, droughts (Carter et al., 2007; Sawada and Takasaki, 2017) and earthquakes, that are seemingly increasing in frequency and intensity. This is sometimes due to the lack of common understanding regarding processes that improve or deteriorate natural resources according to (Ostrom, 2009) while in some cases, there lacks the necessary legislation or enforcement of law that regulate uncontrolled exploitation of natural resources.

Seldom, the nature and type of land tenure available plays a role in the proper management of the environment (Grega and Ankomah, 2016). Social tenure, such as communal tenure, has been traditionally associated with weaker mechanisms for environmental management (Gilolmo and Lobo, 2016) that lead to problems such as massive soil erosion, deforestation, overgrazing and siltation of rivers resulting from practicing agriculture along river-banks. It is the form of land registration and strengths of recognised land rights that influence positive or negative use of land and its natural resources (Andersen, 2011). This is contrary to findings by (Gilolmo and Lobo, 2016) in which land degradation occurred more in areas with formal and more secure land tenure.



Figure 1: Resilience and Sustainability Entities and Stakeholders

Institutions and their participation in national activities plays (see Figure 1) a pivotal role in achieving sustainability if they present good partnerships and cooperative work. These partnerships include Government to Government (G2G), Government to Business (G2B) and Government to non-Government (G2NG) amongst others. However, it must be recognised

that local institutions and sometimes governments do not always put forth policies that favour sustainability and may instead result in resource destruction (Ostrom, 2009; Uphoff, 1992). Uphoff (1992) argues that the challenge in this case, may be the choice of making a balance in establishing development that promotes economic activity at the expense of preserving the natural environment which is normally a habitat for plant and animal life, as well as a public space that can be used for the public's enjoyment through relaxation.

SUSTAINABILITY

Sustainability can be defined as the manner in which systems can regenerate in order to remain functional after interference from an external disturbance (Walker et al., 2002). Sustainability ensures the wellbeing of the future generations, socio ecological systems and irreplaceable natural resources (Kates et al., 2001; Kuhlman and Farrington, 2010) through an attempt to maintain equilibrium between mankind's needs for survival and the preservation of other life support systems on the planet Earth.

Sustainability is a term which is increasingly being used by researchers, politicians and informed members of the public, but it is unclear whether this reflects the sharing of a common understanding, even though some underlying concepts are similar across disciplines. The criteria for carrying out research within a sustainable systems framework are either ill-designed or non-existent (Park and Seaton, 1996). This is largely because of lack of one uniform and clear definition of sustainability as it is applicable in different fields of research and practice. Sustainability in the context of urban planning may involve striking a balance between mankind's need for development and survival and other social, environmental needs in a sustainable manner. This requires the effort of multiple stakeholders from different sectors (see Figure 1) through partnerships (Palmer et al., 2005) and is highly driven by Geospatial data (see Figure 2). Once a balance is struck, the interconnected systems need to achieve some level of reliance in order to maintain such balance.

PROBLEM CONTEXT

The spatial planning domain faces many challenges to include scarcity of land and other natural resources, increasing population, increasing poverty, natural disasters, inadequate housing and increasing slums. Natural disasters such as droughts and floods are occurring with increased severity. Nations worldwide seek to achieve sustainability yet there is no universal method or cookbook approach towards achieving it (Sefayang and Smith, 2007).

There is a definite need for adaptive, self-sustaining and sufficient environmental and non-environmental systems in order to achieve sustainability. Such systems are referred to as resilient systems. Failing resilience or the absence of resilience systems results in increased vulnerability of social and ecological systems to disasters (Adger et al., 2005) in terms of the extent of risk. A resilient social-ecological system comprises of a variety of mechanisms for adopting and coping with change and unexpected shocks. The systems achieve this through learning, adopting and developing defence mechanisms (Adger et al., 2005). It is thus necessary to have resilient systems for effective disaster management execution.

This study attempts to bring into light how to achieve sustainability in planning through the application of resilience theory and sustainability science towards the development of a resilience based sustainability framework as the application of resilience thinking in the field of spatial planning is still largely unexploited (Du Plessis, 2012).

THE RESILIENCE APPROACH

The resilience approach is significant and invaluable in understanding the dynamics of social-ecological systems due to its emphasis on non-linear dynamics, uncertainty and

surprise which are elements that characterise occurrence of events in the real world (Folke, 2006). Resilience defines the ability of a system to adapt, meaning the extent to which a system can maintain its self-organisation or composition and function after there has been a disturbance (Nelson et al., 2007).

The shocks that a city and its socio-ecological system can face include floods, tsunamis, and hurricanes (Adger et al., 2005). Resilience is the capacity which enables systems to maintain a state of equilibrium based on a regenerative capacity to sustain the ecosystem and human livelihoods after unexpected shocks (Adger et al., 2005). It is the belief of the authors that this analogy also applies to urban planning systems. The resilience concept attempts to control or rather prevent change in stable systems thus giving systems including urban design or spatial planning systems the capacity to cope with uncertainty and unexpected shocks as applied to socio-ecological systems (Adger et al., 2005). The concept of resilience can be extended to a community or society. Adger (2000) defines social resilience as “*the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change*”. This means the community does not exist in isolation but is interdependent with political and environmental systems.

From a sustainability point of view, the world thus exists as an integrated and interconnected socio-ecological, economic and political system. All sub-systems need to function properly to ensure effectiveness of the whole system. Resilience can be viewed as “the ability of systems to return to their stable equilibrium point after disruption” (Pickett et al., 2004) by some internal or external forces. In other words, this is the capacity of a system, such as, an urban system, to absorb shocks or disruptions while maintaining functionality as if undisturbed (Folke, 2006).

Sustainable development is difficult to achieve if cities cannot cope with external shocks. The city system in this case has to adapt and return to its initial state of equilibrium (Nelson et al., 2007; Walker et al., 2002) in order to remain functional. The cities should have a resilience capacity which is presented in form of an infrastructure in this study. This resilience capacity is key to achieving sustainability (Ahern, 2011).

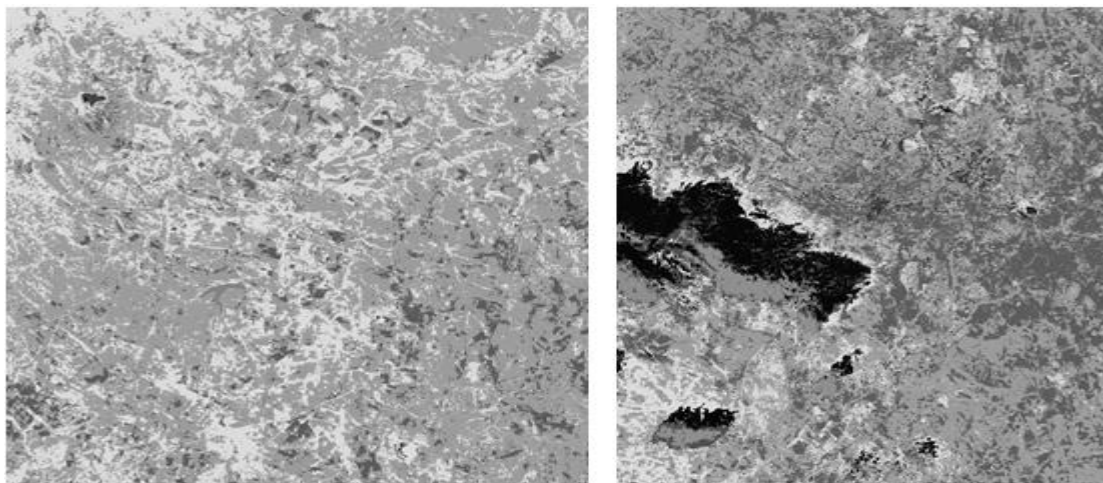


Figure 2: Multispectral remote sensing images: Source – USGS.GOV

Apart from resilient systems, disaster management is highly reliant on real time and other up-to-date spatial data such as multi-spectral remotely sensed imagery (see Figure 2) and real time weather information that is referenced to the earth’s surface. As such, the role of geospatial practitioners such as surveyors, geographic information system analysts and remote sensing specialists is invaluable in ensuring effective resilience mechanisms.

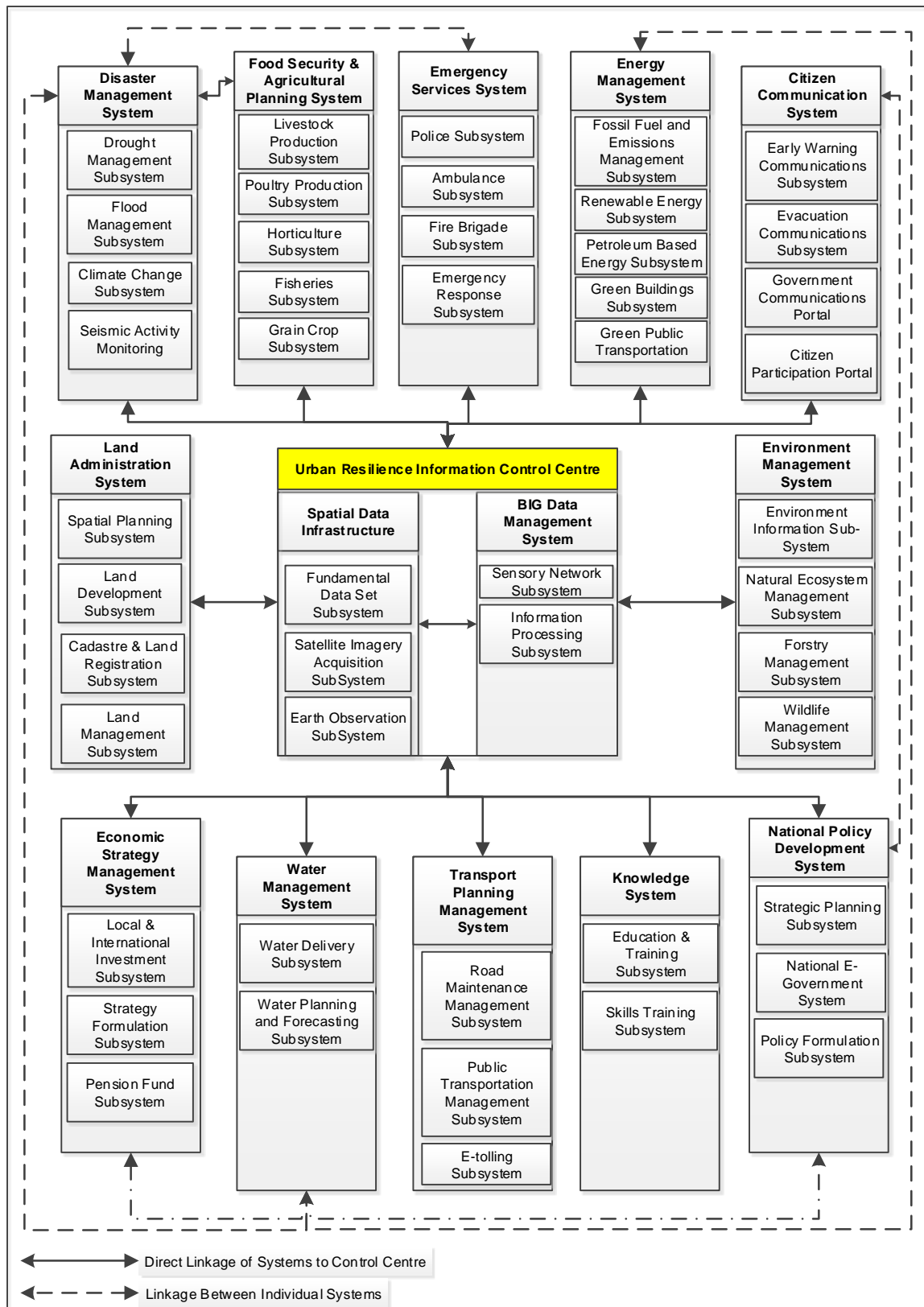


Figure 3: UrbRes Version 1.0 (Resilience Based Sustainability Framework)

TOWARDS A SUSTAINABILITY FRAMEWORK

Sustainability interventions need to be centred on solving problems being faced by communities with the citizens being part of the problem solving. A framework based on the resilience approach is developed by the authors and presented in Figure 3. It is not

comprehensive, but contains the essential systems and subsystems to enable cities to be resilient at a high level of abstraction. This framework, referred to as UrbRes Version 1.0, is based on a systems approach in the development of infrastructure for achieving sustainability. It is a system of systems, like a spatial data infrastructure, comprising of organisations and information systems in different geographical areas. The success of this sustainability framework is based on the willingness of organisations involved in developing and maintaining individual information systems and making sure real time updates are sent to the Resilience Information Control System (RICS).

Systems should be interoperable and linked to sensor networks so that data and information can be collected and accessed seamlessly in real time. The data in the RICS is of great importance as it is the basis for sustainability planning and decision making. The major challenge is, this framework fits into technologically advanced smart cities within the developed world. This does not mean that developing countries cannot adopt this model for managing resilience and sustainability. A piecemeal approach in which governments focus on development of one component at a time and integrating it with the RICS will see full implementation over several years. The second challenge is that, such as system is a key infrastructure just like a spatial or land information infrastructure or road network. This means, UrbRes requires continuous investment or funding from government and the private sector. There is a third challenge of the continued need to update the technology the system is based on in order to meet requirements of processing large amounts of data from the BIG data system in a timely fashion so that decisions can be rapidly made. This system requires continued capacity development of staff who develop, maintain and use the system, so that governments can reap the benefits from this huge investment. Above these challenges, good governance and leadership is key to the successful implementation of this sustainability framework.

UrbRes heavily relies on partnerships, information sharing, investment and reinvestment to keep the system functional. There are various partnerships and cooperation that are needed from different stakeholders. Partnerships in achieving sustainability are recommended in (Palmer et al., 2005). There is great need to share information in a timely fashion hence at the heart of the system in the Urban Resilience Control Centre, which has the Spatial Data Infrastructure (SDI) to enable decision support and BIG data management system to manage data from all other systems.

DISCUSSION

Sustainability involves maintaining equilibrium of a system when it is disturbed, or maintaining the elements needed to renew or reorganise, if a large disturbance or external shock radically alters structure and function (Walker et al., 2002) which is the resilience concept. Sustainability involves the management of linked social-ecological systems that behave as complex adaptive systems. Management of component systems and subsystems (see Figure 3) is thus integral to achieving sustainability (Walker et al., 2002). However, due to robustness of the sustainability framework (see Figure 3) there is need for several stakeholders (see Figure 1) to contribute in maintaining equilibrium of different systems.

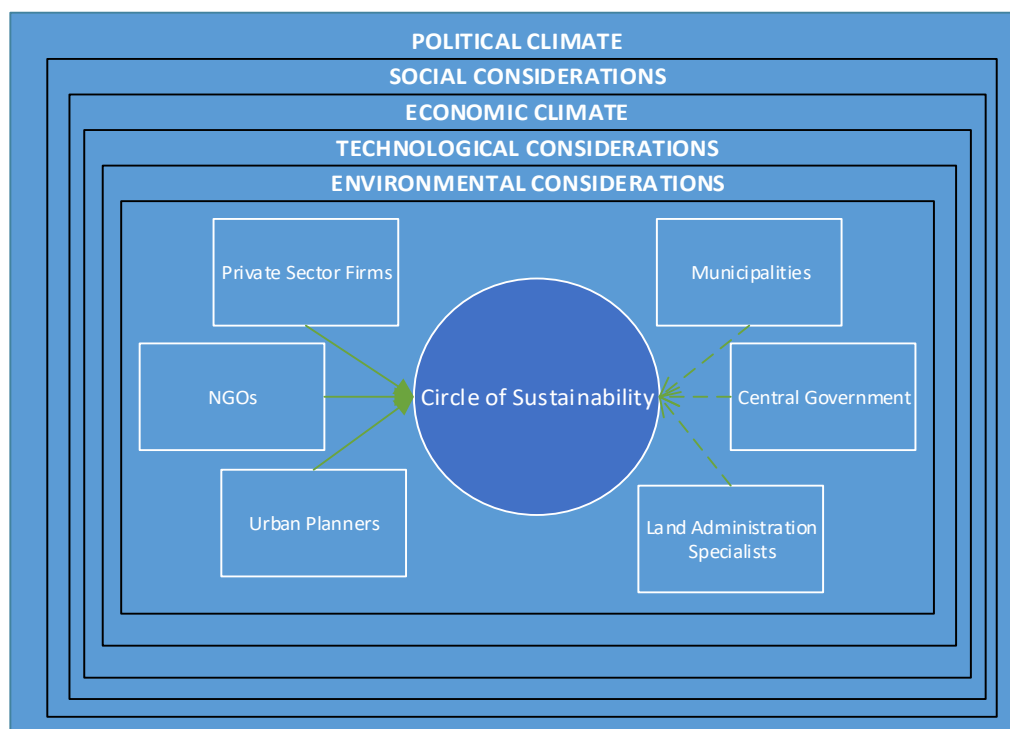


Figure 4: Resilience and Sustainability Management Framework

Managing sustainability is made more complex due to social, economic, environmental and technological considerations (see Figure 5) which result in uncertainties of different nature and magnitudes. These considerations for a particular place or municipality sit on layers on political, economic, social, technological and environmental influences (see Figure 4) affecting the state as a whole. These influences may actually be conflicting or competing against what municipalities need and often may it not be possible to align the local sustainability policy to the national one for the whole country.



Figure 5: The Circle of Sustainability

These competing aspects being into light questions such as: (1) What political climate is prevailing in the country and how does it affect sustainability?, (2) What pressing social requirements does the community have?, (3) What funding mechanisms and budget constraints exist?, (4) How can the nation cope with the changing technology and how can technology be properly harnessed in support of sustainable development and (5) What environmental functions does the nation have and where is the environmental damage that is high priority for regeneration? These questions are related to the political, social, economic,

technological and environmental layers respectively that are presented in Figure 4 and where there is need for equilibrium. Of important note is the increased availability of spatial data such as remote sensing data (see Figure 2) which is useful for monitoring, predicting and managing natural phenomena such as predicting floods and then managing an evacuation plan.

In order to achieve sustainability the political, social, economic, technological and environmental layers need to be in a state of equilibrium. These layers are interdependent so a shock or disturbance, for example, in the economic layer affects funding for activities in the political, social, technological and environmental layers. Thus the whole system should be in equilibrium with respect to its entities.

The circle of sustainability (Figure 5) comprises of 4 major entities namely the adoption of smart technology in support of sustainability and social, environmental and economic sustainability. The circle of sustainability is applied to manage sustainability at a local level such as at municipality level. All municipalities want social, economic and environmental systems to be resilient and sustainable. With the evolution of the smart city concept, municipalities are making efforts to support sustainability using smart information and communication technologies. Within the smart city concept a green environment, good quality of life for citizens and application of green technology are identified as some of the qualities of sustainable cities. The application of concepts presented in Figures 3, 4 and 5 can provide insight into how nations can achieve sustainable development.

CONCLUSIONS

Resilience thinking as a concept, can play an important role in achieving sustainability in spatial planning activities and national policy design and implementation though its practical application is still ambiguous. This paper develops the first version of a resilience-based sustainability framework through identification of systems where resilience aspects can be incorporated. It is based on a systems approach and supports inter-agency cooperation. This framework needs to be further developed and tested on a practical setting. This study is part of a larger research to develop a framework that can be applied in different settings, countries and cities as a basis for incorporating resilient thinking in sustainability related processes. Sustainability planning and decision making needs to be adaptive and, in some cases, anticipatory and predictive in nature. UrbRes version 1.0 provides agility in planning through provision of massive processed inter-agency real time information. UrbRes may provide a solution to problems of being unable to cope with disasters and other shocks faced in the developing world by local government. UrbRes is however not a one-size-fits-all solution but needs to be adapted to suit the particular context and neither can it independently operate as an autonomous decision-making system, but rather provides decision support. The infrastructure requires the skilled human capital to operate it and inter-organisational partnerships and investment-reinvestment are key to its success. In future, when the UrbRes model is complete, there is need to pilot on an urban setting to test its applicability.

REFERENCES

- Adger, W.N. (2000) Social and ecological resilience: are they related?. *Progress in human geography*, 24(3), pp. 347-364.
- Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R., and Rockström, J. (2005) Social-ecological resilience to coastal disasters. *Science*. 309(5737), pp. 1036-1039.
- Ahern, J. (2011) From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning*. 100, pp. 341–343.

- Andersen, K.E. (2011) Communal tenure and the governance of common property resources in Asia: Lessons from experiences in selected countries. Land Tenure Working Paper 20. Food and Agriculture Organisation of the United States. Available online at <http://www.fao.org/docrep/014/am658e/am658e00.pdf> [accessed 10 January 2019].
- Barnes, M., Skelcher, C., Beirens, H., Dalziel, R., Jeffares, S., and Wilson, L. (2008) Designing citizen-centred governance. Birmingham: Joseph Rowntree Foundation.
- Carter, M.R., Little, P.D., Mogues, T. and Negatu, W. (2007) Poverty traps and natural disasters in Ethiopia and Honduras. *World development*. 35(5), pp. 835-856.
- Du Plessis, C. (2012) Applying the theoretical framework of ecological resilience to the promotion of sustainability in the urban social-ecological system. *Smart and Sustainable Built Environments*. 4, pp. 495-502.
- Ecklu, G. (2015) Planning for the people. Available online at <https://www.urbanafrika.net/urban-voices/planning-for-the-people/> [accessed 10 January 2019].
- Feltynowski, M. (2015) Spatial information systems-a tool supporting good governance in spatial planning processes of green areas. *Journal of Urban and Regional Analysis*, 7(1), pp. 69-82.
- Folke, C. (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. *Global environmental change*. 16, pp. 253-267.
- Gajendra, S., Xi, B., and Wang, Q. (2012) E-government: Public participation and ethical issues. *Journal of e-Governance*, 35(4), pp. 195-204.
- Gans, H.J. (1969) Planning for people, not buildings. *Environment and Planning A*, 1(1), pp. 33-46.
- Gilolmo, P., and Lobo, A. (2016) On the relationship between land tenure and land degradation – A case study in the Otjozondjupa Region (Namibia) based on satellite data In: Proceedings of the international colloquium on global governance/politics, climate justice & agrarian/social justice: linkages and challenges. 4-5 February 2016.
- Grega, L., and Ankomah, E.K. (2016) The Environmental Effect of Land Use in the Tenure Systems in Ghana. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64(6), pp. 1889-1897.
- Haider, Z., Shuwen, C., and Hyder, S. (2014) Citizens' participation in e-government services: A Comparative Study of Pakistan & Singapore. *IOSR Journal of Electronics and Communication Engineering*, 9(6), pp. 35-38.
- Kates, R.W., Clark, W.C., Corell, R., Hall, J.M., Jaeger, C.C., Lowe, I., McCarthy, J.J., Schellnhuber, H.J., Bolin, B., Dickson, N.M., and Faucheux, S. (2001) Sustainability science. *Science*. 292(5517), pp. 641-642.
- Khalil, H.A.E.E. (2012) Enhancing quality of life through strategic urban planning. *Sustainable cities and society*, 5, pp. 77-86.
- King, S., and Cotterill, S. (2007) Transformational government? The role of information technology in delivering citizen-centric local public services. *Local Government Studies*. 33(3), pp. 333-354.
- Kingston, R. (2002) The role of e-government and public participation in the planning process. In Proceedings of XVI Aesop Congress, 10 -14 July 2002, Volos, Greece.
- Kuhlman, T., and Farrington, J. (2010) What is sustainability?. *Sustainability*. 2(11), pp. 3436-3448.
- Kurwakumire, E., Togarepi, S. and Masarira T.P. (2016) Democratization of Key Public Sector Information in Zimbabwe - The Road towards Open Information Access? In: Coleman, D., Rajabifard, A. and Cromptvoets, J. (Eds), *Spatial Enablement in a Smart World*, Gilbertville: GSDI Association Press.

- Ostrom, E. (2009) A general framework for analyzing sustainability of Social-Ecological Systems. *American Association for the Advancement of Science*. 325, pp. 419-422.
- Nelson, D.R., Adger, W.N., and Brown, K. (2007) Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*. 32, pp. 395-419.
- Palmer, M.A., Bernhardt, E.S., Chornesky, E.A., Collins, S.L., Dobson, A.P., Duke, C.S., Gold, B.D., Jacobson, R.B., Kingsland, S.E., Kranz, R.H., and Mappin, M.J. (2005) Ecological science and sustainability for the 21st century. *Frontiers in Ecology and the Environment*, 3(1), pp. 4-11.
- Park, J., and Seaton, R.A.F. (1996) Integrative research and sustainable agriculture. *Agricultural Systems*. 50, pp. 81–100.
- Pickett, S.T.A., Cadenasso, M.L., and Grove, J.M. (2004). Resilient cities: meaning, models, and metaphor for integrating the ecological, socio-economic, and planning realms. *Landscape and Urban Planning*. 69, pp. 369-384.
- Resch, B., Summa, A., Zeile, P., and Strube, M. (2016). Citizen-centric urban planning through extracting emotion information from Twitter in an interdisciplinary space-time-linguistics algorithm. *Urban Planning*. 1(2), pp. 114-127.
- Sawada, Y., and Takasaki, Y. (2017). Natural disaster, poverty, and development: An introduction. *World Development*, 94, pp. 2-15.
- Sefayang, G., and Smith, A. (2007) Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental Politics*. 16, pp. 584-603.
- Sharma, G., Bao, X., and Peng, L. (2014) Public Participation and Ethical Issues on E-governance: A Study Perspective in Nepal. *Electronic Journal of e-Government*. 12(1), pp. 82-96.
- Tilman, D., Cassman, K.G., Matson, P.A., Naylor, R., and Polasky, S. (2002) Agricultural sustainability and intensive production practices. *Nature*. 418(6898).
- Uphoff, N.T. (1992) Local institutions and participation for sustainable development - Sustainable Agriculture Programme of the International Institute for Environment and Development, London: Gate Keeper Series.
- Virtudes, A. (2016) ‘Good’Governance Principles in Spatial Planning at Local Scale. *Procedia engineering*, 161, pp. 1710-1714.
- Walker, B., Carpenter, S., Anderies, J., Abel, N., Cumming, G., Janssen, M., Lebel, L., Norberg, J., Peterson, G.D., and Pritchard, R. (2002). Resilience management in social-ecological systems: a working hypothesis for a participatory approach. *Conservation ecology*. 6(1).

END

A COMPARATIVE ANALYSIS OF ACADEMIC PERFORMANCE OF REAL ESTATE AND LAND MANAGEMENT STUDENTS' FROM PRIVATE AND GOVERNMENT SECONDARY SCHOOLS ENROLLED IN UNIVERSITY OF BOTSWANA

Johnson Kampamba¹ and Beldah Dimpho Sankoloba²

1 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

2 University of Botswana, Faculty of Engineering and Technology; Department of Architecture and Planning

This study compares academic performance of students from public and private secondary schools admitted at University of Botswana in Real Estate and Land Management programmes. Further variables such as the type of school they attended (private/public), students and or parent socio-economic background were analysed in order to determine their effects on performance. Students' performance data was obtained from the university system and was compared in order to determine their performance before and after they are enrolled in the two programmes offered by the University of Botswana. The purpose was to establish if there is any difference between the mean groups. A questionnaire was further administered randomly to a sample size of 82 students which was determined using Slovin's formula at 95% confidence level from a population of 102 students. Probability sampling technique was used to pick the sampling elements from the population. This was meant to understand whether the variables above had an effect on performance. Data was analysed using MS Excel. The study will help parents in future to make informed decisions whether to send their children to English medium schools or government schools based on the performance after they are enrolled in the University. The findings revealed that there is a statistically significant difference between the two groups' academic performance based on final secondary school results. On the other hand, there is no significant difference in terms of academic performance when they are enrolled in University. This could be attributed to that fact that they are taught one group when they enrol in these programmes. The implication is that parents should not stress themselves financially, as the results of the two groups when enrolled in university are the same. Private schools could be used as a gate way to university due to good grades that students get.

Keywords: Comparison, academic performance, private schools, public, real estate students.

INTRODUCTION

It is believed that public school graduates are handicapped academically in comparison with private school products, at least during the first year (Evans, 1995). According to Evans (1995) when average grades at University for the freshman year have been compared, however, it has generally been found that the public school group makes the better average than their counterparts.

1 kampambaj@mopipi.ub.bw

2 sankolobabeldah@gmail.com

Most of the studies (Witte, 1992; Sentamu, 2003; West, 1991; Davis, 1954; Kingdon, 1996) focused on comparing students' academic performance in public primary schools to private primary schools; one study (Kwesiga, 2002) focused on analysing academic performance of public and private junior high schools in the basic education certificate; and other studies (Kyoshaba, 2009; Geiser, S and Santelices, 2007; Sander, 1995; Evans, 1995; Neal, 1977) looked at the education offered by the catholic sector by critically analysing the academic performance of students enrolled in such schools and compared them to the performance of students enrolled in private and public schools.

None of the above studies have looked at comparing performance of students using Form V results as well as their University CGPA (cumulative grade point average) amongst students coming from private and public schools doing two programmes (Real Estate and Land Management). The majority of students from private senior secondary schools in Botswana make it to university with high entry points, but when they get at university their progression is uncertain. On the other hand, government secondary schools in Botswana produce a very small number of students that progress to university though progression in University is certain unlike their counterparts.

The purpose of this research is to compare the academic performance of the two tier schools using their Form V results as well as their cumulative CGPA whilst studying for the Bachelor of Science Real Estate and Bachelor of Land Management at the University of Botswana. The objectives of the study are:

- i. to establish the academic performance of Bachelor of Science Real Estate and Bachelor of Land management students from public and private senior secondary schools looking at their entry points; and
- ii. to establish the academic performance of BSc Real Estate and Land management students from public and private senior secondary schools looking at their CGPA's.

Therefore this research seek to answer the following research question 'what is the performance of students from public and private schools enrolled in University of Botswana studying for Bachelor of Science Real Estate and Bachelor of Land Management using Form V results as well as their current CGPA'?

This report is arranged into four major sections, section one covers the background and previous related literature, the next section describes the methodology that was used in addressing the research question and its objectives. Section four presents the results and analysis of the study and finally the conclusions are presented in the last section. This section discussed the introduction and the justification for this research. The next section presents the brief background of the study.

BACKGROUND OF THE STUDY AND BRIEF LITERATURE REVIEW

It is believed that students with higher entry points normally perform well at university (Evans, 1995). Prior performance at A level, Diploma and mature age examinations is the predominant admission criteria to Universities in Uganda (Kyoshaba, 2009). According to Kyoshaba (2009) prior academic performance is used by admission boards in the world to select students for admission. For example amongst many; in the United States, Minnesota measures (2007), in the United Kingdom, Waller & Foy (1987), in South Africa, Swart (1999) and in Kuwait, Mohammad & Alhameed (1988) . According to Staffolani & Bratti (2002) these standards of admission are used by several countries because the most important determinants of students' performance are measures of prior educational performance.

Academic performance is defined by students' reporting of past semester (Cumulative Grade Point Average) CGPA/GPA and their expected GPA for the current semester. The grade point average or GPA is now used by most of the tertiary institutions as a convenient summary measure of the academic performance of their students. The GPA is a better measurement because it provides a greater insight into the relative level of performance of individuals and different group of students. It is measured by the final grade earned in the course (Waller & Foy, 1987).

Historically it has been believed that academic performance is affected by various factors (Geiser and Santelices, 2007; Swart, 1999; Universities Admissions Center, 2006). These factors include admission points, social economic status, and the school background (Geiser and Santelices, 2007; Swart, 1999; Universities Admissions Center, 2006). Geiser and Santelices (2007) and Swart (1999) argued that it is the utmost factor that influence academic performance because it reflects on previous performance. According to the Universities Admissions Center (2006) it reported that selection ranked based on a student's overall academic achievement to enrol in universities in Austria is the best single predictor of tertiary success for most tertiary courses.

Ideally in Universities where private school graduates represent a sizable campus group (Davis, 1954); it seems to be commonly believed that public school graduates are handicapped academically in comparison with private school products, at least during the freshman year (Evans, 1995). When average grades at Princeton for the freshman year have been compared, however, it has generally been found that the public school group makes the better average.

Graetz (1995) implied that educational success is affected by social economic status of parents. In addition, Considine & Zappala (2002) further argued that most of the children with high level of education achievement, are from socially, educationally and economically advantaged families. This could be attributed to the fact that students are well exposed to private schools and scholastic materials, which aid their thinking capacity and intelligence. According to Graetz (1995) social economic status (SES) is defined as the overall position of a person social status in which is the domain contribute to both economic and social achievements. He continues on to stating that the social economic status of an individual is determined by achievements in employment, education, occupational status and income. In this study, social economic status (SES) is characterised by parental occupation, family income, and parental education. Graetz (1995) argues that children from low social economic status families perform poorly in school compared to children from high social economic status families.

On the other hand Sentamu (2003) and Kwesiga (2002) argued that academic performance of a student is influenced by the type of school that particular student is attending. However, Considine & Zappala (2002) observed that the most important determinants of a student's academic performance are measures of prior educational performance. This implies that the students will perform immaculately in their future academics if they have higher previous performance.

Private school offers high quality education at lower costs, this was argued by advocates of private education (West, 1991). Other authors such as (Levin, 1991) stated that schools best suited to meet the nation's educational demands are public schools. There are numerous studies that have provided some empirical support of the relative efficiency of private schools. Findings from these studies shows that students from private schools outperform public school students on standardized tests (Howell, 2004; Neal, 1977). On the other hand, (Krueger, 2004) and (Witte, 1992) finds that when certain characteristics are taken into

considerations (i.e. when controls for student, family back-ground, and other characteristics) the private school effect on achievement is very small. However, these findings do less to resolve the debate because we do not know if a substantial private school tests score effect (even with controls for student, family, and school characteristics) is due to a sector effect, or if omitted school or student characteristics are responsible for the private school advantage.

Private schools are cheaper to run and have better learning outcomes, making them much more cost-effective than public schools. This view is supported by Kingdon (1996) who stated that almost all studies on private schools in India found out that private school teachers earn a fraction of the salary received by a public school teacher. The extent to which the cost of running a school affects its performance has not however been indicated in any study thus raising this question “ do cost effective schools perform better than other schools which can be labelled as ‘results oriented not cost oriented schools?’”

Any analysis of the comparative efficacy/ efficiency of public and private schools will be incomplete without some discussion of the factors behind the better performance of private schools. In general, most studies find at least one of the following factors responsible for poor performance to be prevalent in public schools:

- High levels of teacher absence.
- Low levels of teaching activity conditional on teacher presence.
- High pupil–teacher ratios and multi-grade teaching.
- Unscheduled closure of schools leading to significantly fewer school days.

Private schools, on the other hand, have lower levels of teacher absence and higher levels of teaching activity (Levin, 1991). Classes are smaller in private schools and the phenomenon of multi-grade teaching is less prevalent. Moreover, accountability mechanisms are much greater in private schools as compared their counter parts (public schools) because private schools operates alongside commercial principles (Levin, 1991). Private schools are accountable for student’s performance to fee-paying parents who have the choice to take their children elsewhere if dissatisfied with the performance obtained by their children. On the other hand, no such incentives for performance exist in the context of public schools. Public school teachers, at least those with a regular status, have tenure for life. They are rewarded on the basis of seniority as measured by years in service and not on the basis of performance. (Levin, 1991)

In Botswana education is provided by public and private schools. The education is governed and regulated by Ministry of Education and Skills Development (Ministry of Education, 2002). In Botswana, public Schools are three times the size and also have the highest number of student than the private Schools (Ministry of Education, 2015). Currently more private Schools are emerging and are performing better in the IGCSE and most of the parents are taking their kids from public Schools to private schools on the basis that private schools provide quality education, have decent supervision, high parental commitment, motivation and good methodology leading to the commitment of kids in their education than public schools (Ministry of Education, 2015).

According to Ministry of Education (2015) every child was guaranteed ten years of basic education, leading to a Junior Certificate qualification. Approximately half of the school population attends a further two years of senior secondary school leading to the award of the Botswana General Certificate of Education (BGCSE). After leaving senior secondary school,

provided that the student performed immaculately, the students can attend one of the seven technical colleges in the country, or take vocational training courses in teaching or nursing (Ministry of Education, 2015).

University of Botswana, Botswana College of Agriculture and The Botswana Accountancy College in Gaborone were institutions that were considered by students who performed very well at senior secondary school.

RESEARCH DESIGN AND METHODOLOGY

University of Botswana was chosen as a study area as it offer the two programmes in which students from both private and public schools are enrolled in. Both programmes are offered with duration of 4 years. It was established that the total enrolled students in the two programmes was 102. This is a cross sectional quantitative research that was used on students study in Bachelor of Science Real Estate and Bachelor of Land Management. A questionnaire was chosen as it has the ability to cover large number of people within a shorter period of time and that it is cheap to conduct (Popper, 1959; Brown , 2001; Sekaran, 2013). A questionnaire was further administered randomly to the student population of 102 and a sample size of 82 students was determined using Slovin’s formula at 95% confidence level. Probability simple random sampling technique was used to pick the sampling elements from the population. This was meant to compare academic performance using the two variables being Form V results and CGPA. Data was analysed in MS Excel Data Analysis Tool Pack using a student T-test.

Data presentation and analysis

A total of 75 completed questionnaires distributed to students were returned, from 102 total questionnaires sent out. This resembles a response rate of 73.5%. The high response rate indicates the high interest level of respondents to this subject.

Demographic analysis

The demographic characteristics of the respondents covered five categories. These were: gender, age, programmes of study, year of study, and previous senior secondary school. The demographic data revealed that 44% of the respondents were males while 56% were females. From the finding it shows that there are no respondents aged +31 years and above, 4% of the sample population are aged between 26 – 30 years, 74.7% are aged between 21-25 years and lastly 21.3% of the respondents are aged less than 20 years. From the study sample of 75 students, 46 (61.3%) respondents confirmed to be studying BSc Real Estate whilst 29 (38.7%) respondents were studying Land Management. It was also noted that 24 (32%) students confirmed that they were 4th years, 16 (21.3%) students were doing 3rd year, 12 (16%) students were from 2nd year and 1st year had only 23 (30.7%) respondents. It is evident that the majority of the respondents 59 (78.7%) indicated that they are from public senior secondary schools while 16 (21.3%) stated that they were from private senior secondary schools.

In addressing objective 1 which was ‘To establish the academic performance of BSc Real Estate and Land management students from public and private senior secondary schools looking at their entry Form Five results’. To address this objective, question 5 and question 6 in the questionnaire were used. Which senior secondary school did you attend? The respondents were asked to state whether they were from public or private senior secondary schools. The results are presented in Figure 1 below. The pie chart below shows that a majority (78.7%) of the respondents indicated that they were from public schools while (21.3%) from private senior secondary school.

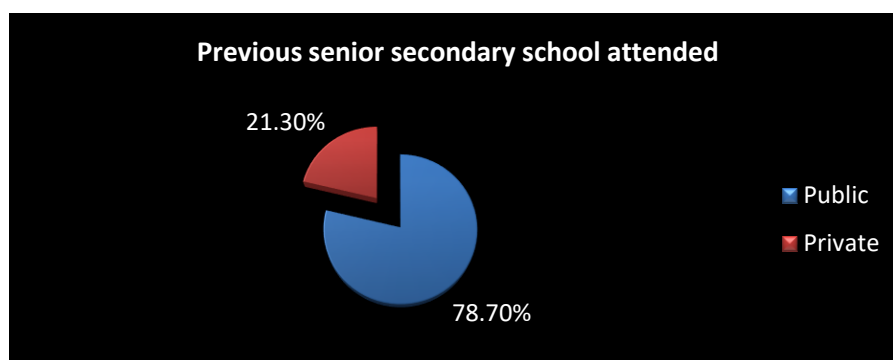


Figure 1: Previous senior secondary school attended
Source: field survey

This results indicates that public senior secondary schools are the most attended schools by most people which is in agreement with (Coleman, 1982) who stated that most parents take children to public schools as the costs are way cheaper as compared to taking children to private senior secondary schools.

Respondents were asked to state the points that they obtained from their previous senior secondary school. The purpose of this question was to find out or rather compare the points obtained by students from public and private senior schools enrolled in Bachelor of Science Real Estate and Bachelor of Land Management. A student t-test for two samples assuming unequal variances was used to analyze results in Table 1 below.

Table 4: t-Test two sample assuming unequal variances

<i>Descriptors used to evaluate the outcome</i>	<i>Public Points</i>	<i>Private Points</i>
Mean	43.86	45.13
Variance	3.12	1.32
Observations	59	16
Hypothesized Mean Difference	0	
Df	37	
t Stat	-3.43	
P(T<=t) one-tail	0.000751188	
t Critical one-tail	1.69	
P(T<=t) two-tail	0.001502376	
t Critical two-tail	2.03	

Source: Field survey

For the results in Table 1 above t- Test was used to predict the relationship between the two groups (public and private) using students entry points to university. This model was used to assess whether the means of two groups are statistically different from each other. This analysis is appropriate whenever you want to compare the means of two groups. The standard error (e) was = 5%. When the computed *P- Value* is less than alpha (0.05) ($P < 0.05$) ($t = -3.43$, $dof = 73$; $p = 0.0015$) then we reject the null hypothesis (H_0) in other words there is no difference between the means. This means that there is statistically a difference between the two means of the groups. Also if the computed T- Static is greater than the critical T values then it means that it falls in the reject region in the t distribution. We can reject in this case

the null hypothesis that the two means are the same therefore there is a difference statistically between the groups.

In Table 1 above, when we look at the computed t- static which is -3.43 it is less than the t- two critical value which is ± 2.03 , therefore it falls under the reject region in the t-distribution. In this case we reject the null hypothesis that the two means are the same, therefore there is statistically significant difference between the groups (private and public student's entry points) thus the null hypothesis is rejected. Also we can use the P-Value to test the hypothesis and see if we will get the same results as using the t-statistic and critical value. The reason is that, the school environment for the two groups are totally different and also they are taught by different people and lastly you will find that the students do not do the same the subjects.

In addressing objective 2 which was 'to establish the academic performance of Bachelor of Science Real Estate and Bachelor of Land Management students from public and private senior secondary schools using their CGPA's. To address this objective, the questionnaire had a section that was used to compare CGPA between private and public students.

Analysis of the CGPA of Real Estate and Land Management Students

The respondents were asked to state their current CGPA. The purpose of this question was to find out and compare the CGPA obtained by students from public and private senior secondary schools while studying Bachelor of Science Real Estate and Bachelor of Land Management at the University of Botswana. A student t-Test for two samples assuming unequal variances model was used to analyse the results.

Table 5: t-Test two sample assuming unequal variances

<i>Descriptors used to</i>	<i>Public CGPA</i>	<i>Private CGPA</i>
Mean	3.60	3.14
Variance	14.40	0.21
Observations	59	16
Hypothesized Mean Difference	0	
Df	64	
t Stat	0.91	
P(T<=t) one-tail	0.18	
t Critical one-tail	1.67	
P(T<=t) two-tail	0.37	
t Critical two-tail	1.99	

Source: Field survey

For the results in Table 2 above, t- Test using two sample assuming unequal variances analysis model was used to predict the relationship between the two groups (public and private) using students current CGPA. This model was used to assess whether the means of two groups are statistically different from each other. This analysis is appropriate whenever you want to compare the means of two groups. The standard error (e) was = 10%. When computed P- Value is less than alpha (0.05) ($P = 0.37 > 0.05$) ($t = 0.91$, $dof = 73$; $p = 0.37$) for two tail then we reject the null hypothesis (H_0) in other words there is no statistically significant difference between the means. In this case the computed p value 0.37 is greater than the critical p value 0.05. This means that there is no statistically significant difference

between the two means of the groups. Also if the T- Static is less than the critical values then it means that it falls in the acceptance region in the t distribution. We can accept in this case the null hypothesis that the two means are the same therefore there is no difference statistically between the groups.

In the table above, when we look at the T- static value which is 0.91 it is less than the t-critical value which is 1.99 therefore it does not fall under the reject region in the t distribution. In this case we fail to reject the null hypothesis that is the two means are not the same therefore there is no difference statistically between the groups (private and public CGPA). This is in agreement with the author (Cohen, 1983) who implied that if the P- Value is greater than the significance level or alpha level we fail to reject the null hypothesis. The results confirmed what other authors had found in previous related studies such as (Cohen, 1983; Ruby, 1988; Howel, 2004; & Sinclair, 1998) and also differed with others such as (Osterman, 2000; Evans, 1995; Graetz, 1995 & Considine & Zappala, 2000). The reason for the results is that both students from public and private are in the same class taught by the same lecturers and also they are doing the same course and lastly the environment is the same.

CONCLUSIONS

The majority of the students from private senior secondary schools get into university with high entry points but end up failing and discontinuing. The implication is that their senior secondary schools did not prepare them for university challenges in terms of learning.

It was also noted that there was no significant difference in the performance of the two groups at University, even though the mean for students from private secondary schools was lower than the students from public secondary schools. This has resulted in students from private secondary schools struggling academically and are attributed with high dropout rates. This implies that the chances of completing studies at university are doubtful for students from private secondary schools.

The implications that these results have on policy is that it is time that policy makers look at the education framework using the two tier systems in Botswana so that it can address the challenges that students from private secondary schools are facing.

Recommendations

These recommendations are aimed at addressing the issues discovered in this research study:

- Educators should establish shortcomings if any or issues that of concern/gaps arising from two tier Botswana education system, private and public senior schools, how they affect learners at University particularly Real Estate and Land Management programmes;
- Educators should ensure that private senior secondary school results correlate with performance at university undergraduate Real Estate and Land Management;
- Universities should consider admitting students from private senior secondary schools after they have done A levels;
- Lecturers should ensure that entrants from both public and senior secondary school should be provided with foundational courses to leverage/bring them at par with the university set up/content;
- Parents should not take their children to private schools as it is costly and at the end of the day those children are going to end up in the same class with students from public

schools and pursue the same endeavour and sometime those children end up failing which makes it very unnecessary to have paid so much money;

- Educators at private senior schools should ensure that they do not spoon feed their students as this kills their thinking capacity as they end up struggling at University; and
- Similar further study can be extended to other universities using a larger sample than the one used in this study.

REFERENCES

- Considine, G. & Zappala, G. (2002). Influence of social and economic disadvantage in the academic performance of school students in Australia. *Journal of Sociology*, 38, 129-148. Retrieved on August 16, 2007 from <http://jos.sagepub.com>.
- Davis, J. A. (1954). *Academic performance of public and private school graduates at Princeton*. Ministry of Education (2015). Ministry of Education and Skills Development. Gaborone, Government Printers.
- Ministry of Education (2015). Ministry of Education and Skills Development. Gaborone, Government Printers.
- Evans, W. a. (1995). Finishing High School and Starting College: Do Catholic Schools Matter? *Quarterly Journal of Economics*. 941-974.
- Geiser, S and Santelices, V. M. . (2007). Validity of high school grades in predicting student success beyond the freshman year. Retrieved on February 8, 2008 from http://cshe.berkeley.edu/publications/docs/ROPS.GEISER_SAT_6.12.07.pdf.
- Graetz, B. (1995). Socioeconomic Status in Education Research and Policy. In Ainley, J, Graetz, B., Long, M. and Batten, M. (Eds). *Social economic Status and School Education*. Canberra: DEET/ACER.
- Kingdon, G. (1996). The quality and efficiency of public and private education: A case study of Urban India. *Oxford Bulletin of Economics and Statistics* 58. 57-82.
- Kwesiga, C. (2002). *Women's access to higher education in Africa: Uganda's experience*. Kampala: Fountain publishers Ltd.
- Kyoshaba, M., (2009). *Factors affecting academic performance of undergraduate students at Uganda Christian University*.
- Mohammad, Y.H.S and Alhameed, M.A . (1988). An evaluation of traditional admission standards in predicting Kuwait University students' academic performance. *Higher education* Vol.17, No.2. Kluwer Academic Publishers, Dordrecht Netherlands.
- Neal, D. (1977). The Effects of Catholic Secondary Educational Attainment. . *Journal of Labor Economics*, January, , 98-123.
- Popper, K. (1959). Importance of questionnaires in a research. In K. Popper. USA.
- Sander, W. a. (1995). Catholic Schools, Dropout Rates, and Educational Attainment. *Economic*. 317-33.
- Sentamu, N. (2003). School's influence of learning: A case of upper primary schools in Kampala & Wakiso Districts. *Uganda Education Journal* , 4.
- Swart, A. (1999). Evaluation of the assessment strategy for admission at Pretoria University. Retrieved on February 14, 2007.
- Universities Admissions Center. (2006). *Universities Admission Index (2006)* Retrieved on February 14, 2007 from <http://www.uac.edu.au/admin/uai.html>.

Waller, D.M and Foy, J. M. (1987). Using British school examinations as a predictor of university performance in pharmacy course: A correlative study. *Higher Education* , Vol 16, No.6, Retrieved on July 4, 2008 from <http://www.jstor.org/stable/3446847>.

West, E. (1991). Public Schools and Excess Burdens. *Economics of Education Review*,. USMC. Enlisted Commissioning Program: <https://web.merc.usmc.mil/G3/Officer/mc03001.html>, 159-169.

Witte, J. (1992). Private School Versus Public School Achievement: Are There Findings That Should Affect the Educational Choice Debate? *Economics of Education Review*,, 371-394.

END

CONSTRUCTION

AN ANALYSIS OF THE GREEN BUILDING CONCEPT AS A BUSINESS CASE IN BOTSWANA

Johnson Kampamba¹ Milidzani Majingo² Simon Kachepa³ and Banyaditse Mogale⁴

1 University of Botswana, Faculty of Engineering and Technology

2 University of Botswana, Faculty of Engineering and Technology

3 University of Botswana, Faculty of Engineering and Technology

4 University of Botswana, Faculty of Engineering and Technology

The aim of this study was to identify services and products instrumental in creating a new market for sustainable development in Botswana real estate industry through the use of green technology. It exploited ways in which green technology could revolutionize the property sector in Botswana. It further investigated the real estate industry's relationship to sustainability, energy markets, demographic changes (Economics) and different technologies in the energy efficiency hemisphere but however did not dwell much into the architectural aspect. A comprehensive literature review was undertaken to provide an overview of the green building concept. A quantitative research approach was adopted and data collected through the use of a questionnaire survey of randomly selected professional architects and developers. The descriptive (mean) and inferential statistics were used to analyse the data. The results showed that Botswana is still at infant stage and cannot sustain the green building concept market due to several factors such as limited resources and lack of knowledge. Government should develop a policy on the green building concept and educate stakeholders on how to make sustainable development a business case in Botswana.

Keywords: Sustainable development, green building concept, real estate industry, Botswana.

INTRODUCTION

The property market has been dominated by the use of traditional non-sustainable buildings, thus as time changes so does the need to diversify. Diversity in terms of style is not the only aspect that needs to be addressed. Buildings consume a large amount of energy for operation (Mao, Shen, Luo, and Li, 2015; Bakaya-Kyahurwa, 2004). Zhong and Liu (2012) stated that green buildings represent one of the most significant and exciting opportunities for sustainable growth on both national and global scales. As Botswana's real estate market continues to grow, innovative ways to improve the real estate market emerge and green technology is one of them. Hall and Link (2015) also noted that the building sector is a driver of GDP, and green building concept offers an opportunity for the increased output with decreased negative impact on the environment. They further state that global construction will increase significantly by 2020 with markets moving towards resource efficiency. Fregonara, et al. (2013) further noted that green buildings take an intelligent approach to energy use. Even though green buildings represent a new phase in construction, most existing buildings are not green, and these structures will keep on being used for a long time to come (Howe, 2005). Enhancing the productivity of existing buildings includes a procedure called retrofitting, which means anything from introducing more vitality proficient fixtures to

1 kampambaj@mopipi.ub.bw

2 Majingom@mopipi.ub.bw

3 Kachepas@mopipi.ub.bw

4 mrbanyaditse@gmail.com

expanding the measure of protection in a building (Howe, 2005). Botswana as a nation can promote this new green building concept to reduce its energy use and make this an alternative investment.

Globally, governments are embracing the use of green building concept as the energy crisis and global warming issues continue to elevate (Mao, Shen, Luo, and Li, 2015; Bakaya-Kyahurwa, 2004; Cole and Kernan, 1996; Green & Dixon, 2016). In Africa, South Africa is one of the few African countries to have adopted green building concept (Simpeh & Smallwood, 2015; Dodge Data and Analytics, 2013; Bakaya-Kyahurwa, 2004). The adoption of the green building concept has helped countries reduce energy consumption, and also reduce the impact on the environment Mao, Shen, Luo, and Li, 2015; Bakaya-Kyahurwa, 2004; Cole and Kernan, 1996; Green and Dixon, 2016; Simpeh and Smallwood, 2015; Dodge Data and Analytics, 2013; Bakaya-Kyahurwa, 2004). Despite the call for sustainable development practices by the United Nations and the World Bank, Botswana has not yet embraced the green building concept thus experiencing power shortages. The consequences of failing to embrace the green building concept are environmental degradation and global warming. The purpose of this study was to establish if the adoption of a green building concept in Botswana would create a market for green building materials and services for existing and new buildings. If the green building concept is embraced, the built environment will need the advisory services from green building consultants on how to retrofit existing buildings so that they are adaptable and how design and cost green building materials. By so doing, this will stimulate the market for green building materials. The objectives for this study were:

- To establish if the introduction of green building concept can support an entirely new market of building materials and services for existing and new buildings;
- To identify the target customers for building materials and services for existing and new buildings; and
- To find ways to promote the green building concept and identify the stakeholder that can make the transition a success.

This report is arranged into four major sections, section one covers the background and previous related literature, section two describes the methodology. Section three presents the results and analysis of the study and finally the conclusions are presented in the last section. The next section presents the background and brief literature review of the study.

BACKGROUND OF THE STUDY AND BRIEF LITERATURE REVIEW

According to Mao, Shen, Luo, and Li (2015) the green building concept extend beyond the walls of buildings and can include site planning, community and land use planning issues. Chao defines a green building concept as the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials, and reducing building impacts on human health and the environment over the entire life cycle of the building.

The green building concept, according to Green and Dixon (2016) evolved in the early 1970s as a result of the increase of fuel costs and concerns about the environment. On the contrary, Jian-lei (2015) states that the history of green building concept dates back from the early 1800s' to the early 1900s' during the industrial revolution in which the transformation of solar energy into electrical energy was implemented. Green and Dixon (2016) stated that, consultants such as Architects and ecologists started looking for solutions like reflective roofing materials and other innovative measures to save energy. With the decrease of fuel prices, the green movement was slowed down and did not receive much encouragement (Green and Dixon, 2016). It was later in early 90's that the green building concept gained momentum and the need for sustainable buildings was encouraged. This resulted in an

official Green home building programme that started in Austin, Texas in 1991 (Green and Dixon, 2016). In addition, Akadiri, Chinyio, and Olomolaiye (2012) stated that the U.S. Green Building Council has a rating standard particularly centred on existing buildings, called EBOM (existing buildings operation and maintenance).

The start of the twenty-first century introduced the era of green structures (Howe, 2005). Following the establishment of the green building concept, an investigation to evaluate existing buildings was conducted and it noted that about 81 million buildings in the United States were creating a lot of waste and gases during development and operation. Upon the establishment of green building concept, governments all over the world have taken a step in making this phenomenon a reality (Green and Dixon, 2016; Jian-lei, 2015; Howe, 2005). The World Green Building Council was founded in 1999 and was formally incorporated in 2002 (Beck, Thorsten, and Maimbo, 2013). Its mandate was “to facilitate the global transformation of the building industry towards sustainability through market driven mechanisms.” The councils are responsible for monitoring and raising awareness about sustainability and green buildings (Beck, Thorsten, and Maimbo, 2013). The world green building council (WGBC) noted that 17 countries have official green building councils and expect the number of countries forming green building councils to increase (Howe, 2005). In Africa, South Africa has adopted green building concept and has already established the green building council (Simpheh and Smallwood, 2015). Further, Gunnell (2009) stated that 51% of South African firms were expected to build structures in line with the green building concept.

On the supply side, the key stakeholders that are likely to participate in the implementation of the green building concept and develop strategies are architects, building engineers, owners and property managers, property developers, quantity surveyors and contractors (Elforгани and Rahmat, 2010). On the demand side, inhabitants, for the most part private companies, consider locating their workplaces in green structures for different economic, productivity, environmental and social advantages (Cole and Kernan, 1996; Mao, Shen, Luo, and Li, 2015; Simons, Choi, and Simons, 2009).

The main attributes that a green building concept tries achieve are:

- iii. resource efficiency (Jiaying, 2016; Yuon, 2013; Akadiri, Chinyio, and Olomolaiye, 2012; Howe, 2005; Plunkett, 2013; Isa, Samad, and Alias, 2014);
- iv. material efficiency (Jiaying, 2016; Zhong and Liu, 2012; Jong-Jin, 1998);
- v. water efficiency (Jiaying, 2016; Cole and Kernan, 1996; Akadiri, Chinyio, and Olomolaiye, 2012; Howe, 2005);
- vi. indoor air quality (Yuon, 2013; Hall and Link, 2015; Mao, Shen, Luo, and Li, 2015; Iveson, 2014).

However, any concept has benefits and limitations. The benefits of the green building concept are:

- vii. Cost savings (Green and Dixon, 2016);
- viii. health and safety (Green and Dixon, 2016);
- ix. value addition (Green and Dixon);
- x. ecological (Green and Dixon, 2016; Mao, Shen, Luo, and Li, 2015; Simons, Choi, and Simons, 2009);
- xi. Environmental (Green and Dixon, 2016);
- xii. economic (Green and Dixon, 2016; Mao, Shen, Luo, and Li, 2015; Simons, Choi, and Simons, 2009);
- xiii. social (Mao, Shen, Luo, and Li, 2015; Simons, Choi, and Simons, 2009).

On the other hand, the limitations of the green building concept are:

- xiv. additional costs (Jian-lei, 2015);
- xv. building location and orientation (Iveson, 2014);
- xvi. availability of building materials (Iveson, 2014)
- xvii. lack of market for building materials
- xviii. Lack of knowledge on the clients
- xix. Lack of finances;
- xx. resistance to change due to cultural factors (Kwame and Julian, 2015).

Finally the business opportunities that might be created by the green building concept are:

- xxi. Suppliers of construction materials;
- xxii. eco friendly landscaping;
- xxiii. green waste facilities management;
- xxiv. green building valuations;
- xxv. green building consultancies (Yuon, 2013; Zhang, 2015).

RESEARCH METHODOLOGY

The target population was 150 real estate developers and architects. This list of developers and architects was used in coming up with the 110 sample size for the study which was determined using Slovin's formula at 95% confidence level with a 5% margin of error/level of significance. These were randomly chosen because of their experience in the construction field. The data collection instrument that was used was a questionnaire. It was chosen because it is cost effective and has the ability to cover a large number of respondents over a short period of time (Creswell, 2014). The questionnaire contained the green building concept and variables that might identify a market for the building materials and related services. A total of 110 questionnaires were randomly administered and a response rate of 68% (75) was achieved.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents

From the results, it was noted that 72% of the respondents were males and 28% were females comprising 60% architects and 40% developers. The majority of the respondents (63%) had ages ranging from 31 and above where as 37% ranged from 20 to 30 years. They were all (100%) in management positions ranging from assistant to senior managers and that the majority (83%) of the respondents had diplomas, degrees, and PhDs whereas very few (17%) had certificates. It was also noted that 53% of the respondents had work experience in excess of 6 years and 47% below 5 years. It was clear from the survey that 72% of the architects and 28% of the developers had knowledge of green building concept. It is clear from the finding that the architects are more knowledgeable than the developers. This might have a negative impact on the implementation of the green building concept on the part of the developers. This finding is consistent with Elforgani & Rahmat (2010) who stated that the architects are amongst the most influential in the design and construction the green buildings.

Respondents were asked to indicate their level of agreement to the statement that "existing market can serve as a platform to support a new green building market in Botswana". This was done using a five point Likert scale (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree). Figure 1 below indicates the results for the market for green buildings.

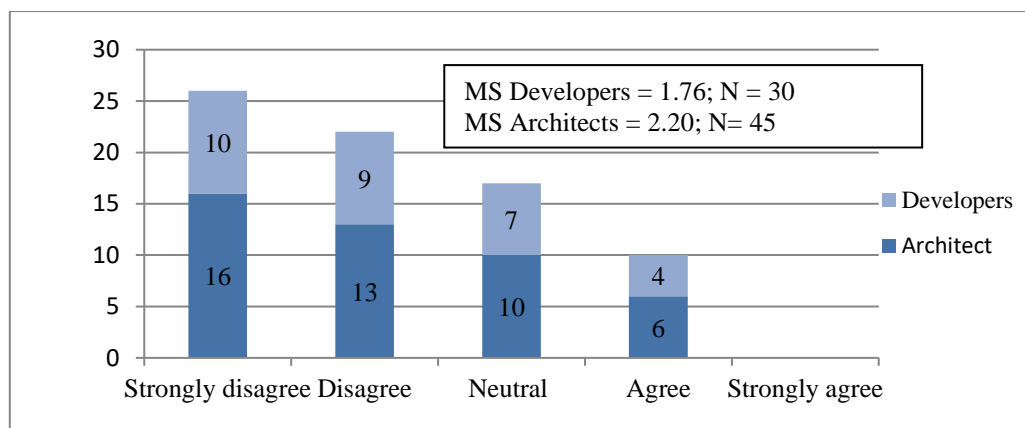


Figure 1: Market for green buildings

Source: Field Survey

The graph is skewed to the right which indicates that the majority of the population disagrees that the existing market can serve as a platform to support a green building market in Botswana. The respondents argued that the main reason why they disagree that the current market could support that of green buildings was that it has never been done in Botswana. They elaborated that without experience there would be a lot of complications and in addition there are no green buildings. However there could be a slight chance that the existing buildings could indeed support the new market. Howe (2005) and Iveson (2014) notes that ‘enhancing the productivity of existing structures commonly includes a procedure called retrofitting, which means anything from introducing more vitality proficient fixtures to expanding the measure of protection in a building’. Perhaps there is no need to wait for someone to build the green building to initiate the market. These added fixtures could be the stimulating factor for a new market. On the other hand, Jiaying (2016) further noted that the materials selected should have the ability to be recycled or reused at the end of their useful life, and that building materials, components and systems should be found locally or regionally to save energy and transportation cost to the project site. Though the result of this study does not support the green market in Botswana, it is clear that the point raised by Jiaying (2016) is relevant in the local market.

Respondents were asked if there are any green buildings in Botswana. It was clear that most of the respondents (92%) indicated that there are no green buildings in Botswana while the remaining (8%) respondents said there are green buildings in Botswana. The respondents were further asked why they indicated so. The reason for this was that Botswana is a developing country which lacks the knowhow and the finances. This result compares with what was noted by other authors (Beck, Thorsten, and Maimbo, 2013; Howe, 2005

Simpeh & Smallwood, 2015) in terms of the small number national green building councils that have been set up.

Respondents were asked to rate public interest on green buildings using a five point Likert scale of 1 being not significant and 5 being highly significant. The responses are concentrated in the middle of the graph which shows that the respondents to some degree are neutral on the public being interested on the green building concept as indicated in their mean scores of 3.23 and 3.04. These results are contrary to what Gunnell (2009) indicated in South Africa that 51% of the firms were expected to build structures in line with the green building concept. The respondents were further asked why they had no interest in the green building concept.

They explained that the public were not really concerned at all about the green building concept.

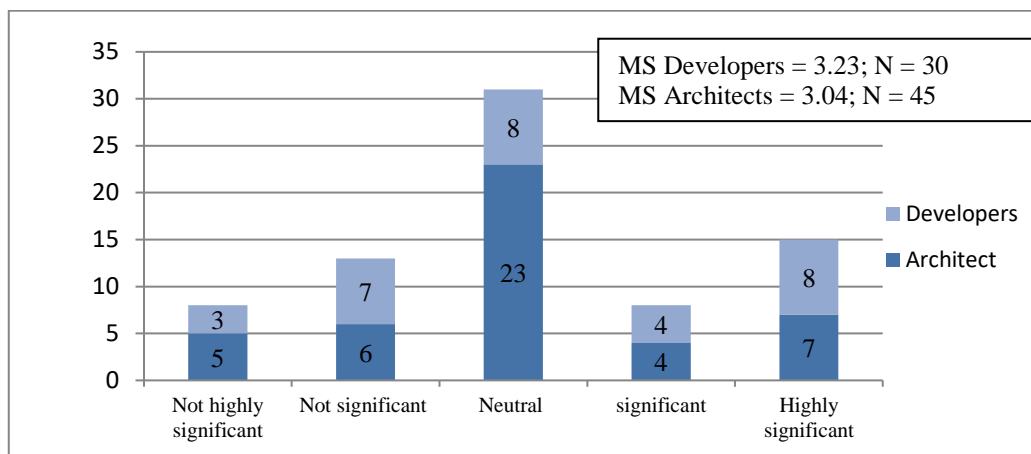


Figure 2: Public interest in green buildings
Source: Field Survey

Respondents were asked to indicate the degree of significance of the following features that can be adopted in the existing buildings in Botswana in Table 1 below. It was noted that as far as water-efficient fittings and rain-water harvesting are concerned, the entire sample agreed that these fixtures were highly significant and were perhaps the most important. When asked why they thought that the fitting of water efficient components in the building were highly significant, most of the respondents were quick to point out that water is an important resource in the building and its shortage usually leads to the collapse of the activity on the building, thus a green building with such a fixture would be very useful. This can be related to Jiaying (2016) who points out that sustainable buildings should be able to reduce water consumption and protect water quality.

Table 1: Features that can be adopted into the current traditional buildings in Botswana

Mean score 1 to 5, (Very low degree = 1), (low degree = 2), (Neutral = 3), (High degree = 4), (Very High degree = 5)								
Equation if Score is for $X < 1.49$ (Very low degree), if Score is $1.50 \leq X < 2.49$ (Low degree), if Score is $2.50 \leq X < 3.49$ (Neutral), if Score is $3.50 \leq X < 4.49$ (High) if Score is for $X \geq 4.50$ (Very high degree)								
	1	2	3	4	5	N	Mean	Comment
Water-efficient fittings	0	0	0	0	75	75	5	Very high degree
Rain-water harvesting	0	0	0	0	75	75	5	Very high degree
Air tightness and vapour barrier	0	20	13	42	0	75	3.29	Neutral
Low solar heat gain coefficient of glass	38	24	12	1	0	75	1.87	Low degree

Objective 1: projected market performance

Respondents were asked to rank the projected market performance of green buildings in Botswana using the Likert Scale of 1 being very bad to 5 being very good. The respondents projected that the market performance of green buildings would be bad as indicated by their mean scores (2.03, Developers and 1.81, Architects). When asked to explain their results, the respondents pointed out that there is no demand for the product and it is most unlikely that the market will perform well. Demand for a product is very important in marketing because it gives the product value and reason to be produced, as justified by DiPasquale & Wheaton (1996). However, this contrary to what is believed by Jiaying (2016) that the materials selected should have the ability to be recycled or reused at the end of their useful life, and

that building materials, components and systems should be found locally or regionally to save energy and transportation cost to the project site.

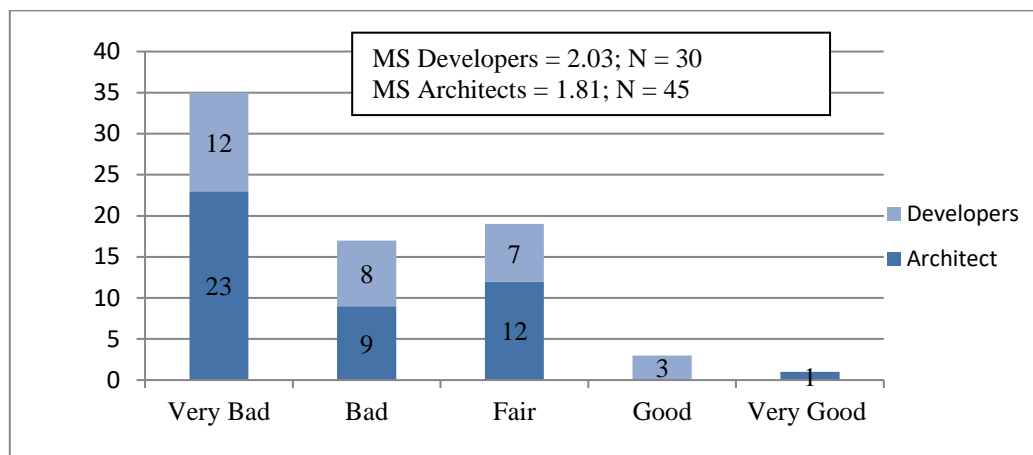


Figure 3: The projected market performance of Green Buildings in Botswana

Source: Field Survey

Respondents were asked to state the proposed success rate for successfully implementing this change to the Botswana market.

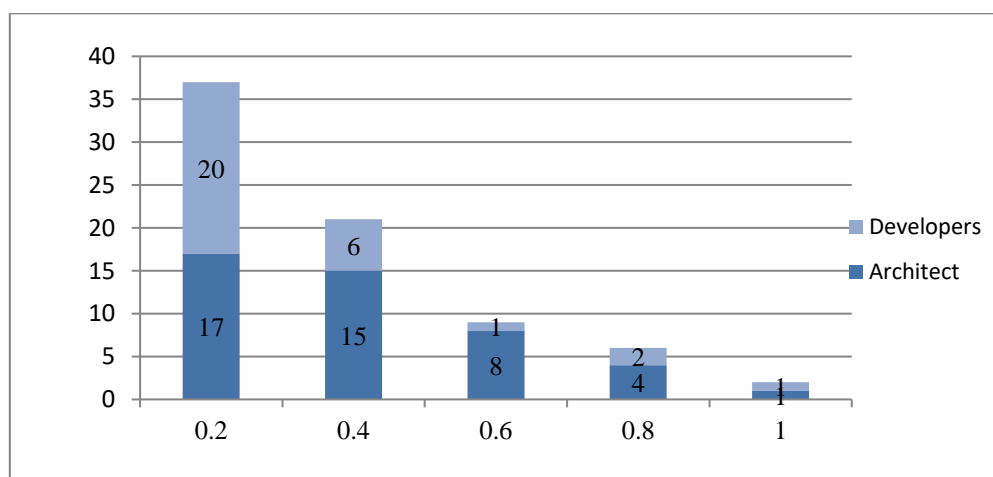


Figure 4: Proposed success rate

Source: Field Survey

The graph is skewed to the right indicating that the majority of the population gave an average low success rate (31% Developers and 44% Architects). When asked why they gave a low success rating they insisted that Botswana was still a developing country and that they did not possess the required materials, knowledge and understanding of such projects and therefore the product (green building materials) would not succeed in the market. This is supported by Hankinson & Breytenbach (2012) who argue that the reliability of information from suppliers and manufacturers is a concern. They gave an example that a manufacturer and supplier may be developing and marketing green building materials but without certifications ensuring that a product is indeed environmentally friendly. However, since Botswana has trade relations with South Africa where most of the building materials come from, the chances of success are likely to be high as it is the case in South Africa. According to Gunnell (2009) South Africa is one of the fastest growing implementers of green buildings

in the world as shown by its unmatched growth rate. It was noted that 51% of all firms in South Africa would have achieved a high level of green activity (Gunnell, 2009).

Respondents were asked to indicate the factors that hinder the success of green buildings using a five point Likert scale of 1 being Very low degree and 5 very high degree as illustrated in Table 2 below. It was noted that lack of market; lack of knowledge on the matter by clients and lack of finances were rated as having a high degree impact on the success of green building where as cultural factors (resistance to change) had moderate degree. This resistance to change confirms Kwame & Julian (2015)'s research which contended that South Africa is dominated by firms that do not want to change their ways in fear of risks and extra costs. From the above results it can be seen that Botswana is no exception.

Table 2: Factors hindering the success of green buildings

Mean score 1 for 5, (Very low degree = 1), (Low degree = 2), (Moderate= 3), (High degree = 4), (Very high degree = 5)									
Equation if Score is for $X < 1.49$ (Very Low), if Score is $1.50 \leq X < 2.49$ (Low), if Score is $2.50 \leq X < 3.49$ (Moderate), if Score is $3.50 \leq X < 4.49$ (High) if Score is for $X \geq 4.50$ (Very high degree)									
	1	2	3	4	5	N	SD	Mean	Comment
Lack of market	1	5	20	25	24	75	1.08	3.88	High Degree
Lack of knowledge on the matter by clients	0	4	13	23	35	75	1.42	4.19	High Degree
Lack of finances/capital	5	7	24	36	3	75	1.44	3.33	Moderate
Cultural factors (the resistance to change)	4	6	24	29	12	75	1.10	3.52	High Degree

Objective 2: To identify the target customers for general services and products

Respondents were asked to identify the target market for the green building concept. The results indicated that the home owners (57%) are the largest target customers, followed by government (19%), developers (13%) and investors (11%). The study revealed that the homeowners are the biggest target population because they spend most of their time in buildings. This finding relates well to what was noted by (Cole & Kernan, 1996). On the supply side, building engineers, proprietors and property managers, architects, and development organizations give an assortment of green building outline and development strategies to the market, making it appealing to potential inhabitants. On the demand side, inhabitants, for the most part private companies, consider locating their workplaces in green structures for different economic, productivity, environmental and social advantages (Cole & Kernan, 1996).

Respondents were asked to indicate the products and services likely to be offered locally and why they thought so?

Table 3: Products and services likely to be offered locally

Services	Yes	No
Supplier of construction materials	13	58
Eco friendly landscaping in property	65	10
Green building consultancy	11	64
Green building valuations	2	73
Green waste facilities management	5	70

It was noted that the most likely service to be offered locally is eco-friendly landscaping in property, followed by supplier of construction materials, green building consultancy, green waste facilities management, and green building valuations. When asked why the respondents felt that Eco-friendly landscaping in property had the best chances they indicated that it did not need so much financial resources.

Objective 3: To find ways to promote the green building concept and identify the stakeholder that can make the transition a success.

Respondents were asked to indicate how the transition from traditional buildings most likely going to be promoted? The study shows that public awareness through road shows (38.7%) was ranked as the best medium for promoting the idea, followed by Market campaigns (37.3%), then physical interaction with the clients (17.3%) and (6.7% 0 for other mediums such as social media, television and radio. The reason for such a high vote for public awareness through road shows was because the respondents felt the roadshow brings the service close to the people and through live entertainment it would attract even more people.

Respondents were asked to rank the stakeholders that would make this transition a success using a five point Likert scale of 1 being least important and 5 most important and how relevant their impact would be in implementing this change. The key stakeholders that were identified in the study in the order of importance are tabulated in Table 4 are the regulating body, government, professionals and property owners.

Table 4: Stakeholders to consider

Stakeholder	Mean	Relevance
Regulating Body	4.31	Controls and makes laws that will act as guidelines in operation.
Professionals	2.76	They are the practitioners who carry out the services
Government	3.31	To enforce and implement programmes on green technology with the help from the regulating body.
Property owners	2.40	They are the perhaps the most important stakeholders as they are the users

CONCLUSIONS

The purpose of this study was to establish if the adoption of a green building concept in Botswana would create a market for green building materials and services for existing and new buildings. From the findings, it is evident that the available structures would not support the green building market. Therefore in conclusion, Botswana cannot sustain a market for the green building concept due to lack of interest and expertise. Whilst it may be possible in future, however for now the level of expertise in the green building concept is low. The lack of a market is attributed to the absence of a policy on the green building concept. The identified customers can support the green building concept on existing buildings through retrofitting. It is recommended that people should be educated more on green building concept. A policy be formulated and a green building council should be established to regulate and promote the green building concept. Further research should look at the viability of implementing the green building concept.

REFERENCES

- Akadari, P. O., Chinyio, E. A., and Olomolaiye, P. O. (2012). Design of A Sustainable Building: A Conceptual Framework for Implementing Sustainability in the Building Sector. *Buildings*, 2, pp. 126-152. doi:10.3390/buildings2020126

- Bakaya-Kyahurwa, E. (2004). Energy Efficiency and Energy Awareness in Botswana. *Industrial and Commercial Use of Energy Conference 2004*, (pp. 1-8. Retrieved on 20/08/2017 from www1.eis.gov.bw/.../Energy%20efficiency%20and%20energy%20awareness%20in%20).
- Beck, Thorsten, and Maimbo. (2013). *Financial Sector Development in Africa: Opportunities and*.
- Cole, R. J., and Kernan, P. C. (1996). Life-cycle Energy Use in Office Building. *Building and Environment*, 31(4), pp. 307-317.
- Creswell. (2014). *Research Design: Quantitative Qualitative and Mixed Methods Approaches*. Lincoln: SAGE Publications, Inc.
- DiPasquale, D., and Wheaton. (1996). *Urban Economics and Real Estate Markets. Econometric Analysis of Office and Industrial*.
- Dodge Data and Analytics. (2013). *World green building trends 2016: developing markets accelerate global green growth*. Bedford: United Technologies.
- Elforgani, M. S., and Rahmat, I. (2010). An investigation of factors influencing design team attributes in green buildings. *American Journal of Applied Science*, 7(7), pp. 976-986.
- Fouka, and Mantzorou. (2011). Major Ethical Issues in Conducting Research. *Health Science Journal*, pp. 4-6.
- Fregonara, E., Curto, R., Grosso, M., Mellano, P., Rolando, D., and Tullani, J.-M. (2013). Environmental Technology, Materials Science, Architectural Design, and Real Estate Market Evaluation: A Multidisciplinary Approach for Energy-Efficient Buildings. *Journal of Urban Technology*, 20(4), pp. 57-80. doi:10.1080/10630732.2013.855512
- Green, A., and Dixon, J. (2016). Standing buildings and built heritage. *Post -Medieval Archaeology*, 50(1), pp. 121-133. doi:10.1080/00794236.2016.1169492
- Gunnell, K. (2009). Green building in South Africa: emerging trends. pp. 1-21. Retrieved from <http://www.woods.co.za/2017/06/22/green-building-activity-and-trends-in-south-africa/20/8/2017>.
- Hall, M. J., and Link, A. N. (2015). Technology-Based State Growth Policies: The Case of North Carolina's Green Business Fund. *Ann Reg Sci*, 54, pp. 437-449. doi:10.1007/s00168-015-0661-5
- Howe, C. J. (2005). *Overview of Green Buildings*. Environmental Law Institute, 41, pp. 43-48.
- Isa, N. K., Samad, Z. A., and Alias, A. (2014). A Review on Sustainability Principles of Building: Formulation of a Theoretical Framework. *Journal of Surveying, Construction and Property (JSCP)*, 5(1), pp. 1-16. Retrieved from <http://e-journal.um.edu.my/publish/JSCP/> on 20/8/2017
- Iveson, K. (2014). Building a City For 'The People': The Politics of Alliance-Building in the Sydney Green Ban Movement. *Antipode*, 46(4), pp. 992-1013. Retrieved on 20/8/2017. doi:10.1111/anti.12047.
- Jian-lei. (2015). Optimal building envelope design based on simulated performance: History, current status and new potentials.
- Jiaying, W. X. (2016). Overcoming the barriers for the development of green building certification in China.
- Jong-Jin. (1998). *Qualities, Use, and Examples of Sustainable Building Materials*.
- Kwame, & Julian. (2015). *Factors influencing the growth of green buildings in the South African Construction Industry*.
- Mao, C., Shen, L., Luo, L., & Li, Z. (2015). Identification of risk factors influencing the implementation of industrialised building systems in China. In L. Shen, K. Ye, & C. Mao (Ed.), *CRIOCM2014* (pp. 219-230). Springer.

- Plunkett, J. W. (2013). *Plunkett's Real Estate & Construction Industry The Only Comprehensive Guide to the Real Estate & Construction Industry*.
- Simons, R. A., Choi, E., & Simons, D. M. (2009). The Effect of State and City Green Policies on the Market Penetration of Green Commercial Buildings. *Journal of Sustainable Real Estate*, 1(1), pp. 139-166. doi:10.5555/jsre.1.75n6412448g4g117
- Simpeh, E. K., & Smallwood, J. J. (2015). Factors influencing the growth of green buildings in the South African Construction Industry. *Smart and Sustainable Built Environment (SASBE) Conference 2015*, (Deft, Netherlands), 09 Dec 2015 - 11 Dec 2015, (pp. 1-9. http://www.irbnet.de/daten/iconda/CIB_DC28812.pdf).
- Yvon. (2013). *Green Technology Utilisation and Opportunities in the Real Estate Development Industry*.
- Zhang, X. (2015). “Turning green into gold”: a framework for energy performance contracting (EPC) in China's real estate industry.
- Zhong, S., & Liu, Z. G. (Eds.). (2012). *Green Power, Materials and Manufacturing Technology and Applications II : Selected, Peer Reviewed Papers From the 2nd International Conference on Green Power, Materials and Manufacturing Technology and Applications*. China: Trans Tech Publications.

END

AN ANALYSIS OF THE GREEN CONCEPT IN THE BUILT ENVIRONMENT IN GABORONE, BOTSWANA

Johnson Kampamba¹, Simon Kachepa², Milidzani Majingo³ and Nancy Fifing⁴

1 University of Botswana, Faculty of Engineering and Technology

2 University of Botswana, Faculty of Engineering and Technology

3 University of Botswana, Faculty of Engineering and Technology

4 University of Botswana, Faculty of Engineering and Technology

This study analysed the concept of green construction in the built environment in Botswana. This was achieved by investigating the extent of the use and adoption of green buildings as well as the consequences of not building green. The research project was influenced by the successful implementation of the green concept across the world with the main proposition being that the green concept has not been embraced in Botswana even though we continue to experience rapid population growth and climate change which are major contributors to negative impacts on the built environment. A mixed methods approach was used in collecting data. Proportional stratified random sampling technique was used to collect data from 66 professionals comprising eight Developers and 58 contractors. Results revealed that the construction industry has greater impact on the built environment. It is therefore important that developers should be aware of the resources needed to deliver, operate and maintain the buildings that are constructed and particularly building green. It was further established that the construction industry were aware of the concept of building green and its parameters. However, the challenges were in the area of actual practice and implementation as a result of lack of government incentives, lack of building codes and regulations, unavailability of green supplies and materials. The implications of the results are that not until the green concept is recognised under the policy framework, achieving sustainability in the built environment would be far-fetched. In order to enjoy the benefits of the green concept, it is therefore recommended that policy makers should enact a law that promotes sustainable development in the built environment.

Keywords: green concept, sustainable development, construction industry, built environment, green buildings, Botswana.

INTRODUCTION

The concept of green building is not new but very important as far as global warming and environmental conservation are concerned (Gottfried, 1996; Keeping and Shiers, 2004; Adebayo, 2016). The buildings that we construct, occupy and adapt are a major resource, and are indeed critical to our success as a society and economy (Green, Hope and Yates, 2015; Keeping and Shiers, 2004; Adebayo, 2016). However, they consume large quantities of resources and have a major impact on our health, wealth as well as on the environment (Green, Hope and Yates, 2015; Keeping and Shiers, 2004; Adebayo, 2016). As a result, many societies around the world gradually adopt sustainable practices in construction (Green,

1kampambaj@mopipi.ub.bw

2 simon.kachepa@mopipi.ub.bw

3 milidzani.majingo@mopipi.ub.bw

Hope and Yates, 2015; Keeping and Shiers, 2004; Adebayo, 2016). Matsila (2012) had noted that green building concepts are inadequately incorporated in the planning policy which is the reason for non-implementation by Town Planners and Property Developers in Gaborone. This research is an overview of the analysis of the green concept in the built environment in Botswana.

Globally, countries have continued to adopt the green concept in construction, as it has been proved to be environmentally friendly and resource efficient throughout the entire life cycle of buildings (Keeping and Shiers, 2004; Adebayo, 2016; Hema, 2012; Hwang, 2012; Qian, Chan and Khalid, 2015). Unfortunately in Botswana, most buildings including the newly built have adopted the traditional methods and materials of construction which are environmentally unfriendly and are the major causes of global warming. The objectives of the study were to:

- i. Evaluate the impact of the using traditional buildings;
- ii. Identify challenges which hinder stakeholders in the construction industry from adopting sustainable construction in Botswana; and
- iii. Come up with measures that could be put to place in-order to catalyze the adoption of the green concept.

This report is arranged in four major sections, section one covers the literature review, the next section describes the methodology that was used in addressing the research question and its objectives. Section four presents the results and analysis of the study and finally the conclusions are presented in the last section. This section discussed the introduction and the justification for this research. The next section presents a brief literature review for the study.

LITERATURE REVIEW

Since the industrial revolution, the world has seen limitless mechanical accomplishments, population growth, and comparing increments in asset utilization (Gottfried, 1996; Jha, Shalwee, Verma and Chaudhari, 2016). The total population has been expanding since mid-twentieth Century (Jha, Verma and Chaudhari, 2016). This huge increment in population puts a nearly unbearable burden on the natural environment (Horvath, 1999), and we are recognizing the “side effects” of our activities: pollution, landfills at capacity, toxic waste, global warming, resource and ozone depletion, and deforestation (Jha, Shalwee, Verma and Chaudhari, 2016; Keeping and Shiers, 2004; Adebayo, 2016; Hema, 2012; Hwang, 2012; Qian, Chan and Khalid, 2015). These efforts are straining the limits of the Earth’s “carrying capacity” its ability to provide the resources required to sustain life while retaining the capacity to regenerate and remain viable (Gottfried, 1996). As a result of this, requests to expand natural and man-made resources have been put forward. Savvy persons have gained enormous ground in innovation in diverse fields to fulfil the constantly developing requests. The majority of the improvements have been done without controlling the evil impacts of the development. Subsequently, the contamination of air, water and soil has influenced the nature of environment and accessible assets denying the next generation of their due share of natural resources (Jha, Shalwee, Verma and Chaudhari, 2016).

According to global estimates and studies in 2010, China replaced the United States of America (U.S.A) as the biggest energy consumer by representing more than 20% of the aggregate energy consumption on the planet. The gap between China and the U.S.A keeps on

extending in light of the fact that while the latter has diminished its energy consumption in the previous years, the former has expanded it by 10% since 2009. As a consequence of its high energy consumption, China is likewise the main energy related CO₂ emitter on the planet. The buildings alone account for half of the energy consumption and greenhouse emissions. Besides, more than 80% of the life-cycle building energy consumption happens amid the actual occupancy operation stage, as opposed to the development stage. Along these lines, the vitality proficiency of existing structures is a key issue identified with the aggregate energy consumption and greenhouse gas emissions (Liang, Shen and Guo, 2015).

Kibert (2005) observed that the unprecedented forces are reshaping the building construction industry, forcing professionals engaged in all phases of building construction, design, operation, financing, insurance and public policy to fundamentally rethink their roles in the building delivery process. Several authors Adebayo (2016), Ahn, Lee, Peña-Mora and Abourizk (2010), Hema (2012), Santamouris (2006) have thus concluded that some of these major forces include rapid population growth in urban areas as well as climate change. According to Santamouris (2001) urban communities are progressively expanding their boundaries and population, and from the climatological perspective, mankind's history is characterized as the historical backdrop of urbanization. The expanded industrialization and urbanization of late years have significantly influenced the quantity of the urban structures, with major effects on the energy consumption on this sector. Sassi (2006) advanced that at the end of the 20th century nearly half of the global population was living in urban areas, and this figure is expected to rise to 60 percent by 2030. The growth in population therefore increasingly becomes a threat to the global environment. The demands that more people will place on natural resources will lead to lower standards of living, more pollution, increased global warming and loss of biodiversity (Langston & Ding, 1997).

Most climate change effects are likely to increase the potential for damage to infrastructure and service disruptions. Environmental change will have expansive effects on building structures. The dangers postured by environmental change in this setting are rapidly increasing. Atmosphere related marvels for instance, flooding and warmth waves can specifically hinder the execution and life span of structures (Wentz, 2015). These marvels can likewise adjust the nature and greatness of ecological effects connected with a specific venture, for example, surface overflow and arrivals of unsafe substances. Environmental change can build the helplessness of the encompassing environment (human and common) to the ecological effects of a venture. For instance, delayed dry season can make amphibian environments more helpless against water withdrawals. Nearby changes in atmosphere and environment working can likewise make certain species more helpless against any troublesome effects brought about by a building venture (Wentz, 2015).

Hwang (2012) advanced that in Singapore only, buildings contribute 16% of the nation's total energy consumption and the energy cost can constitute about 20% to 40% of the total operating costs. Hwang (2012) says that both business and residential structures contribute about 20% of the world's energy consumption when added to that of China. Based on readings such as that of Lazarowicz (2009), climate change is fast becoming the defining global issue of our time. As global greenhouse gas (GHG) emissions increase, and global temperatures rise, life as we know it is under threat. Despite only contributing about 3 percent to global greenhouse gas emissions, places like the African part of the world will bear the

brunt of a rapidly deteriorating climate change. Human security will be threatened by more frequent and severe natural disasters. Hong Kong is experiencing high scarcity of Land and building area, but to this date Hong Kong has seen great benefits in building green thus overcoming this problem. In April 2011 the government of Hong Kong introduced an incentive scheme linking the element of bonus floor area of a development project to promote Green Building design (Qian, Chan, & Khalid, 2015). Developers have incorporated green building features in their developments.

With reference to a study which was done in South Africa, Gunnell (2009) stated that the operation of the building sector accounts for 23% of greenhouse gas emissions, while emissions from the manufacture of the major materials for the building sector amounts to around 18 metric tons of CO₂ per year, or around 4% of total carbon dioxide emissions.

According to Jha, Shalwee, Verma and Chaudhari (2016) the techniques used to build a green home are simple and straightforward. Any methods that could save energy might be adopted in making a green space for residence. On the other hand, Hwang (2012) argued that there are a number of factors that render green buildings disadvantageous. He said, compared to conventional projects, green projects tend to cost more to construct. Capital costs for green projects range from 1 to 25% higher. The costs are often associated with the type of materials used and the construction techniques. Further, Qian, Chan, & Khalid (2015) argued that green buildings can lower the operating costs by 8%–9% compared to regular buildings, and these savings pay for higher initial costs in the relative shorter life cycle of green building.

In addition, other studies (Bhardwaj and Neelam, 2015; Matsila, 2012; Hwang, 2012; Norhidayah and Mei, 2017; Adebayo, 2016; Qian, Chan and Khalid, 2015; Chaudhari, 2015; Jha, Shalwee, Verma and Chaudhari, 2016; Lyamuya and Alam, 2013; Matsila, 2012) have verified that green concept pose certain challenges even for developers, clients and contractors. The challenges of adopting green concept are as follows:

- i. High implementation costs;
- ii. No known alternative chemical or raw material inputs;
- iii. No known alternative process technology;
- iv. Lack of human resources and skills;
- v. Complex construction techniques;
- vi. Adoption of sustainable development is time consuming;
- vii. Lack of knowledge about green construction;
- viii. Unavailability of green supplies and materials;
- ix. Lack of building codes and regulations;
- x. Lack of professional capacity;
- xi. Uncertainty financial performance effects;
- xii. No known alternative technology;
- xiii. Misunderstanding of sustainable technical operation;
- xiv. Resistance to change;
- xv. Low skills level;
- xvi. Weak governance;
- xvii. Institutional capacity;
- xviii. Lack of public awareness of the green concept; and
- xix. Lack of government incentives.

Norhidayah and Mei (2017) noted that although the sustainability concept in property development by public-listed property companies was widely promoted, however, the level of sustainability awareness is quite low. Du'Plessis (2005) conducted a study as part of a process of the development of regional action plans for sustainable building and construction. The paper provided a brief overview of the international debate about sustainable building and construction and attempted to identify the key elements of an action plan for Africa.

Botswana, among others in Africa, is also one of the countries that are at high risk of being affected by climate change considering its semi-arid conditions with inadequate water and energy supply (Matsila, 2012). There is need therefore for proactive reaction to such challenges as well as considering how to reduce environmental and social impacts.

RESEARCH DESIGN AND METHODOLOGY

In order to accomplish the objectives of this research, mixed methods of data collection will be used. According to Harwell (2013) Qualitative research methods focus on discovering and understanding the experiences, perspectives, and thoughts of participants while Quantitative research methods attempt to maximize objectivity, replicability, and generalizability of findings. This study used a combination of questionnaire and interviews to get the data as they are suited to complement each other. The target population of 196 at 90% confidence level was identified using a list of developers and contractors registered with Public and Private Asset Disposal Board (PPADB). A sample of 66 was obtained using the Slovin's formula ($n = \frac{N}{1+(Ne^2)}$ where n = sample size, N = Population and E = Level of significance at 10%). A total of 66 questionnaires for the study sample was prepared and randomly distributed.

Likert scale was used in preparing the questions for the questionnaire by adopting the interval measurement scale. In addressing objective 1, Developers and Contractors were asked to indicate the level of the impact traditional buildings and construction have on the environment using a Likert scale of 1 not harmful and 5 very harmful. The scores from the data obtained were analysed using an evaluation criteria score. For a score of $x < 1.49$ (Not harmful); if score is $1.5 \leq x \leq 2.49$ (Less harmful); if score is $2.5 \leq x \leq 3.49$ (Moderately harmful); if score is $3.5 \leq x \leq 4.49$ (Harmful); and if score is $x \geq 4.5$ (Very harmful).

In addressing objective 2, Developers and Contractors were asked to indicate the level of significance the challenges had on the implementation of the green concept using 1 not significant and 5 very significant. The scores from the data obtained was analysed using an evaluation criteria score. For a score of $x < 1.49$ (Not significant); if score is $1.5 \leq x \leq 2.49$ (Less significant); if score is $2.5 \leq x \leq 3.49$ (Moderately significant); if score is $3.5 \leq x \leq 4.49$ (Significant); and if score is $x \geq 4.5$ (Very significant).

DATA PRESENTATION AND ANALYSIS

Response Rate

A total of 41 completed the questionnaire that was distributed to construction companies and developers out of the 66 questionnaires that were received resulting in an overall response rate of 62.1%. This response indicates a relatively high level of response from the participants because it was self-administered.

Background information of respondents

The demographic characteristics of respondents covered 8 categories which were age group, gender, profession, company experience, number of projects undertaken, size of the company, grade of works, as well annual turnover. The demographics revealed that 60.9% of the respondents were males whereas 39.1% were females. In the age group area, the “36-50” group had the highest response rate of 48.5%, 31.8% were aged “26-35”, 15.2% aged “51-65” while 4.5% were aged between “18-25” years. The questionnaires were mostly attempted by the actual owners of the companies (62%), especially for the small and medium scale companies, as for the rest it was filled out by their secretaries and other staff members. Of all the 41 responses, only 4 companies revealed their total turnover, the other 37 declined to answer the question. From the survey conducted, 26% of the respondents were grade E and D altogether, 38% were grade C and B whereas the rest 36% were grades OC and A. The participants were also asked to indicate the developments that are carried out by their companies as well the number of projects undertaken to date. It is interesting to note that different organizations had different numbers of projects undertaken and all the respondents had undertaken at least 10 commercial construction projects.

Presentation of results and analysis

Objective 1: Impact of the use of traditional buildings

The aim is to evaluate the impact of the use of conventional/traditional buildings. Respondents were asked to rate the effect construction and traditional buildings have on the environment.

Table 1: Level of impact traditional buildings and construction has on the environment

Effects of construction	Frequencies					Mean	Comments
	(1)	(2)	(3)	(4)	(5)		
Carbon dioxide emissions	0	0	0	19	22	4.53	Very harmful
Land fill wastes	0	7	0	21	13	3.98	Harmful
Water pollution	2	15	0	15	9	3.34	Moderately harmful
Energy consumption	0	0	0	26	15	4.35	Harmful

Interest in using local and recycled building materials

In order to gain insight into the type of building design contractors and developers are into, they were asked about the type of material they are often interested in. Both these types of buildings, conventional and green, have certain types of material dominating their structures. The response ranked from not interested up to strongly interested. From the results, 56.1% of respondents indicated that they were interested and 43.9% were strongly interested in using these materials. This shows that even though the locally produced building materials are rarely used, the developers and contractors do have actual interest in using them, now the question becomes, why they cannot use them since they are interested. A report by Lyamuya & Alam (2013) stated that the government should be the one spearheading this practice of using local materials, the authors alluded that people are often reluctant to use these

materials due to the belief that they are often associated with poverty and backwardness more so that they even cost less. Lyamuya & Alam, 2013 further emphasised the need for an official Government Policy to promote local building materials for employment creation, or local research. This would require a robust and political leadership to put the message across. Ordinary people will therefore, follow if this is spearheaded by those with powers.

The finding in the literature review proved that one of the ways of achieving sustainability in buildings is to use recycled material and of course other material that has been specially manufactured to provide such green quality to structures (Kibert, 2005). According to the findings, most contractors and developers do have the desire to use locally produced and recycled building materials yet they still do not use them. These findings are partly in line with what other studies of Adebayo (2016), Du'Plessis (2005), Horvath (1999) noted. In Botswana contractors and developers also do not use these locally produced materials despite the desire. The reason they are reluctant to use local and recycled materials is that; they are more expensive than imported building materials and due to uncertainty of their performance respectively. In other words, even though they had indicated that they do know the green building concept; their knowledge about sustainable construction is still relatively low.

Objective 2: Challenges hindering the adoption of the green concept

Below are some other challenges that are likely to hinder the adoption of green construction.

Respondents were asked to rate these challenges that hinder the adoption of the green concept, and from the responses, it shows that most of the views are centered mostly within “moderately significant” up to “very significant”, except for the “Lack of professional capacity” challenge which 48.8% of the respondents rated not and less significant. However, these results generally show that indeed these factors are the main challenges the construction industry has with regards to adopting the concept of building green, as such, in order to practice or implement this concept, these factors have to be rectified first. Below is a tabular presentation of the results.

Table 2: Challenges that hinder adoption of green construction

Likert scale from 1 to 5, not significant (1), less significant (2), moderately significant(3), significant(4), very significant (5)								
Equation for score is for $x < 1.49$ (not significant) , if score is $1.50 \leq x \leq 2.49$ (less significant), if score is $2.50 \leq x \leq 3.49$ (moderately significant) , if score is $3.50 \leq x \leq 4.49$ (significant) , and if score is $4.50 \leq x \leq 5$ (very significant)								
Challenges hindering adoption of green construction	1	2	3	4	5	Total	MS	Comments
Adoption of the green building concept is time consuming	0	1	10	18	12	41	4.00	Significant
Lack of knowledge of green construction	0	0	12	22	9	41	3.78	Significant
Unavailability of green supplies and material	0	0	4	23	14	41	4.24	Significant
Lack of building codes and regulations	0	2	6	18	15	41	4.12	Significant
Lack of professional capacity	6	8	20	4	3	41	2.61	Less Significant
Uncertainty of financial performance effects	0	1	16	17	7	41	3.73	Significant
No known alternative technology	0	5	9	15	12	41	3.82	Significant
Misunderstanding of sustainable technical operation	0	0	17	18	6	41	3.73	Significant
Lack of government incentives	0	0	7	15	19	41	4.29	Significant
Resistance to change	0	3	15	10	13	41	3.82	Significant

Lack of public awareness of the green concept	6	1	6	7	21	41	3.87	Significant
Weak governance	0	1	17	8	15	41	4.00	Significant
Institutional capacity	3	3	1	17	17	41	4.05	Significant
Low skills level	1	2	8	10	20	41	4.10	Significant
High material costs	2	4	2	13	20	41	4.10	Significant
Lack of human resources and skills	5	0	2	18	16	41	3.98	Significant
High implementation costs	0	0	15	1	25	41	4.25	Significant
No alternative technology	6	2	2	14	17	41	3.82	Significant
Not known alternative chemical raw material	7	7	0	13	14	41	3.50	Significant

Source: Field survey

It is clear that all the challenges in Table 2 are significant except for lack of profession capacity (2.61) which is less significant on the implementation of the green concept. These findings are consistent with what other studies revealed (Bhardwaj and Neelam, 2015; Matsila, 2012; Hwang, 2012; Norhidayah and Mei, 2017; Adebayo, 2016; Qian, Chan and Khalid, 2015; Chaudhari, 2015; Jha, Shalwee, Verma and Chaudhari, 2016; Lyamuya and Alam, 2013; Matsila, 2012).

The above challenges were grouped into five major groups in Table 3 below using Discriminant analysis.

Table 3: Group factors on challenges affecting the implementation of green building concept

Factors	OMS	Weight	Contribution	Number of variables
Human related factors	3.84	0.25	0.96	5
Economic/financial related factors	4.06	0.20	0.81	4
Technological related factors	3.80	0.20	0.95	4
Physical/material related factors	4.24	0.05	0.21	1
Institutional/legal related factors	3.83	0.30	1.15	6
Total		1.00	4.08	20

The effects that these factors have on the implementation of the green building concept in Botswana are significant and the overall effect for all the factors is also significant (4.08). Physical/material and economic/financial related scored higher than the other factors but however their overall contribution is lower than that of institution/legal related factors.

Characterisation of the public's interest in green building concept in Botswana

The participants were asked to give their opinion concerning the general public's interest in green building concept. From the results of the survey, 58.5% reported that people are less interested in the building concept, 24.4% indicated that the public is simply not interested that is why they still lag in terms of adopting the green concept, 12.2% indicated that people are interested whereas only 4.9% of the respondents indicated that the public is strongly interested.

Objective 3: Measures to be put into place to catalyze the adoption of green buildings.

The need to educate people about the green concept

It is clear that 36.7% of the participants agree with the fact that people should be educated on green building and the rest 63.3% also strongly agree to the motion.

Medium of information dissemination

It is clear that majority of the respondents (76%) people want information about the green building concept disseminated through small conferences and seminars, television as well as by including it in the school curriculum. Only the minority (24%) wanted it to be disseminated through the other media platforms such as books, internet and trade magazines.

Enforcement of incorporating the green concept into the development policies of Botswana

It was noted that all the respondents were in agreement that the concept of building green should be incorporated into the planning policies.

CONCLUSIONS

An analysis of the green concept in the built environment in Botswana revealed that; there are significant challenges in adopting the green concept, there is currently no legislation to facilitate the implementation of the green concept regulating green building, and measures should be put in place to promote the adoption of green concept. The implications of the findings are that the green concept will not be adopted in the near future unless a policy to support it is formulated. These results might be the major contributor to global warming and environmental degradation.

It is recommended that the challenges identified in the adoption of the green concept should be addressed. Government should come up with a policy framework which will promote the adoption of the green concept. Other researchers can further analyze this concept of building green in terms of material selection, structural design of the buildings as well as costing.

REFERENCES

- Adebayo, A. A. (2016). Sustainable construction in Africa. Agenda 21 for sustainable construction in Developing Countries, 1.
- Ahn, C., Lee, S., Peña-Mora, F. and Abourizk, S. (2010). Toward environmentally sustainable construction processes: The U.S. and Canada's perspective on energy consumption and GHG/CAP emissions. Sustainability, 2, 354-370.
- Bhardwaj, M. and Neelam. (2015). The advantages and disadvantages of the green technology. Journal of Basic and Applied Engineering Research, 2(22), 1957-1960.
- Du'Plessis, C. (2005). Action for sustainability: preparing an African plan for sustainable building and construction. Building Research & Information, 5(33), 1-11.
- Gottfried, D. A. (1996). Sustainable building technical manual; green building design, construction, and operations. United States of America: Public Technology, Inc.
- Green, E., Hope, T. and Yates, A. (2015). Sustainable buildings. London: ICE publishing.
- Gunnell, K. (2009). *Green building in South Africa: Emerging trends*. South Africa: Department of Environmental Affairs and Tourism (DEAT).
- Harwell, M. R. (2013). Research design in Qualitative/Quantitative/Mixed methods. University of Minnesota.
- Hema, C. (2012, March). Green techniques in building construction (concept). International Journal of Biotech Trends and Technology (IJBT), 2(2), 27-36.
- Horvath, A. (1999). Construction for sustainable development – Defining a Research Agenda for AEC Process/Product Development in 2000 and Beyond, August 26-28, 1-7

- Hwang, B.-G. (2012). Sustainable project management for green construction: challenges, impact and solutions. Sri Lanka: Jac See Tan, National Institute of Education, Singapore.
- Jha, B., Shalwee, Verma, S., & Chaudhari, P. R. (2016). Green buildings concept towards sustainable urban development and panacea for global warming. *International Journal of Latest Research in Engineering and Technology IJLRET*, 2(1), 35-41. Retrieved November 2, 2016, from www.ijlret.com
- Keeping, M., & Shiers, D. E. (2004). Sustainable property development: A guide to real estate and the environment. Oxford, UK: Blackwell Science.
- Kibert, C. J. (2005). Sustainable construction: Green building design and delivery. New Jersey, Canada: John Wiley & Sons, Inc.
- Langston, C., & Ding, G. (1997). The planet in crisis. In C. Langston, *Sustainable practices ESD and the construction industry* (p. 19). Sydney: Envirobook.
- Lazarowicz, M. (2009). Global carbon trading: A framework for reducing emissions. Norwich: The stationary office.
- Liang, X., Shen, G. Q. and Guo, L. (2015). Improving management of green retrofits from a stakeholder perspective: A Case Study in China. (D. Clements-Croome, Ed.) *International Journal of Environmental Research and public health* 12, 13824-13842.
- Lyamuya, P. K. and Alam, K. N. (2013). Earth construction in Botswana: Reviving and improving the tradition. CAA DAKHA 2013; 20th general assembly and conference, (p. 9). Bangladesh.
- Matsila, G. K. (2012). Green building concepts and Town Planning Policy: Assessment of practices in Gaborone, Botswana. Gaborone: University of the Witwatersrand, Faculty of Engineering and the Built Environment.
- Norhidayah, M. N. and Mei, M. A. (2017). Sustainable property. *Property Management*, 35(1), 109-126.
- Qian, Q. K., Chan, E. H. and Khalid, A. G. (2015). Challenges in delivering green building projects: unearthing the transaction costs (TCs). (T. Yigitcanlar, Ed.) *Sustainability*, 7, 3615-3636.
- Santamouris, M. (2001). On the built environment-The urban influence. In V. A. D.N Asimakopoulos, *Energy and climate in the built environment*. (p. 3). London: James & James (science publishers).
- Santamouris, M. (2006). *Environmental design of urban buildings: An integrated approach*. United Kingdom: Earthscan.
- Sassi, P. (2006). *Strategies for sustainable architecture*. New York: Taylor & Francis Inc.
- Wentz, J. (2015). *Assessing the impacts of climate change on the built environment; A framework for environmental reviews*. Washington DC: Environmental Law institute.

END

SUSTAINABILITY ANALYSIS OF ROAD CONSTRUCTION PROJECTS IN KIGALI CITY-RWANDA

David Nkurunziza¹ and Augustin Faraja Irumva²

1, 2 University of Rwanda, College of Science and Technology

Transport infrastructure, including roads, are increasingly being upgraded to accommodate more traffic, increase the level of service, provide mass mobility, reduce vehicle operating cost and create development opportunities in Kigali City. Policies and plans have been put in place to ensure effective feasibility of road projects. However, there has been a lack of consensus on a methodology to guarantee sustainability upon assessment and analysis during road pavement design, construction and maintenance. This paper presents a comprehensive analysis of sustainability in road construction projects, highlighting their economic, social and environmental state of responsibility; in terms of life quality enhancement, leadership effectiveness, proper natural resources allocation, natural world preservation and climate adaptation. Envision sustainability rating system was used to identify and collect primary data, defining road sustainable construction in the context of current Rwandex - Remera road upgrading situation, identifying main stakeholders and tracking their influence for sustainable construction. The results from the analysis showed that there is still poor collaboration reflected by how project team members tend to work as independent entities, focusing on delivering their portion of the project mostly in isolation from other members. In addition, there is less subjective commitment on developing local skills. Designing the road without taking into account its operational relationship with other community infrastructure elements, inadequate design provisions for deconstruction and recycling, using fresh water, ground water, and surface waters at a faster rate than they are being naturally replenished as key findings among others, showed that there is more room for Rwanda and Kigali particularly to improve and review its policies on road construction sustainability which are relatively theoretically present, but lacking when it comes to project implementation.

Keywords: Sustainable Construction, Sustainability Analysis, Envision Rating System, Road Construction Stakeholders.

INTRODUCTION

Sustainable construction is one of many subsets of sustainable development and refers to the creation of construction maintenance, operation of infrastructures, buildings and roads which helps to shape communities in a way that sustains the environment, bring into existence long term durability and overall, enhances the quality of life (Winter, 2008). On the other hand, one of the greatest challenges facing humanity in the twenty-first century is the ability to reconcile the capacity of natural systems to support continued improvement in human welfare around the globe (Miller, 2011).

The Rwanda Transport Policy is aligned with its 2020 Millennium Vision which, inter alia, provides for modern transport infrastructure and cost effective and quality services with due regard to safety and environmental concerns. Considering that, infrastructure should be

1 david.nziza@gmail.com

2 fatix11@gmail.com

developed in a sustainable manner to support economic growth of the country, mobility of the population and serve as a “pivot” for exchange of goods and services at national and regional level (MININFRA Rwanda Ministry of Infrastructure, 2012).

Despite the current approaches to integrating the social, economic and environmental feasibility of pavement projects including road infrastructure, there has recently been a lack of consensus on a methodology to guarantee sustainability upon assessment and analysis during highway pavement design, construction and maintenance in Kigali City. As new roads are constructed and old roads upgraded, the need to satisfy lifecycle functional requirements of social development, environmental sustainability and economic growth of roads is consequently unsatisfied.

According to Jamilus (2013), construction industry is one of the most significant industries that contribute toward socio-economic growth especially to developing countries where Rwanda belongs. Nevertheless, Ismail (2013) appraises the nature of the industry as fragmented, unique and complex to face chronic problems like time overrun (70% of projects), cost overrun (average 14% of contract cost), and waste generation (approximately 10% of material cost).

Rwandan architects and construction industry have been urged to design and build green and sustainable structures in order to help the country achieve its vision of becoming a green and climate resilient country by 2050 (REMA Rwanda Environment Management Authority, 2016). The call was made during the launch of Rwanda Green Building Organization (RWAGBO), which was established as part of Rwanda's pursuit of a green growth approach to economic development favouring the development of sustainable cities and villages. The organization is to supplement the role of Rwanda Building Code and National Housing Policy adopted in 2015, as well as the 2011 National Green Growth and Climate Resilience Strategy.

Since the report published by Brundtland Commission (1987), sustainable development has become a matter of prime importance for all development activities and in 2015, the report of World Bank “Improving environmental sustainability in road projects” has discussed that embedding sustainability principles and best practices into road projects in low- and middle-income countries is a challenge for several reasons, including changing or varying degrees of commitment and limited financial resources. In addition, there is often a lack of understanding about sustainability concepts and how to address them, given country and project specific characteristics (Montgomery et al., 2015).

Since 2000, real Gross Domestic Product (GDP) of Rwanda has grown by almost 8% per year partly driven by construction (7.1% of Rwanda's GDP) in 2015 (MININFRA, 2016). Kigali consequently, is one of the most developing cities in East Africa and its infrastructure development operations in road construction projects are not left apart. For example, Rwanda entered into an agreement with the Export-Import Bank of China to upgrade 54.56 kilometres road network in the City of Kigali (MININFRA, 2016) and the roads are being upgraded and rehabilitated.

Not withholding the fact of development, according to Reid et al., (2008) road maintenance and new construction have a direct effect on these priority areas:

- They consume large quantities of construction materials and generate large quantities of waste.

- The extraction, processing and transporting of these materials is a significant source of greenhouse gas emissions, particularly in the production of cement and asphalt.
- Use of primary aggregates in preference to recycled or secondary aggregates results in depletion of irreplaceable natural resources and damage to the environment where the aggregates are located.
- Incorrect use of materials can result in pollution of the environment.

MATERIALS AND METHODS

The explored literature gave insights to the researchers to carry out site visits on different spots and occasions; developing their statements on sustainability for the current context. As Kigali city was going a series of major road networks upgrade, the case study for precise data collection was a 4-lane highway, linking the main spine of Kigali road network, from Remera to Rwandex and this was the ongoing project dating from the time of data collection. The project was passing through a sensitive wetland of the city and it stretched to new land acquisitions which consequently displaced existing residents.

Primary data was acquired using organised interviews with 30 local residents neighbouring the construction project where 26.6% of the randomly sampled were female. Specific questionnaires were prepared to collect data from project main stakeholders where the respondents were selected using non-probability purposive sampling to inquire information as it applies to their expertise on the project; in the consulting team (HYCOGEC), project pavement engineer and surveying engineer, in the environmental regulating body (REMA), environmental auditor and in the City of Kigali Hall the project manager representative. Secondary data was collected through publicly available and shared reports with the construction project teams. The research was designed as follow:

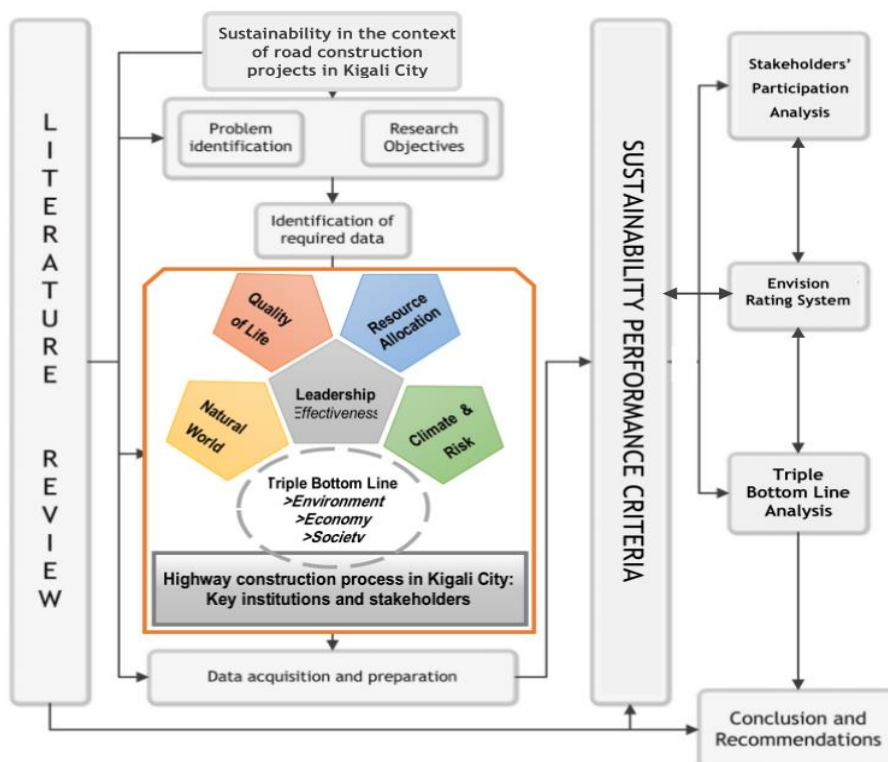


Figure 5: Research design

Data inquired was identified using ‘Envision’ rating system by the ‘Institute of Sustainable Infrastructure’ (ISI). A guide to sustainable highways report by the transport department in the UK (Reid et al., 2008) was used to identify levels of effort and milestones of sustainable highway construction, in the case study for different specific activities carried out at the site.

SUSTAINABILITY ANALYSIS AND RATING SYSTEM

The ‘Envision’ rating system of The Institute for Sustainable Infrastructure (ISI) was used to track responses to fifty-five credit areas broken out into five categories and fourteen sub-categories. Each credit is evaluated as to its applicability to the project, the level of achievement for the credit area and notes to support the selected level of achievement.

The questionnaire used the same categories, sub-categories and credits as the full credentialing and verification system workbook, however, instead of selecting a level of achievement the questionnaire required a simple “yes”, “no” or “not applicable (NA)” to answer the question.

Overall the process to answer each questionnaire was a relatively hard process, since the respondents were time to times busy with their duties; progressively each category was evaluated and the section below illustrates the result of the analysis for conglomerated and categorized questions to proper stakeholders and respondents.

Quality of Life

Only 8% of all questions within the ‘Quality of Life’ category were deemed to be not applicable to the project. With 69% of questions answered as satisfying the credit areas. Opportunities for improvement were related to addressing safety and way finding outside of the immediate project area as well as restoration of public spaces.

1	PURPOSE	QL1.1 Improve community quality of life	3	0	0		3 of 3	NA 8% No 23% Yes 69%
2		QL1.2 Stimulate sustainable growth and development	3	0	0		3 of 3	
3		QL1.3 Develop local skills and capabilities	0	3	0		0 of 3	
4	COMMUNITY	QL2.1 Enhance public health and safety	1	0	0		1 of 1	
5		QL2.2 Minimize noise and vibration	0	1	0		0 of 1	
6		QL2.3 Minimize light pollution	1	0	0		1 of 1	
7	WELLBEING	QL2.4 Improve community mobility and access	3	0	0		3 of 3	
8		QL2.5 Encourage alternative modes of transportation	2	0	0		2 of 2	
9		QL2.6 Improve site accessibility, safety and wayfinding	2	1	0		2 of 3	
10	WELLBEING	QL3.1 Preserve historic and cultural resources	0	0	2		0 of 0	
11		QL3.2 Preserve views and local character	2	0	0		2 of 2	
12		QL3.3 Enhance public space	1	1	0		1 of 2	
TOTAL			18	6	2		18 of 24	

Figure2: Analysis in the quality of life category

Smoothly, many credits in this category were satisfied by the positive will of the government on sustainable development, thus sustainable road construction. Infrastructure projects are seen as contributors to community quality of life as they support sustainable, long-term economic growth and community development, while reducing or eliminating negative impacts on the host community of road neighbours. Broad community endorsement has validated this contribution. Reducing or eliminating potentially negative impacts generally required a reasonably complete impact assessment which was addressed in time for all cases.

Growth in employment and increased productivity contribute to sustainable growth and development. Road construction projects made a contribution by providing short and long term employment in the local community, however the efforts made to develop local skills was poor since the industry is dominated by expatriate contractors with whom training and capacity building of most skilled labour is nearly non-existent. More on that, 23% of the

questions were answered with a negative vote. This was due to poor performance of the project on minimizing noise and vibrations generated during construction.

Leadership

Similar to ‘Quality of Life’, all questions within the ‘Leadership’ category were deemed to be applicable to the project. Only 53% of credits’ questions were satisfied versus 47% of unsatisfied credits.

13	COLLABORATION	LD1.1 Provide effective leadership and commitment	3	0	0		3 of 3
14		LD1.2 Establish a sustainability management system	1	0	0		1 of 1
15		LD1.3 Foster collaboration and teamwork	0	3	0		0 of 3
16		LD1.4 Provide for stakeholder involvement	2	1	0		2 of 3
17	MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	0	1	0		0 of 1
18		LD2.2 Improve infrastructure integration	0	3	0		0 of 3
19	PLANNING	LD3.1 Plan for long-term monitoring and maintenance	1	1	0		1 of 2
20		LD3.2 Address conflicting regulations and policies	2	0	0		2 of 2
21		LD3.3 Extend useful life	1	0	0		1 of 1
TOTAL			10	9	0		10 of 19

No
47%

Yes
53%

Figure 3: Analysis in the leadership category

The effects and consequences of non-sustainability, changes the design assumptions and variables used in infrastructure design and construction. Strong leadership is required to manage this extraordinary level of change and make a meaningful contribution to conditions of sustainability. Incentives for establishing sound and credible management and leadership to address adequately and competently the issues surrounding sustainability were negligently addressed in the project.

Poor collaboration and teamwork among the project team was witnessed. In conventionally delivered projects, project team members tend to work as independent entities, focusing on delivering their portion of the project mostly in isolation from other members. Integrated project delivery brings project team members together early in the planning and design stages to understand how their design assumptions and decisions affect the work of others, positively or negatively. At the basic level of collaboration, the City of Kigali and the project teams should have recognized the importance of addressing infrastructure projects in the context of the entire community/city infrastructure.

Pursing by-product synergy opportunities which is basically keeping track of how road construction wastes and by-products which are independently useless and less valuable would be put to making a more valuable and economic combination, has never been catered for during project planning. Improving infrastructure integration or designing the road to take into account the operational relationships among other elements of community infrastructure neither, was not evidently addressed in the project since most of the surrounding infrastructures on existing road upgrades were considerably negatively affected.

Resource Allocation

Under the ‘Resource Allocation’ category only 27% were answered as “Yes” and the remaining questions as “No”. All questions were applicable to the project, and the findings show that the construction project has poorly managed materials, energy and water. The requirements to satisfy the questions as for sustainability performance were not that demanding to make an excuse that commission to sustainability was not realistic, but also the project has shown poor performance in omission of what should have been catered for according to the agreed commitments, contracts and promises.



Figure 4: Analysis in the resource allocation category

The construction has comparatively used regional materials and reduced excavated materials taken off site (minimize the movement of soils to reduce transportation and environmental impacts) but in parallel, it has poorly observed the reduction of construction materials net embodied energy, which is actually the energy taken for a material to be extracted, transformed, tailored, transported, constructed, operated and maintained over the project life cycle (Shah, 2013). The provision for deconstruction and recycling, the consumption of energy and protection of fresh water availability were also short of consideration in the project.

Considerably, fresh water, ground water, and surface waters are being used at a faster rate than they are being naturally replenished. Though the government through its Environment and Natural resources ministry is committed to reducing the negative impacts of human activities on fresh water availability, quantity and quality, addressing the increasing demands for fresh water by agricultural, municipal and industrial users, the findings show how much unsatisfactory the project was inspected and monitored to achieve these objectives. It is recommended that water usage should be controlled over average maximum conditions, with plans to offset peak withdrawals during low water need periods (Rodrigues, 2013). Ultimate goal should be to replenish fresh water surface and groundwater supplies to an agreed upon undeveloped, native ecosystem condition of quantity and quality.

Natural World

Under the ‘Natural World’ category 35% of the credit area questions were found to not be applicable to the project, this was partly due to the fact that the case study is located in an urban setting. 43% of the questions were answered as “Yes” and 22% as “No”.

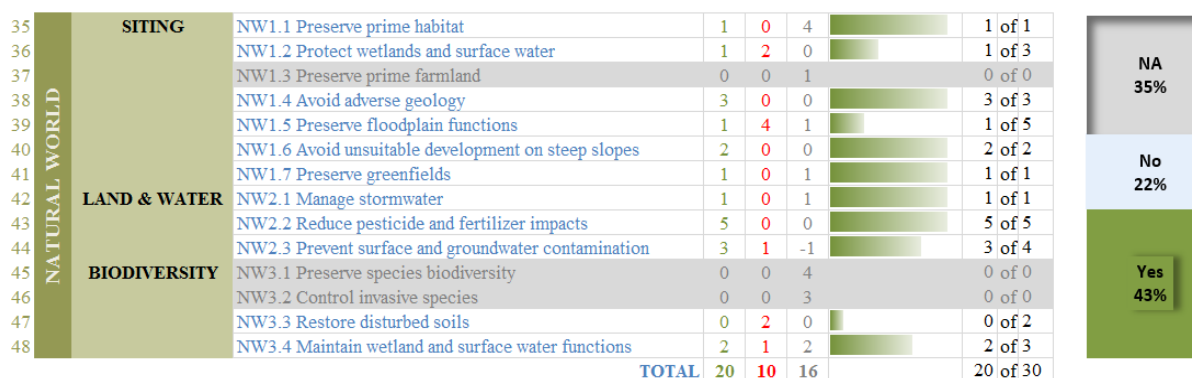


Figure 5: Analysis in the natural world category

Analysing this category on contamination of water, equipment and facilities that contain potentially polluting substances, including fuels, chemicals, and other hazardous or polluting materials, it has been found that they were partly located away from sensitive environments.

Runoff interceptors and drainage have been designed to keep pollutants out of storm water runoff.

Construction causes a change to the natural flow of runoff on a site. Increasing the quantity of impervious surface reduces the amount of storm water that infiltrates into the ground, decreases the amount absorbed and expired by plants (evapotranspiration), and increases the amount of surface runoff (Rooshida, 2012). Low impact development (LID) measures have not been incorporated into the design to reduce negative impacts associated with increased runoff.

At the construction stage, potential sources of groundwater and surface water contamination included spills and leaks from tanks, pipes and construction vehicles, leaching of pollutants from raw or waste materials, and releases of pollutants from demolition of previously constructed works. Less effort has been made to ensure that potentially polluting substances are safely eliminated from operations.

Climate & Risk

All questions within the Climate & Risk category were deemed to be applicable to the project. With 64% of questions answered as satisfying the credit areas. The project scored highest in the resilience sub- category with 5 of 7 questions within the credit areas answered as “yes” while showing the most opportunity for improvement in the emission sub-category scoring 2 of 4.

49	EMISSION	CR1.1 Reduce greenhouse gas emissions	1	1	0		1 of 2	No 36%
50		CR1.2 Reduce air pollutant emissions	1	1	0		1 of 2	
51	RESILIENCE	CR2.1 Assess climate threat	1	0	0		1 of 1	Yes 64%
52		CR2.2 Avoid traps and vulnerabilities	1	1	0		1 of 2	
53		CR2.3 Prepare for long-term adaptability	1	0	0		1 of 1	
54		CR2.4 Prepare for short-term hazards	2	0	0		2 of 2	
55		CR2.5 Manage heat islands effects	0	1	0		0 of 1	
		TOTAL	7	4	0		7 of 11	

Figure 6: Sustainability analysis in Climate & Risk category

Road infrastructures systems are subject to short-term hazards such as earthquakes, flooding, landslides etc. These hazards may or may not be related to climate change, or may have other risk factors. An assessment should have been conducted taking into consideration various types of natural and man-made hazards that are possible in Kicukiro where the main project is located, though it looks like a crossroad of Gasabo and Nyarugenge, thus Kigali city in general. The project should be designed for resiliency, the ability to recover quickly and cost-effectively from short term hazard events. From Rwandex to Remera, there are many types of geologic formations that are difficult to deal with and can either create risk to development or destroy precious assets.

All those categorised and evaluated credits might be well summarized in this chart, with consideration of all data; the study shows an aggregated average score of 51% for the overall performance of the project in five categories using the Envision self-assessment tool.

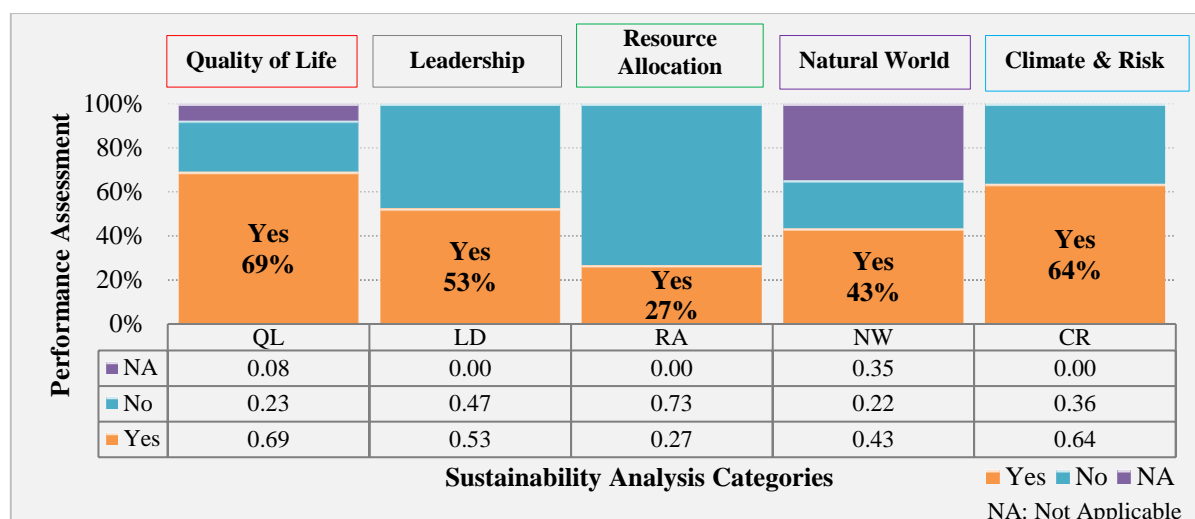


Figure 7: Sustainability analysis summary and performance evaluated in five categories.

SUSTAINABILITY STAKEHOLDERS ANALYSIS

In the process of preparing key methods to inquiring information on the case study, identifying suitable respondents to the cause of the study led to making an analysis on stakeholders involved in road construction projects in Kigali City. From easily recognizable participants such as builders and contractors to abstractly hidden stakeholders such as local neighbours of the project and financial institutions or firms that make loan, donations and grant arrangements. According to Mathur et al. (2013), definition of different construction project stakeholders made a clearer identification and approachable strategy possible.

Stakeholders' Triple Bottom Line (TBL) analysis

The three-sphere framework was initially proposed by the economist René Passet in 1979 and for this study to analyse each stakeholders relationship to economic, social and environmental aspects of the project as for sustainability; each question of the 144 questions in its categories was scored weighed: 1 for 'not related', 2 for 'partially related' and 3 for 'absolutely related'.

Fig. 8 illustrates and clearly shows the influence and what would be the participation of every stakeholder in specific categories and subcategories that contextualize the project from planning to implementation in all evaluated credits. This in contrast can relatively be applicable to other urban road construction projects with consideration of new consultants, contractors and project executive bodies.

In Rwanda, specific bodies parenting from ministries such as the Ministry of Infrastructure (MININFRA), Ministry of Environment (MoE) and the Ministry of Finance and Economic Planning (MINECOFIN) play a major role in every road project. Channelling responsibilities downwards, it goes straight to the Rwanda Transportation Development Authority (RTDA) which mainly oversees transport infrastructures in the whole country; the City of Kigali (CoK) monitors projects of a reasonable scale within urban boundaries. In case of any major project the government through its institutions issues bids and contracts to consultants and then to contractors to implement the project; CoK in this case is responsible.

Rwanda Environmental Management Authority (REMA) comes in to regulate, inspect and monitor all environmentally sensitive aspects of major construction projects. It applies its authority to the extent of discontinuing activities which are non-environmentally compliant. It follows up to make sure that measures of mitigation in the Environmental Impact Assessment (EIA) of the project are followed and implemented. To evaluate each stakeholders input for

sustainable construction requires relative attention on the methodology of project delivery, nature of contracts and collaboration between project team members.

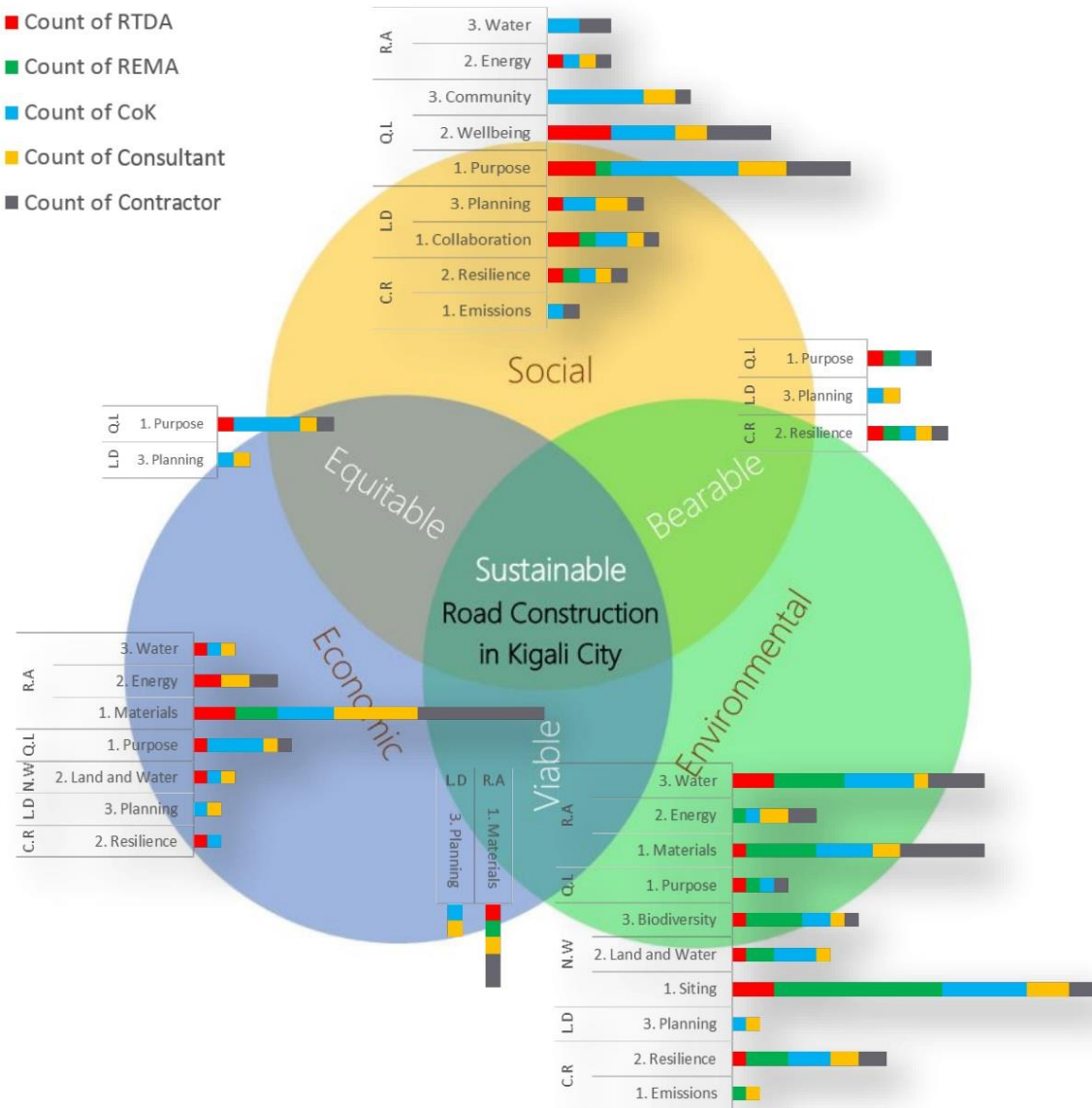


Figure 8: Stakeholders’ absolute relationship to economic, social and environmental credits of the project

CONCLUSION

All stakeholders in road construction as analysed earlier should be brought to more awareness on sustainable construction as specific as it would apply to their duties. Together with that, it is recommended that “Sustainability Analysis” through ‘rating’ or early ‘assessments’ in project planning stage should be a pre-requisite before project implementation with accreditation of internationally renowned rating systems. Once more, for incorporating the sustainability concept in the construction sector for Rwanda, it was seen that making sustainable choices and new construction is not something that should be done in isolation or on an opportunistic basis. A framework of steps that can be domesticated for sustainable practice can be developed further; some barriers might be faced technically or politically but with efforts and positive will altogether, shall hopefully gear the performance of sustainable road construction in Kigali City.

ACKNOWLEDGEMENTS

We would like to express our sincere appreciation to all people and institutions whose support to this research was of high regard to us.

To the officials, corporate engineers and directors from the City of Kigali (CoK), Rwanda Transportation Development Agency (RTDA), Rwanda Environmental Management Authority (REMA) and HYCOGEC Consultant Ltd for easing the process of data collection, taking our consideration and providing us authenticity we needed to make further information inquiries possible.

REFERENCES

- AfDB (2013). Rwanda Transport Sector Review and Action Plan. African Development Bank Group: Temporary Relocation Agency. 1002 Tunis – Belvédère. Retrieved from http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Rwanda_-_Transport_Sector_Review_and_Action_Plan.pdf
- Brundtland, G H. (1987). Report of the World Commission on Environment and Development - Our Common Future. New York: United Nations General Assembly.
- Bueno, P. C., Vassallo, J. M., & Cheung, K. (2011). Road Infrastructure Design For Optimizing Sustainability.
- Gerardo, F. and J. Bryce. (2014). Sustainable Pavement Management. Retrieved from http://link.springer.com/chapter/10.1007%2F978-3-662-44719-2_13#page-2
- Hussin, J. M., Rahman, Ismail A., & Memon, A. H. (2013, March). The Way Forward in Sustainable Construction: Issues and Challenges. 2(1), 15~24.
- Irurah D, K. (2010). Agenda for sustainable construction in Africa. Africa Position Paper.
- James.M.BRYCE. (2008, August 7). Developing Sustainable Transportation Infrastructure. Retrieved from <http://www.wise-intern.org/journal/2008/JamesBryceFinal.pdf>
- Kirk, S., Hills, B., and Baguly, C. (2013). Cost and Safety Efficient Design (CaSE) for rural highways in developing countries. International division, Transport Research Laboratory.
- Lombard, P. (2012). Strategic Transport Master Plan for Rwanda. September 2012, Kigali, Rwanda.
- Mathur, .D., and Kassa, H., (2013). Sustainable streets and highways stakeholders: Analysis of green roads rating systems.
- Miller, T. R. (May 2011). Constructing Sustainability: A Study of Emerging Scientific Research Trajectories. Phoenix: Arizona State University.
- MININFRA. (2012). Public Transport Policy And Strategy For Rwanda. September 2012, Kigali, Rwanda.
- Montgomery R., Howard S., Jr., and Hirsch A., (2015) Improving Environmental Sustainability In Road Projects, World Bank Group Report Number 93903-Lac.
- Reid, J., Chandler E., Schiavi, I., and Hewitt, P. (2008). Sustainable Highways: A Short Guide. Department for Transport .(TRL Limited) June 2008. London: TSO.
- REMA (2011). Building a Climate Resilient Infrastructure and Energy Sector for Rwanda. September 2011, Kigali, Rwanda. Retrieved from http://www.rema.gov.rw/rema_doc/IMCE_Doc/Guidelines-Energy&Infrastructure.pdf
- Rodrigues, M. (2013). Applying the ISI Envision Checklist, Public Works Engineering City of Eugene, July 19, Oregon, US.
- Rooshdia, R., N.Rahmana, N.Zahidah, M.Majida, & F.Ismailb. (2014). An evaluation of sustainable design and construction criteria for green highway.

- Shah, K. (2011). Agenda 21 for Sustainable Construction in Developing Countries – The Indian Case.
- Tashobya, A. (2016, February 13). Construction sector on the spot over environmentally in compliant structures. The New Times. Retrieved from <http://www.newtimes.co.rw/section/article/2016-02-13/197046/>
- Thorpe, D. (2012) Evaluating factors in sustainable road construction and management - a life cycle approach In: Smith, S.D (Ed) Procs 28 th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management, 1235-1244.

END

FACTORS INHIBITING THE USE OF INFRASTRUCTURE BONDS FOR PUBLIC INFRASTRUCTURE DEVELOPMENT IN THE ZAMBIAN CONSTRUCTION INDUSTRY

Chipozya Tembo-Silungwe¹, Josephine Mutwale-Ziko² and Rex Andrea Fernando³

1 Department of Construction Economics and Management, Copperbelt University, Zambia.

2 Department of Construction Economics and Management, Copperbelt University, Zambia

3 Department of Construction Economics and Management, Copperbelt University, Zambia

Desired infrastructure development is the aim of any country, more so developing countries like Zambia. Developed infrastructure is a driver of many industries and sectors of the economy by providing the basic infrastructure needs such as buildings, roads, electricity, water and many others. However, infrastructure development in most cases is restrained due to lack of finance. Infrastructure bonds, given the right political, economic, external outlook and fiscal outlook, may be a viable alternative to infrastructure financing as they can be used to finance several infrastructure using one bond. A survey and secondary data were used to investigate the factors that are inhibiting the use of infrastructure bonds as a means of financing public infrastructure. The findings show that the huge external debt, the minimal gross domestic product and high interest rates are currently inhibiting the effective use of infrastructure bonds as a means of financing public infrastructure. Therefore there is a need to reduce the external debt, effectively managing the monetary and fiscal policies.

Keywords: Infrastructure, Finance, Bonds, Public, Development.

INTRODUCTION

Infrastructure is important in the development of any nation to meet the social and economic needs of its citizens. Infrastructure is the sum of material, institutional, personal facilities and data which are available to the economic agents. These are a backing to attaining a maximum level of economic activities in an economy (Prud'homme, 2004). Additionally, Jochimsen (1966) defines infrastructure as assets that may include roads, tunnels, bridges, railways, airports, harbours, canals, subways and tramways, dams, irrigation networks, water pipes, water purification plants, sewers, water treatment plants, dumps and incinerators, power plants, power lines and distribution networks, oil and gas pipelines, telephone exchanges and networks, district heating equipment and many others. Although infrastructure is cardinal, paying for infrastructure development can be complicated and inhibited by various factors; the main one being finance. Of the many modes that can be used to finance infrastructure such as loans, infrastructure bonds are an option that can be used to finance a number of infrastructure developments using a single bond.

The construction industry in Zambia especially in the public sector normally encounters cost and time overruns due to inadequate finance (Kaliba, et al., 2013). Various modes of finance have been used in the past to finance infrastructure development such as loans, Euro bonds and grants. However, infrastructure bonds are yet to be utilized in financing infrastructure. The objectives of this paper are to establish the need for infrastructure, the gap in

1 chipozya@yahoo.co.uk

2 Josephinemutwale@gmail.com

3 rexfernado11@outlook.com

infrastructure finance, to explore the concept of Infrastructure bonds as a means of financing infrastructure in the Zambian public sector, and to finally to draw conclusions and make recommendations on the subject area.

FINANCIAL GAP IN INFRASTRUCTURE FINANCING IN ZAMBIA

The Zambian economy has continued to recover following a fall in economic growth to 2.9% in 2015, its lowest rate since 1998 to 3.4% in 2016 and 4.1% in 2017 (World Bank, 2017). The economy was hit hard by lower global copper prices, as well as domestic pressures, including a low agriculture harvest after an El-Nino induced drought in 2015, nationwide electrical power crisis, and political uncertainty in the lead-up to the 2016 elections (World Bank, 2017). Falqi (2004) and Borse and Khare (2016) affirm that these and many other occurrences can lead to the diversion of money towards solving other problems while crippling the completion and initiation of most construction projects. In construction management, a project is regarded as successful if it is completed on time, within budget, and is of the desired quality. It can be accentuated that time, quality and cost complement each other and a limitation in one will directly or inversely affects the others (Alinaitwe et al., 2013). Over the past few years most of the infrastructure development projects rolled out in Zambia have suffered from cost overruns, and schedule overruns among other. This trend of government failing to meet its obligation in funding infrastructure is evident from the failure of projects to be completed within the stipulated period as per the contract agreement (Halland et al., 2014). For example, a sum of US\$ 118.7 million was spent on road projects in 2005, US\$ 227 million in 2006 and US\$197 million in 2007 unfortunately; many of these road projects were not completed on time and within the stipulated cost hence, leading to loss of revenue due to cost escalation and schedule delays (Kaliba, et al., 2009). Additionally, Zambia Development Agency (2015) underscores the fact that there is a huge infrastructure financing gap and government is aware that resources from the public sector and development partners are limited and can only cover part of the financing needed.

The constraint of finances in the development of infrastructure have been caused by the aftermath of the global financial crisis that has led to tight measures on borrowing e.g. banks restricted lending. Wong et' al. (2015) attests that a combination of strained public budgets and increasing infrastructure needs plus the global financial crisis has widened the infrastructure financing gap, even though the long-term economic, social and environmental benefits of infrastructure development are firmly established. The challenge of the crisis has hit almost all the developing as well as developed countries such that funding for infrastructure has been greatly affected as seen by the stringent measure set by those offering lending services. This then highlights the need to use a financing option that will help to narrow the gap in infrastructure project financing.

INFRASTRUCTURE BONDS

Infrastructure bonds are a small subset of the broader corporate bond market. Bonds are debt instruments through which finance for infrastructure development can be raised (Oji, 2015). Project bonds are homogeneous securities that finance specific stand-alone infrastructure projects. They can be issued in public markets, or placed privately. Project bonds are a growing area of project finance and provide a potential solution to financing brownfield projects with long-term debt (Croce, et al., 2015).

These bonds are meant for a specific project category usually long term in nature. The 2013 African Development Bank report on “Structured Finance – Conditions for Infrastructure

Project Bonds in African Markets,” highlights the following characteristics of infrastructure bonds:

- i. They are issued to raise capital for specific stand-alone projects;
- ii. They are repaid from cash generated by the project;
- iii. They assume, and their performance is subject to, certain project-specific risk.

In comparison with syndicate loans, infrastructure bonds have offered some contractual positive features that make these bonds more attractive to institutional investors rather than banks. These features include a more standardised capital market instruments that shows better liquidity if the issue size is sufficiently large to generate enough floating securities (Croce et al., 2015). Secondly, larger issue sizes can become a constituent of bond indices, adding further demand from passive benchmark strategies of bond market investors (Sawant 2010). And thirdly, project bonds can be issued with maturities longer than the tenors of syndicated loans that banks normally accept with maturities of 50 or even 99 years (Weber and Alfen 2010).

Infrastructure bonds have been used in several parts of the world including Africa with countries like Kenya and South Africa taking the lead. Kenya for example has been issued with more than three project bonds used to upgrade existing infrastructure. This sets precedence and an example that other African countries can emulate. This therefore shows that Kenya has good regulatory and legal framework as well as a bond market that makes it qualify for the issuance of bonds. Some of the challenge’s impeding the financing of infrastructure for most African countries include high transaction costs, the limited number of “bankable” projects, the multiplicity of regulations, permits and licenses required, and the various governmental agencies and institutions which investors have to deal with in a typical infrastructure project according to the Office of the Special Adviser on Africa (2015).

Credit Rating of Infrastructure/ Project bonds

Credit rating is essential in the issuance of infrastructure bonds and it is usually expressed in alphabetical symbols (i.e. AAA, AA, A – Low Credit Risk, BBB, BB – Moderate Credit Risk, B, C – High Credit Risk and D- Defaulted) (Monaro, 2011). A country's outlook is basically essential in this process because as it will outline certain cardinal aspects such as real GDP, reserves among others. A good credit rating depicts a good history of paying loans on time in the past, it helps investors recognize the risk involved in lending the money and gives a fair assessment of the borrower’s creditability (Sawant 2010). For example Kenya has a credit rating of Baa2 which translates into a lower medium grade while Zambia on the other hand has a rating of B which is under the category of highly speculative. Zambia can learn a great deal from Kenya by adopting some of the fiscal policies that maybe evidently absent or dormant in Zambia.

Taking a more specific approach, rating agencies use the following process categorised into four sects to credit rate a country namely; structural features, macroeconomic factors, public finance factors and external finances factors.

Structural Factors

Different measures are broken down so as to arrive at an overall rating of structural features. Issues that are tackled under this section include regulatory and legal framework, political stability, level of transparency, level of accountability, measures put in place to curb

corruption, the political atmosphere and the banking sector (Locsin, 2015). The consideration of the regulatory and legal framework mainly brings up issues such as political stability as well as political interference. Political stability is the ability of a people's government to share, access, or competes for power through nonviolent political processes and to enjoy the collective benefits and services of the state (Kabir, 2008). Other aspects that are considered are corruption within the political system, contract viability as it reflects the risk of unilateral contract modification, cancellation or outright expropriation and also the quality of bureaucracy which is a shock absorber that tends to minimize revisions of policy when governments change (Locsin, 2015).

Macro-economic Factors

Macroeconomic stability associates itself with issues relating to the level of imbalances in the business environment, unemployment levels and trends, and contributions to growth of different sectors of the economy (Skribane and Jekabson, 2014). A robust and coherent macroeconomic policy framework is an important aspect to take into consideration in the credit rating process (Locsin, 2015). The robustness and coherence are measured through the review of past performance of a country with reference to its economic performance (Vértesy, 2016).

Public Finances Factors

Public finances firstly deals with gross general government debt to Gross Domestic Product (GDP). Gross general government debt to GDP is defined by the Organisation for Economic Co-operation and Development (2017) as the ratio of the amount of a country's total gross government debt as a percentage of its GDP. It is therefore an indicator of an economies health and a key factor for the sustainability of government finance. Secondly, is the aspect of public debt sustainability, public debt sustainability seeks to determine whether a government is able to sustain its debt, this is observed through the weighing of the assets a government has, taking into account other sovereign financial obligations for example obligations under PPP's and the consideration that sustainability of government debts is a function of its path overtime (D' Erasmo et al., 2016). The sustainability of a government debt is highly dependable on the debt/GDP ratio. Sustainability also brings about the scrutiny on government revenues from different sector of the economy for instance through different forms of taxes.

The last aspect to consider is the fiscal structure, which focuses on the breadth of the revenue base, the concentration/diversification of revenue sources and the level of budgetary rigidity in terms of current spending. Fitch (2018) underscores the fact that the degree of budgetary rigidity is also a factor that influences the vulnerability of public finances to shocks, as well as the sustainability of a given debt burden.

External Finance Factors

External finance embodies funds borrowed from a lender or money obtained not from internal reserves. The External finance as measured by rating agencies, considers, scrutinizing the balance of payment which implies that the current account balance of a country is taken into consideration. The account balance to some extent helps in rating the financial stability of a country. Also, a review of commodity dependence is taken into account. This looks at the diversity of an economy and whether a country is very dependable on exported commodities (Fitch, 2018). Furthermore, external debt servicing is viewed as

having an impact on the balance of payment and economic shock. This is as a result of a principle where the balance of payment is deemed to increase in vulnerability when refinancing and debt servicing needs ought to be fulfilled. One other aspect discussed under external finance is external liquidity. External liquidity encompasses first of all reserve currency flexibility.

METHODOLOGY

The above literature review provides the theoretical basis for developing the research framework for this study. The data for the research study was collected from a target group that included the Ministry of Finance, the Ministry of Housing and Infrastructure Development (Departments of Public Infrastructure and Preventive Maintenance), Zambia Development Agency and Zambia Road Development Agency and secondary data from published sources. The target group was chosen purposively because they are beneficiaries of public funding and decision makers to sourcing financing for infrastructure development in Zambia. The main primary data collection tool were a two part survey questionnaires, they were handed out, completed and returned. Part one sought general information about the personal characteristics of respondents, such as qualification profile, class of their organisations, and years of experience, amongst others. In part two, respondents were asked a number of questions relating to public infrastructure finance and infrastructure bonds. The total number of respondents were fifteen (15) with a breakdown of two (2) Quantity Surveyors from the Ministry of Public Infrastructure and Preventive Maintenance respectively, six (6) Economists from the Ministry of Finance, four (4) Civil Engineers from the Road Development Agency and one (1) Economist from Zambia Development Agency. Data collected was analysed using both descriptive and statistical data analysis methods such as frequencies, and percentages. From the secondary data specific information was sought such as unemployment, debt and others figures.

FINDINGS

The section below outlines the findings of the research.

Respondent profile

Bonds in the Zambian construction industry are rare and often handled by few individuals in various ministries. Therefore for this study only 11 respondents took part in the study as follows: Zambia Development Agency (ZDA) 1, Ministry of Finance (MOF) 6 (economists), Ministry of Housing and Infrastructure 4 (quantity surveyors). Of these the knowledge on infrastructure bonds is generally poor (64.29%) with only a few (35.71%) indicating that their knowledge is good. This is because other methods of financing have been used on past projects such as loans.

Proposed nature of infrastructure bond

After giving a brief description of the various types of bonds available namely credit enhanced bonds, informed bonds and forward purchase bonds in the questionnaire, the respondents seem to favour informed bonds due to the characteristics of having an adviser to advise the bondholder, stringent monitoring of the project and an advisor making decisions on behalf of the investor which was seen to also work in favour of all parties involved.

Factors to be considered in the issue of an infrastructure bond

Obtaining of infrastructure bonds normally hinges on having certain factors in check such as structural, macroeconomic and public finance factors which are normally used by rating agencies. The following were the findings on the respective factors:-

Structural factors

The structural factors that are considered are level of transparency, level of accountability, measures put in place to curb corruption and the political atmosphere. The findings showed that the level of transparency is perceived to be fair by 57.14%, good by 21.43% and poor by 21.43%. None of the respondents rated it very good or excellent. Level of accountability was perceived as accountable by less than half (42.86%), 21.43% had the view of not accountable and 35.71% were unsure of governments' accountability on finances. For corruption 35.70% were of the view that there are no measures in place to curb corruption, 42.86 were unsure and 21.43% indicated the presence of measures in place to curb corruption. The last attribute was that of political atmosphere. More than half of the respondents (57.14%) indicated that the political atmosphere is stable, 21.43% indicated it as moderately stable, 14.29 % indicated it as very stable while 7.14 % indicated it as unstable. The structural factors that seem to need attention based on the perceptions of the respondents are measures put in place to curb corruption and the level of accountability.

Macro economic factors

Macroeconomic factors of interest in acquiring infrastructure bonds include, business environment indicators (See Table 1), state of the economy, the ease of doing business, tax regime, government spending and measures put in place to combat market stress (inflation, interest rates etc).

Table 1 shows various indicators which all seem moderate except for trade balance which shows that the country has not necessarily been doing well in 2015 and 2016 due to a deep in copper prices which is the major export. This indicator improved in 2017 as the copper prices increased.

Table 1: Business environment indicators

Indicator	Year		
	2015	2016	2017
GDP Growth	2.9%	3.0%	4.2%
CPI Inflation	10%	17.8%	8.2%
Trade balance	-743.2	-504.6	639.0
Unemployment levels	7.75%	7.78%	7.79%

The state of the economy is perceived to be stable by 64.29%, moderately stable by 14.29% and very stable by 7.14% while 14.29% view it as unstable. Therefore the state of the economy can be viewed to be stable. The World Bank on the *Ease of Doing Business Report* of 2015-2018 show that the ease of doing business has improved from 2015 to 2018 as the country rankings have in improved from 111 (2015) to 97 (2016) to 85 (2017 and has remained at 85 (2018). Further to this, more than half of the respondents (57.18%) indicated that the current tax regime promotes foreign investment. Additionally, the majority of respondents (66.33%) were of the view that measures put in place for example using

monetary and fiscal policies to cartel risks such as inflation, liquidity and interest rates are effective in dealing with the market stresses.

Public finance factors

The level of net debt ratio, changes in fiscal and monetary policies, changes in interest rates, ratio of GDP/ private credit and public debt sustainability all influence the acquisition of infrastructure bonds. The perception on debt ratio by the respondents is that it is currently stable as indicated by the majority 83.33%. however, respondents who reported it as unstable (16.67%) attributed their response to governments' rampant borrowing. Other public finance indicators such as changes in fiscal and monetary policies such as interest rates which change annually as indicated by more than half (67%) the population may not be attractive for long term borrowing.

External factors

The external factors that affect obtaining of an infrastructure bond include debt sustainability, external liquidity, and reserves. Public debt sustainability takes into account the breadth of the revenue base of a country. According to KPMG (2018) there has been an increase in the breadth of revenue from K 53,135,000.80 in 2016 to K 64,510,000.30. The increase in revenue could indicate an improved ability to pay debt and a reduced risk of default in payments. However, the country's debt as of May 2018 stood at US\$9.1 Billion. Notwithstanding though, there was an increase in the Republics profits in 2017 of K 1,304,717,000 from a loss of K910, 281,000 in 2016. In spite of this, there was a decrease in assets in 2017 due to IMF recovery of debt in 2017. This makes the country not to be very liquid which poses' problems for debt repayment. Additionally the country's' reserves in foreign exchange and gold despite having a slight increase in 2017(US 2.4Bn) from 2016 (US 2.3Bn) does not seem to improve the situation in view of the external debt.

DISCUSSION

Infrastructure bonds though a good project financing option does not seem to be a method to be employed in the Zambian construction industry until the inhibitors are addressed. Lenders decisions on bonds heavily rely on credit rating agencies assessments. The categories of consideration for infrastructure bonds are structural feature, macro-economic factors, public finance and external debt finance. The inhibitors found are discussed below in each category.

a) Structural features

Both the political atmosphere as well as economy was found to be stable. These may be used to give an indication on the contract viability. Normally when the political atmosphere is not stable there is the risk of contract modification, cancellation or outright expropriate. These risks seem to be low as Zambian seems to be stable politically. Additionally, the current governance system upholds public accountability while with regards to transparency the respondents deemed it to be fair. The main obstacles in the structural features are the perceived weak measures put in place to curb corruption. This implies that there could be the possibility of fraud, bribery etc in the administration of the funds on projects; nevertheless measures could be put in place to ensure the funds are used as intended.

b) Macro-Economic Factors

The ease of doing business in Zambia seems to be improving going by the World Bank rankings for 2018. Additionally, the current tax regime was found to be promoting foreign investment and also the economy in itself has the ability to retain market access after the aftermath of market stress or dislocation. Furthermore, the current trend in government spending in line with the budget was found to be flexible. This may be accommodating for paying debts but may also imply that funds budgeted for debt repayment may be diverted.

Other indicators such as gross domestic product (GDP) need to be improved; a growth in GDP implies that a country is increasing its average wealth and an increase in wealth subsequently entails a higher credit rank. According to Fitch (2018) economies with sustained high rates of economic growth are typically better able to absorb adverse shocks. The interest rate (9.75%) and inflation (7.8%) though stable are relatively high compared to other countries that have used infrastructure bonds such as South Africa (Inflation 6.5%; Interest rates 4.6%) and Kenya (Inflation 4.35%; Interest rates 9%) in 2018 (Trading economics, 2018). These need to be worked on to improve the macro economic outlook.

Trade balance is another area needing attention as it customarily relies on copper. This therefore calls for diversification which is earmarked for implementation as outlined in the seventh national development plan which aims at developing tourism, agriculture and other mineral exploits apart from copper.

c) Public Finance

The net debt ratio of the country was found to be stable which translates into the ability of the country to sustain debt. Additionally, the change in fiscal and monetary policy in relation to taxes and interest rates respectively showed it was changed yearly. This indicated that the current fiscal structures are flexible and therefore, are able to increase the revenue base. The fiscal and monetary structure change reflects the stability of policy in the short term. It is unclear whether the public finance is autonomous or is driven by political pressure.

d) External Debt Finance

Firstly, the ratio of GDP/ Private Credit was found to be stable. This points to the fact that a country is able to sustain debts and able to pay back with the basis that it has the capacity or a wide revenue base. Last but not the least the resilience of the economy to economic shock was found to be fair, implying that the current policies in the economy put in place to fight against the vice of economic shock are underutilised. The country is not very liquid and needs to improve its revenue so that it is able to pay future debts,

CONCLUSIONS

Infrastructure bonds have proved to be a viable project financing option in other African countries such as Kenya yet are not feasible in the Zambian construction industry as the conditions to be met by the country fall short in some aspects. The areas needing attention are additional measures to curb corruption, increase gross domestic product, decrease in inflation, decrease in interest rates and reduction of the external debt. Once these are improved then infrastructure bonds could be feasible for use in financing multiple projects. Bond rating agencies such as Moody in 2017 rated Zambia as lower medium grade B3 which can only be improved by working on the highlighted areas. This research focused on infrastructure bonds and did not include other types such as municipal, social and corporate bonds which could be

considered as areas of future research for project finance in the construction industry in Zambia.

REFERENCES

- African Development Bank Group (2013) Structured Finance- Conditions for Infrastructure project Bonds in African Markets. NEPAD
- Alinaitwe, H., Apolot, R. and Tindiwensi, D. (2013) Investigation into the Causes of Delays and Cost Overruns in Uganda's Public Sector Construction Projects. *Journal of Construction in Developing Countries*, 18(2), pp. 33–47.
- ASX, 2016. ASX. Available online at: <http://www.ASX.com> [Accessed 19th December 2017].
- Borse, M. & Khare, P., 2016. Analysis of Cost and Schedule Overrun in Construction Projects. *International Journal of Innovative Science, Engineering & Technology*, 3(1), pp. 383 -
- Croce, R. D., Paula, J. & Laboul, . A. (2015) *Infrastructure Financing Instruments and Incentives*. Berlin, OECD.
- D’Erasmus, P., Mendoza, E. G. & Zhang, J. (2016) What is a Sustainable Public Debt?. In: J. B. Taylor & U. Harald, eds. *Handbook of Macroeconomics*. Philadelphia: Elsevier, pp. 2493-2597.
- Falqi, I. (2004) *Delays in Project Completion: A comparative study of construction delay factors in Saudi Arabia and the United Kingdom*, Masters’ thesis 2004, Heriot-Watt University.
- Fitch, A. (2018) *Sovereign Rating Criteria*. London: Fitch.
- Håvard Halland, John Beardsworth, Bryan Land, and James Schmidt (2014) *Resource Financed Infrastructure A Discussion on a New Form of Infrastructure Financing*. The world Bank
- Jochimsen, R. (1966). *Theory of infrastructure: Grundlagen der marktwirtschaftlichen Entwicklung*. Tübingen, J.C.B. Mohr.
- Kabir A.H.M. (2008) *Development Aid in Stable Democracies and Fragile states*. Palgrave macmillan. New York, USA.
- Kaliba, C. J., Muya, M., and Sichombo, B. (2009) The need to reduce costs, schedule overruns and quality shortfalls in construction. 4th Built Environment Conference. Livingstone. Zambia
- Kaliba, C., M Muya, and B Sichombo. (2013). Causal factors of cost escalation, schedule overruns and quality shortfalls in construction projects in Zambia. *International Journal of Construction Management*, 13 (1).
- KPMG, (2017) *Economic Snapshot H1, 2017* , Zambia. Lusaka , KPMG Services Pty Ltd .
- Locsin, M. C. D. (2015) *Local Currency Bonds and Infrastructure Finance in ASEAN+3*, Manila: ADB.
- Monaro, S., 2011. *Project Bonds: The New Frontier for Project Finance in Brazil*, Rio De Janeiro: HSBC.
- OECD (2017) OECD. [Online] Available online at: <https://data.oecd.org/gga/general-government-debt.htm> [Accessed 14 April 2018].
- Oji, C. K. (2015) *Bonds: A Viable Alternative for Financing Africa’s Development*. Pretoria, The South African Institute of International Affairs (SAIIA) .
- Park D and Tian S. (2017) Are infrastructure bonds the next big thing in infrastructure financing? <https://blogs.adb.org/blog/are-infrastructure-bonds-next-big-thing-infrastructure-financing>
- Prud’homme, R. (2004) *Infrastructure and Development*. Paris: University of Paris.

- Sawant, N. (2010) Androgenetic alopecia: Quality-of-life and associated lifestyle patterns. *International journal of Trichology* 2 (2), pp.81-85.
- Skribane I. and Jekabson S. (2014) structural weakness and challenges of the economic growth of Latvia. *Socialiniai tyrimai, social research* 1 (34), pp. 74-85
- The World Bank (2017) *How Zambia can borrow without sorrow*. Washington: The World Bank.
- Thompson, Susan (2012) "Credit rating and project finance default: An important risk management instrument," *Public Infrastructure Bulletin: Vol. 1 : Iss. 8*, Article 10. Available online at: <http://epublications.bond.edu.au/pib/vol1/iss8/10>
- Vértesy, D. (2016) *A Critical Assessment of Quality and Validity of Composite Indicators of Innovation* Joint Research Centre of the European Commission. Draft paper submitted to the OECD blue sky iii forum on science and innovation indicators.
- Weber, B. & Alfen, H. W. (2010) *Infrastructure as an Asset Class*. 4 ed. Chichester, East Sussex, UK: John Wiley and Sons Ltd.
- Wong, A., Kanza, E. & Almeida, P. R. d. (2015) *Strategic Infrastructure in Africa :A business approach to project acceleration*. Geneva, ADB.
- Zambia Development Agency (2015) *Infrastructure: Sector Profile*. Lusaka: ZDA.

END

APPLICATION OF VALUE ENGINEERING SERVICES IN THE MALAWI CONSTRUCTION INDUSTRY

George Mwakasungula¹ and Peter Mbewe²

1 Paramount Holdings Limited, P.O. Box 2736, Lilongwe

2 Department of Quantity Surveying, Malawi Polytechnic, University of Malawi, Private Bag 303, Blantyre 3

With growing global efforts towards sustainable infrastructure development, various professional entities are embarked on developing innovative technologies that add value to existing traditional services in the built environment with the aim of ensuring sustainable infrastructure development. A typical area of importance is value engineering. Thus, a study was conducted to explore the application of value engineering services in the Malawi construction industry. Using qualitative research methods where relevant professional within the industry were interviewed, this paper evaluates construction professionals' attitudes towards provision of value added innovative construction services and links the technical competencies of the practitioners with the usage of value engineering services. A sample size of 86 respondents drawn from 56 different local consulting construction firms representing 93% of the total consulting firms registered by the National Construction Industry Council of Malawi in 2011/2012 financial year was used. Stratified random sampling was used. Data was collected using an open-ended and close-ended questionnaire. The results revealed that value engineering is rarely used by the local construction professionals in Malawi and that construction interventions that provide for value for clients' infrastructural investments, when performed, are usually implemented at design stage. Most respondents stated that clients' lack of insistence to use value engineering contributes to low application of value engineering as clients believe that the use of such a service would increase the cost of services. It is thus recommended that proper efforts should be made to entrench value engineering services within the construction industry through creation of an enabling environment to foster innovations among construction professionals that can help promote sustainable infrastructure development.

Keywords: Construction industry, Innovation, Value engineering.

INTRODUCTION

Clients' growing demands for innovative and cost effective services coupled with the complexity of modern construction project and advancement in technology have motivated development and increased application of value engineering in the construction industry in most developed countries (COEM, 1995). With the benefits of value management becoming well known among clients, the demand for value management continues to increase even in developing countries such as South Africa (Sigle, et al., 2000; Oke and Ogunsemi, 2009, Morrison, 1984). In South Africa, Sigle, et al. (2000) observed that clients are insisting that value management should be applied to their construction projects and such could probably be attributed to the effectiveness of value management as a tool for ensuring value for money.

While value management may be applicable to many sectors of the economy such as industrial sector, manufacturing, construction and processing, there is little information on the extent to which value engineering has been entrenched in the construction sector in Malawi. Construction industry in Malawi is one of the biggest consumers of raw materials and

1 grgmwakasungula21@gmail.com

2 pmbewe@poly.ac.mw

promotion of value management in the sector may not only increase the quality of infrastructure but also boost the productivity of other sectors of the economy. In Malawi, the government is the biggest client for the construction industry as it funds most of developmental projects using donor money or grants. Under such circumstances, value management becomes very ideal in producing the best infrastructure with minimal resources. Effective implementation of value engineering would be achieved if practitioners have relevant value engineering skills. It is against this background that this research was carried out to explore consultants' perceptions on the application of value engineering in the construction industry.

LITERATURE REVIEW

Concept and processes of value management /value Engineering

The concept of value relies on the relationship between the satisfaction of many differing needs or goals and the amount of resources used in achieving such goals as argued by the Institute of Value Management (2011). It should be noted that different stakeholders, internal and external customers may all hold differing views of what represents value as such provision of value management as a service need to emanate from a thorough understanding of what represents value for a specific customer and circumstance. Value management should be aimed at reconciling differences in customer needs and enable an organization to achieve the greatest progress towards its stated goals with the use of minimum resources. The SAVE International Standard (2012) adopts the term value methodology (VM) which encompasses value analysis, value engineering, value management, value control, value improvement and value assurance.

Since its inception, value engineering has been used to determine the best design alternatives for projects, reduce cost on existing projects, improve quality, increase reliability and availability, and customer satisfaction, improve organizational performance, improve schedule, reduce risk and identify problems and develop recommended solutions. Application of value engineering throughout the project life cycle is ideally broken into three stages as indicated in Figure 1 while the value engineering process has been summarized in Table 1. The cost saving increases when value engineering interventions are implemented during the planning and design stages of a project. Value engineering interventions that are sought and implemented during construction, operation and maintenance stages are usually less favourably acceptable as they tend to have an increased cost of implementation.

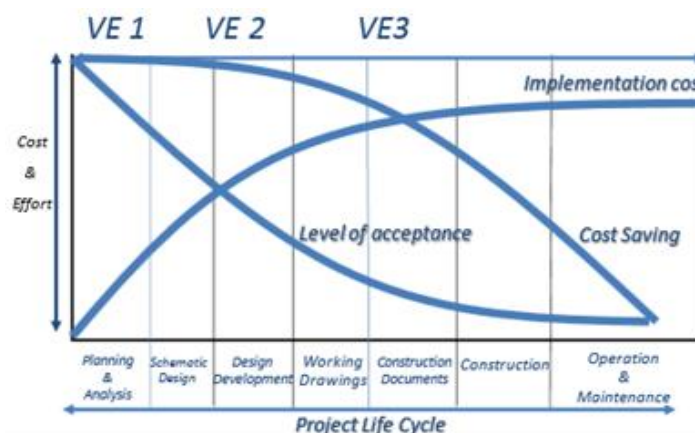


Figure 1: Design stages for application of Value Engineering through project life cycle (adopted from Al-Yousefi, 2010)

Table 1: Value engineering process (adopted from Roseke, 2016)

	VE Phase	Activities and application of phase
Phase 1	1.0 Preparation	study, set aim and direction of study, choose object of VE, form a VE team
Phase 2	2.1 Information	understand the place of order and user demand, collect information and preparation, cost analysis
	2.2 Function analysis	place definition of function and classification, function analysis, function analysis system technique (FAST) diagram
	2.3 Speculation	brainstorming, Delphi technique, synetics technique
	2.4 Evaluation	performance matrix evaluation, cost and riskiness outline evaluation
	2.5 Development	Specification of concept, sketch (outline), cost (LCC) and performance evaluation.
	2.6 Presentation	technological examination, setting alternatives, suitability of alternatives, verification and result announcement
Phase 3	Implementation	final approval of alternatives, write and submit Value Study Table

Why should value management be fully entrenched in the construction industry in developing countries?

Many developing countries face challenges in securing financial resource for financing infrastructure projects. These countries need to make the best use of limited financial resources that may be available from local tax collections and/ or loans from various financing institutions. It is in this vein that value management becomes an ideal tool for optimizing the benefits from the available resources. Research on the impact of value management in minimizing the construction costs spearheaded by SAVE indicated that inclusion of value engineering in construction project may save money up to 30% of construction project costs (Dell’Isola, 1988). In Malawi, where some of public services such as provision of portable water, roads and railway transport system and electricity face increasing pressure due limitations of resources, it is prudent that provision of infrastructure should consider life cycle of such infrastructure while enhancing sustainability through value management.

Barriers to the use of value management in the construction industry

Oke and Ogunsemi (2009) conducted research in Nigerian construction industry which revealed the major barriers to the use of value management in the country as being ambiguous design; time of completion/delay; conflict management; finance; construction methodology; inadequate knowledge of benefits of value management; lack of involvement of professionals right from the onset; greediness of the contractors and consultants; lack of total quality management principles in construction firm; professional incompetence; technology level; procurement style; communication gap; unstable economy; poor management especially on the part of the client; lack of understanding of the concept.

Ramus et al. (2006) noted that the usage of value management/value engineering could be affected if senior management at a company do not express and demonstrate their support and commitment to the use of value techniques. Other barriers to the use of value engineering would be lack of technical competence in using value engineering techniques, many clients do not ask for such a service either because they do not know of its existence or they may think that it would be more expensive if such service is incorporated. Sometimes the time

frame within which a project is conducted may not be enough to incorporate value engineering.

RESEARCH METHODOLOGY

Research approach, data collection methods

There is limited literature about the application of value engineering in the Malawi construction industry. This prompted the authors to use an exploratory research approach so that respondents were not restricted to the type of responses while gauging some specific areas of interest in the area of value engineering. A comprehensive literature review was carried out to assess how value engineering has been adopted in other countries and examine potential benefits of value engineering when effectively applied in the construction industry. Primary data was collected through interviewing respondents using a questionnaire comprising of both open-ended and close-ended questions. The interview centred on the extent to which value engineering is used among each of the construction trades, factors that influence the use of value engineering, and lastly assess the perceptions of practitioners on the benefits of value engineering. Respondents were briefed about value engineering so that they became aware of what was sought. Most questions adopted the use of a four to five point scale to capture the frequency of use of value engineering techniques and gauge people's level of agreement on the specific questions.

Study population, sample size and sampling techniques

A population of about 60 construction consulting firms drawn from a register produced by the National Construction Council of Malawi (2012) was considered for the study. A sample size of 86 respondents drawn from 56 different local consulting construction firms representing 93% of the total consulting firms registered by the construction regulatory body in Malawi for 2011/2012 financial year was interviewed. The firms comprised 33 consulting civil and structural engineering firms, 13 consulting architectural firms and 10 consulting quantity surveying firms selected based on the proportion to the population of companies in each category. Stratified convenient sampling was used. In this case, various groups within the construction consulting industry were identified and a representative number of firms were drawn. The sample was drawn from Blantyre and Lilongwe, two major cities in Malawi. From the register from NCIC, over 95% of consulting firms have their offices in one of these two cities and hence it was convenient that the interviewees be drawn from these two cities to save on cost and time while securing enough representation for the research.

Data analysis

Most of the data was captured and recorded based on agreement and frequency terms. Using a **Likert** scale, the frequency and level of agreement terms were converted to numerical values and such data was analysed to come up with mean scores and standard deviations. This was used to determine the dominant factors/elements within each area under investigation while a standard deviation together with population size (variance) would be an indicative scatter of respondent's perceptions. In addition to this, other questions required the respondents to either give a 'yes' or 'no' answer and these were used in classification of respondents and evaluation of each class based on subsequent responses. Data processing was done using Microsoft Excel software.

RESULTS AND DISCUSSIONS

General characteristics of respondents

The sample comprised quantity surveyors, civil engineers and architects. Respondents’ age, years of experience and academic qualification were captured to define the general characteristics of the respondent. Figures 2(a), 2(b) and 2(c) provide the distribution of age class, years of experience and academic or professional qualification within each respective professional category respectively. Most of the respondents were below the age of 40 and this corresponded well with the years of experience as most of them have less than 10 years of experience comprising mostly holders of bachelors’ degrees (more than 60% within each profession as indicated in Figure 2(c)). Civil engineering has a considerable amount of professionals with a lot of years of experience in addition to holding relevant academic qualifications (more than 50% of civil engineering respondents have more than 10 years of work; about 90% of civil engineering respondents have at least a bachelor’s degree) as indicated in Figure 2(b) and (c).

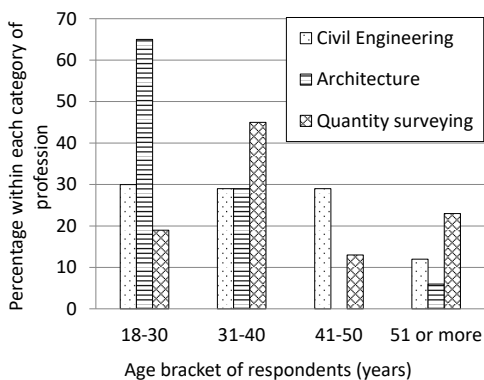


Figure 2 (a): Age of respondents

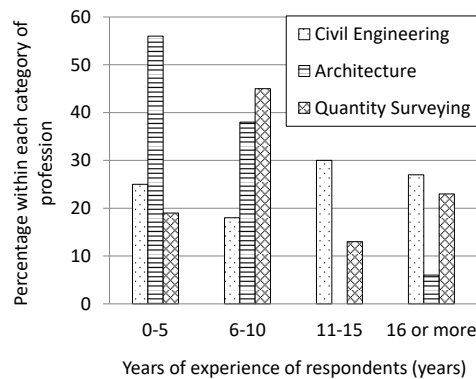


Figure 2 (b): Years of experience of respondents

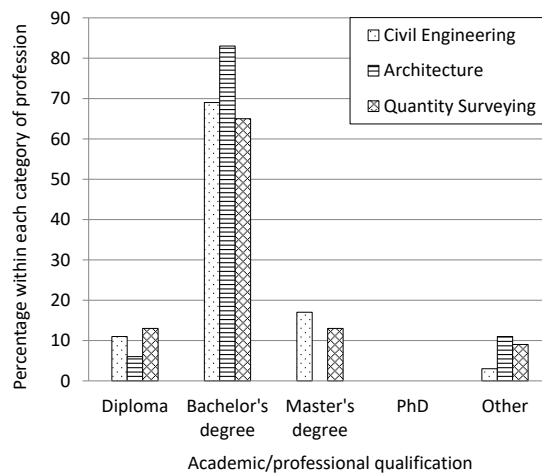


Figure 2 (c): Academic/professional qualification of respondents

Architecture has a considerable amount of fresh graduates with fairly less years of experience as compared to civil engineering and these comprise mostly bachelor’s degree holders (65% of Architecture professionals fall within the age group of 18-30 years; 56% have a maximum of 5 years of experience, and 83% have bachelor’s degree) as indicated in Figure 2(a), (b) and (c). Most Quantity Surveying professionals are bachelor’s degree holders belonging to the age bracket of 31-40 years and have a work experience of about 5 -10 years (45% of Quantity Surveying respondents belong to age bracket of 31-40 years; 45% of Quantity Surveying

respondents have work experience of 6-10 years; 66% have a Bachelor's degree as their highest academic qualification) as shown in Figures 2(a), (b) and (c).

Competence of construction consultants in using value engineering tools within their profession

Competence of construction consultants in using value engineering tools was assessed by using a structured response approach where respondents were interviewed on their knowledge of value engineering concept and tools and usage of such tools during their professional endeavour. The first step in assessing the knowledge about value engineering was to identify the proportion of the respondent with or without knowledge of value engineering; identify the mode/source of training that they underwent to acquire value engineering skills and frequency of use of such techniques.

Knowledge and source of training of value engineering

33% of all respondents answered that they do not know anything about value engineering while 67% know value engineering (see Figure 3). Of the respondents who have knowledge of value engineering, 51%, 11%, 11%, 5%, and 22% acquired their knowledge/skills through academic institutions, professional bodies, in-house within their work places, Value management workshop and other sources respectively. "Other sources" include conferences and seminars, self-study (using internet and books), project meetings, TV documentaries and professional colleagues. It should be noted that within the knowledge of value engineering as investigated in this research there are two issues tackled; namely mere knowledge of the existence of value engineering skills and mastery of such skills through proper training. Most of the respondents who acquired knowledge of value engineering through either academic institutions, professional institutions and value management workshops are the ones who showed some degree of mastery of value engineering tools while the rest only heard about value engineering but do not have relevant mastery skills to use value engineering tools. Furthermore, most of the respondents who responded positively about knowledge of value engineering only knew some of the tools which they use but could not be implemented fully as part of professional practice.

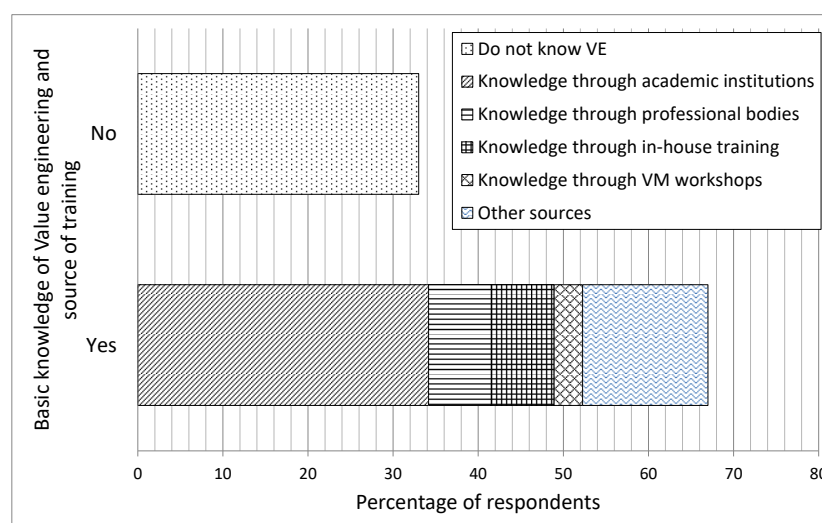


Figure 3: Basic knowledge of Value engineering and source of value engineering training

Use of value engineering

Respondents who had knowledge of value engineering were asked to explain whether their respective companies offer value engineering as a service that is provided to their clients. They were further asked to provide the stages in the project life cycle phases that the value engineering techniques are usually provided. 46% of respondents stated that their companies use value engineering techniques in serving their clients while 54% of respondents stated that their companies do not provide value engineering services. With more than 50% of respondents indicating that their companies do not provide value engineering services, Malawi just like most developing countries has not fully embraced value engineering as reported by Oke and Ogunsemi (2009).

Using a scale of 1 – 4, where 1 = rarely used, 2 = used, 3 = frequently used and 4 = always used, the responses of the respondents on the frequency of use of the value engineering techniques within the following project life cycle phases were captured and analysed as summarised in Table 2. It should be stated that some respondents chose to provide answers for some questions while leaving other questions unanswered as indicated by the number of respondents within each category of building construction life cycle considered in this research. Mean score ranges from 2 to 3 and it may imply that most of the construction engineering professional with knowledge of value engineering moderately use value engineering tools during their professional practices. A mean score of 2.63 for use of value engineering during construction stage, a value similar to those found during other stages of construction, raises a lot of questions about the competence of respondents with regard to use of value engineering techniques. Common practice reveals that use of value engineering during pre-construction stage is very beneficial as it brings substantial cost savings while application of value engineering during construction implies making modifications that may eventually increase the project cost and hence undesirable as indicated in Figure 1 (Al-Yousefi, 2010).

Table 2: Frequency of use of value engineering during pre-construction stage and results from corresponding data analysis

Stage	Number of respondents for the frequency of use				Data analysis	
	Rarely used	Used	Frequently used	Always used	Mean score	Standard deviation
Inception or feasibility	8	12	3	12	2.54	1.20
Conceptual design	8	9	8	14	2.72	1.67
Tender documentation	6	12	3	9	2.50	1.14
Tender Action procurement	10	12	6	7	2.29	1.10
Construction stage	7	10	7	11	2.63	1.14

Respondents whose companies use value engineering were asked to indicate the frequency of use of each of the following value engineering techniques: cost analysis, contractor change proposal, Functional Analysis, Life Cycle costing, Quality Management and Value Management audit. Using a scale of 1 – 4, the responses of the respondents on the frequency of use of each of the techniques were summarised and analysed as shown in Table 3.

Mean scores were used to identify the most dominant techniques used in value engineering among practitioners in the construction industry in Malawi. Amongst the six value engineering techniques that were considered in this research, cost analysis is the most dominant technique used by consulting practitioners while contractors change proposal is

least used as indicated in Table 3. The use of “contractor change proposal” technique/option is least used as this may have cost implications and hence erode the whole essence of value engineering. While value engineering is meant to optimize the best use of available resources in coming up with the best service to customers, emphasis on cost confirms the relevance of value engineering in reducing cost while lower application of functional analysis and life cycle analysis may be attributed to the fact that most practitioners have limited value engineering skills, lack of research and development with most consulting firms which would have provided optimal solutions in coming up with better options for the projects and lack of collaboration among most consulting firms in coming up with project options that optimises limited resources.

Table 3: Frequency of use of value engineering within some project life cycle stages and results from corresponding data analysis

Value engineering techniques	Number of respondents for the frequency of use				Data analysis		
	Rarely used	Used	Frequently used	Always used	Mean score	Standard deviation	Position
Cost analysis	2	8	6	17	3.15	1.00	1
Contractor change proposal	19	9	5	0	1.58	0.75	6
Functional analysis	9	10	10	2	2.16	0.93	3
Life cycle analysis	11	11	3	3	1.93	0.50	4
Quality Management	8	13	9	10	2.53	0.43	2
Value Management audit	12	12	5	0	1.76	0.42	5

General perceptions of value engineering services among construction consulting practitioners

Six reasons that demotivate practitioners from using values engineering were pre-selected and used to explore future prospects of using value engineering Malawi. These are (a) client does not ask for value engineering, (b) company not familiar with value engineering, (c) company has another system in place, (d) company views value engineering as ineffective, (f) firm is too small to use value engineering, and (g) there is insufficient time to perform value engineering.

Table 4 provides a summary of the responses, where terms strongly disagree, disagree, not sure, agree and strongly agree with corresponding numerical values of 1, 2, 3, 4 and 5 respectively adopted for data analysis. Mean scores were used to establish the significance of each factor/reason as shown in table 4. It can be stated that according to construction practitioners, the most dominant factor that discourages them from using value engineering is lack of insistence by clients to have value engineering services, while insufficient time is listed as the least significant factor. Lack of client knowledge might have a bearing on whether a client would request for value engineering. Respondents indicated that clients feel inclusion of value engineering within the project could increase the project cost.

Respondents’ perception on the benefits of value engineering the construction industry was assessed by gauging respondents’ attitude towards level of agreements with specific factors given to them during the interview. The factors include: value engineering optimizes value for clients’ projects, it is effective in reducing costs and it facilitates achievement of functionality for projects. Using terms strongly disagree, disagree, agree and strongly agree, and their corresponding numerical values of 1, 2, 3, 4 and 5 respectively, the frequencies and data analysis of respondents’ level of agreement to the specific questions are reported in

Table 5. It can be noted that all the beneficial factors are of similar significance with optimizing value for client the most dominant.

Table 4: Factors that discourage the use of value engineering in construction industry and results from corresponding data analysis

Factors that discourage the use of value engineering	Frequency					Data analysis		
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Mean score	Standard deviation	Position
Client does not ask for VE services	4	6	0	15	19	3.89	1.35	1
Company not familiar with VE	5	8	0	16	15	3.64	1.42	2
Company has another system in place	4	13	0	12	6	3.09	1.38	3
Company views VE as ineffective	8	16	0	5	3	2.34	1.29	4
Firm is too small to use VE	13	13	0	5	1	2.00	1.16	5
Insufficient time to perform VE	18	9	0	3	0	1.60	0.93	6

Table 5: Respondents' perception on the benefits of using value engineering in construction industry and results from corresponding data analysis

Benefits of using value engineering in construction industry	Frequency					Data analysis		
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Mean score	Standard deviation	Position
Optimises value for clients	1	4	0	7	30	4.452	1.064	1
Effective in reducing cost	0	1	0	20	20	4.439	0.634	2
Facilitates achievement of functionality of projects	1	4	0	21	17	4.140	0.990	3

CONCLUSIONS AND RECOMMENDATIONS

From the research findings, we can conclude therefore that value engineering is not fully entrenched among construction consulting firms in the Malawi construction industry. This reflects the general trends in most developing countries as highlighted by most researchers as reported in Oke and Ogunsemi (2009). In order to promote value engineering among practitioners, there is need to consider and tackle most dominant factors that discourage use of value engineering. The most dominant factor as identified in this research is that clients do not ask for VE services and is followed by unfamiliarity of VE by practitioners. It may be argued that the first factor is not fully within the control of practitioners. Unfamiliarity of VE is the most significant factors within the control of practitioners. Practitioners, therefore, need to be better informed about VE techniques so that they remain competitive while offering best services for their clients.

While the use of value engineering involves both consultants and clients, this research targeted only the consultants. Hence a fair understanding of the cross section of the stakeholders that contribute to the level of application of value engineering in Malawi cannot be fully deduced. Nonetheless, the findings of this research can be used as a springboard for

further comprehensive research on the clients' perception and actual evaluation of competence of consulting firms to establish the knowledge gap in using value engineering.

The study recommends entrenchment of value engineering/value management in the Malawi construction industry through integration of value engineering with other engineering fields that support the construction industry during the training of construction professionals as a way of fostering innovations in the construction industry. Furthermore, the creation of an environment that fosters greater competition among construction firms and increases customer demand for excellent and innovative services will create value for Money for Clients and foster sustainability in the Construction industry.

ACKNOWLEDGEMENTS

The research work was carried out under the Department of Quantity Surveying and Land Economy of the University of Malawi, The Polytechnic. We would like to thank all respondents whose responses contributed to the success of the research.

REFERENCES

- Al-Yousefi, A. S, The synergy between value engineering and sustainable construction: Available at http://www.value-eng.org/knowledge_bank/attachments/ [Accesed 16 June 2012].
- COEM (1995): "Value Engineering". Postal Courses of the College of Estate Management (COEM), UK.
- Dell'Isola, A.J., (1988) Value engineering in the construction industry, Smith, Henchman and Gryll, Michigan.
- Morrison, N. (1984). The accuracy of quantity surveyors' cost estimating. *Construction Management and Economics*, 2, 57-75.
- National Construction Council of Malawi, 2012. Membership. [Online] Available at: ncic.mw [Accessed 12 June 2012].
- Oke, A. and D. Ogunsemi. 2009. Competencies of quantity surveyors as value managers in developing economy. In *The Construction and Building Research Conference of the Royal Institution of Chartered Surveyors (COBRA 2009)*. Cape Town.
- Ramus, JW, P. Griffiths, and S. Birchall. (2006) *Contract Practice for Surveyors 4th ed*, Butterworth Heinemann, London.
- Roseke, B., 2016. The 6 steps of a value analysis. [Online] Available at: <http://www.projectengineer.net> [Accessed 4 February 2018].
- SAVE International (2012) Value engineering. [Online]. Available from: www.value-eng.org/ [Accessed 15 April 2012].
- Sigle, H. M., Klopper, C. H., & Visser, R. N. (2000). The South African quantity surveyor and value management. *Project Forum*. South Africa: Project pro, pp 23-26.
- The Institute of Value management (2011). What is value management? Retrieved on 9 June 2011 from http://www.ivm.org.uk/what_vm.htm.

END

ASSESSING THE NEED FOR CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL SUSTAINABILITY

Anjiba Lampthey-Puddicombe D.¹ and Benjamin Amadi Woke²

1 Department of Quantity Surveying Faculty of Environmental Sciences, Rivers State University Nkpolu-Oroworukwo, Port Harcourt, Nigeria

2 Department of Quantity Surveying, Faculty of Environmental Sciences, Rivers State University

Continuing Professional Development (CPD) is recognized as fundamental to the improvement of standards and skills of professionals, individuals and organisations. CPD means the systematic progression, improvement, maintenance and expanding of knowledge, skills, understanding and development of professionals and technical skills throughout the professionals' life cycle of the practitioner. In as much as this venture seeks to improve on the professional competence of the individual, professionals have neglected and relegated CPD to the background thereby increasing the level of setbacks and deterioration in skills and knowledge acquisition after formal and informal training. The role of CPD on career enhancement and sustainability is the focus of this paper. Quantitative data were collated from professionals in the built environment spanning ten (10) years from 2006-2015 in practice while structured questionnaire was employed to evaluate the factors responsible for non-participation of professionals in CPD in the study area. 490 (70%) out of 700 questionnaires were returned and analysed using the Relative Importance Index (RII). The study reveals that there is a significant impact of CPD on Professionals' skills enhancement to professionals' advancement. The factors responsible for non-participation of professionals in CPD include learning culture, time and work load, resource support, motivation, and effective communication. The study concludes that CPD can only be achieved with effective advocacy and motivation of professional bodies through periodic evaluation of membership status in learning. The study recommends that professionals should be aware of their professional ethics and oath of allegiance of continuous involvement in CPD activities in any form to be abreast with best global practices in the profession.

Keywords: Built Environment, Continuing, Development, Nigeria and Professional.

INTRODUCTION

There are varied definitions to CPD (Bolam and McMahon, 2004). Day and Sachs (2004) suggest a general definition of CPD term used to describe all activities. Continuing professional development (CPD) is fundamental and integral to professional's growth. It is a career-long obligation for professionals. CPD helps to scale up your skills and competencies in organised workshops, conferences, symposia or other sources of formal training in the quest to obtain professional qualifications but most professionals relegate this to the background after formal education. Professional bodies are aware of the importance of CPD and has made conscious efforts to improving the overall professional capacities and competences of its members with the express aim of facilitating their advancement in dealing with emerging challenges, issues and the way forward. This is where CPD becomes relevant to providing professionals with the key and best opportunities. Gusky (2002) asserted that high-quality CPD is a critical element in almost all modern-day suggestions for educational imperilments.

¹ anjibaa@yahoo.com

In a view expressed by Goodall et al. (2005), teaching is an academic qualification that can be obtained in a formal setting such as an institution of higher learning while professional qualification can be obtained from the professions' institutes or institutions. Although the link between teaching and subsequent academic attainment is problematic to determine (Goodall et al, 2005). Nonetheless, educators who are involved in the provision of high-quality teaching through professional development programmes ultimately facilitate improvements in knowledge and on pedagogical practices which subsequently affect students in their efforts to achieving success both in the learning and professional fields (Alexandrou et al, 2005). This paper aims at assessing the role of continuing professional development on professional sustainability with the express objective of examining the factors affecting CPD participation and evaluating the level of professionals' involvement in CPD.

CONCEPTUAL FRAMEWORK

The most important thing regarding education is appetite. Albert Einstein asserted that, "Education is not the learning of facts but the training of the mind to think"- "Education does not begin with the University and it certainly ought not to end there"- Winston Churchill. If these assertions are correct, then continuous training is paramount in any human development and this is embedded in continuing professional development (CPD). CPD helps keep pace with the current standards of others in the profession, acquire relevant skills, changing trends in the profession and keeps you in turn with the latest and newest innovations in your chosen career.

There is a vast difference between academic and professional qualification. Further acquisition of skills and competencies lie on the continuous attendance of organised professional conferences, expositions, workshops, professional tours etc. This is usually done on an-going basis. There is a distinct difference between a training and CPD. While training is linear and formal mostly academic, specific relating to a skill and competence often time-bound in an organised institution, CPD is both a formal and an informal training that is carried out continuously as long as you profess that profession. This process is beyond any formal training where your involvement in professional activities is tracked and recorded, keeping a portfolio or folder of your professional development for reference purposes. CPD is geared towards managing your professional skills and competencies, developing progressively in your chosen profession practically and other relevant ways. It then means that CPD should be recorded to reflect and review the new skills learnt.

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

The Royal Institution of Chartered Surveyors (RICS) (2015) defines CPD as "a commitment by members to continually update their skills and knowledge in order to remain professionally competent". CPD is advocated to address the missing link between industries and institutions and organisations must thrive to ensure that CPD acquisition forms one of their philosophies underlying its establishment. As more people become professionally qualified, CPD will enhance the qualification process through sustainability. While University provides an initial training for practical competence, CPD provides the platform for continuous learning from different sources professional bodies providing the most effective platform to CPD in giving professionals well- articulated formal and informal learning environment. RICS (2008) has broken down and described CPD as: **Continuing**, because learning never ceases, regardless of age or seniority. It is **Professional** because it is focused on professional competence in a professional role and it is concerned with **Development**, because its goal is to improve personal performance and enhance career

progression, which arguably is wider than simply formal training courses. CPD is aimed at self-directed learning or personal professional development. CPD should be a belief (Lannon, 2007). Professional bodies concluded that, professionals must acquire newer skills through CPD as required by codes of conduct and ethics. Though this is a personal responsibility of professionals to keep their skills and competencies current to enable them deliver high-quality service that protects the clients and general public but meeting the needs and expectations of the end-users within the ethics of the profession.

FACTORS AFFECTING PARTICIPATION IN CPD BY PROFESSIONALS

Professional development is a process of intensive and collaborative learning to acquire professional credentials in a formal academic environment and incorporating evaluative approaches to obtain a degree and informal education in industrial experience such as in practice,(Gerard et al. 2013).While this definition perfectly fits what a professional development is, continuing professional development simply known as CPD is widely recognised as fundamental to the improvement of standards and skills of professionals.

Individuals and organisations can open up professional gaps in your skills and capacities for further development. There are factors inhibiting the participants in keeping to their CPD process. These include but not limited to motivation, effective communication resource support, time and workload, non-chalant attitude ,professional truancy, contents that address the needs, opportunity, accessibility and awareness, domestic commitment, dynamics of change, organisational strategy, lack of available literature , relevant and realistic programmes, management support and institutional culture, learning culture, registration System, (Gerard et al. 2013).

A belief in lack of benefits and interests to change and adhere to evolving innovative methods is a big obstacle to CPD, (Birch and Burnett, 2009). Everyone is afraid of change because it is pregnant with unknown facts but inevitable. The earlier we realised this, the better for professional development. Different viewpoints have emanated from several scholars on the factors affecting participants in CPD. Some of these factors include; motivation, access to resources and infrastructure, institutional supports, time and workload, slow learners, etc (Georgina and Hosford 2009; Tabata and Johnsrud 2008) Cheawjindakarn et al, 2012, Guesky, 2002, Johnson et al. 2011; Ellis and Nolan 2005; Hughes, 2005). High work load, lack of available literature and ineffective communication with management and institutions are critical factors for CPD. CPD also conflicts with domestic commitments majorly on the part of the female professionals. This was noted by (Lawton and Wimpenny, 2003).

As paucity of literatures exit in view of the factors that inhibit CPD participation, it is fundamental to prioritise these factors to deal with the most severe factors that inhibit CPD participation. Professionals must be encouraged to participate in CPD because they have a greater benefit and also identify the benefits of CPD as a result of their social status (Knowles et al, 2015).

THE NEED OF CPD

Acquisition of CPD is very important in the area of registration of members in a professional body to help keep the profession in line in terms of skills and competences.

- It definitely helps in keeping you updated with the required and evolving professional skills and knowledge with standards of others in the same endeavour.

- Keeps track your development process (progression); where I came from – where I am –where I am going. Advances the body of knowledge and technology within the profession.
- Keeps you focussed and aware of the changing trend in the profession. Focussed CPD opens up new possibilities, skills and capacities
- You and your competences remain relevant and updated, track all acquired skills, competencies and knowledge formally and informally.
- Advices on career change if necessary
- Widens your knowledge, skills and competencies and stores up in a practical professional folder for reference purposes
- Helps in profession transferability to avoid professional gap with best global practices(Fullan, 2016)
- Markets your competencies to prospective employers and community in the midst of your peers and adds best value for money spent
- Meaningful contributions can be made by you in your team. Effective and efficient, career advancement to attract new positions of responsibilities for leadership, mentorship and management
- Delivers deeper understanding of what it takes to be a core professional to impact in your workplace
- Public confidence is guaranteed from professionals within a short time to assess practical and recognisable progression
- CPD improves the professional sustainability, life, environment and economy as whole (Fullan and Hargreaves, 2013).

CPD opens up a practical professional folder to keep all the experiences and learnt skills in a documented form that attracts credit units for appraisal in some firms and companies. As the need of CPD becomes evident for professional prowess, another school of thought has opined the inclusion of Technology Enhanced Learning (TEL) to run concurrently with CPD, (Abdullah et al, 2017).

CPD within TEL domain is termed a critical factor in the support of educational development (Jones et al. 2010; Kirkwood and Price; 2011, Dash et al., 2012 and Waycott et al., 2010). The need for physical attendance to obtain CPD may not be necessary if an innovative technology can enhance learning from a distance by participants. With innovative technologies recognised and adopted by higher education facilities as in the cases of online discussions (Morris, 2010), motivated stakeholders in the education sector will be interested to participate. Al mulhem, (2013) and Al ghamdi, (2015) posited that, the merging of TEL and CPD has provided a potential critical solution in the need to satisfy and overcome complicated technological challenges.

Other works highlighted the need of incorporating TEL and CPD under the purview for motivating both learning and teaching (Ming and Azman, 2010), valuable and effective approach to achieving success (Hramiak and Boulton, 2013). As technology forces its way to bridge the gap in changes of professional skill, CPD facilitators and stakeholders will begin to adhere to the pressure to deliver CPD training with a view of attaining high level performance (Alhamid et al, 2007).

CHARACTERISTICS OF CPD PROCESS

- Must be a documented process

- Must set development and objectives goals for yourself as noted by (Mtetwa et al., 2010)
- Self-motivated as asserted by (Sharon et al, 2010)
- Learn from experience, review and record learnt skills
- Formal and informal training inclusion
- Attracts credits sometimes to participants for appraisal
- Marketing and networking amongst participants
- Achieve excellence and open to the world with respect to the profession

METHODOLOGY

This study adopted the exploratory survey design approach which involved the use of structured questionnaire for data collection to achieve the objectives of the study. This approach is deemed appropriate since the study only intends to assess the need of continuing professional development in the built environment. The targeted population for this study consists of professionals in the built environment in the Six (6) geo-political zones of Nigeria. The six zones were all included to give credit to the study, professionals' involvement on infrastructural projects and effective management of the projects' scarce resources. The questionnaires were sent to construction operators which include; Quantity Surveyors, Architects, Engineers, Builders, Town Planers, Estate Valuers and Land Surveyors. To eliminate bias according to Leed (1980), systematic approach was employed in the selections. The sample for the study consists of population of 490 professionals identified during the pilot study carried out prior to the study and was adopted for the study.

A structured questionnaire was developed to collect primary data from the sampled respondents. A total of 700 questionnaires were administered and 490 were appropriately filled and returned representing 70% response rate which agrees with the 30% minimum response generally held for any area of interest in quantitative approach (Sheldon, 2016 and Gillham, 2000). The selection was carried out using stratified random sampling technique to form the study sample. This gives overall response rate of 70% which consists of all the professionals. The questionnaire was divided into three parts. The first part requested background information about the respondents. The second part of the questionnaire focused on the factors affecting non-participation in CPD and analysed using Relative Importance Index. Chan and Kumaraswamy ((1997) and Kometa et al (1994) used the Relative Importance Index (RII) Method to analyse the data collected from the questionnaire survey. Analysis was carried out for each group of the respondents. The Relative Importance Index was used to rank the factors affecting CPD participation. The indices were then used to determine the rank of each item. These rankings enabled factors to be compared between the relative importance index as indicated by the operatives. The weighted average for each item for the seven groups of operatives was determined and the Ranks (R) were assigned to each as indicated by the seven groups of respondents. The RII was calculated for each item according to (Lim and Alum, 1995).

$$\text{Relative Importance Index (RII)} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5n} \quad \text{equation (1)}$$

n_5 = Respondents for Strongly Agree, n_4 = Respondents for Agree, n_3 = Respondents for Neutral, n_2 = Respondents for Disagree, n_1 = Respondents for Strongly Disagree

The respondents were asked to indicate their responses on a 16 well-recognized factors affecting participation in CPD rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The raw data was then coded and analyzed with the aid of the Statistical Package for Social Sciences (SPSS) software. The analysis was done to assess the factors inhibiting the non-participation of professionals in CPD for professional sustainability.

Professional sustainability is an act of diligently upholding the integrity of the profession in ethics, codes and conducts now and for the future. Continuous competencies are keys in the profession throughout the professional's career

RESULTS AND DISCUSSION OF FINDINGS

The findings of this study are presented in two sections, according to the general information of respondents and the research objectives earlier stated. General information and company's characteristics of respondents were used for the Study

Table 1 shows in details the general information of the professionals in the population sample for an understanding of the parties whose perceptions were investigated. These consist of the professionals cutting across the six (6) geopolitical zones including the Federal Capital Territory (FCT). For homogeneity, equal number was carefully selected amongst the professionals.

Table 1: Respondents from the six (6) geopolitical zones used for the study

(Source: 2018 Survey)

Geopolitical zone	Professional							Total
	Quantity Surveyor	Architect	Engineer	Land Surveyor	Estate Valuer	Town Planner	Builder	
South-South	10	10	10	10	10	10	10	70
South -East	10	10	10	10	10	10	10	70
South-West	10	10	10	10	10	10	10	70
North East	10	10	10	10	10	10	10	70
North-West	10	10	10	10	10	10	10	70
North Central	10	10	10	10	10	10	10	70
FCT	10	10	10	10	10	10	10	70
Total	70	70	70	70	70	70	70	490

Table 2: Factors affecting the non-participation of professionals in Continuing Professional Development (CPD)

S/No.	Factor	Quantity Surveyor		Architect		Engineer		Land Surveyor		Estate Valuer		Town Planner		Builder		Weighted Average		Ranking
		RII	R	RII	R	RII	R	RII	R	RII	R	RII	R	RII	R	RII	R	
1	Motivation	0.62	9	0.82	6	0.88	5	0.90	2	0.94	2	0.98	1	0.94	1	0.87	4	
2	Effective communication	0.67	8	0.81	7	0.85	6	0.83	4	0.90	3	0.92	3	0.92	3	0.84	5	
3	Resource support	0.95	1	0.89	4	0.80	7	0.89	3	0.84	5	0.93	2	0.85	6	0.88	3	
4	Time and Workload	0.90	2	0.97	1	0.89	4	0.80	7	0.89	4	0.88	6	0.89	4	0.89	2	
5	Non chalant attitude	0.40	16	0.74	9	0.75	8	0.70	9	0.80	6	0.89	5	0.80	5	0.73	8	
6	Professional truancy	0.54	12	0.68	10	0.72	9	0.66	10	0.76	8	0.83	7	0.71	8	0.70	10	
7	Relevant and realistic programmes	0.51	13	0.50	14	0.71	10	0.76	8	0.73	9	0.80	8	0.70	9	0.77	7	
8	Content that address the Need	0.59	10	0.44	15	0.49	16	0.65	11	0.61	12	0.75	9	0.50	12	0.58	13	
9	Opportunity, accessibility and awareness	0.75	5	0.41	16	0.66	11	0.54	15	0.69	10	0.66	13	0.63	10	0.62	11	
10	Management support and institutional culture	0.74	6	0.85	5	0.95	2	0.82	5	0.60	13	0.61	14	0.46	13	0.72	9	
11	Learning culture	0.82	3	0.93	2	0.98	1	0.81	6	0.95	1	0.91	4	0.93	2	0.90	1	
12	Domestic commitment	0.45	15	0.51	13	0.60	12	0.50	16	0.55	14	0.74	10	0.42	14	0.54	15	
13	Dynamics of change	0.79	4	0.92	3	0.91	3	0.94	1	0.77	7	0.71	11	0.74	7	0.83	6	
14	Organisational strategy	0.70	7	0.75	8	0.55	13	0.61	12	0.54	15	0.67	12	0.41	15	0.60	12	
15	Lack of available literature	0.48	14	0.63	11	0.53	14	0.56	13	0.68	11	0.53	16	0.58	11	0.57	14	
16	Registration System	0.55	11	0.54	12	0.52	15	0.55	14	0.49	16	0.54	15	0.40	16	0.51	16	

(Source: 2018 Survey)

From the factors culled from literatures and previous researches, learning culture was ranked first followed by time and work load. Africa especially Nigeria, has not improved on her learning culture after formal and linear school in terms of CPD. Resource support was ranked 3rd, motivation 4th and effective communication 5th. It is now obvious that, there are inadequate resource supports if any. Professionals can hardly access any grant or support. Either they are ignorant of the availability or inaccessible to these facilities. Every professional should have a mentor for motivation or motivate herself for continuous self-directed learning to add value to society and posterity. Communication is still a problem. A lot of avenues now exist for easy dissemination of information but professionals are oblivious to these. Dynamics to change was ranked 6th while relevant and realistic programmes was ranked 7th. Change is mandatory but optional. A lot of professionals can hardly embrace change, always stereotyped to the old ways of doing things as learnt in the University for decades. This is unhealthy for professional sustainability. Programmes must be relevant and realistic for maximum participation. Nonchalant attitude of professionals was ranked 8th while Management support and institutional culture ranked 9th. Professionals care less of what happens in their professions after formal training especially in Nigeria. This can be likened to professional truancy and was ranked 10th. Opportunity, accessibility and awareness ranked 11th. Organisational strategy ranked 12th, closely followed by Contents that address the need ranking 13th. Lacks of available literature, domestic commitment, registration System were ranked 14th, 15th and 16th. These factors according to respondents were not too important in continuing professional development (CPD).

CONCLUSION

It was not unexpected that learning culture was ranked first amongst the factors that contributed to non- participation in CPD because it is a critical ingredient at every stage of professional development. Successful change involves learning how to do something new. The more learning culture we exhibit, the higher the chances of professions' survival. CPD keeps you on track with new opportunities and competencies, advances the body of knowledge and technology, increased public confidence, protection of quality of life in the built environment, construction sustainability. There should be a stimulating environment for professionals to allow CPD hold sway.

RECOMMENDATION

Continuing professional development is a veritable tool for professional sustainability. Below are some recommendations to successfully harness this virtue.

You must continue to study in your little spare time

There must be a deliberate plan to develop your career and grow in it.

Must be engaging and fun.

CPD should be well grafted and displayed to portray its essence

Industries should have a structure in place for intermittent CPD exercises.

The inclusion of Technology Enhanced Learning (TEL) e.g. Online Conference learning

REFERENCES

Abdullah, A., Yota D. and McCrindle, R. (2017) Factors affecting academics' involvement in TEL continuing professional development (CPD). *Journal of Education and Practice*. Vol. 8, No. 10, pp.142-148.

Adey,P.(2004) *The professional development of teachers*. London: Kluwer.

- Afshari, M., Bakar, K.A., Luan, W.S., Samah, B.A. and Fooi, F.S. (2009) Factors affecting teachers' use of information and communication technology. *International Journal of construction*. 2(1), 77-104.
- Al ghamdi, K.M. (2015). Can an ICT CPD programme have an impact on EFL teachers in Saudi Arabia? A case study . University of Warwick.
- Al mulhem, A. (2013) Developing an e-learning training package for academic staff in a University in Saudi Arabia. University of Plymouth.
- Alexandrou, A., Field, K. and Michelle, H. (2005) The continuing professional development of educators: Emerging European issues: Didcot Symposium Books.
- Birch, D. and Burnett, B. (2009) Bringing academics on board: Encouraging institution wide diffusion of e-learning environment. *Australasian Journal of Educational Technology*. 25(1), pp117-134.
- Bolam, R. and McMahn, A. (2004) Literature, definitions and models: towards a conceptual map. In C. Day and J. Sashs (Eds), *International Handbook on the Continuing Professional Development of Teachers*, pp 33-64. Berkshire: Open University Press.
- Chan, D.W.M. and Kumaraswamy, M.M. (1997) A Comparative study of causes of time overruns in Hong Kong Construction projects. *International, Journal Project. Management*. 15(1), 55-63.
- Cheawjindakarn, B., Suwannatthachote, P. and Theeraroungchaisri, A. (2012). Critical success factors for Online Distance Learning in Higher Education. A Review of the Literature: *Creative Education*, 3(8), 61-66.
- Dash, S., Magidin De Krammer, R., O'Dwyer, L., Masters, J. and Russell, M. (2012) Impact of Online Professional Development on Teacher Quality and Student Achievement in Fifth Grade Mathematics. *Journal of Research on Technology in Education*. 45(1), 1-26.
- Day, C. and Sashs, J.(2004) Professionalism, performativity and empowerment: discourse in the politics, policies and purposes of continuing professional development. In C. Day and J. Sashs (Eds), *International Handbook on the Continuing Professional Development of Teachers*, pp 3-64. Berkshire: Open University Press.
- Ellis, E. and Nolan, M.(2005) ‘‘ Illuminating continuing professional education: unpacking the black box’’, *International Journal of Nursing Studies*. Vol. 42, No. 1. Pp. 97 – 106.
- Fullan, M. and Hargreaves, A. (2013) *Teachers development and educational change*. New York: Routledge
- Fullan, M.(2016). *The new meaning of educational change* (5th ed.). New York and London: Teachers College Press.
- Georgina, D.A. and Hosford, C.C. (2009) Higher education faculty perceptions on technology integration and training. *Teaching and Teacher Education*. 25(5),690 – 696.
- Gerard, B., Rub, F.P. and Kees Van Wijk(2013) Factors influencing CPD. A Delhi study amongst nursing experts. *European Journal of Training and Development*. Vol 37, Issue 3.
- Gillham, B. (2000) *Developing a questionnaire*. London: Continuum.
- Goodall, J., Day, C., Lindsay, G. and Harris, A. (2005) *Evaluating the Impact of Continuing Professional Development (CPD)*. Department for Education and Skills, G.B.
- Guskey, T. (2002). Professional Development and Teacher Change. *Teachers and Teaching*. 8(3), 381-391.
- Hramiak, A. and Boulton, H.(2013) Escalating the use of Web 2.0 technology in secondary schools in the United Kingdom: Barriers and enables beyond teacher training. *Electronic Journal of E-Learning*. 11(2), 91 -100.

- Hughes, E.(2005) ‘‘Nurses’ perceptions of continuing professional development’’, *Nursing Standards*. Vol. 19 No. 43, pp41-49.
- Johnson, A., Hong, H., Groth, M. and Parker, S. (2011) ‘‘Learning and development: promoting nurses’ performance and work attitudes’’. *Journal of Advanced Nursing*. Vol. 67 No. 3, pp 609 -620.
- Jones, C., Romanau, R., Cross, S. and Healing, G. (2010) Net generation or Digital Natives: Is there a distinct new generation entering university? *Computers and Education*. 54(3), 722-732.
- Kazaz, A., Manisali, E., & Ulubeyli, S. (2008) Effect of basic motivational factors on construction workforce productivity in Turkey. *Journal of Civil Engineering and Management*. 14(2), 95-106.
- Kirkwood, A. and Price, L. (2011) *Enhancing learning and teaching through technology: a guide to evidence-based practice for academic developers*. Higher Education Academy.
- Knowles, M., Holton, E. and Swanson, R.(2015) *The Adult Learner: The Definitive Classic in Adult Education and Human Resources Development (8th Ed)*. Routledge London and New York.
- Kometa, S.T., Olomolaiye, P.O. & Harris, F.C. (1994) Attributes of UK construction clients influencing project consultants’ performance. *Construction Management and Economics*. 12(2), pp. 433-443.
- Lannon, S.(2007) ‘‘Leadership skills beyond the bedside professional development classes for the staff nurse’’. *Journal of Continuing Education in Nursing*. Vol. 38, No. 1, pp. 17-23.
- Lawton, S. and Wimpenny, P. (2003) ‘‘Continuing professional development: a review’’, *Nursing Standard*, Vol. 17, No.24 pp. 41-44.
- Leed, P.D.(1980) *Practical Research*, New York Macmillan Publishing.
- Lewis, J. L. & Sheppard, S. R. J. (2006) Culture and communication: Can landscape visualization improve forest management consultation with indigenous communities? *Landscape and Urban Planning*. 77, 291–313.
- Ming, T., Hall, C. and Azman, H.J.(2010) Supporting Smart School Teachers’ Continuing Professional Development in and through ICT: A model for change. 6(2),5 -20.
- Minott, M.A.(2010) Reflective teaching as self-directed professional development building practical or work-related knowledge. *Professional Development in Education*. 36(1-2), 325-338.
- Morris, D.(2010) Are teachers technophobes? Investigating professional competency in the use of ICT to support teaching and learning. In a Proceeding-Social and Behavioural Sciences. 2(4010-4015).
- RICS (Royal Institution off Chartered Surveyors). 2015. Continuing Professional Development (CPD). Online. Available at: <<http://www.rics.org/za/regulation/1/compliance/1/continuing-professional-development-cpd/>>(Accessed: 2 December 2015).
- RICS (Royal Institution off Chartered Surveyors).2008. Lifelong learning – A new approach. (Online). Available at:<<http://www.rics.org/MyRICS/Regulation/Life+Long+Learning+A+New+Approach.htm>>(Accessed:25 March, 2013).
- Sharon, L.N.M., Tjim, A.T., Anthonius de Boer, Gerda C., Andries, S.K. and Rashmi, A.K. (2016) Factors influencing participation in continuing professional development: A focus on motivation amongst pharmacists. *Journal of Continuing education in health profession*. 36(3), 144-150.
- Sheldon, J. (2016) Qualitative and Quantitative – Which method is for you? 5-6.
- Tabata, L.N. and Johnsrud, L.K.(2008) The impact of faculty attitudes toward technology, distance education and innovation. *Research in Higher Education*. 49(7), 625-646.
- Waycott, J., Bennett, S., Kennedy, G., Dalgarno, B. and Gray, K.(2010) Digital divides? Student and staff perceptions of information and communication technologies. *Computers and Education*. 54(4), 1202-1211.

END

LAND SURVEYING AND MANAGEMENT

AN ANALYSIS OF CAUSES OF CONFLICTS ON STATE LAND IN ZAMBIA: EVIDENCE FROM THE CITY OF LUSAKA

Anthony Mushingi¹, Ephraim Kabunda Munshifwa² and Hastings Shamaoma³

1 Copperbelt University

2 Copperbelt University

3 Copperbelt University

The objective of this paper was to analyse causes of conflicts on state land in Zambia. It was set on the principle that a good land governance system is a prerequisite for order and economic development. Using evidence from the city of Lusaka, the study used both primary and secondary data to conclude that conflicts on state land are occurring with greater frequency and intensity. Amongst causes identified were illegal allocation of land, invasion of idle or undeveloped private or public land, double allocations, insufficient supply of affordable state land, insufficient monitoring of land use, and ineffective cadastral surveying; all symptom of an ailing land governance system. This leads to wastage of resources, violence, hinders local and inward investment, decline of food production, and denies government an opportunity to raise revenue; overall leads to disorder and retards economic development. In this regard, it is recommended that the Zambian government should work on preventing land conflicts through among other things, curbing illegal land allocations and invasion of vacant land, ensuring that land institutions adequately monitor land use, and curbing illegal surveys.

Keywords: State Land, Land Conflicts, Land Governance, Zambia.

INTRODUCTION

Land is crucial to Africa's social and economic development, as the majority of the population depend on it for their livelihoods (Van Der Zwan, 2010). Unfortunately, socio-economic development in Africa is adversely affected by land conflicts (Arko-Adjei, 2011; Deininger and Castagnini, 2004; LRRRI, 2009; Mwambashi, 2015; UN-Habitat et al., 2015). Literature review indicated that inadequate and inappropriate land policies, laws and institutions as well as low levels of implementation (that is, implementation of policies and laws) among others were major causes of land conflicts in a significant number of African countries (see for example, Van Der Zwan, 2010; Kagwanja, 2016). The foregoing shows that research works on land conflicts have been undertaken in many African countries.

Like most African countries, Zambia faces an equal share of land conflicts on state land. Media reports show an escalation of cases of fighting over land in most cities and urban centres, especially in the cities of Lusaka, Ndola and Kitwe (see for example, Zambia Daily Mail, 4 May, 2015; Zambia Daily Mail, 28 January, 2018; Zambia Reports, 23 February, 2013). In many cases the results of conflicts on land is disorder and retardation in economic development. This paper analyses the causes of these conflicts, their impacts and possible solutions. In so doing, the paper answers the following key questions: Firstly, what are the causes of conflicts on state land in

1 anthonymushingi@yahoo.com

2 kabunda.munshifwa@hotmail.com

3 hshamaoma@gmail.com

Zambia? Secondly, what are the impacts of these conflicts on state land in Zambia, and finally, what can be done to prevent such conflicts on state land in Zambia?

UNDERSTANDING STATE LAND AND LAND CONFLICTS

State land

The Lands Act of 1995 provided two distinct categorisations of land: state and customary land. Statutory tenure comprises property rights regulated by state policies, laws and institutions, such as central and local governments (Government of the Republic of Zambia [GRZ], 1995). This includes land under the jurisdictions of cities and municipal councils but excludes land under traditional authorities. The granting of land rights on state land follows clearly stipulated processes which include land use planning, cadastral surveying, land servicing, land allocation, land registration, and land titling. Land use planning, as the first process, involves the identification of available land, preparation of the layout plans (that is, showing which part of land is to be used for residential, industrial, commercial, agricultural or other urban uses and which parts are to be retained as open spaces). Secondly, cadastral surveying is the determination of the location of each parcel of land, the extent of its boundaries, surface area and to indicate its separate identity both graphically on a map and physically on the ground (GRZ, 2006). The third process involves servicing of plots, which includes provision of water, roads, electricity and sewerage. Fourthly, land allocation or granting of land rights, follows. This is a process of selection of the person to whom an area of land is to be allocated or allotted for the specific purpose of development for a particular and identified use (Kinyungu, 2007). Land registration, follows as the next process. This process involves the making and keeping of records relating to land transactions affecting land, and any other relevant data about its physical and abstract attributes depending on the purpose for which it is intended to use the register (Acquare, 1984). Land titling, that is when an individual or firm is given formal property rights (that is, right to use, right to manage, right to generate income, right to transfer, right to exclude, and right to compensation) is the final process. These rights are recognised and protected by law. It can be seen from the foregoing that land use planning, cadastral surveying, land servicing, land allocation, land registration, and land titling are interrelated process in the creation of property rights on land. A properly structured land governance system forms the basis for an efficient land and property taxation system (UNECE, 1996).

Land conflicts

Land conflict is a disagreement over rights to land by two or more parties, individual or groups (Bruce and Holt, 2011). Land conflicts within a country will occur at either the interpersonal level or intra-societal level (Wehrmann, 2008). These conflicts may occur between individuals, individuals and public land institutions, firms and individuals and so on. Literature shows that land conflicts are caused by various factors and these may be political, legal and judicial, institutional, operational, and technical (see for example, GLTN/UN-Habitat, 2013; LRRRI, 2009; Wehrmann, 2008). Resolving the foregoing elements require good land governance system. Good land governance implies having effective political (for example strong political will to tackle land issues), legal and judicial (for example sufficient implementation and enforcement of land policy and legislation), institutional (for example sufficient dissemination of land information to the public), operational (for example sufficient staff, equipment and finance in public land institutions), and technical (for example effective land use planning and cadastral surveying) elements (Deininger et al, 2012; Wehrmann, 2008). These in turn lead to prevention of land conflicts.

RESEARCH METHODOLOGY

Methodologically, both primary and secondary data were collected. Primary data was collected during a bigger study conducted from May 2016 to September 2016. In this study, information was collected from 23 key informants (9 employees from central and local government - Ministry of Lands and Natural Resources, Ministry of Local Government, and Lusaka City Council; 5 employees from Lands Tribunal, Subordinate Court, High Court, High Court Mediation Annexure, and Supreme Court; 3 employees from Zambia Land Alliance, Civic Forum on Housing and Habitat, and People's Process on Housing and Poverty in Zambia; and 6 employees from 3 law firms and 3 private land surveying firms); 6 academics and 204 households of Chilenje South. Questionnaires were used to collect information from key informants while face to face interviews were used to collect information from academics and households. Purposeful sampling was used to identify key respondents and academics whereas households were randomly interviewed. In June 2018, telephone interviews were used to collect information from selected employees from Lusaka City Council, Ministry of Lands and Natural Resources, law firms and private land surveying firms. This was done to verify the information collected in 2016. In terms of secondary data, both published and grey literature was used. Seven types of documents were considered for the review: (1) peer-reviewed journal articles, (2) books, (3) newspapers – print and electronic, (4) theses, (5) Zambian land laws, (6) technical reports published by the Zambian Government, and (7) technical reports published by international organisations.

RESULTS AND DISCUSSION

Causes of conflicts on State Land

Research findings show that conflicts on state land are occurring with greater frequency. Causes of conflicts on state land include but not limited to the following:

Illegal allocation of land by some politicians and council employees

There are rampant illegal allocations of state land by some politicians such as councillors, ruling political party officials and some employees in councils (Mushinge, 2017b). Put differently, illegal allocations of land are a cancer sweeping across Zambia (NAZ, 2015). The high frequency of illegality and lawlessness in land allocation are threatening law and order in the country (AllAfrica, 2016). In the face of this problem, the Government established the Task Force against Illegal Land Allocation in 2014. Findings show that the taskforce is not functioning well due to insufficient staff, insufficient vehicles and inadequate funding from Government. Thus, illegal land allocations have continued.

Invasion of idle or undeveloped private or public land

Evidence gathered from interviews and documents indicate that the current state land delivery in the country is not based on the principle of equity. Particularly, the poor are not able to easily access state land. For example, in random street interviews conducted by Zambia Land Alliance in 2016, various interviewees commented:

Only the rich get state land in Zambia, there is really no chance for people without money. That is why people end up going to political party cadres hoping that it will be faster and cheaper, but they end up being cheated as well. The Zambian government must consider the plight of the poor when it comes to issues of access to state land; it is sad to note that even non-Zambians are given priority over Zambians when it comes to state land allocation. Government must first look at its own people; many Zambians are already poor, if we lose our land where are we going to go? Are we going back to colonial era? (ZLA, 2016, para. 4, 7 and 8).

It is against this backdrop that some people in low income group have continued to try and find ways to access land by using illegal means. One way is invasion of idle or undeveloped private or public land. Chama (2007) identified the two most common types of land invasion in the country as:

- Invasion of open state land which has been reserved for government use or land under the jurisdiction of local authorities but left open for a long time.
- Invasion of formally planned and allocated land by groups of people who threaten and bar legal land owners from taking possession of their land: such invasion also cover land that is held on title but not developed.

Conflicts over invaded state land involve violent confrontation as the authorities or the title holders seek to remove the invaders from the land. Thus, in some instances, either title holders or invaders have ended up losing lives while trying to defend their pieces of land. For instance, in 2013, a former Member of Parliament (Barnabas Chella) was axed to death by peasant farmers over the Mfubu Ranch land in Kitwe (African News Hub, 06 September, 2013). The former Member of Parliament was killed by more than 80 land invaders who had invaded on his farm. Not dissimilarly, in the same year (2013), two residents in Kampasa area in Chongwe District, Lusaka Province were shot dead by Zambia National Service personnel who were carrying out an eviction exercise (Lusaka Times, 15 June 2013).

Double allocation of State land

Research findings show that lack of coordination among land institutions and poor record keeping at municipalities cause double allocation of land. On the one hand, the Department of Resettlement in the office of the Vice President, Ministry of Mines and Mineral Development, Land Husbandry Section in the Ministry of Agriculture, and Municipalities in the Ministry of Local Government are involved in land allocation. To achieve effective land allocation, these institutions are expected to collaborate. However, coordination is lacking (Interview with Municipality Employee, 2018). Lack of coordination among land institutions sometimes lead to the same parcel of land being offered to different people by different land institutions.

On the other hand, poor record keeping is rife at municipalities (Interview with Municipality Employee, 2018). For instance, according to Mulolwa (2016: 74):

The poor record keeping on land has made the information not to be maintained in a uniform way. It is fragmented, and do not seem to aid decision-making on land based issues. It has been observed that inadequate land information management has led to lack of transparency and accountability in the process of land allocation.

According to this research, poor record keeping by municipalities has compounded the state land challenges being faced by councils countrywide. For instance, a single parcel of land could be allocated to two or more people. Cases of double allocation of state land are common (Chitengi, 2015; KCC, 2012; GRZ, 2012; UN-Habitat, 2012). In other cases there are multiple site plans on the same piece of land allocated to different people. Poor record keeping prevents the council staff to quickly know which land is already planned, who has been allocated for what and where.

Provision of insufficient land information to the public

According to MLNREP (2014) and MNDP (2017), the public has little information on land issues. Land institutions do not adequately disseminate information to the public on land allocation procedures, land laws, land rights and other land issues. For instance, random street interviews conducted by Zambia Land Alliance in 2016, revealed that many residents feel there is not enough

education on land laws, land allocation procedures, land rights and responsibilities (ZLA, 2016). One of the interviewees commented:

Honestly speaking as a young person, I have no idea; I do not know where I should start from if I decide to acquire land today. There is need for more information; the land institutions should educate the public on land issues (ZLA, 2016, para.2).

Due to lack of or limited information on land issues, some people buy land without investigating ownership details. The end result is that people buy land belonging to others; which leads to land conflicts.

Insufficient supply of affordable State Land

This study shows that the exhaustion of serviced state land coupled with the increase in demand for land has put pressure on the Ministry of Lands and Natural Resources and Municipalities to find alternative land. In the face of increased pressure, government introduced the Land Development Fund through the Lands Act of 1995. The fund is meant for opening up new areas for development. In particular, the fund is used for land use planning, cadastral surveying, and provision of services such as roads, electricity, water and sewerage. However, over time, the opening up of new areas has been adversely affected by unpredictable and inadequate funding from the Treasury – Ministry of Finance (MLNREP, 2014). In this regard, low funding has been the most prominent hindrance in trying to achieve the objectives of the Land Development Fund. The end result has been insufficient supply of affordable state land. Insufficient supply of land causes conflicts because many people compete for very few available parcels of land. For instance, some people who have no access to land may end up evading any available idle or undeveloped private or public land.

Insufficient monitoring of land use

Land institutions (that is, Ministry of Lands and Natural Resources and Municipalities) have not been monitoring land use through site inspections (Mushinge, 2017a). Thus, these land institutions are unable to identify land problems early enough. Put differently, land institutions are reactive and not proactive. For instance, Municipalities wait until people have built and then demolish their properties on allegations that they built on illegal land (Mushinge, 2017a). The first concern that arises is whether people must be allowed to spend a lot of money developing structures that the municipality later comes to demolish; this is not fair especially to poor people. The demolition of property leads to riots over state land in Zambia. Findings show that land institutions are unable to monitor land use due to lack of transport, insufficient staff and inadequate financial resources.

Ineffective cadastral surveying

There are only a few licensed Land Surveyors in Zambia coupled with lengthy unpredictable approval times of survey records by Surveyor General's Office, which leads to a big back log of unsurveyed properties in Zambia (Chileshe and Shamaoma, 2014). As a result, municipalities usually allocate unsurveyed land to would-be developers which in turn contribute to cases of encroachment, misallocation and land conflicts. The other problem is that most municipalities lack appropriate survey equipment and use tapes and low accuracy hand held Global Navigation Satellite System (GNSS) receivers to set out plots and show clients on the ground, which also leads to misallocation and encroachment. Furthermore, there are a number of illegal surveys being undertaken by unauthorised surveyors thereby contributing to unreliable data in the cadastral property register (GRZ, 2017).

Out of date cadastral records

According to procedure, all cadastral survey maps are supposed to be updated upon approval but research findings show that cadastral maps are not regularly updated (Chileshe and Shamaoma,

2014). The out-of-date cadastral maps do not properly reflect the situation on the ground which is a breeding ground for encroachment and multiple site plans of the same parcel of land.

Ineffective land use planning

Land use planning is done in an ad hoc manner and this in turn lead to disorderly land development (UN-Habitat, 2013). For instance, land is allocated where there are services such as roads, underground water and sewerage pipes. A number of plots have been created on roads and under power lines and over the drainage (Interview with Municipality Employee, 2018). In addition, when land has been identified and planned, municipalities are required to provide services such as water, roads, electricity and sewerage. However, in practice, land parcels are allocated to people (in most cases) without the provision of services despite land users paying service charges (Interview with Municipality Employee, 2018). For instance, boundary conflicts occur when land is allocated and occupied without provision of roads. Land owners who need access to their properties make their road(s) and in the process encroach on other properties in the respective areas.

Wrongful repossession of land

Section 13 of the Lands Act, Chapter 184 of the laws of Zambia provides for the re-possession or re-entry of the parcel of land where the lessee is found to be in breach of the conditions of the lease. However, there are cases where Land Officers (at the Ministry of Lands and Natural Resources) do not follow the procedure for re-possession. Wrongful repossession causes land conflicts in situations where Land Officers re-allocates the parcel of land to another client while the original title holder still holds on to the original title; and later re-surfaces to claim the parcel of land. In other cases, municipalities in conjunction with Land Officers re-plan or sub divide the repossessed parcel of land and offer it to different clients without cancelling the parent or original title and the original title holder continues to pay ground rent and reclaims the property (Interview with Lawyer, 2018).

Ineffective checking of layout plans

Municipalities prepare layout plans for their respective areas and subsequently request the Ministry of Lands and Natural Resources to check land availability and number the layout plans. Before numbering, staff at the survey department have to check whether the planned land is available and plot the new layout to update noting sheet (this process is known as temporary noting). Research findings show that due to sheer complacency by the staff at the Survey Department, sometimes the plans are not checked and this leads to numbering plans where other plots already exist. The outcome is two layout plans with different parcel identification numbers on the same land. This implies that the same parcel of land could be allocated to two people but with different parcel identification numbers.

Impacts of conflicts on State Land

Conflicts on state land have a number of serious negative implications such as:

Wastage of time and money

According to Land Rights Research and Resources Institute [LRRRI] (2009), conflicts on land lead to wastage of time and money during the period of conflict resolution, since most of the land conflicts take very long to be resolved. For example, some land conflict cases have been pending in courts for more than 5 years (Interview with Lawyer, 2018). The share of long-standing (> 5 years) land conflict cases is greater than 20% of the total pending land conflict court cases (Mulolwa, 2016). A lot of resources are wasted which can be used for developing the land. For instance, in the case involving the invasion of property number 33857, Libala South, Lusaka

District, the land owner (that is, Disadvantaged Children Pathfinder Association Trust - DCPAT) indicated that so far they have spent more than US\$ 5000 in litigation costs. This money could have been used to develop the land. It should be pointed out that since the case is still in court, DCPAT may still incur more costs.

Violence

Land conflicts have sometimes degenerated into violence which involves demolition of houses, loss of human life and rioting by people. For example, government agencies have been demolishing houses that have been built on land which was acquired illegally. The following media reports are illustrative:

- In May 2015, a number of families were left in the cold after the Lusaka City Council demolished their houses in Chalala area in Lusaka District (Daily Nation, 21 May 2015).
- In December 2015, the Zambia Police demolished over 800 houses in Lusaka West area (Lusaka Times, 15 December 2015).
- In August 2016, Lusaka City Council demolished over 30 structures (that is, 18 houses at window level, four at roof level, three long wall fences and several slabs and foundations) in Lilayi Shaft five (5) area (Lusaka Times, 04 August 2016).

Hinder both local and inward investment

Land conflicts deter both local and inward investment. No development can take place on land with conflicts. For instance, prime land known as Baobab land located in Lusaka District has remained undeveloped since 2006 because of a land conflict.

Decline of food production

During land conflicts, some people may escape their areas of production due to fear and insecurity. This makes them stop engaging in urban agricultural production and livestock keeping which leads to the decline of food production (LRRRI, 2009).

Deny government an opportunity to raise revenue

Local and central governments are denied an opportunity to raise revenue from property taxes (rates) and ground rent. For instance, disputants may not pay rates or ground rent until the conflict is resolved.

CONCLUSION AND RECOMMENDATIONS

The findings of this research showed that conflicts on state land are occurring with greater frequency. Amongst causes identified were illegal allocation of land by some politicians and council employees, invasion of idle or undeveloped private or public land, double allocation of state land, insufficient supply of affordable state land, insufficient monitoring of land use, ineffective cadastral surveying, out of date cadastral records, ineffective land use planning, wrongful repossession of land, and ineffective checking of layout plans. The foregoing predicament leads to among other things wastage of resources, violence, and hinder local and inward investment. In light of the presence of land conflicts, the research suggests that the central and local governments should work on preventing land conflicts through:

- Curbing illegal land allocations and invasion of vacant land;
- Curbing double allocation of land by improving coordination among land institutions as well as improving land record keeping in municipalities;
- Improving dissemination of land information to the public through the media such as radio, television and newspapers.

- Providing adequate land development fund to enable the municipalities opening up sufficient land;
- Ensuring that land institutions adequately monitor land use;
- Ensuring that the Survey Department at the Ministry of Lands and Natural Resources update cadastral maps regularly;
- Curbing illegal surveys;
- Improving land use planning by avoiding allocating land where there are services. Here, there is need to ensure that land use plans clearly indicate where the services are located. Municipalities should also adequately provide services whenever land owners pay for service charges;
- Ensuring that the correct procedure is followed when repossessing land; and
- Ensuring that the Survey Department at the Ministry of Lands and Natural Resources effectively check the layout plans.

It should be borne in mind that if the problem of conflicts on state land is not resolved, the problem will become worse soon or later.

REFERENCES

- African News Hub (06 September 2013). Squatters' kill ex-Kitwe member of parliament over land. Available online at <https://www.africannewshub.com/news/371486-squatters-kill-ex-kitwe-mp> [accessed 11 June 2018].
- Acquare, E. (1984). Principles and issues: Land tenure and rural productivity in the Pacific Islands, FAO.
- AllAfrica (2016). Zambia: Stop illegal land allocation. Available online at <http://allafrica.com/stories/201601270416.html> [accessed 1 June 2018].
- Arko-Adjei, A. (2011). Adapting land administration to the institutional framework of customary tenure: The case of peri-urban Ghana. PhD Thesis. Delft University of Technology, Delft.
- Bruce, J.W. and Holt, S. (2011). Land and conflict Prevention: Initiative on quiet diplomacy. Colchester: University of Essex.
- Chama, K. (2007). Urban demolitions in Zambia: challenges and opportunities of rapid urban growth in a developing country. Nairobi: United Nations Human Settlements Programme.
- Chileshe, R. and Shamaoma, H. (2014). Examining the challenges of cadastral surveying practice in Zambia. South African Journal of Geomatics, Vol. 3, No. 1, January 2014 pp. 53-63
- Chitengi, H. S. (2015). Deriving lessons for urban planning and housing delivery from the resilience of informal housing systems in Zambia. PhD Thesis. University of Dundee, Dundee.
- Daily Nation (21 May 2015). LCC demolish houses in Chalala. Available online at <https://zambiadailynation.com/2015/05/21/lcc-demolish-houses-in-chalala/> [accessed 11 July 2018].
- Deininger, K and Castagnini, R. (2004). Incidence and impact of land conflict in Uganda. Available online at <http://documents.worldbank.org/curated/en/948741468778157488/pdf/wps3248Uganda.pdf> [accessed 28 August 2018].
- Deininger, K., Selod, H. and Burns, A. (2012). The Land Governance Assessment Framework: Identifying and Monitoring Good Practice in the Land Sector. Washington DC: World Bank.
- Government of the Republic of Zambia (GRZ). (1995). Lands Act. Lusaka: Government Printers.

- Government of the Republic of Zambia (2006). Draft land administration and management policy. Lusaka: Ministry of Lands.
- Government of the Republic of Zambia (2012). Report of the committee on lands, environment and tourism for the second session of the eleventh National Assembly. Lusaka: National Assembly of Zambia.
- Government of the Republic of Zambia (2017). Draft national land policy. Lusaka: Ministry of Lands and Natural Resources.
- GLTN/UN-Habitat (2013). Land and conflict: A handbook for humanitarians. Nairobi: United Nations Human Settlements Programme.
- Kagwanja, J. (2016). Good Governance and Regulatory Frameworks Lessons from the AU Agenda on Land. Paper presented at the Fourth High Level Forum on Global Geospatial Information Management (GGIM) “Good Land Governance for the 2030 Agenda 20-22 April 2016, Addis Ababa, Ethiopia.
- KCC (2012). 2012-2016 Strategic Plan. Kitwe: Kitwe City Council.
- Kinyungu, N. (2007). Urban land markets and corruption in Kenya. Urban Research Symposium, World Bank, Washington, DC, May 14 – 18, 2007.
- LRRRI (2009). The changing terrain of land use conflicts in Tanzania and the future of a small producer. Paper prepared by the Land Rights Research and Resources Institute for presentation to the Commonwealth Association of Surveying and Land Economy (CASLE) on 29 June 2009 at White Sands Hotel in Dar es Salaam, Tanzania.
- Lusaka Times (15 June 2013). Zambia National Service officers shoot dead two illegal land settlers in “self defence”. Available online at <https://www.lusakatimes.com/2013/06/15/zambia-national-service-officers-shoot-dead-two-illegal-land-settlers-in-self-defence/> [accessed 04 July 2018].
- Lusaka Times (15 December 2015). PF leadership in Lusaka upset by demolition of 800 illegal houses. Internet edition. Available online at <https://www.lusakatimes.com/2015/12/15/pf-leadership-in-lusaka/> [accessed 11 July 2018].
- Lusaka Times (04 August 2016). Lusaka City Council justifies decision to demolish illegal structures. Available online at <https://www.lusakatimes.com/2016/08/04/lusaka-city-council-justifies-decision-demolish-illegal-structures/> [accessed 11 July 2018].
- MLNREP (2014). Strategic plan 2014-2016. Lusaka: Ministry of Lands, Natural Resources and Environmental Protection.
- MNDP (2017). Seventh national development plan 2017-2021. Lusaka: Ministry of National Development Planning.
- Mulolwa, A. (2016). Improving land governance in Zambia: Implementation of the land governance assessment framework. Lusaka: University of Zambia.
- Mushinge, A. (2017a). Role of land governance in improving tenure security in Zambia: towards a strategic framework for preventing land conflicts. PhD Thesis. Technical University of Munich, Munich, Germany.
- Mushinge, A. (2017b). Assessment of the lands tribunal in resolving state land conflicts in Zambia. International Journal of Social Science Studies, 7 (18), pp. 16-23.
- Mwambashi, E.R. (2015). Assessing the Impact of Land Conflict between Farmers and Pastoralists in Tanzania: A Case of Ulanga District Council. Master’s Thesis. Mzumbe University, Tanzania.
- NAZ (2015). Debates. Lusaka: National Assembly of Zambia.

- UN-Habitat (2012). Zambia urban housing sector profile. Nairobi: United Nations Human Settlements Programme.
- UN-Habitat (2013). The state of planning in Africa: An overview. Nairobi: United Nations Human Settlements Programme.
- UN-Habitat, GIZ, TUM and GLTN (2015). Land Tenure Security in Selected Countries. Nairobi: United Nations Human Settlements Programme.
- Van Der Zwan, J. (2010). The need for conflict-sensitive land policy and land governance in Africa. Strengthening the economic dimensions of peace building. Practice Note Series. London: International Alert.
- Wehrmann, B. (2008). Land conflicts: A practical guide to dealing with land disputes. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.
- Zambia Daily Mail (4 May 2015). Deal with illegal land allocations. Available online at <http://www.daily-mail.co.zm/deal-illegal-land-allocations/> [accessed 22 October 2018].
- Zambia Daily Mail (28 January, 2018). No more land in Lusaka – Kapata. Available online at <http://www.daily-mail.co.zm/no-more-land-in-lusaka-kapata/> [accessed 21 October 2018].
- Zambia Land Alliance (2016). Lusaka residents call for more land information. Available online at http://www.zla.org.zm/wpnb_news/lusaka-residents-call-for-more-land-information/ [accessed 03 July 2018].
- Zambia Reports (2013). Chief justice urges proper land monitoring. Available online at <http://zambiareports.com/2013/02/23/chief-justice-urges-proper-land-monitoring/>. [accessed 22 October 2018].

END

ANALYSIS OF FLOOD PLAIN FOR SUSTAINABLE FLOOD DISASTER MANAGEMENT USING REMOTE SENSING

Jeremiah Uriah¹, Amina Dienye² and James Ogaluzo³

1 Rivers State Ministry of Lands and Housing, Port Harcourt.

2 Rivers State University, Port Harcourt, Rivers State, Nigeria

3. Geomaps Gallery Nigeria Ltd.

Flood plain is a natural ecosystem that provides land for development; transportation, recreation, agriculture, and hydro power generation. When the land is inundated by water from the rivers, streams, creeks, runoff etc, it poses a challenge if not sustainably managed. This requires that floodplain management programs should be put in place by government authorities which are the case in many countries mostly, the developed nations. This work focuses on analyzing the flood plain and developing a digital database for the floodplain of Ogbunabali Port Harcourt, Rivers State, Nigeria for sustainable land use assessment and management. The software used is ESRI's ArcGIS 10.1 and SURFER 10. Dataset include topographic survey data obtained at 30m interval and SPOT image with 2.5m x 2.5m spatial resolution. The data was downloaded from total station and saved in excel spreadsheet in xyz coordinates. The elevation data was used to model contour, slope, Triangular Irregular Network, flow direction and flow accumulation which depicts the hydraulic pattern of the floodplain. The flows are from the landward to the floodplain center with gentle slope. The floodplain digital database consists of four land use/ land cover which are water body-21.324ha, dumpsite-0.626ha, nypa palm-16.583ha, and built-up area-4.413ha. The database is necessary for the estimation of flood rate damage. High resolution satellite images and 2D floodplain software should be used to map all floodplains in Port Harcourt for flood disaster management.

Keywords: Flood, Floodplain, Sustainable, Disaster management, Remote sensing.

INTRODUCTION

Floodplain according to (FEMA 480, 2005) is defined as any land area susceptible to being inundated by flood waters from any source. The source of floodplain water may be rivers, streams, creeks, lagoons, drainage systems, and runoff water from urban areas. Floodplain has been a major characteristic of most coastal communities with tributaries from the main Atlantic Ocean. Most settlements (city, town, village and hamlet) situated along water channels, creeks, lagoons, and river estuaries in the Niger Delta region. Floodplain may vary in areal extent from one location to another and may vary in term of biodiversity abundance. Generally, identify as a dry area adjacent to wetlands, low lying areas with poor drainage capability, and small water pond (Department of Natural Resources, 2006). It is formed by deposit of lateral and vertical accretion (Wolman and Leopold, 1957). In addition, materials deposited in floodplain are eroded from upland areas of the drainage basin and from overbank flow. Floodplains are one of the fertile ecosystems and contain cultural and natural resources that have values to the society. Its

1 jeremiah.uriah@yahoo.com

2 aminadienye@gmail.com

3 jamesogaluzo@gmail.com

functions are enormous and include agricultural activities, water supply, hydropower development, aesthetic beauty, and site for transportation routes (Task Force on the Natural and Beneficial Function of the Floodplain, 2002). It also serves as route for discharge of excess water, and a suitable site for human infrastructural development (Association of Floodplain Managers, 2008). Floodplains also provide groundwater recharge, filter sediment and contaminants, recreational site, and habitat for flora and fauna (West Virginia Quick Guide, 2009). However, most of these functions are gradually degraded due to anthropogenic activities such as mining, intensive agricultural activities, and infrastructural development. Floodplains are hydrologically important, environmentally sensitive and ecologically productive area is supported with articulated management plan to ensure full utilization of its potential. In United States, floodplain management was promulgated by the passage of the National Flood Insurance Act of 1968 (Lynn, 2009). The Act established National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA). Floodplains management is best achieved from detail base map depicting all features in the area and a topographic data to delineate hydrology and hydraulic characteristics of the area. The base map is produced from the horizontal coordinates obtained from field survey and are used to depict streets, railway lines, stream networks, settlements, and agricultural lands and others features located in the floodplain. This study used DEM from topographic survey to model the hydrology of Ogbunabali floodplain and geographic information systems.

STATEMENT OF PROBLEM

Floodplain encroachments by human activities are responsible for flash flood in urban areas (FEMA 480, 2005). Floodplain channels may be blocked by solid waste generated from residential, industrial, and commercial areas. The case is not different from Port Harcourt City where floodplain channels have been completely covered by solid waste like bottles, plastics, metal objects, papers from schools and factories etc. These human induced activities on floodplain have been responsible for flood cases in the city. For example, the 2017 flood in some parts of Port Harcourt City causing loss of valuable properties in millions of naira is a good example. The flood affected the office of the Federal Road Safety Commission (FRSC) along Port Harcourt / Aba expressway (see figure 1 below) and other public and private residence in D/Line, Nkpogu, Diobu and Borokiri (Leadership News Paper, July 29 2017). The FRSC office is situated within buffer radius of 30m from the Ntawogba creek. The flood was caused by the blockage of Nwaja and Ntawogba (two major creeks that traverse Port Harcourt City

AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to model the hydrology and hydraulic characteristic of Ogbunabali floodplain using digital terrain model (DEM) from topographic survey. The study is structured to achieve the aims stated below;



Figure 1: Flooded FRSC office along PH/ Aba expressway. Source: Leadership New Paper, July 29, 2017.

(a) To determine the floodplain hydraulic and hydrological spatial pattern using digital elevation models (DEMs) from topographic survey data.

(b) To develop digital floodplain base map (DFBM) of the study area.

The creation of digital database of Ogunabali floodplain will further advance the awareness of flood impact on properties in the area. Also, the floodplain base map will assist policy makers to provide up to date reports on the extent and damage cause due to flooding. The base map will assist government agencies in identifying flood risk and vulnerable areas based on the floodplain hydrological and hydraulic characteristics.

JUSTIFICATION OF THE STUDY

Several researchers have used different approach in floodplain study with emphases on flood risk zone and vulnerability mapping. Samarasinghe et al (2010) used HEC-HMS and HEC-RAS GIS software and remote sensing data to validate flood information forecast, planning and management in Kalu-Ganga River basin, Sri Lanka. The dataset used for the study include; satellite image data, topographic data, hydro-metrological data, and census data. Also, (Lawal et al, 2014) used Minimum Distance Algorithm to develop the extent of flood and compared their effect in flood generation in the state of Perlis, Malaysia. Datasets applied are geological map, topographic map, and SPOT image and these data were processed using GIS software. The study concluded that correlation exist between extracted model and the flood factors. (Bera et al, 2012) used Landsat ETM+, TM, LISS-111, STRM, geological map, climatic data, soil map, ground water data, rainfall data, and population datasets and ERDAS IMAGINE 9.2, ArcGIS 9.2, and PCI Geomatica-9.1 software to generate flood risk and vulnerability map of Mongalkote block in Eastern India. The study identified five vulnerable flood areas in the study area. Similarly, (Muhammad and Iyortim, 2013) study the middle course of River Kaduna, Nigeria flood that have claimed several lives and properties using high resolution image, field interview observation, and DEM data. The flood vulnerable areas were model using ArcGIS software and the results overlay on image to show affected properties. The reviews above focused on mapping vulnerable areas and but the floodplains hydraulic pattern which is main input in the management process of floodplains has not been done, especially within the study area.

STUDY AREA

Ogunabali floodplain (see figure 2 below) in Port Harcourt local government Area, Rivers State, Nigeria is located on longitude 279745mE – 280246mE and latitude 530161mN – 531922mN in the WGS-1984, UTM Zone 32N coordinates system. The floodplain has a total area of 42.943ha and perimeter of 4657.99m and it is narrow in the north and wider in the southern part. It is bounded by Elekahia in the North, Nkpogu in the East, Amadi-ama in the South, and Ogunabali in the West. The floodplain is a tributary of Amadi-ama River (salt and tidal river) that flows to and from Nwaja creek. The elevation of the floodplain ranges from -0.32m to 8.1m as obtained from filed survey data.

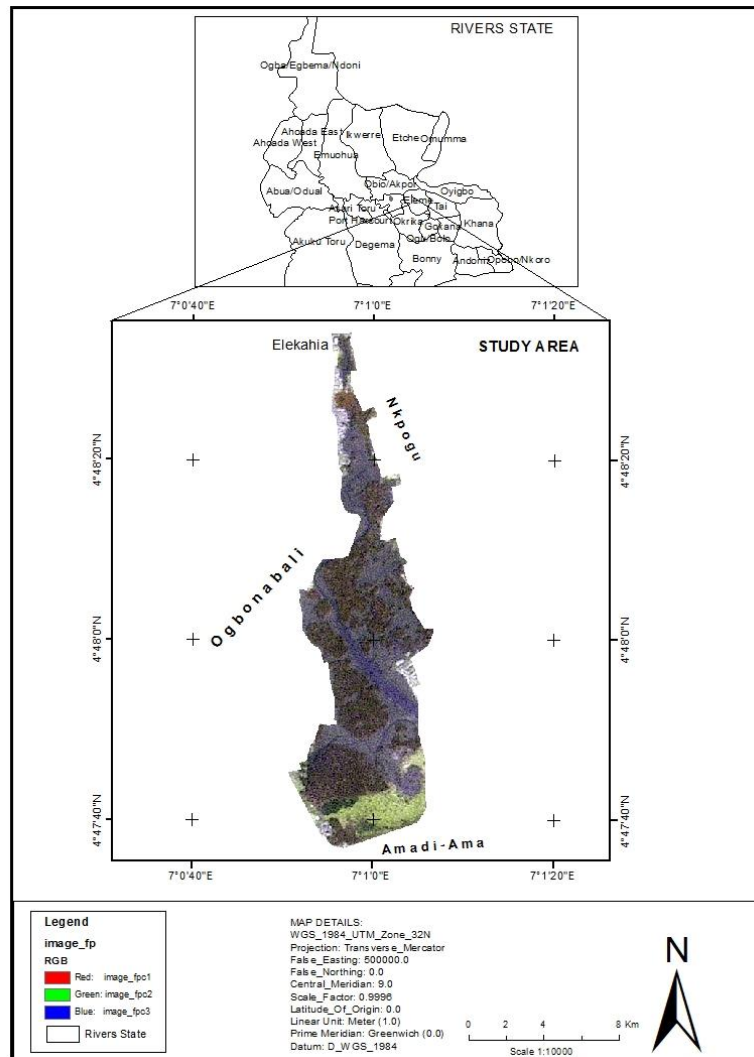


Figure 2: Map of Ogunabali floodplain.

BRIEF LITERATURE REVIEW

Conventional Survey Method

Floodplain may be map using traditional survey methods to obtained planimetric points defining the area. The traditional survey method involves the use of Theodolite or Total station to carry out measurements of details within floodplains. The Theodolite or Total station may be 1” or 2” instrument to approve the measurement accuracy. The observed data may be recorded directly in

the field sheets or downloaded from the memory in the case of Total station. Conventional floodplain mapping methods may be suitable for small area and less difficult terrain. According to (FEMA 480, 2005) floodplain maps are used for the regulating of new flood prone areas, insurance policies, and granting of loan by the lenders and federal agencies.

Remote Sensing Method

According to Dano et al (2011) satellite imageries for floodplain delineation are categories as optical sensor example Landsat image, and microwave sensor example Radar satellite image. Landsat image is mostly used in floodplain mapping because they can be downloaded free-of-charge from its website in any part of the globe. Landsat satellite was launched into orbit on July 23, 1972 (Anji 2008) for environmental studies. Floodplain can also be mapped using SPOT image (Lawal et al, 2014). SPOT image is a 2.5m x 2.5m spatial resolution image launched by France in 22 February, 1986 (Richards and Xiuping, 2006). Other high spatial resolution image for floodplain mapping includes QuickBird, and IKONOS with 0.61m and 1m spatial resolution respectively. The high cost of these imageries has reduced the use of Remote Sensing approach in flood plain mapping and planning. The high cost of these images has prevented their use for floodplains mapping.

DEM from photogrammetric data

Photogrammetry is another method of acquiring digital elevation model (DEM) of surface locations. (Punmia et al, 2005) defined photogrammetry as the science and art of obtaining accurate measurements by use of photographs taken from specific altitude for the purpose of constructing topographic maps, classification of soil, geological mapping, and for military operations. This field of study started in the 19th century by Aime Laussedat, an officer in the Engineering Corps of the French Army and is being regarded as the father of photogrammetry (Zhilin et al, 2005). In 1849 Laussedat justified the use of photograph to prepare topographic map and this might mark the beginning of application of photogrammetry in topographic mapping.

DEM from LiDAR data

LiDAR (also called LADAR or laser altimetry) is an acronym for light detection and ranging (NOAA, 2012). LiDAR is an airborne system for large area coverage and some are used as ground-based stationary and mobile platforms for data collections. It is an elevation data source fitted with an active laser pulse which enhanced its efficiency in working day and night (Hiremath and Kodge 2010). LiDAR data are mostly collected at night and under clear weather conditions. It operated in the near-infrared region of the electromagnetic spectrum, while the bathymetric LiDAR operated in the green laser wavelength with greater penetration of water and the ability to detect bottom features. Unlike other remote sensing systems, LiDAR records ground elevation in thick vegetation areas through the canopy holes. The absolute accuracy of LiDAR system ranges from 10cm to 20cm for most recent data and 15cm to 30cm for older data LiDAR (NOAA, 2012). LiDAR data can be used in the following surface modeling such as; contour map, slope model, triangular irregular network, cross section determination, flow direction and accumulation models, watershed delineation to mention a few.

METHODOLOGY

Dataset and Software

The study was carried out using elevation data at 25m grid interval obtained from Total station traverse. Secondly, high resolution SPOT satellite image clipped from Google Earth with a spatial resolution of 2.5m x 2.5m was used to digitize features within the study area floodplain.

Similarly, the following software were used to facilitate this study and they are;

- a) ESRI's ArcGIS 10.1 vector base GIS software was used to digitize the features in the study area and creation of geodatabase, hydraulic modeling of the floodplain and compilation of maps; and
- b) SURFER 10 was used to generate additional digital terrain model (DTM).

Control Establishment

Three control points were established following the rule of proximity and inversibility. Table 1 below shows the coordinates of the controls established using Promark 3 DGPS

Table 1: Coordinate listing of control stations.

STATION	EASTINGS	NORTHINGS	ELEVATION (m)
TBM1	280194.032	530231.983	5.01
TBM2	280248.295	530250.647	5.24
TBM3	280063.270	530178.334	4.97

Total Station Traversing

Traversing from the established control points was carried out in other to determine eastings, northings and elevation (X,Y,Z) of the ground points (Kavanagh, 2010) of the study area. The observations were taken at grid interval of 25m throughout the study location. The observations were taken using Leica 805 Total station instrument and its accessories.

Data Processing

Generation of Triangular Irregular Network (TIN)

Triangular irregular network (TIN) is a digital elevation model (Sulebak, 2000) and is one of the methods of hydraulic modeling of floodplain. TIN model produced a network of triangular surfaces based on interpolated points with the vertices representing peaks, depressions and passes, and the triangular edges represents ridges and valleys (Heywood et al, 2006). TIN model was produced from the points data download from Total station and saved in MS excel in easting, northing and elevation column. The output TIN was generated using default nine (9) classes of equal interval to represents the floodplain terrain.

Slope Model

Slope model is very useful in hydraulic modeling of floodplain. It describes the topography of the study area from the interpolated points. The TIN created above was converted to raster by double clicking TIN to Raster from the 3D Analyst Tools. The slope model was generated by double clicking slope from the raster surface module and the converted TIN to raster selected as input file. The output file was generated using degree of slope as output measurement with nine (9) classes of equal interval.

Contour Model

Contour line joins all points of equal elevation and is perhaps one of the traditional applications of digital terrain models (DTMs). It is based on interpolation principle (Zhilin et al, 2005) where values are generated at unknown locations within the study area. Contour models are used to delineate linear features such as banks and channels and point features such as hills and sinks in the floodplain. It is generated by double clicking contour from the raster surface module in the 3D Analyst Tools. In the dialogue box the raster model created earlier represents input raster and a contour interval of 0.10m was specified to produce contour model.

Flow Direction Model

The flow direction is a digital terrain model used in floodplain hydraulic modeling. It shows the direction of surface and groundwater flow within floodplain. Flow direction was generated using blank grid file in SURFER 10 software.

DATA ANALYSIS AND PRESENTATION OF RESULTS

Modeling Floodplain Elevation

Figure 3a below is the spot heights from topographic survey of the floodplain. The data was acquired using total station instrument in coordinate mode. The minimum, maximum and mean elevation was -0.32m, 8.10m, and 1.21m respectively. Similarly, figure 3b below is the contour model of Ogunabali floodplain. The contour model was produced at contour interval (CI) of 0.10m and the contour line and values represented in brown colour. Contour model is a 2.5D representation of the topography utilized in floodplain modeling.

Triangular Irregular Network (TIN) model is another digital elevation model technique used in floodplain hydrology as shown in figure 4a below. TIN model was produced from the topographic data using the default nine (9) class intervals. The classes are represented using different colours, for example, the maximum elevation with values ranges from 6.831m – 7.724m is shown in Arctic white colour, it is followed by 5.938m – 6.831m as shown in gray colour. The least TIN elevation values ranges from -0.313m – 0.580m represented by Beryl green colour.

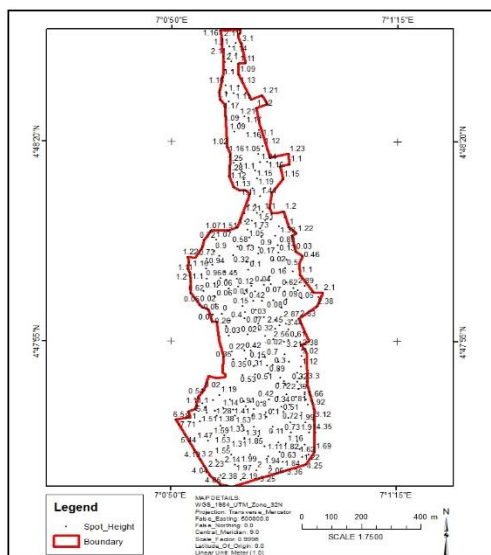


Figure 3a. Spot heights of Ogunabali floodplain.

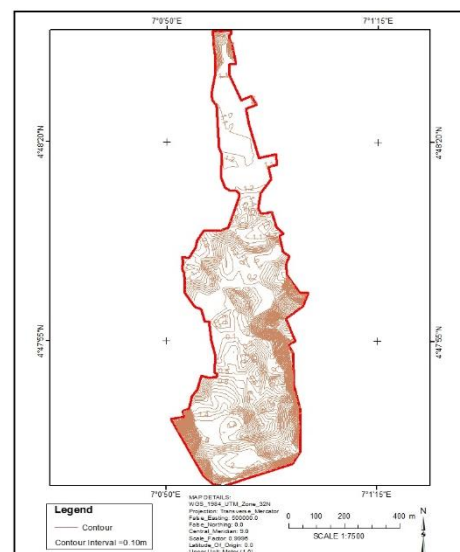


Figure 3b: Contour model of Ogunabali floodplain.

Figure 4b below shows the slope model of the floodplain produced from the converted TIN model to raster surface. The slope model was produced using the degree of slope and classified into nine (9) default classes. The slope values were presented from the smallest range to the highest range with different colours. The first and the least degree of slope range from 0.00 – 0.47 degrees, followed by 0.47 – 1.10 degrees. The highest slope ranges from 10.33 – 13.31 degrees as shown in red colour.

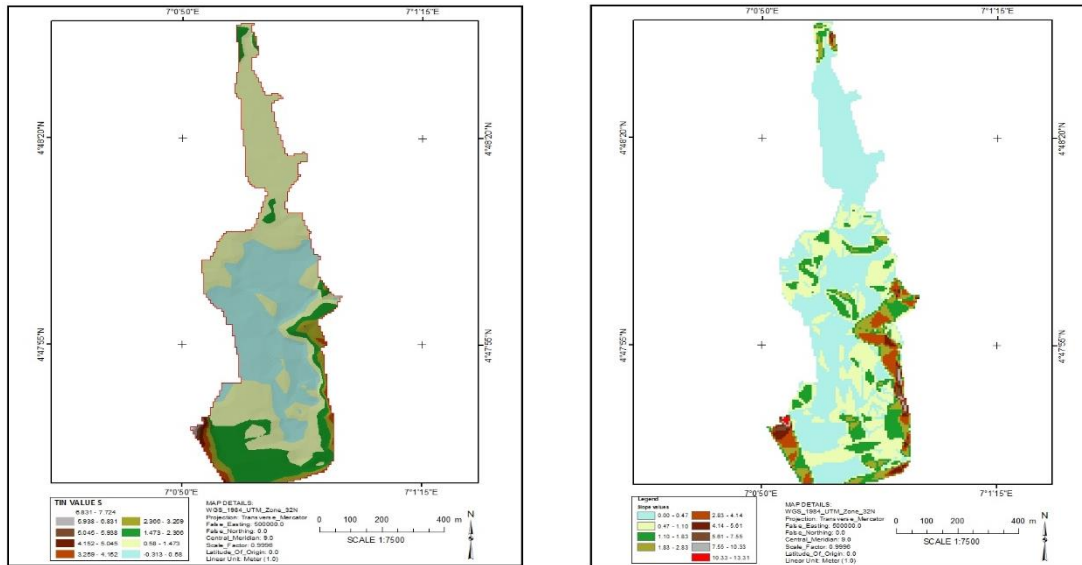


Figure 4a: TIN model of Ogunabali Floodplain

Figure 4b: Slope model of Ogunabali floodplain

Modeling Floodplain Hydrology and Hydraulic Patterns

Flow accumulation model was produced from flow direction raster model obtained from digital elevation model (DTM) using hydrology tool in the ArcGIS 10.1 spatial analyst tools. The model was reclassified into five classes from minimum (0.00) to the maximum (745) accumulated flow using natural breaks interval. The minimum accumulated flow cells range from 0.00 – 23.37 represented in white colour followed by 23.37 - 90.57 accumulated flow. The third-class ranges from 90.57 – 189.90 which was followed in the order by 189.90 – 341.82 represented with Medium apple green colour. The final class ranges from 341.82 – 745.00 as shown in Mars red colour.

Figure 5a above is the flow direction model overlay on contour model of the floodplain. Flow direction model was produced from SURFER 10 using 1-Grid Vector Map command. The model arrows show the direction of water flow in the floodplain. Also, the length of the arrow depends on the magnitude, or steepness of the slope. From the model high flow is represented with longer arrows with magnitude 0.102 while low flows are shown by shorter arrows with magnitude 0.00008 as shown in the model legend. Figure 5b shows the land cover/land use within the floodplain which will aid in the management planning and use. Table 2 below shows the classification of the land use.

Table 2: Area of each feature class in the geodatabase.

Feature Class	Area (ha)
Built-up	4.413
Dumpsite	0.626
Nypa palm	16.583
Water body	21.324

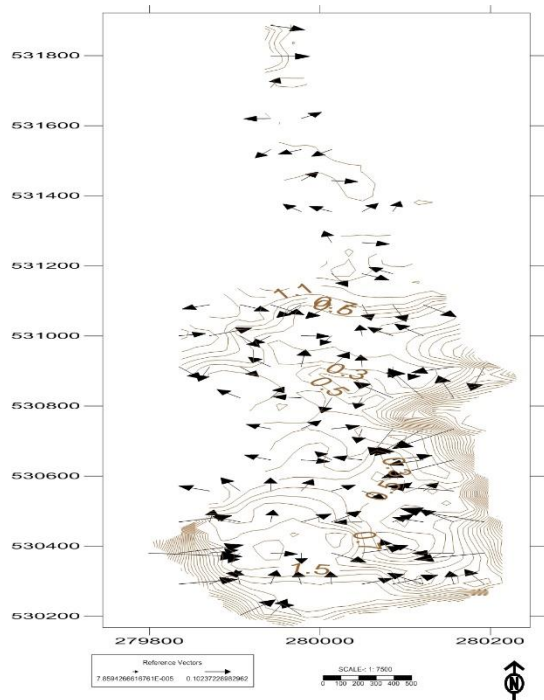


Figure 5a: Flow direction model using 1-Grid model.

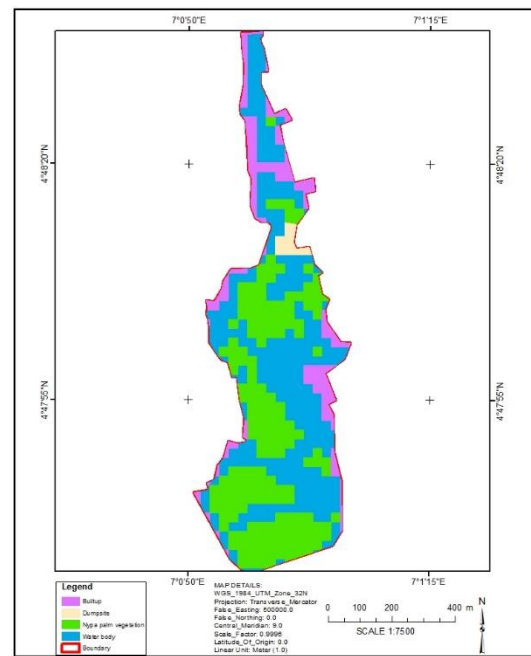


Figure 5b: Vector map and overlaid on contour

DISCUSSION OF RESULTS

Hydrology and Hydraulic patterns of the Floodplain

The hydraulic modeling of the floodplain shows that the flow patterns are in different direction of the upland area. The contour lines were crowded at three locations namely: extreme north, east and southwest positions, indicating steep slope. But at the central position of the floodplain, the contour lines are evenly spaced, indicating gentle slope topography. It then implies that water and materials will flow from steep slope to gentle slope. Similarly, TIN model also shows steep slope at the edges with values 3.259m to 8.831m and gentle slope with values -0.313 to 2.366m in the floodplain center. The maximum slope angle occurs at the edges with value 10.33 – 13.31 degrees as shown in red colour on the slope model. The slope angle at the center varies from 0.00 – 0.47 and from 0.47 - 1.10 degrees respectively. The hydraulic pattern of the floodplain is further explained using flow direction and accumulation models to represents the actual flow in the area.

The flow direction model shows high flow magnitude on the steep slope represented by long arrows with value 0.102 magnitude. The arrows are pointing towards the floodplain center with gentle slope (small slope angle). Also, at the floodplain center the arrows are smaller which indicates that flow magnitude is smaller compared to the edges. The directions of the longer arrows reflect the topography and proved that flood water will flow from steep slope (higher

gradient) to gentle slope (lower gradient) area. The flow accumulation model shows the maximum flow accumulated cell with value ranges from 341.82 – 745.00 in red colour at the southern map area. This high flow accumulation raster cells can be used to channel water from the floodplain. In most cases they defined stream flow in the floodplain and are the resultant of flows from other directions.

CONCLUSION AND RECOMMENDATION

The knowledge of the floodplain hydrology and hydraulic (H&H) characteristics is essential for the effective management of flood plains. The H&H data were incorporated into the floodplain digital database which guaranteed automatic data storage, editing, and retrieval. The study utilized contour model, Triangular Irregular Network (TIN) model, slope model, flow direction and accumulation models derived from topographic survey data to determine the spatial pattern on Ogbunabali floodplain, which is the main input in the management of the floodplains apart from vulnerability mapping. The hydraulic patterns derived from the models are the same and shows that the flows are from the higher slope along the edges, to the lower slope of the floodplain center. The use of high-resolution satellite imageries and 2D software have demonstrated the need for their use in sustainable flood plain and disaster management.

For further study, the following recommendations were made;

- a) That the digital database of all floodplains in Port Harcourt city should be developed for the effective management of flood disaster in the city.
- b) That high-resolution satellite image should be used to create floodplain database that will aid estimation of flood damage.
- c) Insurance policy for individual living within floodplain areas in the city should be developed based on the floodplain base map.

REFERENCES

- Anji, M. R. (2008). *The TextBook of Remote Sensing and Geographic Information Systems*, 3rd Edition, 4-4-309, Giriraj Lane, Sultan Bazar, Hyderabad-500 095-A.P, p92.
- Bera, J., Kartic, B., Moumita, P. (2012). *Application of RS & GIS in Flood Management A Case of Mongalkote Blocks, Burdwan, West Bengal, India*, International Journal of Scientific and Research Publications, Vol. 2, No. 11, pp. 1-9.
- Charles, D. G., and Paul, R. W. (2008). *Elementary Surveying An Introduction to Geomatics*, 12th Edition, Pearson Education, Inc, Upper Saddle River, New Jersey 07458, pp. 831.
- Department of Natural Resources, (2006). *Floodplains and Floodplain Management*, DNR Waters in St. Paul 500 Lafayette Road St. Paul, MN 55155-4032, pp. 1-2.
- Dano, U. L., Abdul-Nasir, M., Ahmad, M. H., Imtiaz, A. C. (2011). *Geographic Information System and Remote Sensing Applications in Flood Hazards Management: A Review*, Research Journal of Applied Sciences, Engineering and Technology, Vol. 3, No. 9, pp. 933-947.
- Dean, B. G. (2009). *Analysis of LiDAR Elevation Data for Improved Identification and Delineation of Lands Vulnerable to Sea-Level Rise*, Journal of Coastal Research, No. 53, pp. 49-58.
- DHI (Danish Hydraulic Institute), (2007). *Mike 21 Flow Model Hydrodynamic Module User's Guide*, pp. 1-90.
- FEMA 480, (2005). *National Flood Insurance Program (NFIP) Floodplain Management Requirements. A Study Guide and Desk Reference for Local Officials – FEMA480*, pp. 8.

- Heywood, I., Cornelius, S., and Carver, S. (2006). *An Introduction to Geographic Information System*, 3rd Edition, Pearson Education Limited, Edinburgh Gate Harlow Essex CM20 2JE, England, pp. 77, 91.
- Hiremath, P. S., and Kodge, B. G. (2010). Generating Contour Lines using Different Elevation Data File Formats, *International Journal of Computer Science and Application*, Vol. 3, No.1, pp. 19-25.
- HEC-RAS (Hydrologic Engineering Centre- River Analysis System), (2016). *User's Manual*, Version 5.0, CPD-68, U.S. Army Corps of Engineers, Davis, CA 95616, pp. 1-960.
- Jay, S. A. (2010). *Latest LiDAR and Sensor Technologies for Mapping Applications*, Northrop Grumman, pp. 1-31.
- Kavanagh, B. F. (2010). *Surveying with Construction Applications*, 7th Edition, Pearson Education, Inc, Publishing as Prentice Hall, One Lake Street, Upper Saddle River, New Jersey, 07458, pp. 125.
- Leadership New Paper, (July 29, 2017). <http://leadership.ng/2017/07/29/rage-port-harcourt-creeks/>
- Lawal, D. U., Matori, A. N., Yusuf, K. W., Hashim, A. M., and Balogun, A. L. (2014). Analysis of the Flood Extent Extraction Model and the Natural Flood Influencing Factors: A GIS-based and Remote Sensing Analysis, 8th International Symposium of the Digital Earth (ISDES), IOP Conf. Series: Earth and Environmental Science Vol. 18, pp. 1-6.
- Lynn, E. J. (2009). *Geographic Information Systems in Water Resources Engineering*, 1st edition, CRC Press Taylor & Francis Group Boca Raton London New York, pp. 193.
- Lee, I-C., Liang, C., and Ron, L. (2010). Optical Parametric Determination for Mean-Shift Segmentation-Based Shoreline Extraction Using LiDAR Data, Aerial Orthophotos, and Satellite Imagery, ASPRS 2010 Annual Conference San Diego, California, April 26-30, 2010, pp. 1-8.
- Otto, H., and Rolf, A. (2009). *Principles of Geographic Information Systems*, ITC Educational Textbook Series, International Institute for Geo-Information Science and Earth Observation, Enschede, pp. 78.
- Muhammad, S. P. (2009). *Coastal Changes Assessment Using Muti Spatio-Temporal Data for Coastal Spatial Planning Parangtritis Beach Yogyakarta Indonesia*, Master Degree Thesis, Gadjah Mada University, pp. 56.
- Muhammad, I., and Iyortim, O. S. (2013). Application of Remote Sensing (RS) and Geographic Information Systems (GIS) in Flood Vulnerability Mapping: Case Study of River Kaduna, *International Journal of Geomatics and Geosciences*, Vol. 3, No. 3, pp. 618-627.
- NIMET, (2011). *Nigeria Climate Review Bulletin*, pp. 1-40.
- NOAA, (2012). *Lidar 101: An Introductory to LiDAR Technology, Data, and Applications*, National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, 2234 S. Hobson Ave. Charleston, SC 29405, www.csc.noaa.gov, pp. 1-76.
- North Carolina Cooperating Technical State, (2003). *LiDAR and Digital Elevation Data*, pp. 1-6.
- Punmia, B. C., Jain, A. K., and Jain, A. K. (2005). *Surveying Vol. 11*, Fifteenth Edition, Laxmi Publication (P) Limited, 113 Golden House, Daryaganj, New Delhi – 110002, India, pp. 523.
- Richards, J. A., and Xiuping, J. (2006). *Remote Sensing Digital Image Analysis*, 4th Edition, Springer-Verlag Berlin Heidelberg, Germany, pp.397.
- Sulebak, J. R. (2000). *Application of Digital Elevation Models*, DYNAMAP, White Paper, pp. 1-11.
- Samarasinghe, S. M. J. S., Nandalal, H. K., Weliwitiya, D. P., Fowze, J. S. M., Hazarika, M.

K., and Samarakoon, L. (2010). An Application of Remote Sensing and GIS for Flood Risk Analysis: A Case Study at Kalu- Ganga River, Sri Lanka, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science, Vol. XXXVIII, Part 8, Kyoto Japan 2010, pp. 110-115.

END

MONITORING WETLAND DEPLETION (IN PORT HARCOURT, NIGERIA) USING SATELLITE IMAGERY.

Amina Dienne¹, Dagogo Fubara², Godwill Pepple³.

1 Rivers State University, Port Harcourt, Rivers State, Nigeria

2 Rivers State University, Port Harcourt, Rivers State, Nigeria

3 Rivers State University, Port Harcourt, Rivers State, Nigeria

One of the biggest threats to wetland conservation and management is urban development. Port Harcourt city in recent times is undergoing massive urban development. The wetlands in Port Harcourt are threatened by this urban development irrespective of its importance to the environment; hence the wetlands have become endangered ecosystems. The resultant effect of lack of research and control to the conversion of these wetlands, irrespective of the size, leads to their depletion in area as well as losing ability to buffer runoff. Geospatial analyses of wetland depletion to enhance wetland management and environmental sustainability in the midst of pressures from urban development was done. The study analyzes land cover /land use changes (LCLU) using Landsat imageries. The satellite images covering the area were acquired and analyzed using ArcGIS10.3, and ENVI 5.0. The total area analyzed was 22.309km². At the end of the classification stage in ENVI 5.0 we have six (6) feature classes, namely, bare land, water body, built-up area, light vegetation, mangrove and nypa palm. Accuracy assessment using kappa statistics shows the overall accuracy assessment. The bathymetric information enabled relating surface depth to river channel depth. The study concluded that there is need for wise use of wetland resources and improvement of institutional arrangement so that wetland policies can be fully integrated into the planning process across all disciplines.

Keywords: Wetland, Depletion, Sustainable, Satellite Imagery, Bathymetry.

INTRODUCTION

Wetlands which are terrestrial or semi-terrestrial ecosystems, are vital to our economic future and are among the earth's most productive eco-system (Olalekan, Abimbola, Saheed, & Damilola, 2014). Controversially, wetlands are the earth's most endangered ecosystems. The United States Fish and Wildlife Service defines wetlands as lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Such lands support predominantly hydrophytes periodically (Mitsch and Gosselink, 1993). They are undrained hydric soil and are saturated with water or covered by shallow water at some time during the growing season of each year (Cowardian, Carter, Golet, and LaRoe, 1979). Six per cent of the global land area comprises wetlands (Turner, 1990), but the physical extent of wetlands and their quality (in terms of species diversity, etc.) have declined greatly over the past years (Turner, 1990). Most of the physical losses have been due to the

1 aminadienye@gmail.com

2 dagogomj@yahoo.com

3 abie1802@yahoo.com

conversion of wetlands to other land uses, for example residential and agricultural. However, the benefits derived from such conversion must be sustainable, environmentally friendly and tailored towards food security in the case of agricultural purposes. The demand for land as a resource for developmental purposes does lead to changes in land use/land cover which may lead to either great benefit or great losses economically. According to International Training of Trainers on Wetland Management (ITTWM) (2009), wetlands are hugely diverse but they all share one fundamental feature: the complex interaction of their basic components – soil, water, animals and plants. Wetlands destruction is affecting river flood mitigation, water supply and water resources management in various parts Nigeria. There is no gainsaying, therefore, that the depletion of wetland ecosystems in Nigeria increases the task of water resources management in the country. (Oluwagbenga, Rapheal & Momodou, 2009). The alarming rate at which the wetlands are vanishing within the study area obviously portends some dire consequences which need to be addressed.

STATEMENT OF PROBLEM

When wetlands are altered without considering their full value, the negative consequences can be felt immediately by local people, and the nations' economy may be affected adversely. In figure 1 below, the conversion of wetland seems to have resulted in river overflow. According to Land Use and Land Cover Change (LUCC) Newsletter (2001), wetlands clearing for any purpose, results in carbon emissions. The consequences of nutrient run-off from surface soils is also as a result of intensified land use. The amount of wetland loss needs to be ascertained, otherwise the quantitative resultant effect cannot be derived.

The lack of information in the literature concerning tropical wetlands especially in developing countries (Turner,1990) causes the valuation of wetlands to be ineffective. In Rivers State there is very scarce information concerning wetlands and how they ought to be managed. Construction works are being executed in these ecosystems without conservative measures. Geospatial analysis which will promote the administration and use of these wetlands are seldom of concern.



Figure 1: Overflow of water due to absence of wetland in a sample study area

A combination of tidal and bathymetric data in relation to the loss of the wetlands due to urbanization will aid analyses of the depletion effects.

STUDY AREA

The study area (Port Harcourt City) as shown in figure 2 below, is one of the twenty-three Local Governments Areas and capital of Rivers state. It is found in the south southern part of Nigeria, otherwise called the Niger Delta Region of Nigeria. It has an area of about 360sqkm (140sqmi),

with a population of 1,382,592 (2006 Census). It is located between latitude $4^{\circ} 39' 45''\text{N}$ and $4^{\circ} 50' 00''\text{N}$ and longitude $6^{\circ} 56' 15''\text{E}$ and $7^{\circ} 7' 32''\text{E}$.

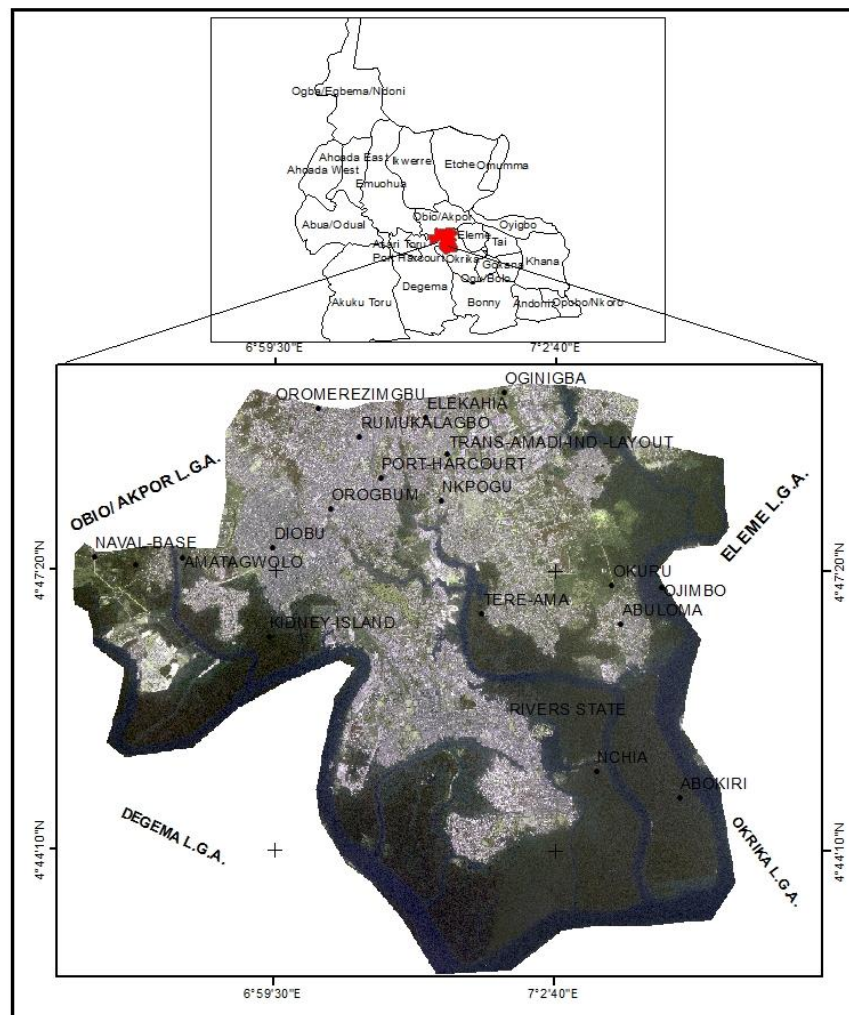


Figure 2: Study Area map

AIM OF THE STUDY

The aim of this research is to monitor wetland depletion within the study area using satellite imagery to enhance wetland management and environmental sustainability in the midst of urban development.

OBJECTIVES OF THE STUDY

In order to achieve the aim, the following objectives are to be achieved:

1. To determine the size of the wetland in the study area within the investigation period.
2. To map and generate the inventory of wetlands and their current uses within the study area during the period of investigation.
3. To evaluate the spatio-temporal wetland changes for other purposes within the study area over a specific period (1984-2014).

LITERATURE REVIEW

Geospatial Analyses of Wetland

Geospatial analysis is the gathering, display, and manipulation of imagery, GPS, satellite photography and historical data, described explicitly in terms of geographic coordinates or implicitly, in terms of a street address, postal code, or forest stand identifier as they are applied to geographic models. Geospatial analyses filter out relevant from irrelevant data and apply them to conceptualize and visualize the order hidden within the apparent disorder of geographically sorted data. Doing so allows them to provide accurate trend analysis, modeling and predictions.

Spatio-temporal analyses through the use of remote sensing and GIS techniques in Lagos state, Nigeria show that in 1986 the total area extent of forested wetlands, non-forested wetlands and cultivation in Lagos State were 68.28 sq. km, 3.97 sq. km and 107.877 sq. km respectively. In 1994 the research showed that forested wetlands and non-forested wetlands decreased to 64.689 sq. km and 3.907 sq. km respectively; while cultivation also decreased to 100.723 sq. km. Thus, between 1986 and 1994 three land use/land cover under investigation lost physical area of coverage. However, in 2000 cultivation and non-forested wetlands increased to 109.239 sq. km and 4.367 sq. km respectively; while forested wetlands decreased to 57.55 sq. km. (Oluwagbenga et al, 2009).

Wetland Loss / Encroachment Mapping

Wetland loss being an environmental concern has made countries to devise ways for which their wetlands could be effectively managed alongside the physical developments. In order to develop the wetlands inventory, the US National Wetland Inventory utilized high-altitude photography to map wetlands in the United States. They were able to produce highly detailed wetland maps covering 40% of forty-eight (48) states and 10% of Alaska. Wetland losses began to be much clearer when the negative impacts of human disturbances on the functions of the wetlands was separated.

Importance of Wetlands

The loss of even small wetlands (referred to the percentage of wetland to the total area) (Tuner, 2002) is one of the MOST cumulative impacts on wetland. Mitch & Gosselink (2000) declared that when less than 10% of a watershed is a wetland, higher peak storm water flows will occur. Similarly, they estimated watersheds to maintain a minimum of 3-7% of its area in wetland coverage in order to maintain adequate flood control and water quality. The importance of wetlands is so critical such that if ignored, residents will definitely face the cost of higher insurance premium, lower property value and reduced recreation facilities, hence, the need to determine the size of wetland depleted. Wright et al (2006) in the executive summary of his article reiterated the key roles these wetlands play in watershed quality. His work revealed that the benefits associated with the wetlands increase as the total wetland cover increases in a watershed. In view of his findings, flood control infrastructure and water treatment must be planned for as wetlands are reclaimed.

Benefits of wetlands Restoration

The benefits associated with the restoration of wetlands to land owners include the reduction of negative impacts of drought and flood by retaining run-off water, ground and surface water quality is increased, watershed sedimentation is reduced because soil erosion is reduced. There is also reduction in the amount of green gases and carbon emissions will be absorbed by the restored wetland, in order words, terrestrial sequestration is increased.

Wetland Legislations

Earlier in the problem statement the researcher stated that information about wetland is very few and insufficient especially in developing countries. In the case of Rivers State in Nigeria which is the researchers focus, the situation is as stated, little or no information is available about the management of wetlands. Maureen & Ngozi (2016) examined the existing legal framework for the protection of wetlands in Nigeria with a view to identifying gaps and deficiencies in the laws. They found out that the existing legislations were inadequate, and so proposed that a vibrant legal framework should be established to ensure healthy and sustainable use of wetlands within the country. In Washington DC, there are no specific natural wetland laws, but the wetlands are managed under regulations related to both land use and water supply. In 1985 and 1990, farm bills under the conservation reserve and wetlands reserve programs - two incentive approaches for the protection and restoration of wetlands were introduced. (EPA, US 2008).

From the foregoing, although researches on wetlands have been carried out based on the increasing awareness about the importance of these natural resources, yet in developing countries of which Nigeria (the domain of the study area) is inclusive, their protection and restoration are yet to be taken seriously.

Research Gap

In 1985, Adeniyi opined that most developing countries had little information regarding the use and management of wetland. Turner (1997) also stated that most of the world's environmental issues and global changes are attributed to land use and land cover changes. These changes especially as it affects our natural resources as a nation are influenced by factors such as population, technology, infrastructural development, industrialization, housing, agriculture. Wetlands are so important for the sustained existence of man, which is the focus of the Global Agenda. According to LUCC (2001), we need to consider and understand the recent changes in the land cover/land use, the complexities of the changes and relate with historical information. This research will address the non-availability of geospatial information of wetlands within the study area and the relationship of the wetlands at river banks with depth of river channel.

METHODOLOGY

Remote Sensing Approach

Satellite Remote Sensing approach was employed for this study. The reason is not farfetched. This approach has advantages that suit the prevailing challenges in the locality. Remote sensing is the acquisition and measurement of data/information on some phenomena, object or material by a recording device that is not in physical or intimate contact with the feature under surveillance. This is done by sensing the emitted energy and processing, analyzing, and applying that information. The advantages of overcoming inaccessibility and rather slow contact methods, historical image record and change detection documentation ability, and the anonymous approach were considered appropriate for the study.

System Requirement

In analyzing change in wetland area in the study area, the following software and hardware were utilized namely:

- a) ESRI's Arc GIS 10.3 was used for the clipping of the images used in the study, and for map compilation.
- b) ENVI 5.0 software is adopted for image processing.

- c) Laptop computer with processor Intel® Core (TM2) Duo CPU P9700, 4.00GB RAM, and 64-bit operating system.

Data Acquisition and Reliability

Data acquisition is a process of identifying and gathering data required for an application. The data acquired for this work include the following:

- a) Landsat 5 Imagery 1984 Multi Spectral Scanner (MSS) – 13/12/1984 – B234
- b) Landsat 7 Imageries- Enhanced Thematic Mapper plus (ETM+) 1999 – 29/11/1999 – B345
- c) Enhanced Thematic Mapper (ETM) 2014 – 06/01/2014 – B345
- d) Ground Coordinates (geodetic) for accuracy assessment and georeferencing.

These datasets were obtained from the Rivers State Ministry of Lands and Survey, Moscow Road, Port Harcourt. The imageries are auto rectified imageries referenced to the World Geodetic Reference System, downloaded from <http://glovis.usgs.gov/>. The characteristic of the image is shown in the Table 1 below. These were used to compile the map and obtain the spatial pattern of the wetlands in the study area. The images were processed using ENVI 5.0 software where the classification of the land cover/land use was obtained.

Table 1: Characteristics of LandSat images

Sensor Type	Path/ Raw	Imagery Date	Spatial Resolution	Band Used	Wavelength (µm)
MSS	188/57	13/12/1984	60m (re-sampled to 30m)	B2 B3 B4	0.52-0.60 0.63-0.69 0.69-0.90
ETM+	188/57	29/11/1999	30m	B3 B4 B5	0.63-0.69 0.69-0.90 1.55-1.75
ETM	188/57	06/01/2014	30m	B3 B4 B5	0.63-0.69 0.69-0.90 1.55-1.75

Source: Author, 2018.

Data Processing

Image Re-sampling

The Landsat image (1984, 1999 and 2014) used for the study were re-sampled to spatial resolution of 30m x 30m using ArcGIS. The image re-sampling operation was necessary in order to have similar spatial resolutions (ground scale measurement) for all the imageries in the study.

Band Combination/Band Stacking

In delineating wetland areas, it is important that the various bands of the acquired imagery are combined. This is simply because the objects in the environment have different spectral reflectance that are visible in either of the bands in the visible region of the electromagnetic spectrum. The color composite of the study area was performed in ENVI from the raster processing tool by adding three bands, bands 5, 4 and 3. This combination of near-IR (Band 4), mid-IR (Band 5) and red (Band 3) offers added definition of land-water boundaries and highlights subtle details not readily apparent in the visible bands alone.

Image Clipping

The study area extent was defined using the image clipping operation tool in ArcGIS toolbox – Raster processing tool. Image clipping operation restricts the researcher within the scope of

study, thereby eliminating unwanted data intruding in the results (Richard, 2015). The clipped image was exported in TIFF to ENVI and here it was resaved in GeoTIFF that is readable.

Image Classification

The method of classification employed for the study was the supervised classification method using a vector layer containing training polygons. This study adopted the Maximum Likelihood approach (MLC). This process was carried out for all the bands of the three imageries, 1984, 1999 and 2014 using the ROI tool from the standard tool bar. From the standard tool bar click on “**BASIC Tools**” - **Create ROI tool – ROI tool**.

At the end of this step, the result yielded six (6) classes of interest, Bare land, Water Body, Built Up Areas, Light Vegetation, Mangrove and Nypa Palm

RESULTS AND ANALYSIS

Presentation of Results

The results obtained from the methods employed satisfied the objectives of the study. The classifications of the images were validated to ascertain the true area. The distribution summary for the six classes of 1984, 1999 and 2014 are stated in tables 2 - 4 below. The results of the classification process for the three epochs are shown in figure 3 below.

Table 2: Classification Distribution Summary for 2014

S/No	Classes	No of points picked	%	Area (km ²)
1	Bare land	97	6.744	1.505
2	Water Body	261	10.004	2.232
3	Built-Up	732	33.428	7.458
4	Light Vegetation	186	37.276	8.316
5	Mangrove	139	3.136	0.699
6	Nypa Palm	77	9.412	2.099
	TOTAL	1472	100	22.309

Source: (Author, 2018)

Table 3: Classification Distribution Summary for 1999

S/No	Classes	No of points picked	%	Area (km ²)
1	Bare land	110	4.383	0.978
2	Water Body	106	13.065	2.916
3	Built-Up	265	38.641	8.624
4	Light Vegetation	124	22.246	4.965
5	Mangrove	110	16.565	3.697
6	Nypa Palm	79	5.101	1.129
			100	22.309

Source: (Author, 2018)

Table 4: Classification Distribution Summary for 1984

S/No	Classes	No of points picked	%	Area (km ²)
1	Bare land	92	2.937	0.655
2	Water Body	132	12.762	2.847
3	Built-Up	174	24.810	5.534
4	Light Vegetation	102	37.190	8.297
5	Mangrove	103	10.905	2.433
6	Nypa Palm	37	11.397	2.543
		640	100	22.309

Validation of Classification Results

After the digital image classification using MLC, the classification was validated using error matrix (Congalton, 1991). Error assessment of remotely sensed image data classification is essential due to a number of factors such as positional accuracy, inability to train correctly, and classification method adopted (Lu and Weng, 2007). The error matrix which is also called confusion matrix in some literature, produced Kappa Index of Agreement (KIA) from which accuracy assessment was based. The Kappa coefficient is the difference between the actual agreement and the change agreement (Lentilucci, 2006).

Confusion Matrices (Pixels)

The confusion matrix is calculated by comparing the location and class of each ground truth pixel with the corresponding location and class in the classification image. Each column of the confusion matrix represents a ground truth class and the values in the column correspond to the classification image's labeling of the ground truth pixels. For 1984, 1999 and 2014 the total land classification shows 640, 794 and 1492 counts. The Kappa coefficient which defines the overall accuracy of 95.98% is 0.94 for 2014.

Omission /Commission

Errors of omission represent pixels that belong to the ground truth class but the classification technique has failed to classify them into the proper class. The errors of omission are shown in the columns of the confusion matrix. Errors of commission represent pixels that belong to another class that are labelled as belonging to the class of interest.

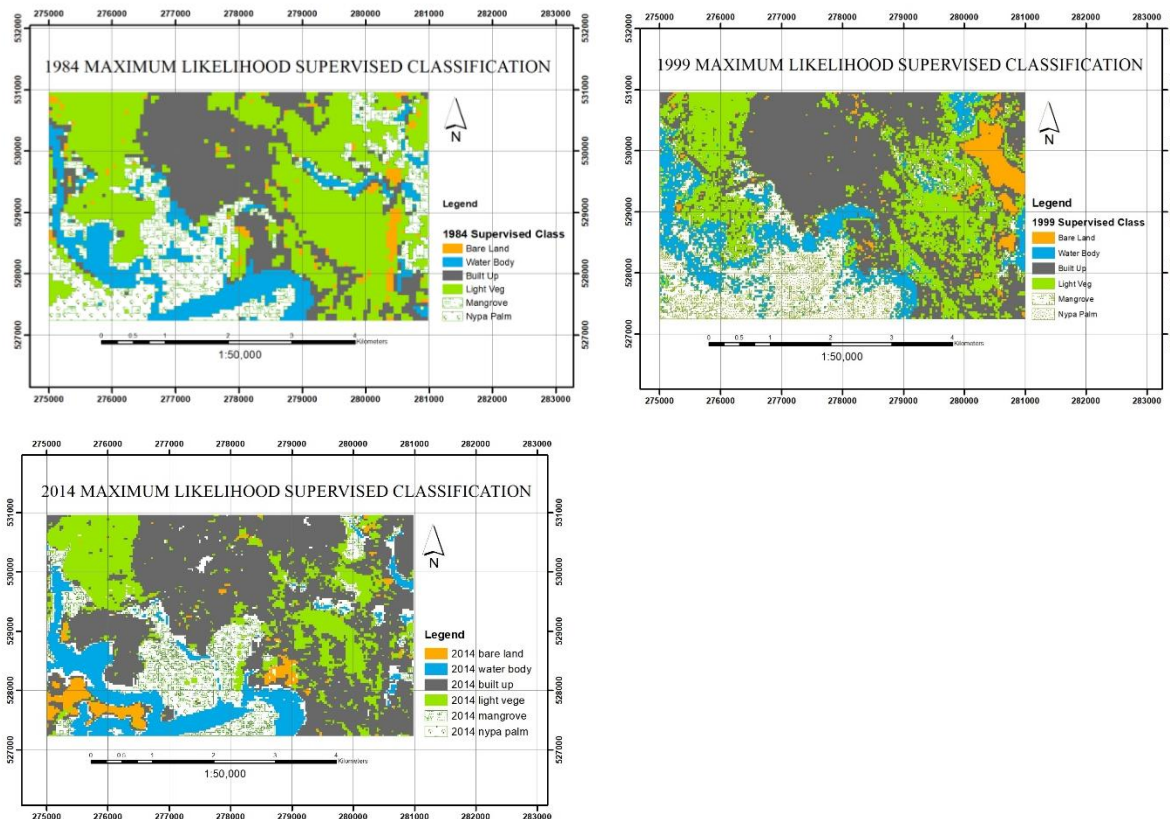


Figure 3: Maps showing results of Image classification for three epochs (1984, 1999, 2014)

Table 8: Land Use/Land Cover change per class in hectares

LULC	1984		1999		2014		1984 – 1999 (15years)		1999 – 2014 (15years)		1984 – 2014 (30years)	
	Area (ha)	% Area	Area (ha)	% Area	Area (ha)	% Area	Area (ha)	% Total Change	Area (ha)	% Total Change	Area (ha)	% Total Change
Bare land	65.5	2.937	97.8	4.383	150.1	6.744	32.3	1.45	52.3	2.35	84.6	3.79
Water Body	284.7	12.762	291.6	13.065	223.2	10.004	6.9	0.31	-68.4	-3.07	-61.5	-2.76
Built-Up	553.4	24.810	862.4	38.641	745.8	33.428	309	13.86	-116.6	-5.23	192.4	8.63
Light Vegetation	829.7	37.190	496.5	22.246	831.6	37.276	-333.2	-14.94	335.1	15.03	1.9	0.085
Mangrove	243.3	10.905	369.7	16.565	69.9	3.136	126.4	5.67	-299.8	-13.44	-173.4	-7.78
Nypa Palm	254.3	11.397	112.9	5.101	209.9	9.412	-141.4	6.34	97	4.35	-44.4	1.99
TOTAL	2230	100	2230	100	2230.5	100						

Source: (Author, 2018)

The bar charts in figure 4 below is a statistical representation of table 9 above. The built-up area increased from about 24.81 hectares in the year 1984 to 33.4 hectares in 2014. This resulted in a decline in the area of wetland defined by the mangrove classification for the location from 10.905 hectares to 3.136 hectares between 2000 and 2014.

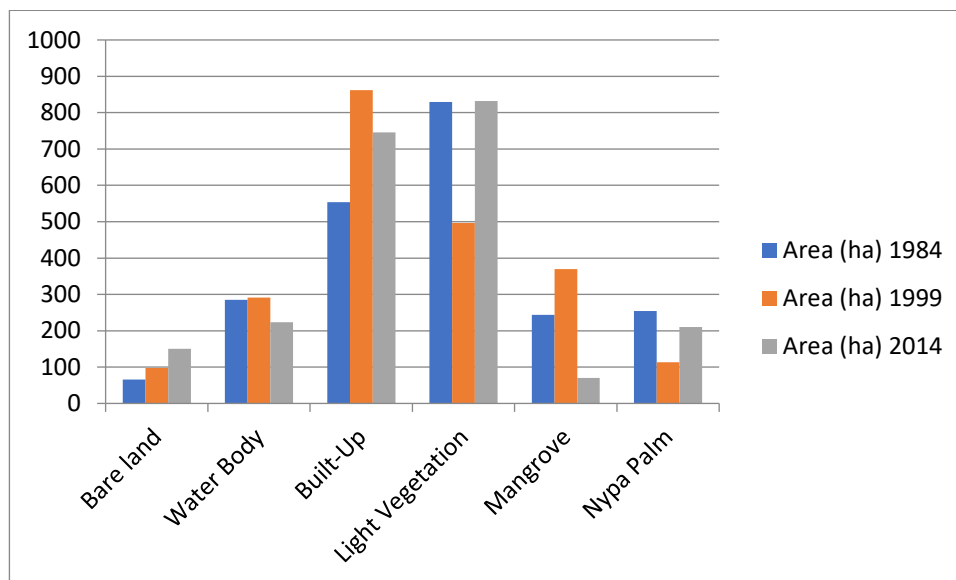


Figure 4: Comparism of three results

CONCLUSION

Six Land Use/Land Cover (LU/LC) types were identified on the satellite imageries within the period under review, 1984-2014. The processed and classified satellite imageries of 1984, 1999, and 2014 showed the status of the wetlands for the respective years. The wetland configuration in 2014 was then compared with those obtained from satellite imageries of 1984 and 1999. Reclamation activities were prominent in the study area and played vital roles in depleting the wetlands. The combination of Image processing technique in Remote Sensing and as well as the GIS software used has proved to be a unique and vital tool in detecting wetland changes over time. As the size reduces the land is converted for mostly agriculture as defined by the light vegetation class feature. The application of satellite remote sensing technology in wetland studies especially along the coastal area is a sure course of action that should be adopted.

RECOMMENDATIONS

Based on the study and the results achieved, the following recommendations are made:

1. The depreciations of wetlands even in tidal coastal area should not be overlooked
2. Remote sensing methods for wetland mapping and impact assessment should be the basis for planning and decision making in all regions.
3. This research offers a solution to the challenge of mapping wetlands using conventional survey method
4. Further studies associated with wetlands should be carried out and the information/data resulting from such studies should be made accessible to the public.
5. The study recommends regular mapping of wetlands to avoid indiscriminate conversion of wetlands to assist in better boundary definition among communities and better quality images free of cloud cover and haze would allow for a more accurate assessment of land use/land cover, possibly removing most error affecting the classification methods.

REFERENCES

- Congalton, R. G. (1991). A Review of Assessing the Accuracy of Classifications of Remotely Sensed Data, *Remote Sen. Environ*, vol. 37, pp. 35-46.
- Cowardin, L.M., Carter V., Golet F.C. and LaRoe E.T. (1979): *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. U.S. Fish and Wildlife Service: Washington, D.C.
- International Training of Trainers on Wetland Management (ITTWM) (2009).
Wageningen, Netherlands
- Lentilucci, E. (2006). On Using and Computing the Kappa Statistics, pp. 1-17.
- Lu, D., and Weng, Q. (2007). A Survey of Image Classification Methods and Techniques for Improving Classification Performance, *International Journal of Remote sensing*, vol. 28, no. 5, pp. 823-870.
- LUCC (Land Use and Land Cover Change) Newsletter (2001): **Land Use and Land Cover Change**. No. 7, December 2001
- Maureen, N. A & Ngozi, O.O (2016): Legal Framework for the Protection of Wetlands in Nigeria. *Journal of Law, Policy and Globalization*. ISSN 2224-3240(Paper) ISSN 2224-3259(Outline), Volume 54, 2016.
- Mitsch, W.J. and Gosselink J.G (1993): **Wetlands**. 2nd Edition. Van Nostrand Reinhold: NY, NY.
- Olalekan, E. I, et al (2014). Wetland Resources of Nigeria: Case Study of the Hadejia-Nguru Wetlands. *Poult Fish Wildl Sci* 2:123. doi: 10.4172/2375-446X.1000123.
- Oluwagbenga O., Raphael O. O and Momodou Soumah (2009): Geospatial Mapping of Wetlands Potential in Ilesa, Southwestern Nigeria. FIG Working Week 2009 (Surveyors Key Role in Accelerated Development) Eilat, Israel, 3-8 May 2009. TS 4B – SDI in Municipality and Natural Resources Management.
- Richard, J. U. (2015). Object-Oriented Classification Using Aerial Photograph and Spot Image of Eagle Island Port Harcourt, Rivers State, Nigeria, *International Journal of Advance Research*, Vol. 3, No. 12, pp. 11-23.
- Turner Kerry (1990): *Sustainable Wetlands: An Economic Perspective*. Wetlands: Market & Intervention Failure – Four Case Studies. Edited by Turner Kerry and Jones Tom. Earthscan Publications Limited, London.
- Turner, M.G. (1997): Spatial Simulation of Landscape changes in Georgia: A comparison of three transition models. *Landscape Ecology*_Vol. 1 pp. 29-36
- Wright, T et al (2006). *Wetland & Watersheds: Direct and Indirect Impacts of Urbanization on wetland quality*. An article of the Centre for watershed quality, Dec. 2006. Available online at <http://www.stormwatercenter.net>.

END

GOVERNANCE OF TENURE: KEY TO SUSTAINABLE LAND ADMINISTRATION IN NIGERIA

Amina Dienye¹, Godwill Pepple² and James Ogaluzo³

1 Rivers State University, Port Harcourt, Rivers State, Nigeria

2 Rivers State University, Port Harcourt, Rivers State, Nigeria

3 Geomaps Gallery Nigeria Ltd

Ensuring accessible and effective management of land for sustainable land administration is one basic need in any nation which could be achieved through Good Governance of Tenure. The social norms in Nigeria about Rights to land must be addressed and changed via the review of our national laws or instruments relating to land ownership. This paper identified some gaps in the Land Use Act, 1978; Cap 202, Laws of the Federation of Nigeria (LFN): part II, Section 6 paragraph 4 'Principles of land tenure', and Section 28, sub section 4, 'Revocation of Land Rights' relating to Free, Prior and Informed Consent (FPIC) as documented in the Voluntary Guidelines for the Governance of Tenure (VGGT). It therefore proffers some ways in which Rights to Land could be enhanced in land administration. In conclusion, the desire and great need for the conformity of the land use Act and the international soft law could be satisfied if creating awareness, regulating the cost for land registration to minimum, and decentralization of Land Administration institution is done.

Keywords: Good Governance, Tenure, Land Administration, Land Use Act,

INTRODUCTION

Tenure refers to the relationship among people with respect to their rights to hold land or other natural resources. Governance is the specific system by which a political system is ruled. (Food and Agriculture Organization of the United Nations. 2012) It is the process, or the power of governing. Hence, it is a system where political relationships exist among the people

Governance of tenure refers to the way in which access to, and control over natural resources is managed in a society. It includes:

- How competing priorities and interests of different groups are reconciled;
- How individuals and groups participate in decision making;
- How accountable the Government is to its citizens; and
- How the society obliges its members to observe rights, freedom, rules and laws (FAO, 2012).

Effectiveness in addressing tenure problems depends largely on the quality of governance. In Nigeria it has been obviously experienced that tenure problems do exist. The results of these problems include lack of food and security which are paramount in sustaining any developing nation, like ours.

1 aminadienye@gmail.com

2 abie1802@yahoo.com

3 jamesogaluzo@gmail.com

The Land Use Act, 1978, Chapter 202, Part II (Principles of land Tenure), part V (Revocation of Rights of Occupancy and Compensation thereof) are needful for governance. More importantly, to ensure good and equitable right to Land, the process of Free, Prior and Informed Consent (FPIC) as stated in the international soft law '**Voluntary Guidelines for the governance of Tenure**' should be recognized and embedded in the Act.

As land professionals, who have capacity in Geospatial technologies relating to the demarcation of boundaries, we come in direct contact/close range with the indigenes of communities. We are able to recognise and identify their route/origin as regards land ownership.

Changing Laws is important, but changing the social norms and awareness in Land administration institutions is even more so (Willi, 2006). Women advocacy for land rights is on the increase and therefore creates an environment for conflict. This is the situation in Nigeria where families dominated by women often results in a lineage where the future males resolve to regain property they have been deprived of, creating conflict amongst the communities concerned. According to Willi (2006), experience has suggested that there is ultimately no substitute for political struggle in the fiercely contested arena of women's land rights.

As Government decide to step up their duties, especially in reviews of national and state laws, we as professionals in the land sector, must brace up to collaborate with the Government and the people; standing in the gap to promote equitable rights to land, together, ensuring peace, security, and food for the growth and sustenance of our Nation.

Quality and responsible governance of tenure requires:

- a) Recognition of the legitimate tenure rights of people;
- b) Safeguarding these legitimate rights against threats of all kinds;
- c) Promotion and facilitation of the enjoyment/satisfaction of these rights owned;
- d) Providing access to legal justice that deal with infringement; and
- e) Prevention of violent conflicts and tenure disputes, and opportunities for corruption.

A REVIEW OF THE VGGT GUIDELINES

The Voluntary Guidelines for the Responsible Governance of Tenure (VGGT) was developed through a Global Multi-stakeholder consultation process. Government officials, civil society organisations, private sector representatives, and academicians were consulted in fifteen (15) meetings that accessed issues and actions to be included in the Guidelines instrumental by EU (FAO, 2013).

The VGGT was endorsed on the 11th of May 2012 by the committee on World Food Security (CFS) at its 38th session after 3 weeks intense intercut in July 2011, October 2011 and March 2012. It is the first comprehensive global instrument on tenure and its administration to be prepared through intergovernmental negotiations (UNFAO, 2012)

The major objective of the Guide is to seek improvement in governance of tenure of land, fisheries and forest: for the benefit of all.

Improving tenure governance by providing information of internationally accepted practices for systems that deal with the rights to use, manage and control land, fisheries and forests.

- Contribute to the improvement and development of policies, legal and organizational frameworks that regulate the kind of tenure right existing over resources;

- Strengthen the capacity and modus operandi of agencies and all persons concerned with tenure governance; and
- Promotes cooperation between the agencies (private sectors, judicial authorities, local Governments, farmers’ organizations, forests users, landlords, indigenous people, civil society, academia).

Principles of VGGT

There are basic principles of implantation of the guidelines. These principles are essential in all facets of development, which includes:

- Human Dignity;
- Non-discrimination;
- Equity and justice;
- Gender equity;
- Holistic and sustainable Approach;
- Consultation and participation;
- Rule of law;
- Transparency; and
- Accountability

Who is this guide for and how should it be used?

The voluntary guidelines for the governance of tenure is a reference tool that provides administrators, technicians and professionals, working in the land sector with guidance and examples of good practices. It is therefore a support tool or instrument for reference to all sectors of the economy responsible for activities bothering on land issues.

It should be employed in processes leading to decision making both on the part of the administrator and the client. It should be employed by the legislative and judicial arms of government that are involved in resolving issues on land conflicts.

One of the principles of VGGT that will ensure good practices of any Government is ‘consultation and participation’. Free, prior and informed consent (FPIC); a process of consultation and participation is internationally recognized as the right of humans.

Free- when there is no force intimidating or manipulating.

Prior - this means advanced search for consent before any form of authorization. The indigenous people are allowed the time to owe to a consensus.

Informed - The indigenous people are fed with every information that relates to the activities for which the resource is sought. The information should be in a format that will enable the people understand the positive objective of the purposed activity. Such information may and should include;

- i. The nature, shape, speed, duration of the project.
- ii. Scope of the project
- iii. Required personnel for the implementation
- iv. Purpose of the project
- v. Procedures that are involved in executing the project

Consent - The people must have agreed to the project. The indigenous people have right to withhold or offer consent.

GENDER – EQUITABLE GOVERNANCE OF LAND TENURE

Gender –equitable participation in land policy-making processes is the first step towards responsible gender-equitable governance of Land Tenure. In the governance of Land for

both women and men, the government as a major stakeholder has the onus to carry out sensitization and training on all staff in the relevant ministries and departments. It is also necessary that the government encourages other stakeholders' participation (civil society, private sectors) via multi-stakeholder dialogue process; embrace the participation of women and men in the process of land policy-making.

Millions of women around the world suffer abuses of their rights to own, inherit, manage and dispose their land. Across the world demands for women rights to land have met formidable resistance because they challenge patriarchal control (Willi, 2006). According to the Columbia Centre on Sustainable Development and the Sustainable Development Social Network for United Nations, women produce an estimated 60- 80% of food in developing countries, yet they are rarely given secure rights to land (SDSN, 2014).

How to make Land Registration and titling more accessible and gender- equitable.

One of the ways in which land registration and titling could be made more accessible and gender-equitable is to decentralize land administration institutions. In Ghana, this had been experienced so that the number of documents registered by women in their own names in the deeds registration system increased substantially between 2005, when there were only two (2) land registries in the whole country, and 2006 when land administration was decentralized and more registries opened outside the capital city. (FAO, 2013).

Another approach is to act on the registration fees to support gender-equity in land administration. This approach was employed by the Nepal Government because the charges for land registration impacts on women accessibility, as tested. The amount of land registered by women tripled between 2006 and 2009 as the rate of exemption increased from 10% in 2006 to 25% in 2009.

It is obvious that 'Gender-Equity' has to be mainstreamed into the governance of Land Tenure in Nigeria to ensure that the interests and needs of all people – Women and men - are addressed.

LAND USE ACT OF 1978

The contrasting tenure systems in the Northern and Southern part of Nigeria, and the considerable hassle in getting land for public purposes especially in southern Nigeria resulted in the Military government search for unifying the two (2) systems through the Land Use Decree of 1978 (Akin, 2011).

Land not being alienated to strangers and migrants did not go easy with the extensive labour migration due to colonialism. As colonial era progressed, land alienation then grew extensively in volume and geographical spread, and on the contrary resulted in litigations and communal strife, due to violent confrontations, which is what the VGGT tries to guide against.

Obviously, the Land Use Decree made government acquisitions for public interest easier, minimised the burden of land compensation and reduced court litigations over land, but this resulted in the following setbacks:

- a) The power of the governor and Local Government to revoke any right of occupancy over land for "overriding public interest" has been used arbitrarily and helps to emphasize the fragile nature of the certificates' rights.
- b) Hence the banks are reluctant, as well as the courts to accept statutory certificate of occupancy as a conclusive evidence of title holding as to secure bank loans. Women are therefore marginalized, especially single mothers.
- c) It has resulted in the abrogation of ownership rights to land. The nationalization by the government is inconsistent with democratic practices and operations of a free

market economic system. This is not a good mark of governance aimed at achieving sustainable development.

This is evident in the sections of the Act stated here:

Cap 202: part II, Section 6 paragraph 4 Principles of land tenure, states;

“The local Government shall have exclusive rights to the lands so occupied “against all persons” except the governor”.

In Part V: Revocation of rights of occupancy and compensation thereof.

Section 28, sub-section 1. States that “It shall be lawful for the Governor to revoke a right of occupancy for overriding public interest.”

Overriding public interest is explained as it relates to both customary and statutory rights of occupancies. See the following sub-sections of section 28:

(2) Overriding public interest in the case of a statutory right of occupancy means--.

(a) the alienation by the occupier by assignment, mortgage, transfer of possession, sublease, or otherwise of any right of occupancy or part thereof contrary to the provisions of this Act or of any regulations made thereunder;

(b) the requirement of the land by the Government of the State or by a Local Government in the State, in either case for public purposes within the State, or the requirement of the land by the Government of the Federation for public purposes of the Federation;

(c) the requirement of the land for mining purposes or oil pipelines or for any purpose connected therewith.

(3) Overriding public interest in the case of a customary right of occupancy means -

(a) the requirement of the land by the Government of the State or by a Local Government in the State in either case for public purpose within the State, or the requirement of the land by the government of the Federation for public purposes of the Federation.

(b) the requirement of the land for mining purposes or oil pipelines or for any purpose connected therewith;

(c) the requirement of the land for the extraction of building materials;

(d) the alienation by the occupier by sale, assignment, mortgage, transfer of possession, sublease, bequest or otherwise of the right of occupancy without the requisite consent or approval.

Conditions for the entitlement of compensation is also clearly stated in section 29 sub-sections (2) paragraph (c) and sub-section (3) paragraph (b)

Section 29 subsection (3) states that “If the holder or the occupier entitled to compensation under this section is a community the Governor may direct that any compensation payable to it shall be paid –

(a) To the community; or

(b) To the chief or leader of the community to be disposed of by him for the benefit of the community in accordance with the applicable customary law; or

(c) Into some fund specified by the Governor for the purpose of being utilised or applied for the benefit of the community.

Section 28, sub section 4, states: “The governor shall revoke a right of occupancy in the event of the issue of a notice by or on behalf of the (head of the federal military

Government) if such notice debuses such land to be refined by the Government for public purposes.”

DUTY OF STATES AND NATIONS

Now every society state or nation has the duty (responsibility) to adopt this FPIC. FPIC relates to other rights as contained in legally binding documents such as: that of;

- a) (ICESCR) –International convention on economic social and cultural rights.
- b) ICCPR – international convention on civil and political rights.

FPIC is of benefit to all nations because respecting FPIC reduces the risk of having disputes which may or can escalate into communal or inter-governmental conflict. This is because it ensures that communities can meaningfully participate in decision making processes.

The people can negotiate their fair and enforceable outcomes and also withhold their consent to a project if their needs, priorities and concerns are not adequately addressed.

It is the duty of Government to ensure that human rights of indigenous peoples are respected, protected and fulfilled. It is the duty of the Government to ensure that the private sectors, and all other having interest in land resources respect the rights of indigenes by adequately protecting them.

Therefore, it becomes incumbent on the Nigerian Government to;

- a) Review and where necessary revise our national laws
- b) Effectively maintain judicial processes that will ensure enforcement of indigenous people’s rights.
- c) Ensure companies respect these rights, by providing their FPIC prior to imposing measures.

For better policies, the Nigerian Government should conduct a detailed review of legislation as regards land policies in relation to the VGGT.

In Africa, Namibia engaged the VGGT for the successful introduction of property tax on commercial agricultural farms which was based on a detailed analysis of the situation and how proposed charges would affect stakeholders. (Monkam, 2015)

Sierra Leone has conducted a renewal of their legislation in line with the VGGT (Andrew, 2017)

CONCLUSION

The content of the Act does not consider the rights of the people in terms of ownership via the customary law. There is this desire and great need for the conformity of the land use act and the international soft law. The review of the Land Use Act reveals that, the rights and interests of the local people are not considered in line with the VGGT-free, prior and informed consent. Therefore, a strong advocacy for reviews of National laws that provides room for sustainable development and the provision of food and shelter, to all.

REFERENCES

- Andrew, H. (2017). FAO Report by Andrew Hilton. Andrew.Hilton@fao.org Paper prepared for ... – ConfTool. https://www.conftool.com/.../index.../06-04-Hilton-361_paper.pdf?...
- Akin, L. M, 2011. Land Reform in Nigeria: Progress, Problems and Prospects. A paper by the presidential Land Reform Committee Chairman.
- Food and Agriculture Organisation of the United Nations, (2013) Governance of Tenure: Technical Guide 1.

- FAO, 2012. Respecting Free, prior and Informed Consent. Practical Guidelines for Governments, Companies, NGO's, indigenous people and local communities in relation to land acquisition.
- Monkam, N. 2015. How Property Task Would Benefit Africa.
www.iaao.org/media/Topics/International/
- Sustainable Development Solutions Network, (2014). Indicators for Sustainable Development Goals – Working Draft, Paris, France and New York, USA: SDSN.
<http://unsdsn.org/resources>.
- Sustainable Development Solutions Network, 2014. DSN, 2014. Why good governance of Land and tenure security need to be part of the sustainable Development Goal Framework. A report by the Columbia Center on sustainable investment. <http://unsdsn.org/resources>.
- UN Food and Agricultural Organisation, (2012). Voluntary Guidelines on the Responsible Governance of Tenure of Lands, fisheries and Forests in the context of National Food Security. ISBN 978-92-5-107277-6
- Willi, Z, 2006. Good Governance in Land Tenure and Administration. XXIII FIG Congress, Technical Paper TS 71- Global Land Tenure- Challenges and Innovation, Munich, Germany, October, 2006.

END

FIT - FOR - PURPOSE CADASTRE: DEVELOPMENT OF A GEOSPATIAL INFORMATION SOFTWARE FOR DIGITAL LAND ADMINISTRATION

Oluibukun Gbenga Ajayi¹, Omoware Oluseun Bolarinwa², Joseph Olayemi odumosu³, and Abdullahi Ahmed Kuta⁴

*1,3,4 Department of Surveying and Geoinformatics, Federal University of Technology, Minna, Nigeria
2 Interspatial Technologies, Lagos, Nigeria*

This research seeks to develop a geospatial information software for the automatic generation, and easy administration of cadastral layout data for the Nigerian land registry using Rapid Application Development Model (RAD). The software was designed to handle and process both manually extracted cadastral layout data and automatic generation of cadastral layout data in shapefile format thereby creating a fit-for-purpose system for land administration in Nigeria. This approach gives room for storing data into a spatially enabled database, which facilitates easy data extraction, processing, querying, updating and distribution of cadastral layout data. The software was extended to process AutoCAD script files that can be used in layout plan production. Procedures were also added to the software for direct transformation of coordinates from one projection system to another. The developed software was tested by transforming the coordinates of 12 GCPs from Clarke 1880 (Minna Datum) to WGS 1984 (UTM Zone 32), and the experimental result was compared with those obtained from a commercial software using independent Student T-test. The statistical analysis reveals that there is no significant difference at 99% confidence level.

Keywords: Rapid Application Development model, Geospatial Information System, Fit-for-purpose cadastral, Layout administration, Land management.

INTRODUCTION

The enormous importance of landed properties in the economic growth and development of a nation makes proper land administration very crucial. “Land administration refers to the processes of recording and disseminating information about the ownership, value, and use of land and its associated resources. It includes the determination (sometimes known as the adjudication) of rights and other attributes of the land, the survey, detailed documentation, and the provision of relevant information in support of land markets” (Dale & McLaren, 2005). Land administration is an important infrastructure, which simplify the implementation of land policies in both developed and developing countries (Enemark, 2009). Developing countries such as Nigeria are beginning to embrace the potential of geospatial technology especially in fields such as land administration and real estate (Afolabi, 2017). The vocation of cadastre for all countries has become multipurpose: serving administrative mandates, maintaining an up-to-date database, assigning values for

¹ ogbajayi@gmail.com; gbenga.ajayi@futminna.edu.ng

² bware185@gmail.com

³ odumossu4life@yahoo.com

⁴ abdullahi_kuta@yahoo.com

taxation, calculating subsidies, addressing rural development and agrarian management, and providing products and services to citizens and companies (ESRI, 2005). Also, estate surveyors and property valuers rely on access to comprehensive, reliable and timely evidence of property transactions in order to make informed predictions of value (Wyatt, 2006). Traditional land management has often failed to find effective solutions, hence, the need for a system that recognizes the interdependent nature of economic development, protection of the environment, and institutional reform by a system which can respond to a greater number of various users and help create a basis for informed decision-making, particularly at the local level (Nichols, 1993).

The development of land-registration systems and the construction of Land Information Systems (LIS) or Geographic Information Systems (GIS) are very important prerequisites for the efficient management of land in a developing country like Nigeria (Karikari *et al.*, 2005). For successful fulfilment of the different tasks, it is essential to make data acquisition, create a GIS/LIS-based decision support system which can shorten and enhance the quality of decisions (Podor & Nyiri, 2010) in digital land administration. The major benefit of the automation of land administration is the conversion of land records from analogue (paper) form to digital form, helping to stop the loss of essential land records due to neglect, wear and tear, purposeful destruction or removal by wayward staff members and to the damages of the tropical climate (Karikari *et al.*, 2005). Data for digital land administration (survey data) are usually obtained/generated from the design of any cadastral layout (whether government layout, customary layout or a private estate layout) in form of setting-out data, which are later processed for use in the allocation of plots within the layout. Land administration in Nigeria essentially involves a cadastral input; since land must be discussed in terms of location, extent/size, shape, ownership rights and encumbrances (Augustus & Moses, 2016) which implies that spatial, as well as attribute data are key requirements (Oboli & Akpoyoware, 2010). Ndukwu, *et al.* (2013) emphasized the importance of survey documents in the accurate delineation of cadastral boundaries because only such documents can certify the location and dimension of the particular land parcels.

In Nigeria's Federal Capital Territory (Abuja), government layout and every other cadastral layout data are generated and processed using various GIS software (commercial and open sourced). Most of the commercial software are expensive and are characterised with manual parcel information extraction from the already designed layout; an error prone process which is not just time consuming but also limits the administration function of the software. Available GIS and CAD software such as ArcGIS, AutoCAD, Carson, etc, are limited in rapid data generation and presentation of the generated data in a customized format to serve as base for the production of survey document acceptable in Nigeria land registry. Furthermore, available datasets within the study area are known to be from heterogeneous sources, and as such, referenced to different coordinate systems. Homogenizing these data sets by transforming them into a uniform coordinate system has been quite challenging, especially for some locally developed software in Nigeria such as Mapsheet and others which are cheaper and of course, less robust. These software tools rarely offer the dual advantage of providing coordinate transformation and query capabilities, which are key in an effective land administration system. For a successful GIS development in developing countries, it must be developed with adequate local knowledge, and by allowing those who understand the peculiar needs of their society to be in charge of GIS implementation in land administration (Ramasubramanian, 1999; Taylor, 1991). This may involve some quite different GIS configurations and solutions from those already successful in the developed nations (Taylor, 1991), including software development to meet the need of a particular community based on their land titles.

One of the components of digital land administration is the software which should match the stage of development and specific requirements of a particular State, counties, society etc. Patented software solutions implemented in developed countries cannot be successfully deployed in developing countries since the system and administrative incompatibilities are too great (Zein, *et al.*, 2015). Zein, *et al.* (2015) stated that neither open source nor proprietary software option can fully cater for the requirements of land administration and cadastre authorities, hence, the need for customization in order to meet the requirements of the requesting authority, region or country. For decentralized regional development in the third world, appropriate techniques should usually be low in capital costs; be maintained without a high level of expertise; and they should not involve patents, expensive copyrights and royalties (Yapa, 1991).

To overcome the challenges and limitation of the currently existing GI software that are not fit-for-purpose, this research is aimed at developing a geospatial information software for digital land administration, specifically designed to meet the peculiar yearnings and requirements of Nigeria's cadastral system. The development of an open source land administration software which is user-friendly, fully automated, and robust enough for effective land management, and domesticated to satisfy the local needs of Nigeria's land registry is herein presented.

METHODOLOGY

Data source and data preparation

Already designed government layout of Mpape Annex located in Mpape, Abuja (FCT), Nigeria was used for the experimentation of the functionality of the designed software. The data was extracted both manually and via the use of shapefile. The manual data was extracted from the layout plan into two files. One of the files contained the coordinate data and the second file contained each plot details which includes the plot number, land use, and sequentially arranged beacon ID. This was extracted and stored in the software's compatible format for data processing.

Phases of software development

The Rapid Application Development (RAD) model was employed for this study and it basically consists of four developmental phases which are: requirement planning, user design, construction, and implementation. Brief details of these phases are as follows:

Requirement planning

This phase combines element of the system planning and system analysis phases of the Software Development Life Cycle (SDLC) (Sabale and Dani, 2012). It entails system function definition, software and hardware requirements, and source of data. The designed framework for the requirement planning phase is presented in Figure 1.0. The hardware and software required for the development of this application are a Laptop computer system with windows 8 operating system of 64bit, Python 2.7.2, ArcGIS 10.1, Microsoft Visio 2010 for model design, Postgresql 9.1.13 and PostGIS 9.0, Python Mega Widget (PMW), psycopg2, Python Imagery Library (PIL) 1.7.1 WIN 32, IBM SPSS 16.0, and Pyproj Python Library extension.

User design phase

This phase consists of detailed analysis of activities or functions related to the designed software. It entails creation of action diagrams using Unified Modelling Language (UML), system procedure or method design, user interface design and spatial database design. The use case diagram shows the sequence of transactions that will be performed by the

software to yield an outwardly visible and measurable result of values as shown in Figure 2.

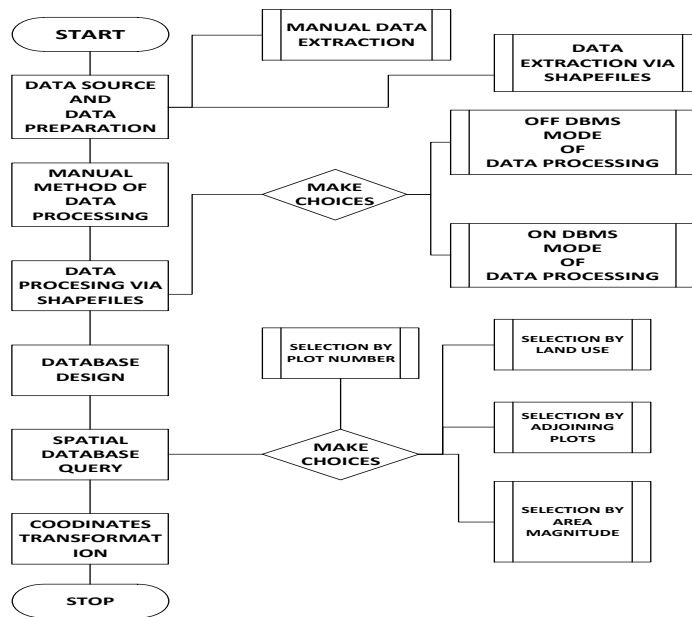


Figure 1: Design flow chart

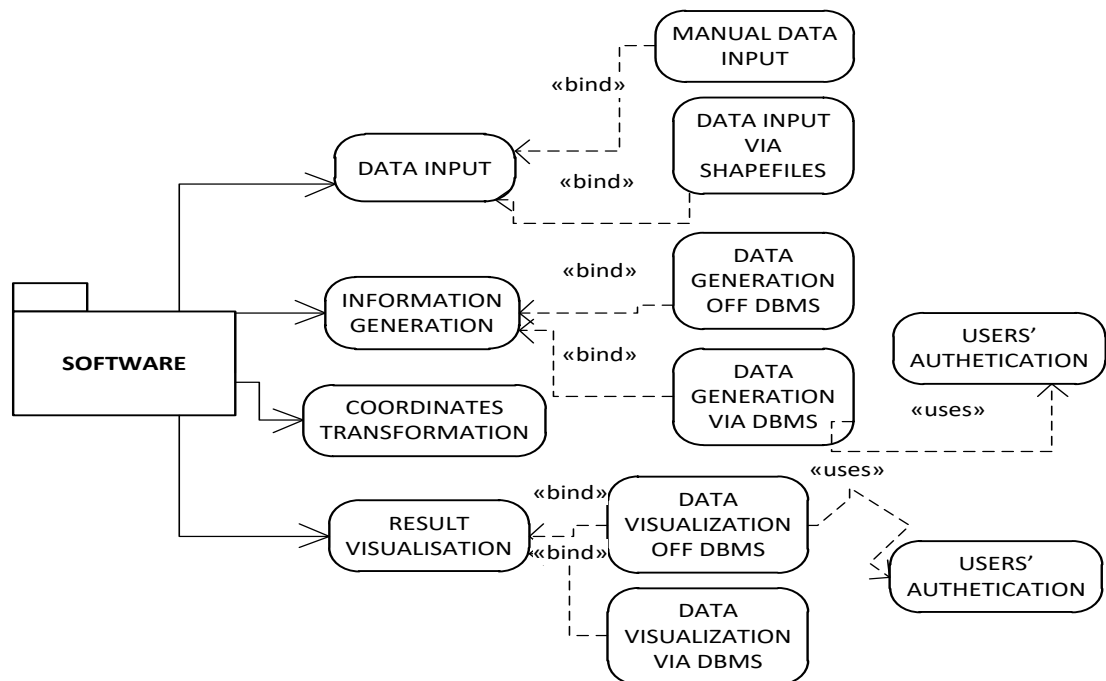


Figure 2: Use Case Diagram

A spatial database that optimizes storage and querying of spatial data was designed. Postgresql in conjunction with PostGIS was used as the database server for this application. Python Psycopg2 module APIs was used to integrate Postgresql with Python. Table 1 shows the various field representation used with their meaning and uses while Figure 3 presents the entity diagram. All of these fields highlighted in the entity diagram are of character data type. Also, a password was created using the password table in the SQL database for security purposes.

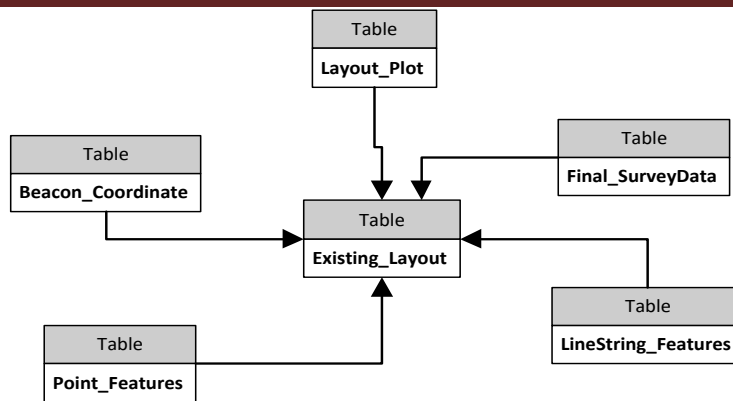


Figure 3: Entity relationship diagram

Table 1: Different fields with their uses

FIELD NAME	USES	KEY
Layout_name	Used to store layout name	Primary Key
Location	Used to store layout location	None
LGA	Means Local Government Area	None
Boundary	Used to store boundary geometry i.e. the perimeter value of the existing layout	None
CAD_Zone	Use to store cadastral zone of the layout	None
FID	An identification number for an object	Primary Key
Beacon_ID	Used to store beacon identification number	None
Layout_ID	Used to store layout name to link the existing layout table	Foreign Key
Plot_Number	Use to store plot numbers	None
Beacon_geom	Used to store boundary point geometry	None
From_stn	Simply means station from	None
Easting	Simply used to store the Easting value of the plot boundary	None
Northing	Simply used to store the Northing value of the plot boundary	None
Bearing	Simply used to store the Bearing value of the plot boundary	None
Distance	Used to store distance value	None
To_Stn	Used to store identification number	None

Construction phase and system implementation

Construction phase is the logical coding, design, and documentation of the software to ensure the workability of the system while system implementation entails installation and testing of the software using different cadastral layout plans to verify how accurate the result is. In RAD, each developmental stage was clearly tested to avoid a complicated debugging process. Also, for the coordinate transformation module, the results obtained from the application were compared with results gotten from other standalone commercially available software.

RESULTS AND ANALYSIS

The back computation obtained via the automated shapefile method including data from the DBMS off mode and the DBMS on mode sub-methods is presented in Figure 4. Geospatial query of the data stored in the database which include plots selection by plot number, shape, area, land use etc is presented in Figure 5. Finally, results of the statistical

analysis of the difference between the transformation results obtained from the developed software and CoordTrans Franson software (v.2.3) was presented.

Query by plot number

Both spatial and attribute query types were performed on selected land parcels within the Mpape annex layout located in Mpape, Abuja. This query demonstrates how land parcels can be easily identified using the plot numbers within the designed software. In performing this query, parcel 109 was used and the obtained results are shown in Figure 4 and Figure 5 respectively.

Plot selection by land use

Figure 6 and Figure 7 are the results of query that highlights land parcels that are specifically designated for a particular use within the layout. Some of these land uses include estate, recreation, religious, commercial, industrial etc. For this experimentation, land parcels dedicated to be used as estates within the layout were queried. The query result shows that four (4) different land parcels were designated as estate plots within the layout. Their areas in square meters are also generated as shown in Figure 6 while Figure 7 shows the graphical location of the land parcels which could aid quick identification of the land parcels on the ground.

Figure 4: Generated back computation from query of Plot 109

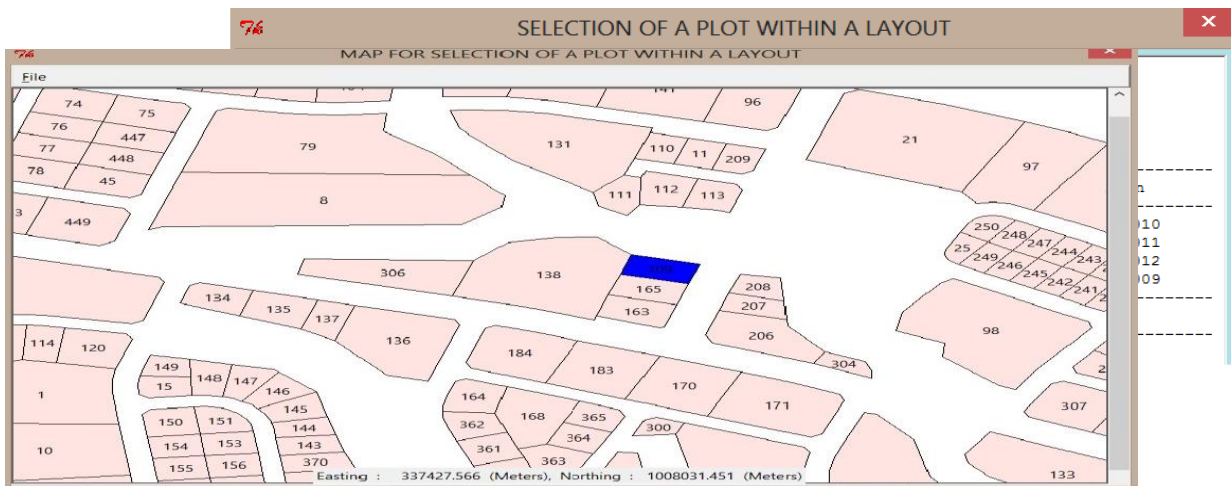


Figure 5: Graphical query result of Plot 109 within the Mpape annex layout in blue

LIST OF PLOTS FOR ESTATE IN FINAL SURVEY DATA FOR MPAPE ANNEX (RELOCATION)		
PLOT NUMBER	LAND USE	AREA (m)
14	ESTATE	10528.05
178	ESTATE	4896.774
3	ESTATE	4671.49
99	ESTATE	10750.36

Figure 6: List of estate plots from parcels selection by land use

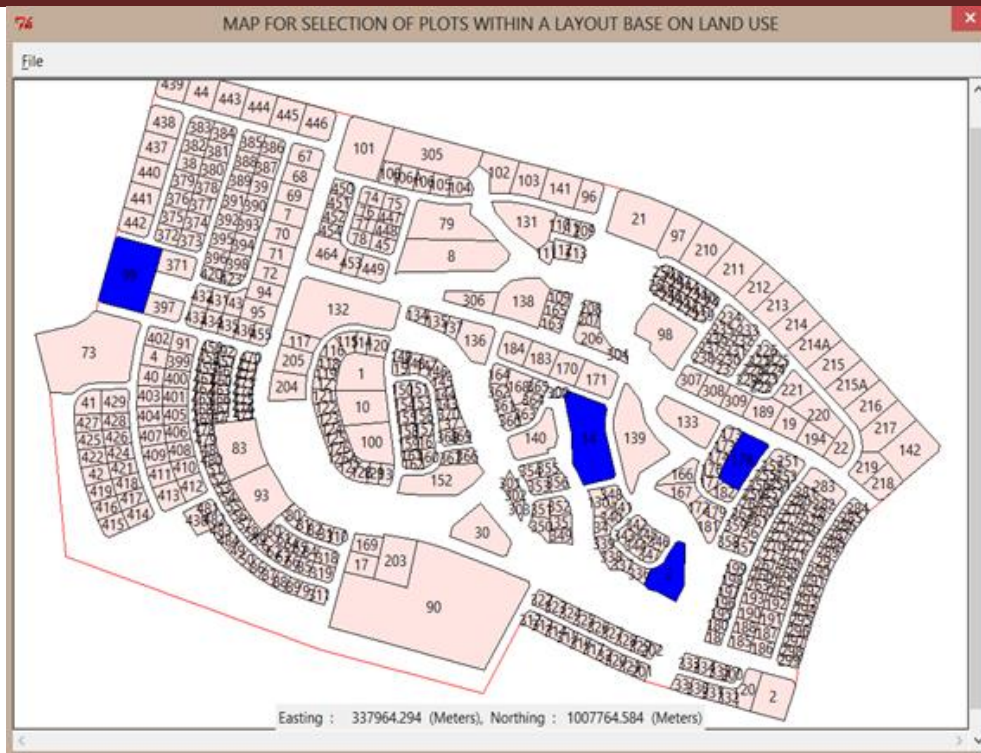


Figure 7: Graphical display of land parcels designed for estate land use.

Adjoining parcels selection

This query selects land parcels that adjoins a particular parcel. In other words, it seeks to provide answer to the question of which plots are sharing common boundary with a particular land parcel. In this case, selection of parcels that shares boundary with plot number 269 was performed. Both graphical and numerical result were shown respectively in Figure 8 and Figure 9. The result displays the parcel IDs, location of the plots, their land use and area. Five (5) land parcels were identified and they were all residential land parcels.

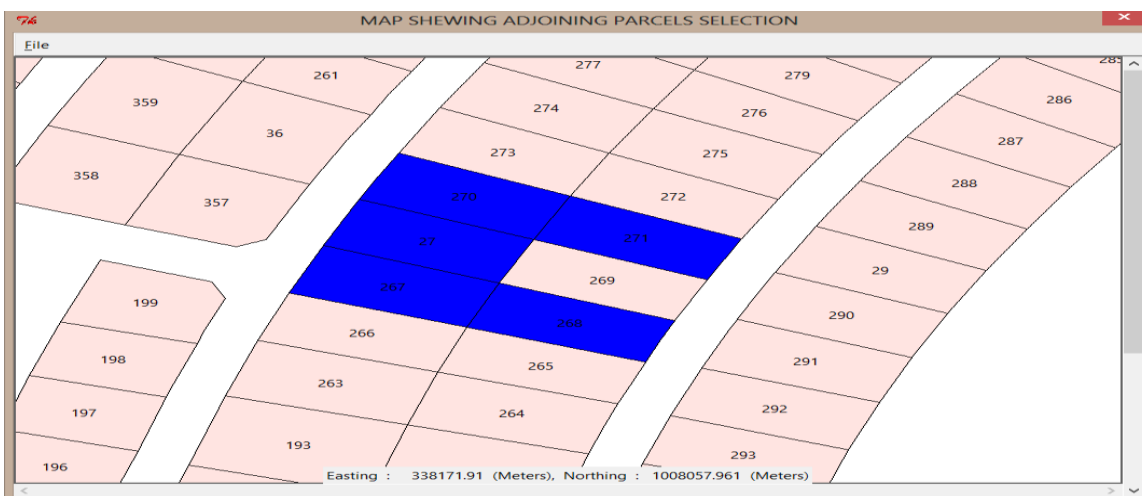


Figure 8: Adjoining parcels with plot 269

The screenshot shows a window titled "SELECTION OF INTERCEPING PLOTS" with a close button in the top right corner. Inside the window, there is a table titled "LIST OF PLOTS THAT TOUCHES PLOT 269". The table has three columns: "PLOT NUMBER", "LAND USE", and "AREA (m)". The data rows are as follows:

PLOT NUMBER	LAND USE	AREA (m)
267	RESIDENCIAL	777.971
268	RESIDENCIAL	729.244
27	RESIDENCIAL	775.997
270	RESIDENCIAL	776.696
271	RESIDENCIAL	728.03

Figure 9: Numerical data for adjoining parcels with plot 2

Statistical analysis of coordinate transformation results

Investigation of the significant relationship between results generated using the developed software and an existing commercial software (i.e. FRANSON CoordTrans) using DGPS acquired coordinates of selected points in Federal University of Technology, Minna, Gidan Kwano Campus. The GCP coordinates are on Clarke 1880 (Minna datum) coordinate system. The coordinates were transformed from Clarke 1880 (Minna datum) to WGS 1984 (UTM zone 32N). Table 2 shows the coordinates of the control points to be transformed, the transformed coordinates using both FRANSON and the developed software, and the computed discrepancy.

Table 2: Coordinates transformed from Clarke 1880 (Minna datum) to WGS 1984 (UTM zone 32N) using FRANSON CoordTrans and the developed software

CONTROL ID	COORDINATES TO BE TRANSFORMED FROM CLARKE 1880 TO WGS84		TRANSFORMED COORDINATES USING FRANSON		TRANSFORMED COORDINATES USING THE DEVELOPED SOFTWARE		COMPUTED DISCREPANCY BETWEEN THE TRANSFORMED COORDINATES	
GPS 01	220563.650	1055093.620	220487.050	1055213.240	220487.051	1055213.238	-0.001	0.002
GPS 02	220520.721	1054871.476	220444.120	1054991.090	220444.122	1054991.094	-0.002	-0.004
GPS 03	220479.441	1054695.011	220402.840	1054814.630	220402.843	1054814.630	-0.003	0.000
GPS 04	220311.437	1054605.810	220234.840	1054725.430	220234.839	1054725.429	0.001	0.001
GPS 05	220116.372	1054652.098	220039.770	1054771.720	220039.775	1054771.717	-0.005	0.003
GPS 06	220072.819	1054948.048	219996.220	1055067.670	219996.222	1055067.666	-0.002	0.004
GPS 07	219981.402	1055090.831	219904.810	1055210.450	219904.805	1055210.843	0.005	-0.393
GPS 08	220152.680	1055171.226	220076.080	1055290.840	220076.083	1055290.843	-0.003	-0.003
GPS 09	220423.788	1055127.084	220347.190	1055246.700	220347.189	1055246.701	0.001	-0.001
GPS 10	220211.809	1055018.750	220135.210	1055138.370	220135.211	1055138.368	-0.001	0.002
GPS 11	220337.637	1054858.332	220261.040	1054977.950	220261.039	1054977.950	0.001	0.000
GPS 12	220267.280	1054789.379	220190.680	1054908.000	220190.682	1054908.998	-0.002	-0.998

Table 3: Group statistics of the Student T test

	SOFTWARE	N	Mean	Std. Deviation	Std. Error Mean
COORDINATES	1	12	2.9904E2	185.35512	47.85849
	2	12	2.9904E2	185.35382	47.85815

Student's-T distribution statistical test in the form of equality of mean vectors was performed to check whether the results obtained from the developed software are significantly different from those obtainable from commercial software (FRANSON). Details of the hypothesis test are as highlighted below:

The null hypothesis 1: there is no difference in population mean of the coordinates gotten from the coordinate transformation from Clarke 1880 (Minna Datum) to WGS 1984 (UTM zone 32N) using both software.

The alternate hypothesis 1: there is difference in population mean of the coordinates gotten from the coordinate transformation from Clarke 1880 (Minna Datum) to WGS 1984 (UTM zone 32N) using both software.

From the two statistical analysis presented in Tables 3 and 4, the data sets were tested for significant difference at 99% confidence level using IBM SPSS software. For this analysis, Sig. (2-tailed) value of 1.00 was reported which implies that the null hypothesis was accepted because the Sig. (2-tailed) value is greater than 0.01 at 99% level of confidence. This simply implies that there is no significant difference between the coordinates generated by FRANSON CoordTrans software and the developed software.

Table 4: Independent sample test

Independent Samples Test								
		T-test for Equality of Means						
		T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	99% Confidence Interval of the Difference	
							Lower	Upper
COORDINATES	Equal variances assumed	.000	28	1.000	.00053	67.68188	-187.02227	187.02334

CONCLUSION

This research presents a robust, automated, user-friendly and fit-for-purpose land administration tool that is poised to solving the complex land management problems of the Nigerian cadastral system. Its major contribution to knowledge includes:

1. Automatic generation of spatial and attribute layout data from existing layout designs and presenting the data as shapefiles so that it can be easily manipulated in other GIS software environment (data interoperability).
2. Presentation of a coordinate transformation tool as a module in the land administration and management software for the unification of data sets that are referenced to different coordinate systems.
3. Robust database that affords near-real-time query for quick extraction of spatial information.

Further research efforts will attempt to upgrade this software into a web-based application for real time handling of multipurpose cadastral layout data generation and administration.

ACKNOWLEDGEMENT

The authors would like to thank Surv. S. A. Ajibade (of blessed memory) for his guidance and constructive comments on this manuscript.

REFERENCES

- Afolabi, B. (2017). Applying geospatial technologies to real estate decision making in Nigeria, GIS professional Newsletter - 04/12/2017 [Accessed 21 February 2018].
- Augustus, D., & Moses, O. O. (2016) The importance of cadastral survey information for effective land administration in Nigeria. *International Journal of Environment and Pollution Research*, 4(1), 26–32.
- Dale, P. F., & McLaren, R. (2005). GIS in land administration. *Geographical Information Systems*. Second Edition. Abridged, 859–876.
- Enemark, S. (2009). Land administration systems- managing rights, restrictions and responsibilities in land. *Map World Forum*, Hyderabad, India., (February), 1–15.
- ESRI. (2005). GIS for cadastre management: the framework for cadastre systems. ESRI® GIS Technology in Europe.
- Karikari, I., Stillwell, J., & Carver, S. (2005). The application of GIS in the lands sector of a developing country: Challenges facing land administrators in Ghana. *International Journal of Geographical Information Science*, 19(3), 343–362.
<https://doi.org/10.1080/13658810412331280149>
- NASA (1992). Recommended approach to software development, National Aeronautics and Space Administration (NASA), Goddard Space Flight Centre Greenbelt, Maryland 20771. Revision 3
- Ndukwu, R.I, Chigbu, N., and Ebinnel, E.S. (2013). Cadastral geodatabase of Uwani layout Enugu Nigeria for land administration using ArcGIS cadastral fabric model, *Research Journal in Engineering and Applied Sciences*, 2(1), 62-69.
- Nichols, S. (1993). Land registration: managing information for land administration. University of New Brunswick, Canada.
- Oboli, C. E., & Akpoyoware, A. O. (2010). Reform in cadastre and land administration in Nigeria-coping with challenges in development. In *Facing the Challenges – Building the Capacity* (pp. 11–16). Sydney, Australia: FIG Congress 2010.
- Podor, A., & Nyiri, J. (2010). GIS application in real estate investment. *Scientific Journal of Riga Technical University Economics and Business Economy: Theory and Practice*, 20, 94–100.
- Premium Times (2014). Investigation: How FCT officials steal houses, lands from Abuja indigenes in huge resettlement fraud. Being a news reported on 14th September, 2013. On official website: <https://www.premiumtimesng.com/news/144385-investigation-fct-officials-steal-houses-lands-abuja-indigenes-huge-resettlement-fraud.html>
- Ramasubramanian, L. (1999). GIS implementation in developing countries: learning from organisational theory and reflective practice. *Transactions in GIS*, 3(4), 359–380.
<https://doi.org/10.1111/1467-9671.00028>
- Sabale, R.G., Dani, A.R. (2012). Comparative study of prototype model for software engineering with system development life cycle, *IOSR Journal of Engineering (IOSRJEN)* Volume 2, Issue 7. PP 21-24.www.iosrjen.org

Wyatt, P. (2006). Using a geographical information system for property valuation. *Journal of Property Valuation and Investment*.

Yapa, L. S. (1991). Is GIS appropriate technology quest? *International Journal of Geographical Information Systems*, 5(1), 41–58.
<https://doi.org/10.1080/02693799108927830>

Zein, T., Timm, C., Hartfiel, P., & Ag, H. L. (2015). Concept, design and development of land administration and cadastre systems using open source software. In *Linking Land Tenure and Use for Shared prosperity*. “2015 World Bank Conference on Land and Poverty” The World Bank - Washington DC, March 23-27.

END

GEOSPATIAL DETERMINATION OF PATTERNS OF ACCESSIBILITY TO HEALTHCARE FACILITIES IN OSUN STATE, NIGERIA

Joseph Tunde Fadahunsi¹

1 Department of Surveying and Geoinformatics, Obafemi Awolowo University, Ile-Ife.

The study examined the patterns of accessibility to healthcare facilities in Osun State, Nigeria. This was with a view to improving the equitable access to healthcare facilities in the State. Primary and secondary data were used in the study. The primary data were obtained using hand-held Global Positioning System (GPS) receiver to obtain the geographic coordinates of all the healthcare facilities in the State. The secondary data comprised the list of all the healthcare facilities in the state, obtained from the Osun State Hospitals' Management Board and Orthophotomaps covering the state, collected from the Office of the State Surveyor-General. Settlements, rivers, railway line, Local Government Area (LGA) boundaries, and roads were extracted from the Orthophotomaps. The data were analysed using percentage and Geographical Information System (GIS) analysis tools such as buffering, overlay and query. The study identified 657 healthcare facilities of three categories, namely, primary (603, 91.8%), secondary (51, 7.8%) and tertiary (3, 0.5%) in the State. Also, the results identified 1, 573 settlements of 103 towns and 1,470 villages in the State. Also, the results show that 93.4% of the settlements fall within 5km radius of the primary healthcare facilities, 70.8% of the settlements fall within 10 km service radius of the secondary healthcare facilities and only 35.0% of the settlements fall within 20 km service radius of tertiary healthcare facilities. The study concluded that there were inequalities in the patterns of accessibility to healthcare facilities in the study area.

Keywords: Geospatial, healthcare, facility, accessibility, settlements.

INTRODUCTION

Healthcare facility refers to an institution, place or building that operates health services for the prevention, diagnosis or treatment of human diseases, including the basic equipment, stock of drugs, vaccines, clean water, constant supply of electricity (power), medical record tools, ambulances, for mobility of patients, freezers, qualified health officers and medical personnel, *etc*, which make it possible for the improvement of the patients' healthy living (Ademiluyi and Aluko-Arowolo, 2009; Emeet *al.*, 2014).

The health structures in Nigeria are arranged in a hierarchical order. These are primary, secondary and tertiary health institutions; each being the responsibility of Local, State and the Federal Governments respectively. Federal government has

¹ tundefada@gmail.com

responsibility for policy formulation, monitoring and evaluation of the nation's healthcare system (Awosika, 2005; Adeyemo, 2005).

Access to healthcare services is a multidimensional process involving the quality of care, geographical accessibility, availability of the right type of care for those in need, financial accessibility and acceptability of service (Peters *et al.*, 2008). Thus, accessibility to healthcare is the ability of a population to obtain quality healthcare services; however, it varies across space because neither health professionals nor residents are uniformly distributed (Lou and Wang, 2003).

The objective of the study is to determine the patterns of accessibility to healthcare facilities in the State using GIS technique with a view to improving accessibility to healthcare facilities in the State.

The central place theory (CPT) provides crucial concepts in understanding spatial and hierarchy in distribution of healthcare facilities in urban and peri-urban areas. The theory takes its origin from the work of the German geographer, Christaller (1966), who studied the urban system of Southern Germany during the 1930s, as quoted by Rodrigue (1975). The theory provides an appropriate theoretical background for the understanding of the spatial configuration of healthcare facilities in Osun State. For example, buffering tool in GIS can be used to determine the locations of healthcare facilities in a region to show how close or otherwise are these facilities to each other in compliance with the CPT. Also, overlay tool in GIS can be used to determine the spatial arrangement of healthcare facilities in an area to show whether the arrangement conform with CPT or not.

THE STUDY AREA

Osun State was carved out of Oyo State on August 27, 1991. Its capital is Osogbo. It is located in South West of Nigeria. Osun State is landlocked and occupies a land mass of approximately 14,875 square kilometers. It lies between Latitudes $06^{\circ} 55'N$ and $08^{\circ} 07'N$; and Longitudes $04^{\circ} 06'E$ and $05^{\circ} 05'E$ (Figure 1). Ondo and Ekiti States bound Osun State on the East, on the West by Oyo State, on the North by Kwara State and to the South by Ogun State. The state is currently made up of 30 Local Government Areas (LGAs) and has estimated population of 3,763,074 in 2014 (Osun State Hospitals Management Board, 2014).

For the determination of patterns of accessibility to the healthcare facilities in the study area, a database for the healthcare facilities in the State was created to determine service areas around the healthcare facilities and analyse accessibility in the State. Thiessen technique (air-line-distances) was employed for the determination of patterns of accessibility to the healthcare facilities in the State. The method requires that two assumptions be made; that all the clients would use the nearest healthcare facility and that they would all travel along a straight line path. Network analysis, which is more accurate, might have been used, but due to the lack of road distances and driving time data, the method was not used.

GIS analytical tools (buffering and query tools) were employed. Buffering analysis was used by creating buffer (catchment) of 5km, 10km and 20km distances around primary, secondary and tertiary facilities respectively. Query by selection was used to determine the actual number of settlements within each buffer zone of the healthcare facilities. Osun state has 103 urban settlements and 1,470 settlements.

RESULTS

Accessibility to primary healthcare facilities

Analysis of settlements within 5km of primary healthcare facilities as shown in Figures 2 and 3 revealed that out of 1,573 settlements, high proportion, 1,469 (93.4%) of the settlements fall within the buffer zones. The high proportion of the settlements within 5 km buffer zone indicates that the primary healthcare facilities are physically accessible to the general populace. Only 104 (6.6%) settlements fall outside the 5 km buffer zone of the facilities; and they are located in Olaoluwa, Irewole, Isokan and Ayedade LGAs. However, some LGAs like Ife Central, Ilesa West, Osogbo, Olorunda, Ede North and Irepodun are over-served.

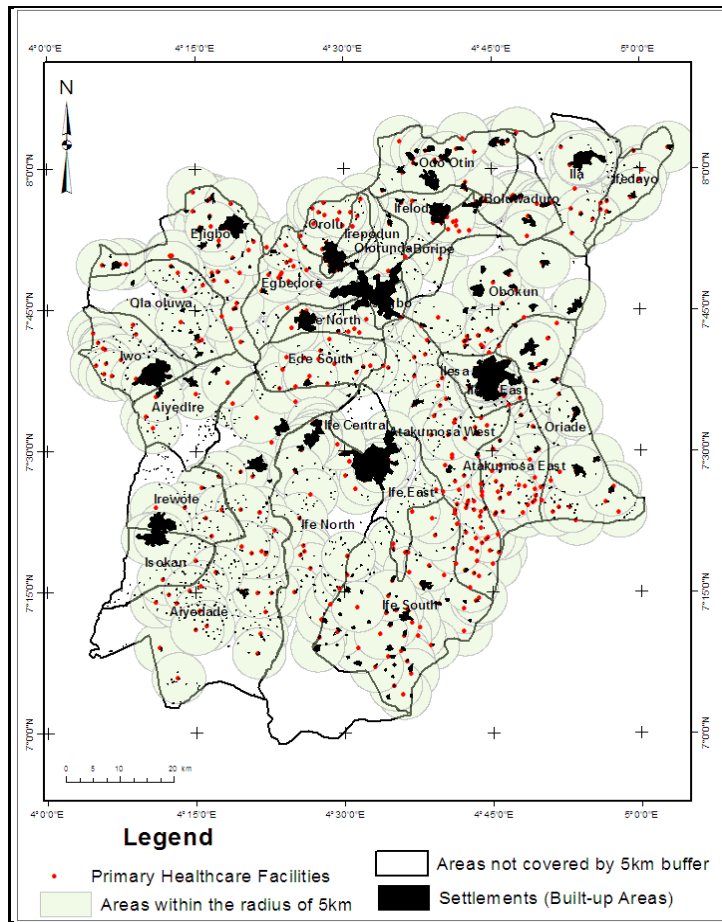


Figure 2: Result of 5 km buffer distance around primary healthcare facilities

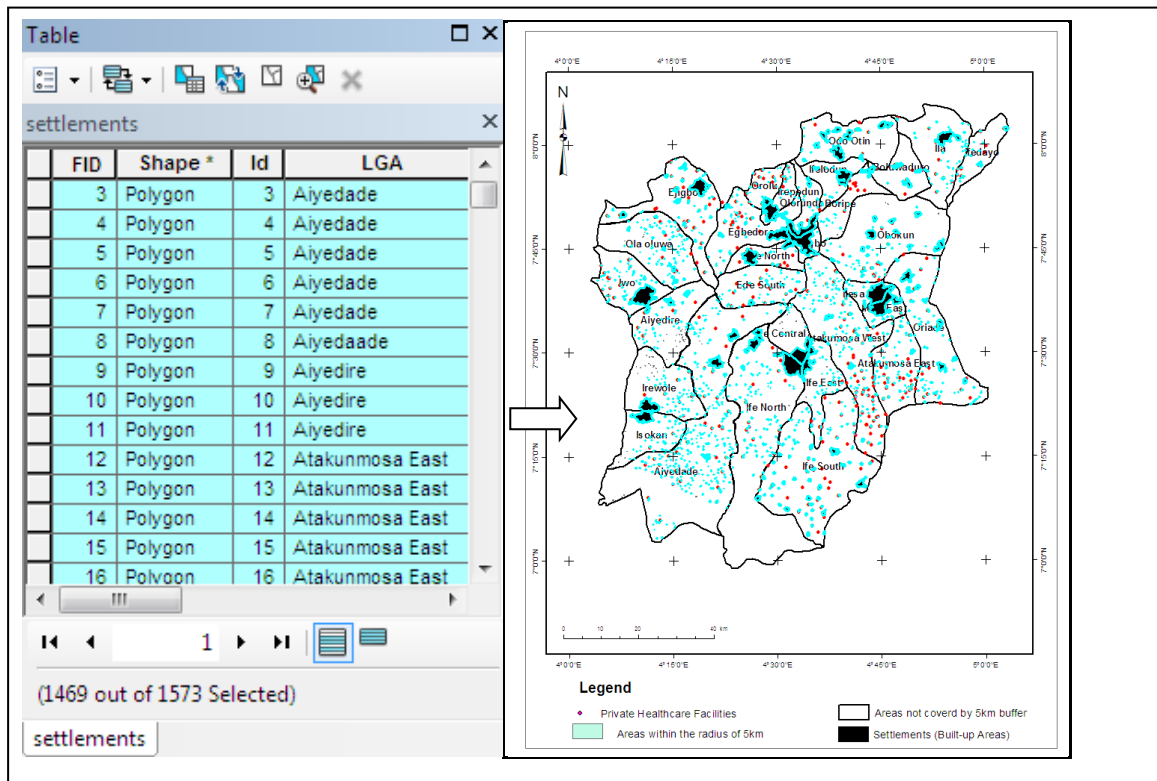


Figure 3: Result of the query by selection of settlements within 5km of the primary healthcare facilities

Accessibility to secondary healthcare facilities

Analysis of settlements within 10km of secondary healthcare facilities as shown in Figures 4 and 5 revealed that out of 1, 573 settlements, 1, 114 (70.8%) of the settlements fall within the buffer zones. Four hundred and fifty-nine settlements fall outside the buffer zone; these settlements are distributed among the following LGAs: Irewole, Isokan, Ife North, Ife South, Atakumosa West, Olaoluwa, Ayedade, Iwo and Ejigbo. This indicates that greater number of people have access to secondary healthcare facilities in the study area. This suggests that, physical accessibility within 10km of secondary healthcare facilities among settlements in the study area is high. The implication of this is that secondary healthcare facilities in these settlements are at advantage of having good access to the healthcare facilities. Local Government Areas like Aiyedade, Ife North, Ife South are under-served while some LGAs like Bolorunduro, Osogbo, Atakumosa East and Atakumosa West are over-served.

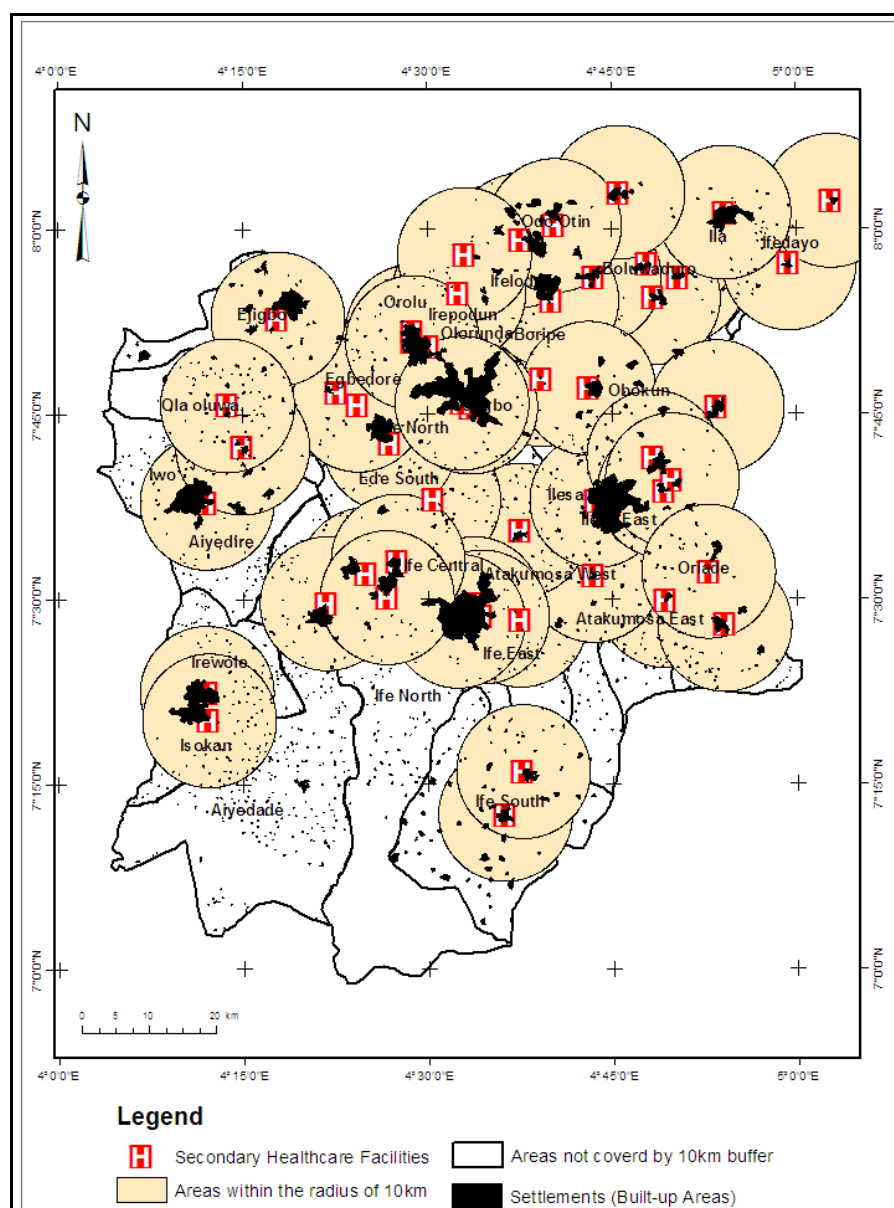


Figure 4: Result of 10 km buffer distance around the secondary healthcare facilities.

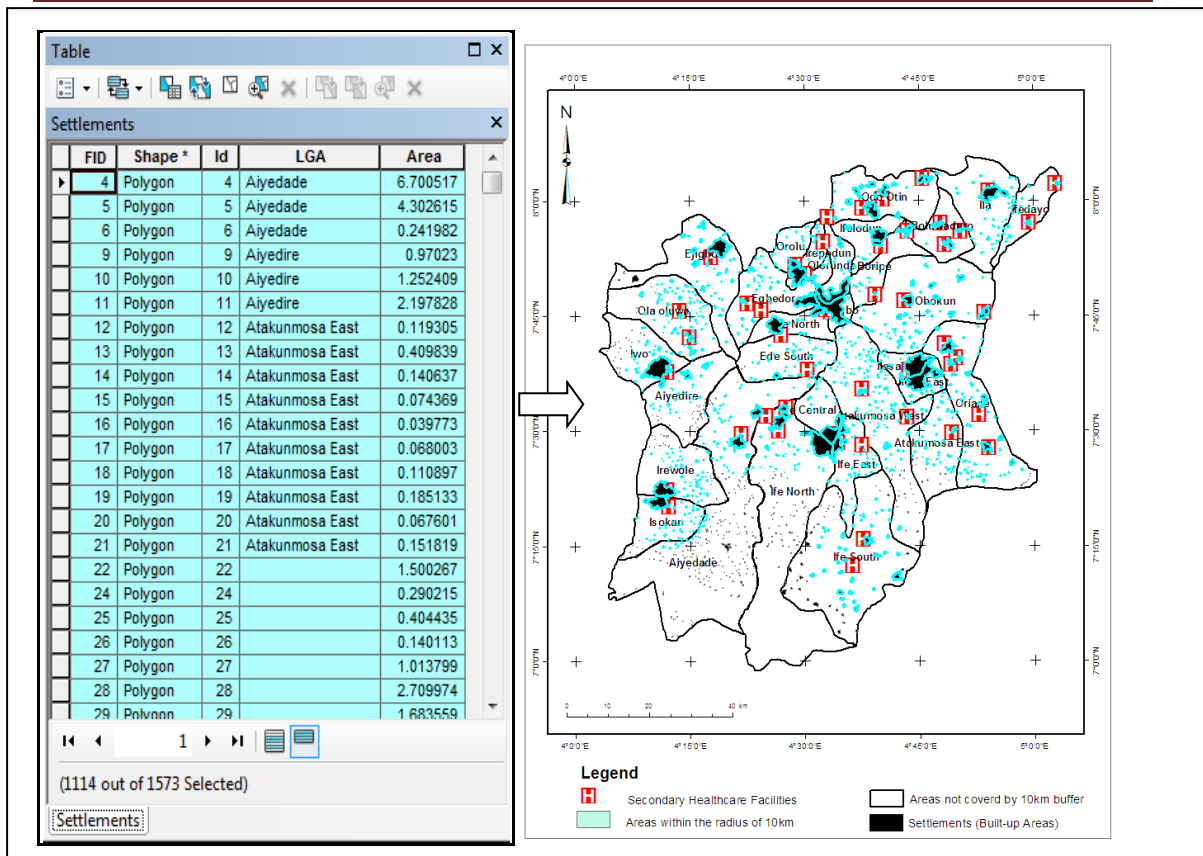


Figure 5: Result of the query by selection of settlements within 10km of the secondary healthcare facilities

Accessibility to tertiary healthcare facilities

Figures 6 and 7 revealed that out of 1,573 settlements, 550 (35.0%) settlements fall within the 20km buffer zones of the tertiary healthcare facilities. Twenty kilometer radius covers the following LGAs fully: Osogbo, Olorunda, Orolu, Irepodun, Ede North, Ilesa West, Ilesa East, Ife Central and Ife East LGAs, while it covers the following LGAs partly: Ede South, Agbedore, Ifelodun, Obokun, Ife North, Ife South, Atakunmosa East, Atakunmosa West, Oriade and Odo-Otin. However, the buffer extends albeit slightly to Ekiti, neighbouring state. The LGAs that are not covered at all are Ejigbo, Olaoluwa, Iwo, Aiyedire, Irewole, Isokan, Aiyedade, Boluwaduro, Ila and Ifedayo. The implication is that patients would have to travel very long distances before they can access the tertiary facilities.

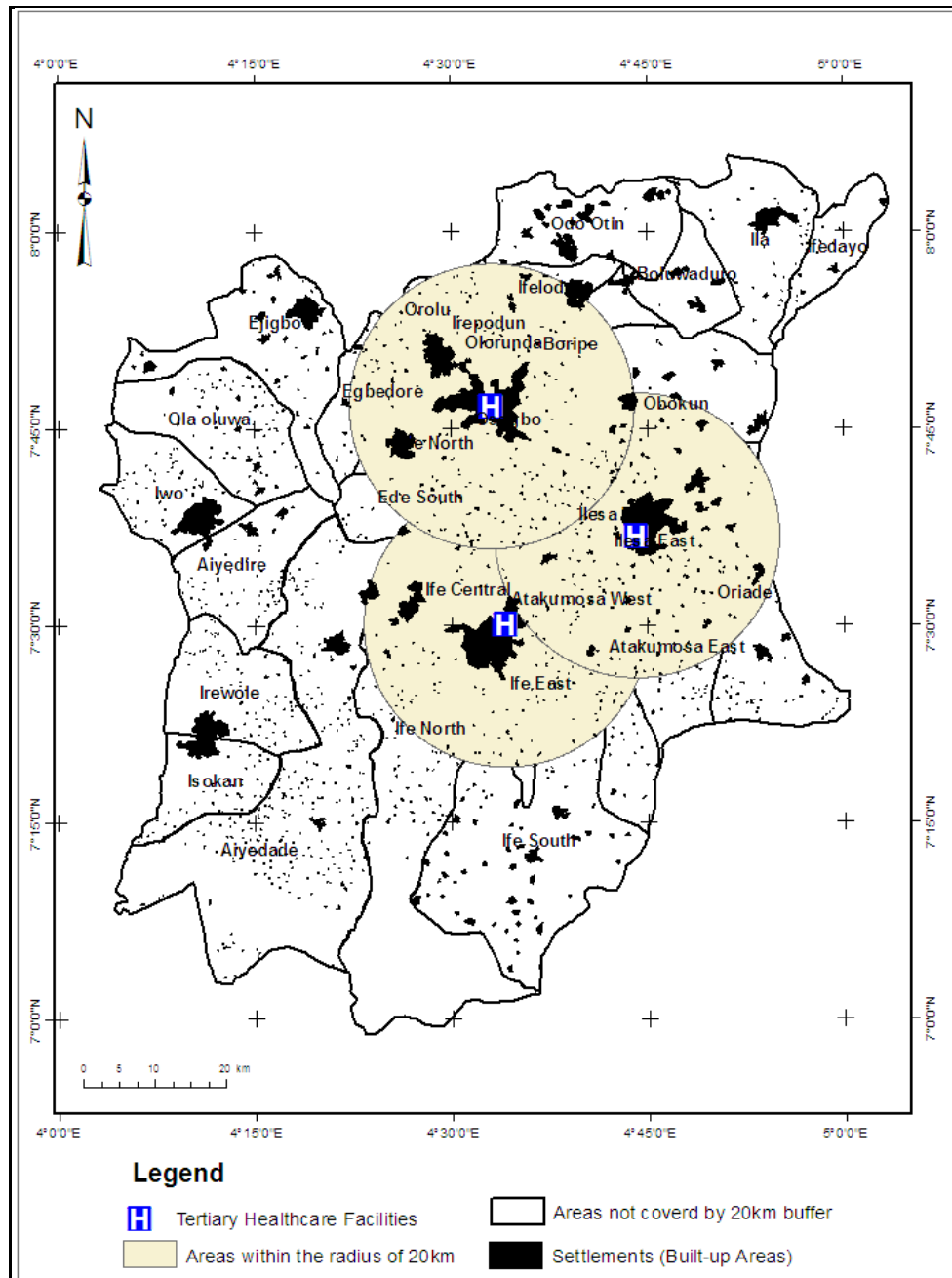


Figure 6: Result of 20 km buffer distance around tertiary healthcare facilities

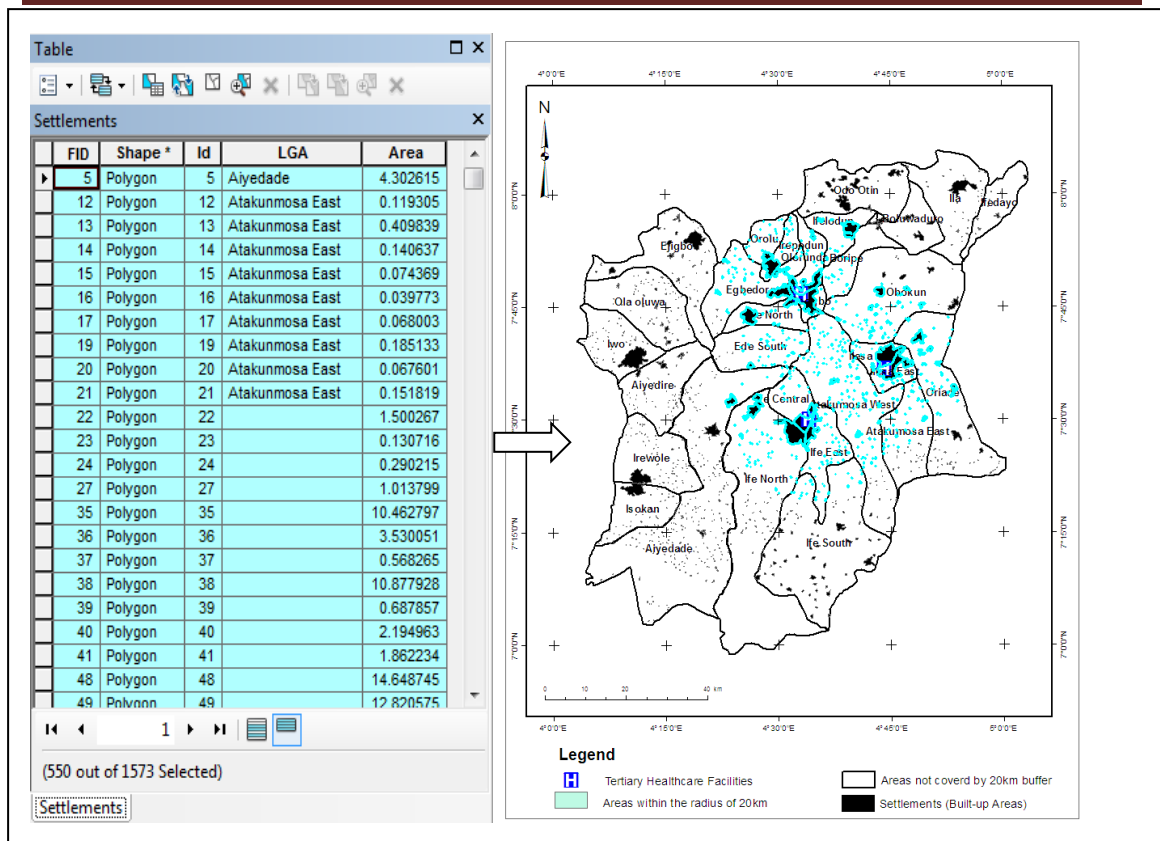


Figure 7: Result of the query by selection of settlements within 20km of the secondary healthcare facilities

Table 1 shows the summary of the accessibility levels to the various healthcare facilities in the State. The results show that accessibility level to healthcare facilities varies among the settlements in the study area. The percentage of the populace that has access to primary healthcare facilities is the highest compared to other types of healthcare facilities. It indicates that primary healthcare facilities is the most accessible to the general public, followed by secondary healthcare facilities and finally, tertiary healthcare facilities. This is in congruent with the Central Place Theory. This suggests that most patients living in areas outside the buffer zones are more likely to use more accessible alternative sources of healthcare such as prayer houses and traditional healthcare facilities.

Table 1: Percentage of accessibility levels to the various healthcare facilities

Type of Healthcare facility	Buffer Distance (km)	Total number of settlements	Number of settlements within the buffer zone	Percentage of settlement within the buffer zone
Primary	5	1573	1469	91.3
Secondary	10	1573	1114	70.8
Tertiary	20	1573	550	35.0

LIMITATIONS OF THE STUDY

This study has two major limitations. First, we measured geographic access from the population block centroid rather than each resident’s home or work address. The second limitation stems from the edge, boundary or border effects. The edge effect occurs when the areal unit under study is defined by a boundary that can actually be

crossed. Geographic boundaries are only administrative borders. People can cross these boundaries. Residents of Osun State are free to travel outside the state to receive healthcare in the tertiary healthcare facilities closest to them, in surrounding states like Oyo, Kwara, Ogun, Ondo or Ekiti.

CONCLUSIONS AND RECOMMENDATIONS

The total number of the settlements mapped in Osun State was 1,573 of which 103 are towns and 1,470 are villages. For service radius of 5 km for primary healthcare facilities, 93.4% of the settlements fall within the radius, while 70.8% of the settlements fall within 10 km service radius of the secondary healthcare facilities. In the case of tertiary healthcare facilities, only 35.0% of the settlements fall within 20 km service radius. It indicates that primary healthcare facilities are the most accessible to the general public of all the types of healthcare facilities followed by secondary healthcare facilities and finally tertiary healthcare facilities. This suggests that most patients living in areas far away from the secondary and tertiary facilities are more likely to use more accessible alternative sources of healthcare such as chemist shop, prayer houses and herbal homes.

This study has revealed that there is need for adequate urban planning that incorporates location of healthcare facilities so that the residents can have access to the facilities and services within a minimum distance. Also, it has been revealed by this study that serious inequality existed in the accessibility to healthcare facilities in the State. In order to improve the accessibility to healthcare services in the study area; densification of healthcare facilities and improving the traffic infrastructure should be considered.

Also, the study effectively showcased the capability of GIS as a veritable tool for decision support system for determining accessibility to public services such as healthcare facilities. It is cost effective and it should be encouraged and adopted for policy making and implementation. Thus, it is recommended that the accomplished results should be considered, by decision makers, in the future city planning in order to improve accessibility to healthcare facilities.

REFERENCES

- Ademiluyi, I. A. and Aluko-Arowolo, S. O. (2009) Infrastructural Distribution of Healthcare Services in Nigeria: An overview, *Journal of Geography and Regional Planning*, 2(5), pp. 104-110.
- Adeyemo, D.O. (2005) Local Government and Health Care delivery in Nigeria: A Case Study. *Journal of Human Ecology*, 2, pp. 149 – 160.
- Awosika, L. (2005). Health Insurance and Managed Care in Nigeria, *Annual of Ibadan Postgraduate Medicines*. 3(2), pp. 40-47.
- Bhatt, B. and Joshi, J. P. (2013) A Geospatial Approach for Assessing and Modelling Spatial Accessibility of the Primary Health Centers in Tribal Talukas of the Vadodara District. *International Journal of Geomatics and Geosciences*, 3(3), pp. 582-591.
- Christaller, W. (1966). (Translated by Baskin, C. W) *The Central Places of Southern Germany*, Englewood Cliffs, N. J. Prentice Hall.

- Eme, O. I. ,Uche, O. A. and Uche, I. B. (2014) Building a Solid Health Care System in Nigeria: Challenges and prospects. *Academic Journal of Interdisciplinary Studies*, 3(6), pp. 501-510.
- Kemboi, T. K. and Waithaka, E. H. (2015) GIS Location-Allocation Model in Improving Accessibility to Health Care Facilities: A case Study of Mt. Elgon Sub-Country. *International Journal of Science and Research*, 4(4), pp. 3306-3310.
- Luo, W. and Wang, F. (2003) Measures of Spatial Accessibility to Health Care in a GIS Environment: Synthesis and a Case Study in the Chicago Region” *Environment and Planning B: Planning and Design*, 30(10), pp. 865-884.
- Nteta, T. P. (2009) Accessibility and Utilization of the Primary Health Care Services in Tshwane Region, unpublished Master of Public Health Dissertation submitted to the School of Public Health, Faculty of Health Sciences, University of Limpopo.
- Olujinmi, J. A. B. (2007) Accessibility of Rural Dwellers to Health Care Facilities in Nigeria. *Pakistan Journal of Social Sciences*, 4(1), pp. 44-55.
- Osun State Government (2014). Official Diary of Osun State of 2013 Osun State Ministry of Information and Strategy, Osogbo.
- Osun State Hospitals Management Board (2014) Monthly Report of Patients Turn-over Deliveries and Deaths in all the Health Facilities of Osun State Hospitals for the month of March 2014, Osogbo.
- Peters, D. H, Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., Rahman, M. H. (2008). Poverty and Access to Healthcare in Developing Countries. *Annals of the New York Academy of Sciences*, 11(36), pp. 161-171.
- Rodrigue, J. P. (1975).Retail Centre Planning and Central Place Theory, Northridge: Eisner California State University.

END
