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FACULTY OF COMMERCE LAW AND MANAGEMENT WITS BUSINESS SCHOOL

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What are the prevailing infrastructure funding models in Sub-Saharan Africa?

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Research thesis submitted in fulfilment of the requirements for the degree of Masters of Management in Finance & Investment

Under the Supervision of

Professor Kalu Ojah

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously, in its entirety or in part, submitted it at any university for a degree.

_____ _____

Signature Date

Acknowledgements

It is only through the grace and mercies of my eternal heavenly father that all knowledge is produced and understood. I am grateful to the almighty Jehovah for the little seed that He has planted in my heart that manifests itself in the ability to complete these milestones.

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Abstract:

This paper assesses and describes the various prevailing infrastructure financing mechanisms in Sub-Saharan Africa (SSA). This study, through a multi-country regression panel framework of the top 10 recipients of Public Private Partnerships (PPP) investments in Sub-Saharan African between 1991 and 2014, finds that government budget constraints, macroeconomic conditions and institutional quality are significant determinants of infrastructure finance. Policy implications are that SSA governments need to focus on building and maintaining sound fiscal and monetary discipline. Institutional factors cannot be ignored in this process, as these are critical to creating an environment that is conducive to building trust and reducing risk perceptions for potential investors as well as providing the room for innovative solutions.

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CHAPTER 1. Introduction

1.1 Linking infrastructure and economic growth

Within the private and public sector, infrastructure development is fundamental for economic growth, Fedderke and Garlick (2008). Esfahani & Ramírez (2003) point out that improvement in investment and the performance of infrastructure, will in general have positive effects on economic growth. However, such a setting needs to be augmented by institutional and organizational reforms that are more fundamental than simply designing infrastructure projects and spending money on them.

Calderon and Serven (2004) analyse the effects of infrastructure development on growth and income distribution. The finding is that the volume of infrastructure stock has a significant positive effect on long-run economic growth, infrastructure growth and simultaneously lowers income inequality. Using a cross-country approach, Sanchez-Robles (1998) concludes that there is a positive impact of public infrastructure expenditure on economic growth. However, Sanchez-Robles argues that in defining an optimal infrastructure policy, policymakers need to follow a cost-benefit analysis along with evaluating alternative intervention measures.

Although significant economic performance strides have been made across Sub-Saharan Africa (SSA), SSA's long-term growth has been slow relative to other developing countries. SSA has experienced less than half of the average growth and about half of average investment efficiency levels obtained in other developing regions, Ndulu (2006) and Estache A., Speciale, B., & Veredas, D. (2005). The major bottlenecks to faster, improved and evenly distributed growth for the SSA region lie in the infrastructure gap. Identifying sources of funding to bridge this infrastructure gap becomes the main challenge for policymakers and business practitioners.

In line with the above, because of the fundamental role that infrastructure development plays for long-term economic growth, this paper assesses and describes the various prevailing infrastructure financing mechanisms in SSA. Furthermore, this paper examines whether alternative funding strategies are optimal.

1.2 Context of the study

One of the main challenges Africa faces is the lack of infrastructure growth and this continues to negatively impact on economic growth. In this section, typical conventional facts about some of the infrastructure challenges that different sectors face in Africa are outlined. Challenges within the power generation, telecommunications, transportation, water supply and sanitation sectors are among some of the matters that will be discussed.

1.2.1 Facts about Sub Saharan Africa's Infrastructure Needs:

Evaluating the power generation sector shows that Africa is the only region whose per capita consumption of electricity is decreasing. This is evident by comparing Spain which has a population of 45 million and it generates the same amount of power as all of Africa's power combined and Africa has a population of approximately 1 billion, see Eberhard and Gratwick (2015).

According to a McKinsey Report (Roxburgh, 2010), using an electricity demand driven approach, SSA needs capital investments of USD835 billion by 2040 to meet the growing demand of its electricity requirement. Currently, power outages are a common occurrence in SSA and this highlights the lack of generation capacity and regular electricity supply.

Nevertheless, the McKinsey Report results are supported by the following factors:

- The growth in number of households (West Africa is increasing at rates of 2.4% per annum),
- The urbanization rate (approximately 50% of SSA's population is expected to migrate to urban centres by 2040 compared to 38% in 2010),
- Electrification rates (current rates are hovering on the 35% mark with prospects of a rate of 71% by 2040),
- Consumption levels per household (with increasing wealth levels, household consumption is also expected to increase by 30% by 2040).

Another infrastructure aspect consistent with trends in Africa is the rapid growth in telecommunications. Since the year 2000, mobile firms have signed up more than 316

million phone subscribers, which is greater than the entire United States of America population (Roxburgh, 2010). Paired with this is tower infrastructure, allowing for GSM signal access, which has risen over 50% since 1999. Compared to developing nations SSA's infrastructure has not lagged significantly. However, SSA's broadband access still remains underpenetrated and is still expensive by global standards.

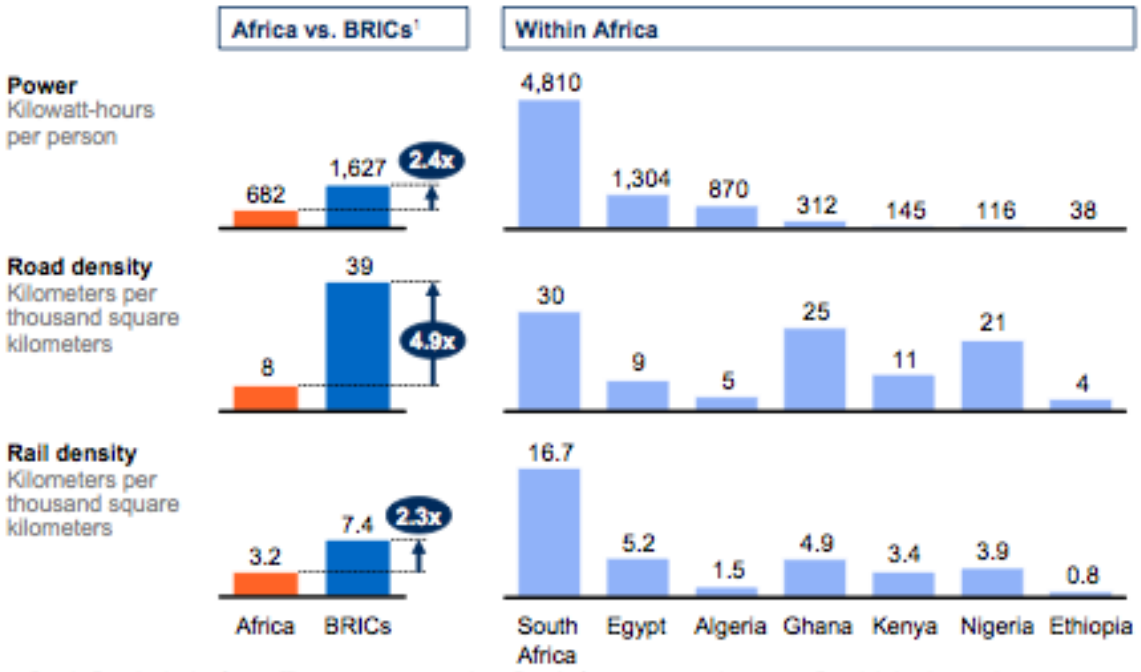
In the context of the transportation sector, most African populations live in landlocked countries with sparse road densities. According to Ncube (2010), the percentage of paved roads in Sub-Saharan Africa is about 13% compared with 25.1% in East Asia and Pacific, and 27% in Latin America and Caribbean regions. This inherently generates spill over effects on the ease of efficient intra-Africa trade. What further complicates the transport deficit in SSA is the below-average air transport provision in world standards. Accessing West Africa in many instances requires connecting flights through Europe.

With water supply, Africa has limited storage and irrigation infrastructure and this usually results in underutilised resources. Although Africa has vast natural endowments with respect to water, the limited storage and irrigation infrastructure creates a scenario of underutilised resources. According to a 2012 United Nations report, LATAM has 91% improved access to sources of drinking water whilst SSA has around 61%. The report further explains that 69% of the SSA population still do not have improved sanitation facilities access and whilst the share of the population practising open defecation has declined, there is an increasing trend in total numbers moving from 188 million in 1990 to 224 million in 2008.

The World Bank estimates the total cost of Africa's infrastructure requirement to be USD 75 billion per year driven by a deficit of about USD38 billion of investment per year, and a further USD37 billion per year in operations and maintenance. This translates to a total required spending of close to 12% of Africa's GDP with a funding shortfall of USD35 billion per year (Foster and Briceño-Garmendia, 2010). Figure 1.1 illustrates Africa's infrastructure gap relative to BRIC countries with respect to power and transport. African countries have lower kilowatt-hours per person generation capacity in comparison to the BRIC countries except for South Africa. When looking at the data at an aggregate level, on average BRIC countries generate 2.4 more kilowatt-hours per person than Africa. This serves to further highlight the significant lag in power generation capacity in Africa. Road infrastructure

paints a grimmer picture of the gap, with road density in Africa countries on average being close to 5 times sparser than BRIC countries. Ghana, Nigeria and South Africa are however not too far from the BRIC road density average.

Figure 1-1: Africa vs. BRICs Infrastructure GAP



1 Brazil, Russia, India, China. The comparisons exclude Russia for roads and rail because Russia's land area distorts the statistics.

SOURCE: World Development Indicators, McKinsey Global Institute

Table 1.1 provides a summary of the number of completed infrastructure projects per region from 1990 to 2013. Within this period Latin America and East Asia (considered as economic peers of SSA), exceeded SSA's number of infrastructure projects threefold, with their prime focus being on the power and transport sectors.

These descriptive statistics point to a much-needed review of the supply of long term capital for Africa, both in terms of infrastructure but more importantly in closing the power deficit. Foster and Briceño-Garmendia (2010) highlight that close to 60% of the funding gap relates to the power gap.

Table 1-1: Regions ranked by number of projects, 1990-2013

Region	Power	Telecom	Transport	Water and sewerage	Grand Total
East Asia and Pacific	881	81	383	474	1819
Europe and Central Asia	441	293	76	46	856
Latin America and the Caribbean	901	152	566	275	1894
Middle East and North Africa	44	48	35	26	153
South Asia	548	77	450	15	1090
Sub-Saharan Africa	166	205	102	28	501
Grand Total	**2981**	**856**	**1612**	**864**	**6313**

Source: World Bank 2014, Private Participation in Infrastructure Database

1.3 Motivation of the study

There has been a renaissance in the economic and political importance of SSA as a destination of investment expenditure and infrastructure development has been a prominent factor in shaping dialogue in this regard. As an example, the Government of South Africa and the European Union have established a ZAR1.5 billion fund called the Infrastructure

Investment Programme for South Africa (IIPSA). The primary of the programme is to provide financing through EU grants and concessional loans from participating Development Finance Institutions. Development of national and regional infrastructure projects is an evolving feature of IIPSA.

With this increased focus and demand it is therefore critical to ensure that there exists a body of academic literature that explores SSA's key challenges with regards to infrastructure financing and innovative recommendations to remedy them. The aim of the study is to place further impetus to the development of sound infrastructure financing strategies in SSA. It also will aim at providing practitioners with the necessary tools to assess viable options in this regard.

Increasingly African governments have become reliant on Private Public Partnerships (PPP) and Private Participation Investments (PPI) to attract infrastructure funding. The terms of engagement have varied from full financial exposure to cover the underlying cost to other forms of fiscal support such as: guarantees, in-kind grants, and tax-breaks (Izaguirre & Kulkarni, 2011). As an example of this in 2012, 12 African heads of state approved the Programme for Infrastructure Development in Africa (PIDA) that calls government, business and private donors to foster new partnership methods to execute on the 51 Priority Action Plan (PAP) infrastructure projects across multi-sectors through 2012 to 2020.

In this context, Ehlers (2014) has argued that there ought to be a legal framework for PPP or creation of specialized governmental agencies to finance infrastructure projects, as it is one of the critical roles the government ought to fulfil. He continues to assert the notion that the use of private sector financing hinges on a sensible transfer of risks and returns, although its involvement along with the public sector may improve efficiency due to the sharing of skills. Yet there are findings that infrastructure bonds and loans seem most desirable to diversify risk, provide transparent capital market instruments, while developing countries need to make use of development banks and export credit to promote the financing of infrastructure.

To help scale up and complement existing facilities within African infrastructure financing, the African Development Bank (AfDB) has been embarking on various activities ranging from basic lending, advisory services, and development equity. This is achieved through a

financing facility that is structured as a mechanism for funding access as well as a systematic arm for addressing challenges with project finance in Africa (World Economic Forum, 2013).

CHAPTER 2. Literature Review

This section provides a broad literature review on infrastructure financing and other alternative avenues that are available for SSA. Thus, the literature review provides an overview on the following components: Public sector infrastructure financing, sovereign wealth funds, development finance institutions, private infrastructure finance, public private partnerships, project finance, project bonds, institutional investors and the role of China in infrastructure finance.

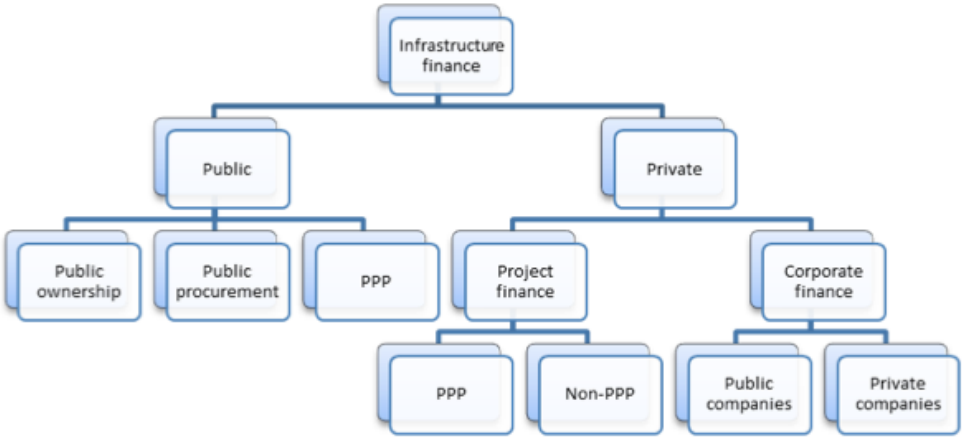
The term “infrastructure” has evolved over time, and with that a conventional acceptance of broadly dividing the term under two categories, namely economic and social. Economic infrastructure typically includes transport, communications, power generation, water supply and sanitation facilities. [1]

Infrastructure finance projects often comprise of a web of complex contract structures and have various distinct phases with different risk profiles and return characteristics (Ehlers, 2014). Ehler further describes the different phases of the infrastructure finance as being Planning, Construction and Operational. This implies that funding for the same project can go through multiple forms and the various stakeholders need to be critically aware of which funding mechanism is relevant at which stage to ensure seamless conclusion of the projects. The selection of the correct funding source is a function of the undercurrents of the economic and political frameworks. Thus mutual public and private engagement becomes key to ensuring the success of the corporative initiatives.

Figure 2.1 derived by Inderst (2013) outlines a graphical representation of the standard funding sources available for infrastructure projects.

[1] On the other hand social infrastructure includes educational and health-care facilities, though some authors include cultural and recreational facilities (Fedderke & Garlick, 2008). In the context of this paper, infrastructure finance will always refer to financing gaps in the context of economic infrastructure.

Figure 2-1: Infrastructure Finance Funding Sources



Source: Inderst (2013)

2.1 Public Sector Infrastructure financing in Africa

Infrastructure finance provision in developing countries, particularly SSA, has been traditionally financed through the public sector, however the private sector share has improved in the recent years (Swaroop, 1994). Swaroop also highlights that in the absence of an appropriate rate of return, services that require a single service provider due to economies of scale or such related reasons, would not be possible through purely private sector funding. SSA's primary infrastructure requirements have typically been single service provider oriented (i.e. power generation, road and water sewerage works).

In SSA the public sector remains the most important source of local financing, with the middle income countries predominantly basing their financing requirements on tax revenues and selective income streams from state owned enterprises. In lower income countries the public sector contributes approximately half of total spending and a third of this spending (or an equivalent of 1.5% of GDP) is attributable to capital investments (Briceño-Garmendia, Smits, and Foster 2008).

In SSA over the 2006-09 period, there has been an equal split between public and private contributions to funding of PPI. Most of the private funding has been directed to the telecommunications sector. Public sector funding has been concentrated in direct sourcing

from the government with the Gautrain light rail concession being the primary target of this funding at USD3.5 billion (Izaguirre & Kulkarni, 2011).

The number of projects has been driven by public sector participation. Close to 45% of the projects have received half of their funding from the public sector. Multilateral and bilateral agencies continue to interestingly feature key sources of funding in SSA providing 17% of the funding to PPI investment in new projects with most of this funding going to energy and transport projects. The energy sector has been funded by multilateral and bilateral agencies with a contribution of 54% of the direct funding to cover investment commitments in 2006–09. The private sector has contributed 45% whilst government only funded 1% (Izaguirre & Kulkarni, 2011).

Perkins, Fedderke and Luiz, 2005 make an observation that the need for infrastructure investment is a permanent requirement. Public-sector budgets have the onus both at a national level and municipal level to ensure prudent management and effective use of funds; a requirement is often not given the necessary attention that it deserves.

In the early 1990s governments around the world began to involve the private sector in the provision and financing of infrastructure, which gave rise to public-private partnerships (PPPs). Few factors led to this trend; fiscal budget constraints to support long-term funding, lack of technical and managerial capacity within the public sector, rapid technological innovation and a growing need to mitigate against operational risk. Africa lagged behind in this trend, continuing to rely heavily on public sources of funding. (Harris, 2003)

2.2 Sovereign Wealth Funds (SWFs)

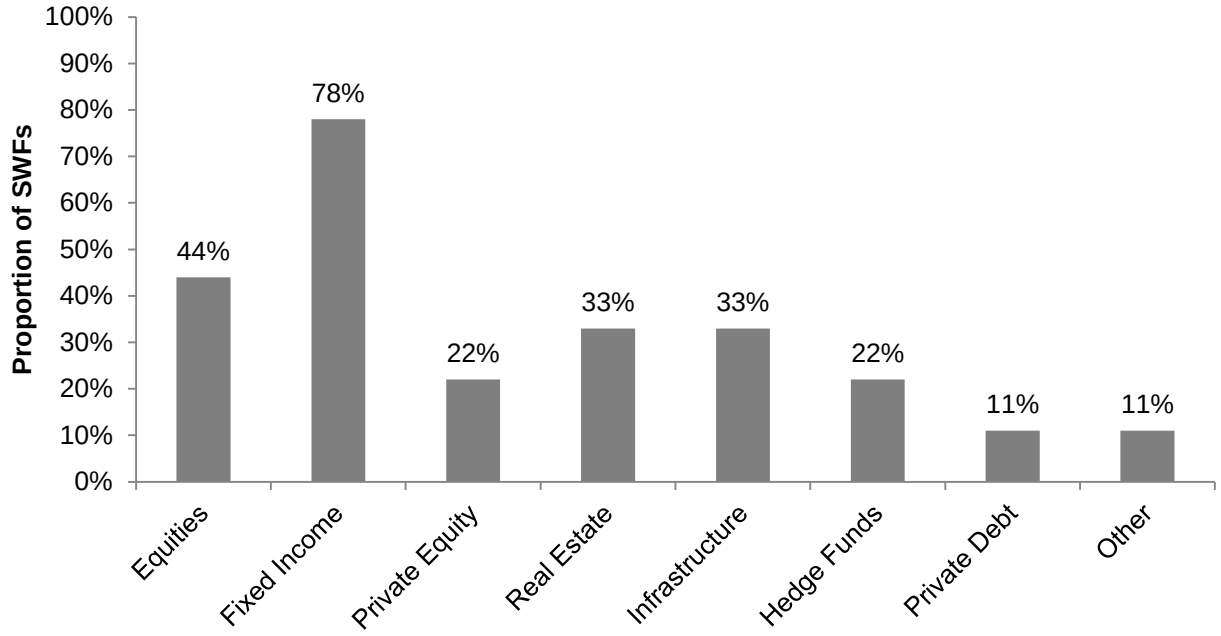
Sovereign wealth funds (SWFs) by convention have been traditionally formed and employed by countries with large commodity export revenues with the economic purpose of smoothing out inter-temporal consumption for economies, primarily a savings tool, and use as a stabilizing mechanism for reducing the impact of fiscal revenue and foreign exchange volatility. Africa as a whole has a relatively low number of SWFs totaling a meager count of 17, with Nigeria's newly established fund (Nigeria Sovereign Investment Authority) reported to be USD 1.4 billion and Angola's Fundo Soberano de Angola (FSDEA) at USD 5 billion, the recent joiners.

Globally, SWFs increased investing in infrastructure from 47% in 2010 to 61% in 2011 (Preqin, 2011). This serves to highlight an increased appreciation of the synergistic outputs required by SWFs and infrastructure development. Kingombe (2011) asserts the potential of SWFs as a suitable source of infrastructure funding in Africa. Kingombe notes that SWFs are less restricted in their asset class allocation by design and are assessing opportunities for allocation of funds to non-traditional or alternatives assets, infrastructure in particular. Africa's largest SWF, the Libyan Arab African Investment Company has invested over USD800 million in 13 African countries, (EIB, 2013).

China in recent years has become an important source of infrastructure funding through the China Investment Corporation and the China-Africa development fund, an external SWF, with over 27 projects totaling USD540 million thus far. The key deviation from traditional funding is that Chinese funding is typically resource backed. A noteworthy example is the "Angola Model". This model financed through China's Export Import Agency with Angola's Ministry of Finance in 2004 included a total loan package of USD4.5 billion for reconstruction of infrastructure in Angola in exchange of a guarantee of a mutually pre-agreed minimum daily supply of oil to China's national oil corporation (Sinopec), a joint venture with Angola's Sonangol (Kingombe, 2011).

Traditional investments, which are typical fixed income and equity securities, are still ubiquitous with SWFs and continue to take a significant share of their portfolios. There is however a surge in alternative assets forming an integral share of the portfolios of many SWF investors over recent years. The primary reason is that the investor's requirement for portfolio diversification and asset acquisition will generate higher yields and help them meet their long-term profitability objectives. Figure 2.2 below highlights that the proportion of African SWFs still invest primarily in Fixed Income and equities, however 33% of these SWFs are investing in alternative assets such as real estate and infrastructure. This ties in with the key mandates of SWFs to develop and expand their respective countries infrastructure stock.

Figure 2-2: Proportion of African Sovereign Wealth Funds investing in each asset class



Source: Preqin 2015

Triki and Faye, (2011) affirm that both North and Sub-Saharan Africa SWF investments are still highly concentrated in the real estate, hotels and hospitality sector. Furthermore, they observe that North Africa has seen more investments in the banking and financial sector, whilst foreign SWFs invested in the industrial sector and extractive industries in sub-Saharan Africa. North Africa has received a larger share of foreign SWFs resources, mainly due to value clustering of large real estate and infrastructure projects.

Participation of SWFs in infrastructure deals in SSA is increasingly becoming more important. There are some key noteworthy deals worth noting that highlight this experience in recent times. In South Africa, a consortium including Abengoa, Industrial Development Corporation and Public Investment Corporation acquired Xina Solar Power Plant, a 100 MW concentrating solar power project located in Pofadder, in a deal worth USD908 million in 2014. Another notable deal, though contentious due to social and environmental issues, is the Lake Turkana Wind Power Project a 310MW Wind Power Project facility being developed 50 kilometres, north of the town of South Horr in Kenya by a large consortium of investors including Aldwych International, Finfund, IFU, KP&P Africa, Netherlands

Development Finance Company (FMO), Vestas Wind Systems. This deal worth USD870 million was concluded in March 2014. Table 2.1 highlights other top 5 notable deals for 2015.

The largest Africa focused fund, though privately owned, to date is the Pan African Infrastructure Development Fund II, which is looking to raise USD1.2 billion to invest in power, transport, water and sanitation, ICT and healthcare infrastructure across the continent. This fund is managed by Harith Fund Managers, a partnered of Kupanda Capital, which is a niche-focus investment platform that enables investors and businesses to plan, execute and manage their ventures in Africa. Should the fund successfully reach its target size, it would be the second largest Africa-focused vehicle of all time, behind Abraaj Infrastructure and Growth Capital Fund, which closed in December 2007 after attracting USD2 billion in institutional commitments. Other prominent Africa-focused include COMESA Infrastructure Fund, managed by PTA Bank, which targets investment in trade-related infrastructure projects within COMESA member states. The Pembani Remgro Infrastructure fund is another recently launched entity specializing in infrastructure investments.

Table 2-1: Notable Africa-Based Infrastructure deals completed in 2014

Asset	Location	Industry	Investors	Deal Size (million)	Stake	Date
Xina Solar Power Plant	South Africa	Solar Power	Abengoa, Industrial Development Corporation, Public Investment Corporation	908 USD	100%	Jun-14
Lake Turkana Wind Power Project	Kenya	Wind Power	Aldwych International, Finnfund, IFU, KP&P Africa, Netherlands Development Finance Company (FMO), Vestas Wind Systems	870 USD	100%	Mar-14
Azura-Edo IPP	Nigeria	Power Plants	African Infrastructure Investment Managers, Aldwych International, Amaya Capital Partners, American Capital Energy & Infrastructure, ARM-Harith Infrastructure Investments	750 USD	100%	Mar-14
KaXu Solar Power Plant	South Africa	Solar Power	Abengoa, Industrial Development Corporation	7,500 ZAR	100%	May-14
Kipeto Wind Farm	Kenya	Wind Power	African Infrastructure Investment Managers, International Finance Corporation (IFC)	316 USD	100%	Oct-14

Table 2-2: Notable Africa-Focused Unlisted Infrastructure Funds in market by target size

Fund	Firm	Target Size (mn)	Fund Status	Manager Location
Pan African Infrastructure Development Fund II	Harith	1,200 USD	First Close	South Africa
COMESA Infrastructure Fund	PTA Bank	1,000 USD	Raising	Burundi
Engross Fund I	Cape Mount Management	800 USD	Raising	Bahrain
Pembani Remgro Infrastructure Fund	Pembani Remgro Infrastructure Managers	500 USD	First Close	South Africa
Meridiam Infrastructure Africa Fund	Meridiam	300 EUR	First Close	France

2.3 Development Finance Institutions

Development Finance institutions (DFIs) have contributed significantly to infrastructure financing in SSA. By their construct, DFIs are typically government sponsored and owned institutions that make investments in sectors and countries that are commonly seen as unattractive to other private investors. DFIs participate in activities where there is a general lack of capital but where the private sector can be leveraged in. Furthermore, DFIs are effective where there is great potential for market failure, where its interventions are greatest and in sectors and countries that are geared and in need for development, using the instruments that are most appropriate (Kingombe, Massa, & Willem, 2011). In addition to financing of projects geared for advancing development, there also exists a significant secondary impact that is provided by DFIs, and this is the role of a "pathfinder" in the financing sense. Private investors are often comforted by the knowledge of a DFIs prior presence in a new market thus enabling second around effect of investors who can leverage off established expertise and a coordinated strategy.

Musasike (2004) defines the fundamental role of DFIs in the market economy as "a tool or mechanism to crowd in private financial flows by providing a package of services that not only fill the fiscal gap between capital for pure pubic good finance provided by the state on the one side and pure commercial projects on the other, but also seek to narrow the gap in the finance system". This gap in the finance system in SSA is also exacerbated by a general lack of sovereign credit ratings that are of investment grade, with some countries having no ratings in some instances. Thus the cost of funding based on the investor appetite is often intolerable in the absence of interventions provided by DFIs. In 2012, over USD10 billion came from DFI investments, which represents close to 24% of the total external financing of nearly USD30 billion.

The most prominent DFIs participating in infrastructure financing in SSA are listed below. The World Bank's IBRD is a major contributor, whilst the African Development Bank and the Development Bank of South Africa are increasingly finding new methods of funding infrastructure in the region.

- Islamic Development Bank (IBD)
- World Bank Groups' International Bank for Reconstruction and Development,

- Development Bank of South Africa (DBSA)
- Agence Française de Développement (AFD).
- African Development Bank (AfDB),
- European Investment Bank (EIB),
- East African Development Bank (EADB)

Table 2-3: Funding Commitments by DFIs, 2009 - 2014

	Funding Commitments (US$Bln)	% of total Focus DFI commitments
World Bank	20,8	22,5%
DBSA	16,5	17,8%
ADB	16,2	17,5%
AFD	9,1	9,8%
Others (nine)	30	32,4%
Total	**92,6**	**100%**

Source: ICA Africa Report 2014

There have been new financing initiatives to bolster infrastructure growth through development finance institutions, and examples include:

- The Global Infrastructure Facility, which is currently capitalised at USD 100 million was established by the World Bank, and focuses on structuring and preparation of infrastructure PPPs in developing and emerging markets.
- The Infrastructure Investment Programme for South Africa (IIPSA) is a EUR100 million fund established in partnership with the European Union the South African government. The primary purpose of the fund is to provide South African and participating European development finance institutions with grant funding and long-term financing for bankable infrastructure projects in South Africa and the region.
- The Programme for Infrastructure Development in Africa (PIDA), is a partnership between the African Union Commission, the NEPAD Planning and Coordinating Agency, United Nations Economic Commission for Africa and the African Development Bank. The programme seeks to develop a vision, strategies, policies, and a programme for priority African infrastructure development.

- The Africa50 Infrastructure Fund with a fund reported fund value of USD 87 million established in 2013 by PIDA aims to provide project finance expertise as well as project development support for commercially sustainable African infrastructure.

- The Emerging Africa Infrastructure Fund (EAIF) provides funding of USD 10 million - USD 50 million, with terms of 15-20 years for private sector businesses established by the Private Infrastructure Development Group (PIDG). These are granted at standardized commercial terms.

- The Global Infrastructure Fund invests in infrastructure projects across the globe.

2.4 Private Infrastructure Financing in Africa

Barring South Africa and Nigeria, SSA is characterised by a Private sector that is relatively underdeveloped and small in size. Ndulu (2006) observes that developing countries typically have small private sectors and thus the domestic public sector has been the prevailing source of infrastructure, accounting for 70% of current spending. Globally the private sector accounts for 20–25% and official development assistance (ODA) for 5–10% (Briceno et al., 2004). The situation is grimmer when one looks at the size of the private sector in SSA in particular.

In their study of the examination of how the institutional environment affects private sector participation in infrastructure projects in developing economies (40 in total with 6 being from SSA) Banerjee et al (2006) surprisingly find that the more corrupt countries have higher levels of PPI. African states have consistently ranked poorly on the corruption index (barring for Seychelles, Rwanda, Mauritius and Namibia, no African state is rated in top 50 countries with low corruption) however this factor alone cannot be solely reliable as a determinant for infrastructure investment.

A key challenge associated with infrastructure financing in SSA has been the determination of the appropriate pricing placed on provision of services stemming from the infrastructure outputs. Investors are keenly interested on Return on investment. There is a need for improved metering and billing in the infrastructure services provided in Africa however this does not necessarily guarantee optimal use of revenue without appropriate institutional frameworks that foster accountability and simplified regulatory procedures (Anderson, Bank, & Collier, 1989). Eberhard and Shkaratan (2012) support this notion in identifying

sound pricing as a prerequisite for raising the finance necessary to meet investment requirements (i.e. Return on Investment). They further argue that predominantly in the energy sector under-recovery of costs has had serious implications for the financial health of utilities and has had the impact of slowing the pace of service expansion.

However in an analysis of the determinants of foreign direct investment (FDI) to developing countries Asiedu (2002) found that infrastructure development and a higher return on investment have no real effect on FDI in SSA. This counter-intuitive result is argued to be driven by uncertainty of government policy in SSA countries. Due to the long term nature of Infrastructure projects, longer payback and build periods as well as the likelihood of the services to be of a public good, there is a predisposition for political and regulatory interference, which increases the regulatory risk such investments may be facing (Sheppard, Klaudy, & Kumar, 2006)

Due to its complex nature, infrastructure finance lends itself to high risk, more especially in SSA when considering the institutional challenges. Project bankability is the catalyst to successful financing and implementation of projects in SSA. Collier (2014) maintains that the following tools; standardization, subsidized risk insurance, re-bundling, commitment devices and appropriate accounting, would enable SSA countries to de-risk projects and improve their bankability. He also argues that the challenge is for a coordinated organizational design that will ensure that Africa's infrastructural need is met.

(Ratha, Mohapatra, & Plaza, 2008) attribute the shortage of private capital attraction in SSA financial markets that are shallow, securitization laws that are inadequate or unenforceable, banks and firms which are of investment grade, and an absence of national credit-rating agencies. However, they continue to argue that SSA countries need create an environment that is attractive to a broader set of investors such institutional investors and pension funds as well as expand public-private partnerships as additional sources of funding.

2.5 Understanding Public Private Partnerships

Since the popularity in the 1990s PPPs have evolved and have gone through various permutations. However, PPPs can be traced back to the early 16th and 17th centuries in Europe, with France being a prime example of use of concessionary programs in expansive public works such as canal construction, road paving, waste collection, public lighting, mail distribution and public transportation.

A few definitions have been provided in literature:

"A long-term contractual arrangement between the public and the private sector to realize public infrastructure and services more cost effectively and efficiently than under conventional procurement" (Daube, Vollrath, & Alfen, 2007)

"A long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance". PPP Knowledge Lab

Yescombe, (2002), provides a more explanatory definition and outlines a PPP as follows:

- *a long-term contract (a "PPP contract") between a public and private sector party*
- *for the design, construction, financing and operation of public infrastructure ("facility") by the private sector party*
- *with payments over the life of the PPP contract to the private sector for the use of the facility, made either by the public sector party or by the general public users of the facility*
- *with the Facility remaining in public sector ownership, or reverting to public sector ownership at the end of the PPP contract*

Under the above construct the public sector procures a set of services from the private sector to fulfil its infrastructure demands as opposed to a purchase of assets. This purchase includes the provision of financing and operation of the underlying infrastructure for a predetermined period.

The structure of the PPP arrangement can take different forms of participation. An outline of the most common methods is provided below.

- Build–Develop–Operate: Operation of the asset is preceded by a purchase or lease of an existing asset by the private sector party from the public agency and a capital injection with the purpose of enhancement and development of the infrastructure asset.
- Build–Own–Operate: The private party is mandated a single contract with provisions of both construction and operation of the infrastructure asset by the public agency. The design of the project is specified by the public agency however ownership rests with the private party.

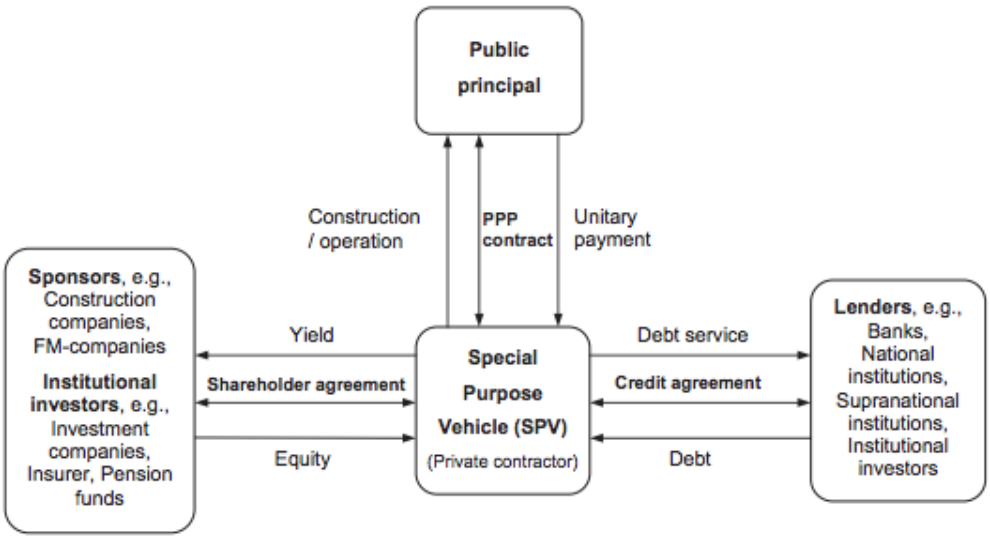
- Build–Operate–Transfer: The structure is similar to the Build Own Operate structure however operation of the infrastructure asset is for a specified period of time under a contract or franchise agreement with the agency. Upon termination of the contract, ownership and operation of the infrastructure is transferred to the public agency.

2.6 Project Finance as a funding tool.

Project finance has been defined as an essential technique for financing projects that are capital intensive, long-term and are not of a small-scale, with the key-differentiating factor being the efficiency of how risk allocation is distributed between all the relevant stakeholders (Shen-fa & Xiao-ping, 2009). Simplistically, it is the funding of a project on the basis of its expected future cash flows. However Esty & Christov (2002) further elaborates on this definition by expressing it as the creation of an independent special purpose vehicle (SPV), which is financed through equity stakes and debt provisions from banks and project sponsors on a non-recourse basis with the aim of financing a specific capital asset over a long tenor.

Figure 2.3 provides a visual representation of the typical structure of a project finance deal with the relevant stakeholders. The various stakeholders have different interests both from a returns perspective and the associated contractual structures.

Figure 2-3: The structure of a Project Finance deal



Source: (Daube et al., 2007)

Ultimately, Project finance is designed to reduce transaction costs associated with long term financing, specifically those arising from agency costs such as lack of information on optimal investment and capital allocation, as well as insufficient monitoring and enforcement of corporate governance (Kleimeier & Versteeg, 2010).

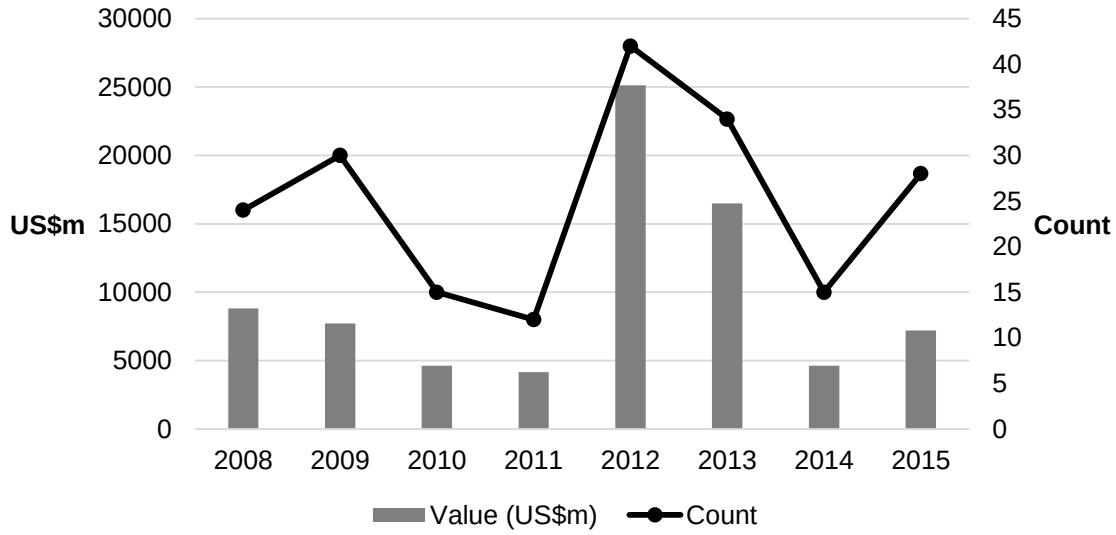
Sawant (2010) defines project finance as the financing of a single-purpose infrastructure asset with a finite life through separate incorporation non-recourse or limited recourse debt, high debt levels, and detailed long-term contracts; the composition of such assets is not altered during the course of the SPV's life.

Risk allocation is often sighted as the principle advantages of Project Finance. This is achieved through a number of contractual arrangements that apportion risk to various stakeholders participating in the financing structure (i.e. construction and completion risk, operating and revenue risk, pricing and foreign risk). The contractual structure helps to allocate risk to the participants who are best suited to handle it. These features fit well in the African context given the relatively higher risk of financing capital.

Criteria such as the investment volume and the allocation of risks as well as the individual risk-return-structure of the investor affect the involvement of different forms and sources of capital. With project finance lenders are interested in equity stakes that are commensurate the risks associated with the project. Riskier projects intrinsically require the borrower to “put more skin in the game” as compared to lower risk projects. A 10–15% equity stake has been the acceptable threshold by the sponsor in practice. Project finance deals are highly leveraged and in the case of large deals the shortfall between equity and debt can be filled with mezzanine-capital (Daube et al., 2007)

Kleimeier and Versteeg (2010) argue that intrinsic characteristics of project finance make it a useful financing for augmentation of deficient institutional and financial development factors prevalent in developing markets. They further argue based on a sample of 90 countries that project finance is an effective tool to deal with high-risk environments. In spite of these critical features that are SSA has lagged behind the rest of the world in this regard.

Figure 2-4: SSA Project Finance transaction volume, 2008-2015



Source: IJ Global (2015)

Figure 2.4 highlights project finance transaction volumes from 2008 to 2015. SSA project finance deals increased in 2015 compared to the previous year, boosted by strong activity in the power and renewable energy sectors. Deal count almost doubled from 15 to 28 with transaction with volumes totalling USD7.1 billion, compared to USD4.6 billion in 2014. More than USD2.2 billion financed 5 power deals and in renewables, USD3.2 billion was spread across 14 transactions. Project Finance in SSA peaked in 2012 primarily driven by the USD12 billion Oil-Refinery primary financing structure. From 2008 to 2015 a total of USD78.8 billion has been invested through project finance with a total count of 204 deal structures. This pales in comparison to Latin America with a total of 570 deals with total value of USD230 billion.

Three key limitations exist in Africa's ability to attract Project finance. First, SSA countries in bulk suffer from the demise of low or non-existent sovereign ratings. This results in a limitation in financial market accessibility and where sovereign ratings exist, constrained to short term financing. Second, SSA countries have shallow capital markets to support the long-term financing requirements of project finance. Typically, these are supported by the credit enhancements like guarantees. Third, the risk characteristics of a project finance structure tend to be more susceptible to political and regulatory interference, which increases the regulatory risk such investments need (Sheppard et al., 2006)

2.7 Project Bonds in SSA

Project bonds are defined as a bond issued to capital market investors, which finances (the whole or part off) a project financing. The bond can be used for initial project financing either co-financing with commercial bank debt or it can be used to refinance to existing bank debt, often post construction (Conduit & Lee, 2013).

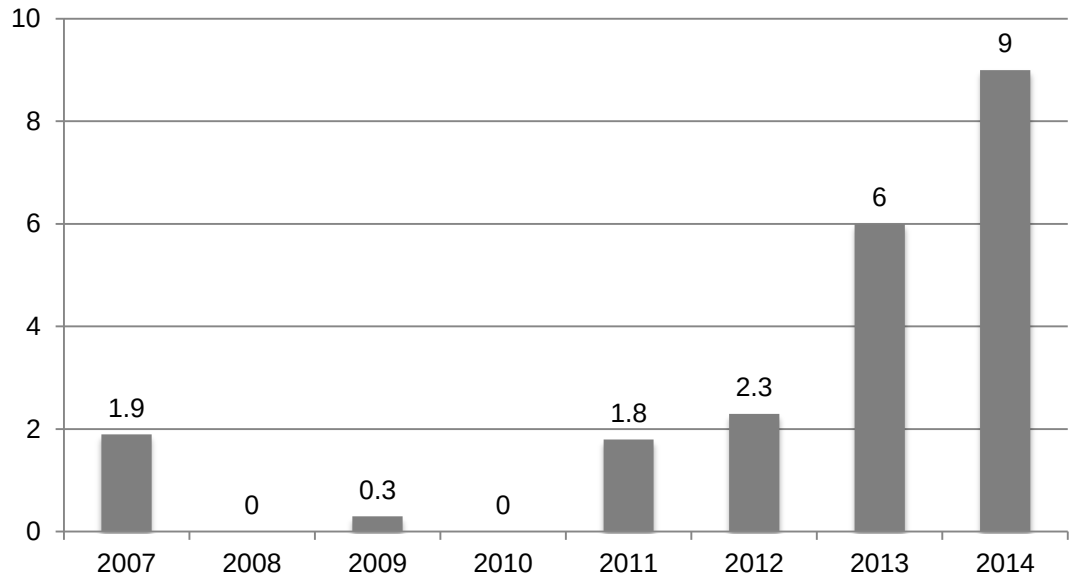
Mezui & Hundal (2013) are more specific in defining the characteristics of infrastructure project bonds and their use. At a base level project bonds are used for capital raising for specific standalone projects; coupons and principal repayments are serviced from the cash flows generated by the specific project; and their performance is subject to certain project specific risk.

Croce and Gatti (2014) noted that the demand for project bonds has increased globally due to the overall decline of traditional sovereign and corporate bond yields on all major asset classes. This has led to fixed income investors seeking investments with better risk/return profiles, which have been relatively scarce. This is in slight contrast with Sawant's (2010) observation that infrastructure bonds do not have a favourable risk-return profile, due to political risk and other unique risk factors, however they have low correlation with equities and the other asset classes, which makes them valuable as portfolio diversifiers.

Across most of Sub-Saharan Africa, efforts have centred on reforms of issuing sovereign bonds, often with the aim of closing the infrastructure finance gap. However, these reforms are not void of challenges. Many sovereign countries in SSA do not have risk ratings. Typically, the natural resource rich countries such as Nigeria often need to set up sinking funds as a commitment tool of future revenues to secure financing.

In spite of this, 2012 and the first half of 2013 had significant Eurobond issuances, notably Ghana (USD750 million 10 year bonds), Rwanda (USD400 million 10 year bonds), Zambia (USD750 million 10 year bonds), Tanzania (USD500 million seven-year private placement) and Angola (USD1 billion 7-year private placement). Eurobond issuance in SSA has predominately been denominated in dollars, however in February 2013 the IFC issued a five-year, local currency NGN12 billion denominated bond (in Nigeria as part of a program to deepen the domestic bond market across Africa whilst in September 2013, Kenya issued its sixth infrastructure bond for KES20 billion.

Figure 2-5: Bond Issuance in SSA (Excl. South Africa), 2007 – 2014



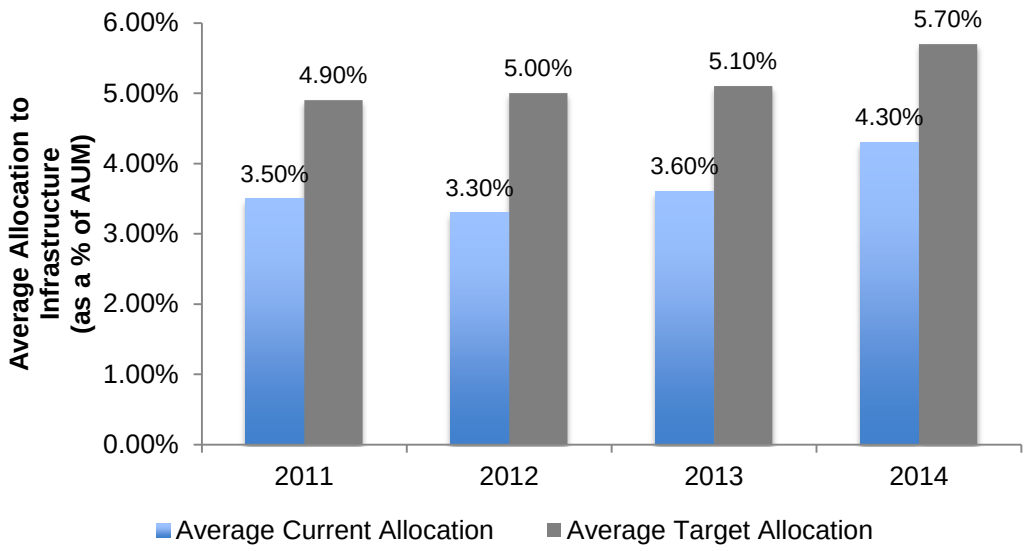
Source: World Bank Debtor Reporting Systems

Bond issuance in SSA has traditionally been limited to South Africa. However, from the time when Ghana debuted with its issuance in 2007, countries in SSA, including those that have been helped by the HIPC (Heavily indebted poor countries) and MDRI (Multilateral debt relief initiative) debt relief, have quickly latched on to sovereign bond issuance. A combination of increased investor appetite for higher returns and softer global market conditions have expedited and enabled more efficient access to international capital markets. Sovereigns, have issued USD6 billion in 2014, this excludes South Africa. This is equivalent to 25% of foreign direct investment inflows and 29% of disbursements from official creditors. The debut sovereign bonds issued by Ethiopia (USD1 billion) and Kenya (USD2 billion) were substantially over-subscribed, and the same applied for countries that had bond reissuances. Examples of these are Ghana and Zambia. To manage the public debt portfolio, and for infrastructure financing, earnings from sovereign bonds are typically used to benchmark for future expected corporate and government bond markets issues. The 10-year, 6.625% Eurobond issued in December 2014 in Ethiopia, has been reserved for development of sugarcane plantations, a hydropower dam, and amelioration and extension of the railway network (IDS, 2016).

2.8 Institutional Investors and their potential role

In the quest for higher long-term yield, asset and liability profile matching and duration hedging, pension funds and insurance providers have come out as strong contenders for sources of infrastructure funding. There has been rapid growth in institutional investment in infrastructure finance however this still represents around 1% of total assets. Certain pension funds in different countries have adopted investing in infrastructure financing more readily than others with the likes of Australia and Canada actively increasing their allocation to infrastructure over the recent past with allocations as high as 10-15% (Croce & Yermo, 2013).

Figure 2-6: Average Current and Target Allocations to Infrastructure, 2011 - 2014



Source: Preqin Infrastructure Online

Figure 2.6 highlights trends in infrastructure allocations. Globally the average current allocation of investors to infrastructure has increased from 3.5% in 2011 to 4.3% in 2014, with the average target allocation increasing from 4.9% to 5.7% over this time period. Preqin (2015) asserts that allocations to infrastructure are likely to continue to grow in the near future, with 67% of investors from a survey of 148 fund managers confirming plans to increase their allocation to infrastructure over the longer term

Chile provides a prime example of a proactive approach to alternative non-traditional sources of funding from an emerging market. With limited access to financial, organizational and human resources, Chile was faced with a major infrastructure deficit particularly in the

transport sector. Chile embarked on a franchising program through a build-operate-and-transfer (BOT) contract, which entailed a private firm building and financing an infrastructure project and then collecting user fees for a predetermined period (usually between 10 and 30 years). On conclusion of the franchise created the infrastructure built is transferred to the government. Over a 10-year period Chile managed to produce 21 BOT concessions involving investments of USD3.6 billion, mainly in highways and airports (Engel, Fischeer, & Galetovic, 2003).

SSA has significant structural challenges when considering the viability of pension funds as potential infrastructure investors. Structural factors such as the prevalence of state-controlled pension systems, low quantity of private pension funds, undeveloped capital markets and restricted alternatives for financial investment instruments, practices that promote holding of illiquid real estates, inadequate regulations for governing investment of assets, short-term bank deposits and government securities, have contributed to pension funds in SSA remaining largely underdeveloped (Irving & Manroth, 2009).

Table 2.4 highlights the key pension funds in SSA. South Africa has the largest assets under management (USD312 billion), with a distant second being Nigeria with USD14 billion. This highlights the disparity in the sophistication of the pension fund markets across SSA.

Table 2-4: Key Pension Funds in SSA

Country	Concentration	Assets (US$ bn)	Corporate bonds
Kenya	17 fund managers; NSSF has 1/3rd assets	5	Can hold up to 30% of portfolio, but currently 6%
Uganda	NSSF accounts for 95% of pension assets	0.8	NSSF holds 2.5% of assets in corporate bonds
Tanzania	Five largest funds account for 60% of total assets	2.1	New guidelines put 30% limit on corporate bonds
Nigeria	Top 3 control 55% as- sets; top 5 control 69%	14.3	35% limit on non-sovereign bonds; currently holds 2.5%
Ghana	SSNIT dominant; 14 PFAs (Pension Fund Administrators) registered for new fund	2	30% limit; currently no corporates in market
South Africa	GEPF has c.37% assets; competitive private FMs	312	Regulation 28 allows 100% investment in fixed income corporate bonds
Namibia	GIPF has 82% assets; Largest PFA has 60%	8.5	Permissive regulation allows corporate bonds
Botswana	BPOPF is largest fund; no data for others	5.6	Permitted but limited availability
Zambia	NAPSA and AfLife are around 80% of market	2	20% in a single sector

Source: WEF (2013). Strategic Infrastructure in Africa A business approach to project acceleration.

2.9 The role of China in infrastructure in SSA

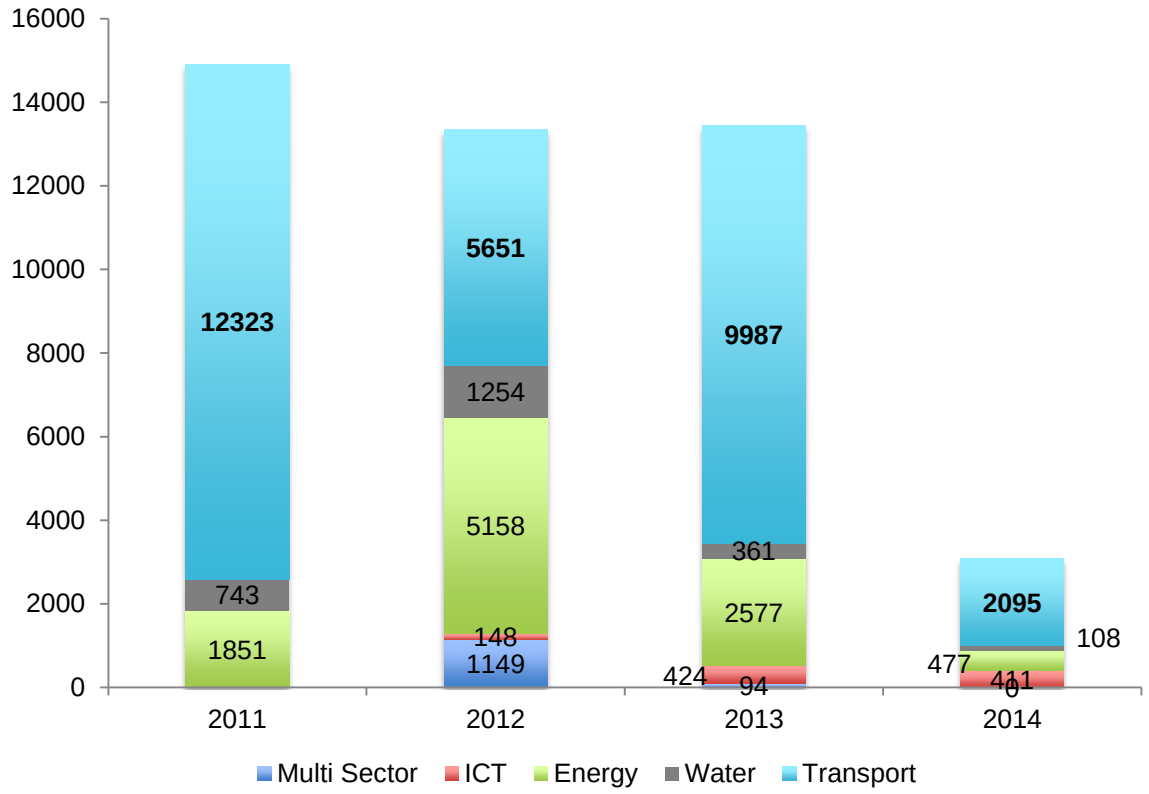
China has emerged as an important financier of SSA's infrastructure requirements in recent years. Since the late 1990s Chinese and SSA trade relations have strengthened so significantly that China became SSA's largest export and development partner in 2013. This has been spurred by China's rapid industrialization program. China's GDP growth over the past 10 years has averaged 10%. Nearly a third of China's energy imports come from SSA, which is a vital trade link, especially as energy consumption rates in China have grown by more than twice the global average over the past 10 years. The existence of domestic production and large efficiency gains has not curtailed China's appetite for raw materials such as coal, oil and natural gas. Heavy industrialization combined with urbanization continues to be the main drivers for large raw material consumption. Chinese banks such as the People's Bank of China, the China Development Bank, and the Export-Import Bank

of China (Exim Bank of China), funded large scale African infrastructure projects (Pigato & Tang, 2015).

China's most common form of funding structure for SSA has been through the infrastructure for resources loan model. This loan structure makes use of two basic legal instruments: a bilateral framework cooperation agreement stating the general terms (volume, purpose, interest rate and maturity) and a loan agreement signed by the China Exim Bank and the borrower. A key feature to the structure of these loans is that the interest rate is typically below the benchmark of the People's Bank of China, with the difference being subsidized by the Chinese central government. The repayment period is characteristically long, ranging between 15 to 20 years, including a 5 to 7-year grace period. Structured mostly as an export credit facility, these credit lines come tied to the procurement of services, goods and often labour from China (a minimum of 50%), leaving in general only a small margin for local content in the recipient country. The capital never actually leaves China. It is administered on a project basis through the borrower's account with Exim Bank in China, and payments are made directly to Chinese contractors against completion of the construction project (Alves, 2013).

China accounts for 34% of the total official financing amount on infrastructure in SSA, higher than any other funder. However, China accounts for only 3% of the number of aid projects, indicating that the size of Chinese funded projects is larger. The USA is the second largest bi-lateral infrastructure contributor, but its total aid volume during the period is far less than that of China. Northern donors together contribute to 28% of the total aid amount in infrastructure, but they account for 76% of the number of aid projects, indicating the small scale of these projects (Chen 2013).

Figure 2-7: Chinese Commitments to Africa Infrastructure by Sector, 2011 - 2014



Source: ICA 2014

Chinese commitments whilst significant have reduced over the past few years. Figure 2.7 illustrates that commitments have reduced from a high of USD14 billion to USD3.9 billion in 2014. The transport and energy sector together account for over 80% of the investments. The most significant investments in transport in 2014 were for a USD875 million loan for the expansion of Côte d'Ivoire's Autonomous Port of Abidjan and a USD700 million loan to finance construction of a new airport in Khartoum, Sudan. Within the energy sector, USD41 million loan was granted to the Zambian government to construct electricity transmission lines and a USD136 million loan to the Tanzanian government for the construction of the 50MW Singida wind farm project. However, it should be noted that different sources report different commitment values due to the lack of full disclosure on Chinese investments in SSA.

CHAPTER 3. Research Methodology

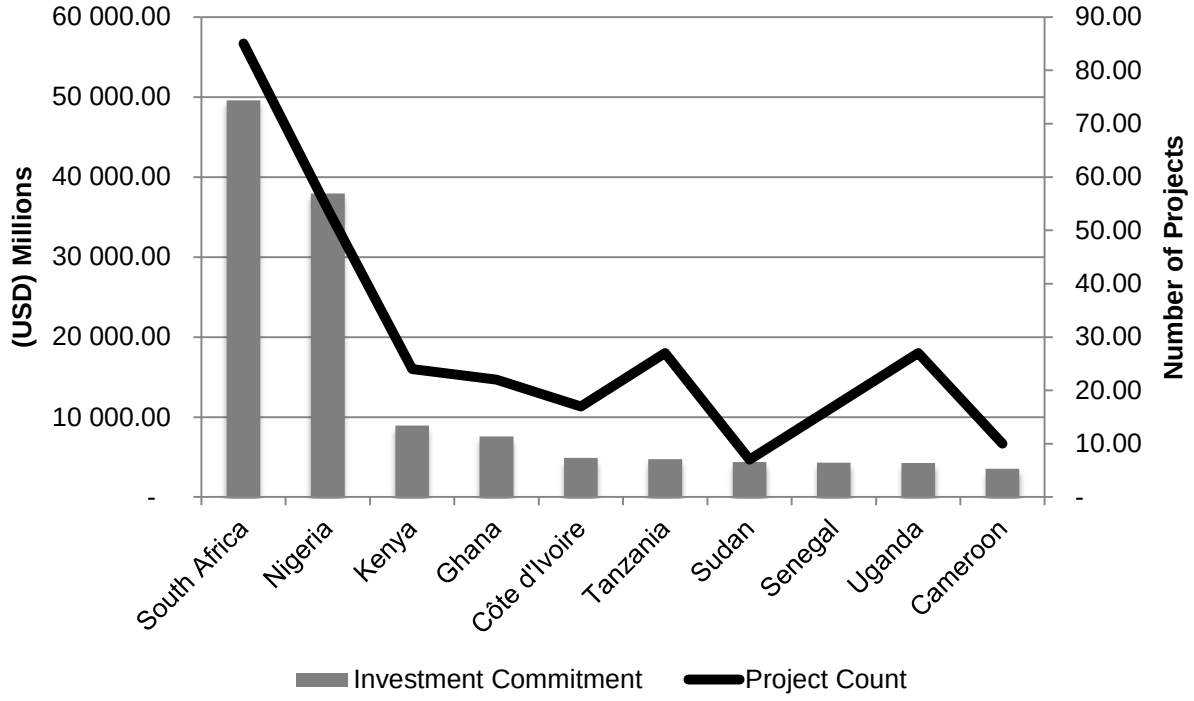
In relation to Infrastructure finance as an asset class Inderst (2013) argues that the one major challenges in assessing infrastructure finance mechanisms is that Infrastructure as a separate category is a relatively new occurrence. Infrastructure finance will typically be broadly categorised under other asset classes such as equities, bonds, private equity, real estate, alternative or real/inflation-linked assets.

When dealing with infrastructure financing the prime constraint is data. This is due to the absence of a central database. Thus there is a reliance on multiple data sources. However there have been improvements in the quality of the provision of data. The primary data source is the World Bank database that has time-series project level data, which spans the period 1984 to 2014. The World Bank Private Participation in Infrastructure (PPI) database tracks contract and investment information for private infrastructure projects in low and middle-income countries.

The research focuses on one of the financing mechanisms that have been discussed in the literature review. We investigate the determinants of PPP infrastructure financing in SSA making use of the 80/20 principle (i.e. Focus on countries with 80% of total infrastructure finance through PPP from 1991 to 2014 in SSA which total 10 countries). This paper analyses the application two models as well as their suitability. Both models employ a multi-country regression in a panel framework. In the first model we analyse factors that affect the number of projects that are completed in a PPP structure. In the second model we look at the variables that determine the investment dollar value in PPP.

Figure 3.1 presents the top 10 SSA countries by PPP investment commitment to be analysed in the multi-country regression. A total of 290 projects were completed in the period of analysis with investment commitment of USD130 Billion. South Africa and Nigeria as expected hold the largest share of total investment amount in the period of analysis.

Figure 3-1: Top 10 SSA Countries - PPP Investment Commitments and Annual Project Count, 1991 -2014



Recent studies such as those by (Hammami, Ruhashyankiko, & Yehoue, 2006; Kasri & Wibowo, 2015; Mengitsu, 2013), have noted that there are four critical explanatory factors that determine PPP investment and the associated number of projects, namely, government resource constraints; macroeconomic conditions; market conditions and institutional factors. Due to data limitations Hammami et al., 2006 propose a few proxy indicators across these factors and for this paper we conform to the indicators chosen by Kasri and Wibowo (2015). Based on data availability for the 10 countries we review the variables with their a-priori expectations in table 2 below.

Table 3-1: Data Description

Factor	Proxy Indicator	Unit	Data Source	aPriori Expectation
Dependent Variables				
PPP Project Count	Number of PPP Projects	Annual Count	World Bank PPI Database 2016	
PPP Project Investment	Amounts of PPP Projects	$ Million	World Bank PPI Database 2016	
Explanatory Variables				
Government Resource Constraints	AID	% of GNI	World Bank Development Indicators Database 2016	Negative
	External Debt	% of GNI	World Bank Development Indicators Database 2016	Negative
	Fuel Export	% of merchandise exports	World Bank Development Indicators Database 2016	Negative
Macroeconomic Conditions	Inflation	Annual %	World Bank Development Indicators Database 2016	Positive
	Domestic credit to private sector	% of GNI	World Bank Development Indicators Database 2016	Positive
	M2 – Money Supply	% of GNI	World Bank Development Indicators Database 2016	Positive
Market Conditions	GDP Per Capita	Logged USD PPP constant	World Bank Development Indicators Database 2016	Positive
	Population	Logged annual count	World Bank Development Indicators Database 2016	Positive
Institutional Factors	Government Effectiveness	Index Number (-2.5<I<2.5)	World Wide Governance Indicators Database 2016	Positive
	Regulation Quality	Index Number (-2.5<I<2.5)	World Wide Governance Indicators Database 2016	Positive
	Stable Political Environment	Index Number (-2.5<I<2.5)	World Wide Governance Indicators Database 2016	Positive

To estimate the determinants of PPP we use the below specification for both the count and Investment amount models.

$$PPP_{it} = \beta_0 + \beta_1 GovConstraint_{it} + \beta_2 MacroCondi_{it} + \beta_3 MarketCondi_{it} + \beta_3 InstFactors_{it} + \mathcal{E}_{it}$$

Where GovConstraint represents the government resource constraint proxies, MacroCondi

represents the macroeconomic condition proxies, MarketCondi represents the market condition proxies and InstFactors represents the institutional factors proxies. Key differences in analysis for both models rest in the methodology employed.

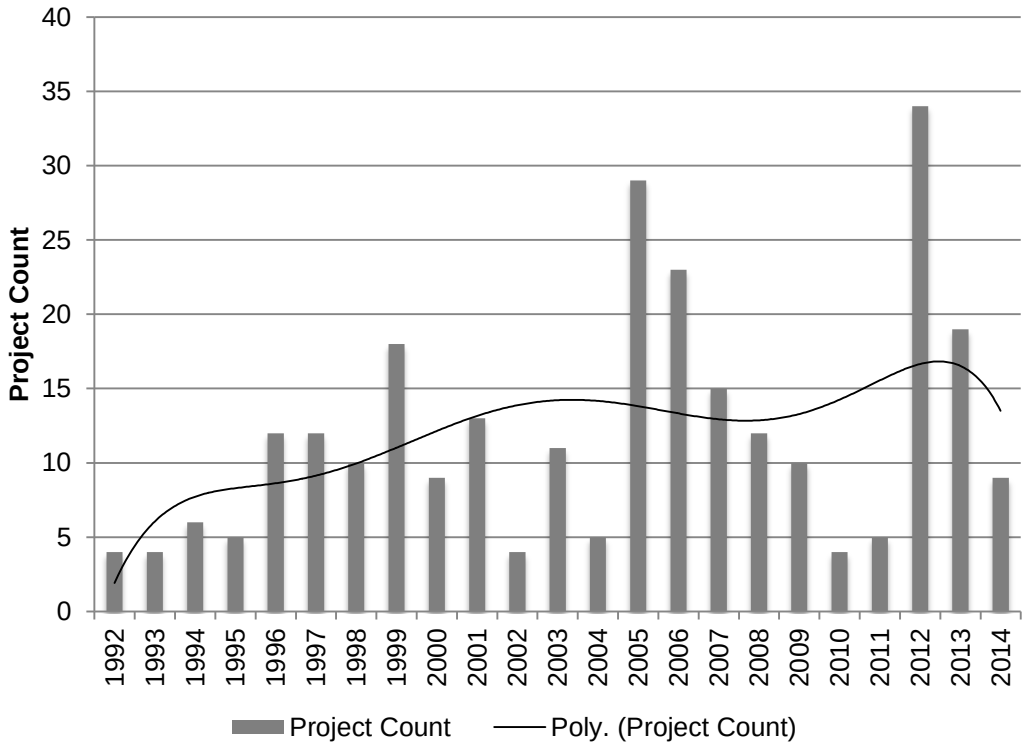
Since the project count data is ordinal in nature the relevant models typically used for such analysis in econometric literature are the poisson distribution, negative binomial regression, zero inflated count models and zero truncated count models. Recent studies (Kasri & Wibowo, 2015) have used the random-poisson model and we restrict our study to the same in this paper. To analyze the determinants of the investment amounts, the paper follows the Generalized Least Squares (GLS) methodology. This is to deal with the general problem of autocorrelation and heteroscedasticity in Panel Data. This is in line with methodologies followed by Hammami et al., 2006; Mengitsu, 2013; Kasri & Wibowo, 2015. However a caveat is required with regards to this remedy, as this imposes a distribution on the error terms which may not be observable or readily testable and, in the event of misspecification which may lead to incorrect standard errors and biased coefficients.

CHAPTER 4. Results

4.1 Descriptive Statistics

There has been a steady increase in the number of PPP projects completed in the period of analysis. Figure 4.1 highlights the trend in the number of PPP projects. However there have been periods of steep increases and declines. Between 2005 and 2011 there was a steep decline in the number of completed projects. However, 2012 saw the largest number of projects completed, a total of 34, with the 26 of these being completed in South Africa in the renewables energy sector. 1992, 2002 and 2010, had the lowest number of projects at 4 with an average of 12 projects per throughout the period.

Figure 4-1: Number of PPP projects for the Top 10 countries, 1991 - 2014



The trend is slightly skewed when looking at the investment amounts in the top 10 countries. Figure 4.2 highlights the investment amounts in PPP projects. There has been extreme volatility in the investment amounts however this is explained by the presence of South Africa in the countries analysed. South Africa and Nigeria typically has had larger projects in relation to the other 8 sampled countries. Total investments between 1991 and 2014 amounted to USD139 billion with a peak in 2001, driven by the MTN Nigeria

greenfield project in the telecoms sector, of USD21 billion. The average investment amount for the period was USD5 billion. A gradual increase in PPP investment amounts can be observed between 2003 and 2007, which is coincidentally a period associated with the commodity boom, before downturn as a result of the financial crisis in 2008.

Figure 4-2: Investment amounts of PPP projects for the Top 10 countries, 1991 - 2014

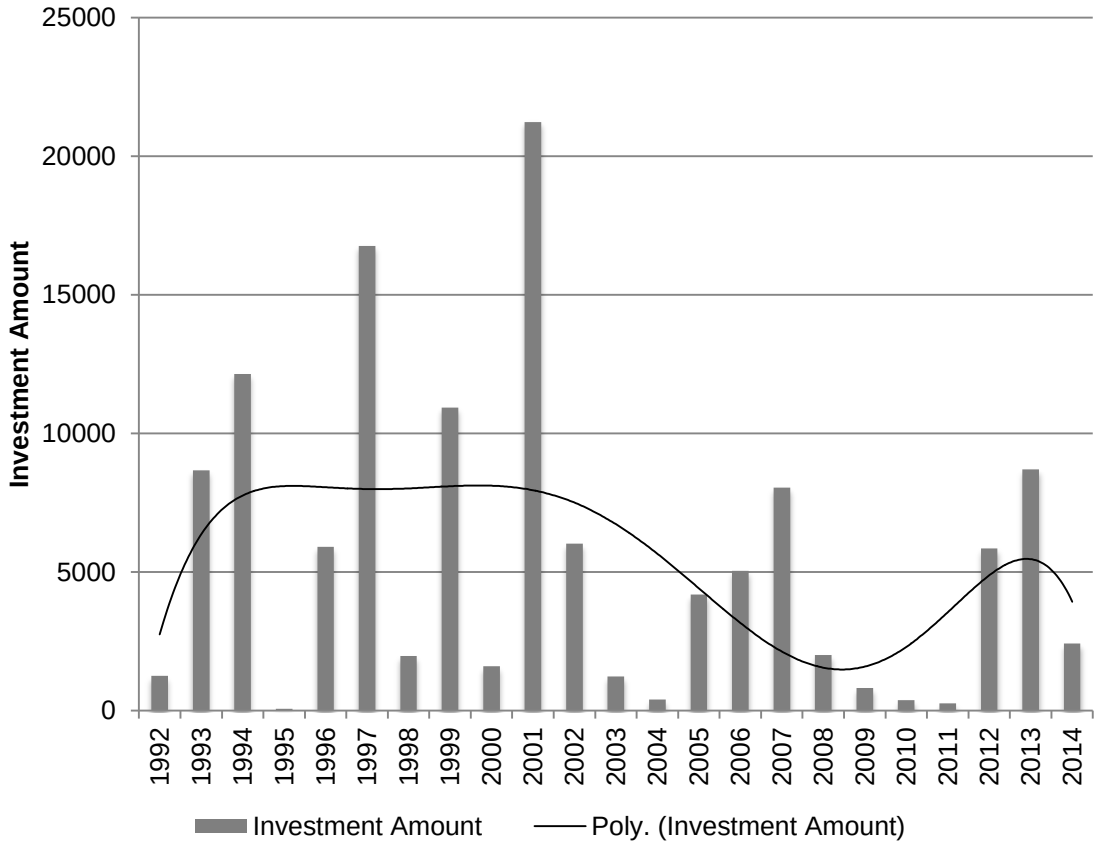


Table 4.1 below provides a summary of the descriptive statistics for the explanatory variables between 1991 and 2014. For the government constraints factors on average the top ten countries had 6.86% and 67.33% of their GNI in foreign aid and external debt respectively. However, there is great dispersion on the external debt between the 10 countries with an average max of 108% for Cote d'Ivoire and min of 24% for South Africa. With respect to fuel exports as a percentage of merchandise exports, there is an average of 24.81%, however this variable also suffers from the same dispersion issues as the external debt variable as a result of countries such as Nigeria and Sudan with large oil exports.

For the macroeconomic conditions inflation stood at 13.17% with a trough of -3.21%, whilst average domestic credit to private sector as a percentage of GNI stood 30.46%, which speaks to the extent of the development of the financial markets. For market conditions the

GDP per capita between the countries averaged USD3,244 however, this is skewed upwards by South Africa with an average of USD10,826. It is however worth noting that this is below the average income of developing countries of USD6,597 globally (Kasri & Wibowo, 2015). The population variable, which serves as proxy for market size, averages 37 million across the top 10 countries with Nigeria being an outlier with an average population of 133 million over the period of analysis.

With respect to the institutional factors, the top 10 countries seem to have a general weakness across all the chosen proxies. All the institutional factors range between -2.5 (a weakness) and 2.5 (a strength). The government effectiveness index as defined by the World Bank "reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies". For the top 10 countries the index of government effectiveness averaged -0.42. South Africa is the only country in the sample with a positive average. The stable political environment index, which measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism, had an average of -0.74 lowered by Nigeria's average of -1.33. The regulatory quality index reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The average index for this proxy is -0.34 and has the least dispersion from the three proxies chosen. This is summarized in table 4.1 below.

Table 4-1: Summary Statistics for the Determinants of PPP investments, 1991 - 2014

Variables			N	Mean	Median	Maximum	Minimum	Std. Dev.
Government resource Constraints	AID	% of GNI	227	6.86	5.92	30.22	0.21	5.56
	External Debt	% of GNI	236	67.33	58.60	251.29	4.29	50.08
	Fuel Export	% of merchandise exports	191	24.81	10.99	99.66	0.00	30.84
Macroeconomics Conditions	Inflation	Annual %	237	13.17	7.71	132.82	-3.21	19.65
	Domestic credit to private sector	% of GNI	111	30.46	13.24	160.12	2.97	42.86
	M2 Money Supply	% of GNI	111	30.54	23.22	80.80	12.66	16.86
Market Conditions	GDP Per Capita	Logged USD PPP constant	240	7.88	7.79	9.43	6.67	0.58
	Population	Logged annual count	240	17.16	17.10	18.99	15.86	0.68
Institutional Factors	Government Effectiveness	Index Number (-2.5<I<2.5)	190	-0.42	-0.41	0.88	-1.61	0.52
	Stable Political Environment	Index Number (-2.5<I<2.5)	190	-0.74	-0.53	0.20	-2.66	0.77
	Regulation Quality	Index Number (-2.5<I<2.5)	190	-0.34	-0.25	0.78	-1.51	0.49

4.1.1 Determinants of PPP Investments (Top 10 countries in SSA)

Table 3 provides a summary of the regression outputs of the estimated model for PPP investments for the Top 10 countries in SSA. For robustness the regressions are performed with both Fixed Effects OLS and Fixed Effects GLS. The results are consistent across both methodologies. The results shared suggest that government constraints, macroeconomic conditions and institutional factors do have an impact on the PPP investments in the top 10 countries. More specifically is that the more aid provided, the larger the fuel exports as a percentage of merchandise, the higher the domestic credit to the private sector (i.e. depth of financial market) and the more effective the government efficiency, the higher are the levels of PPP investment. A surprising outcome from the estimation is that high external indebtedness is associated with lower PPP investment. This can be explained by that in most instances PPPs are debt to the government (even though in many cases the government sets up an SPV that becomes the de facto debt issuer) and, although the cash flows from funded projects are “ring-fenced” for purposes of paying off the debt, it is likely that many fund suppliers would hesitate to lend more to countries/governments that have already issued plenty of debt in international debt markets. Alternatively, they will demand a

higher rate of return that might be a deterrent to using PPPs. This is because heavily indebted governments have a higher risk of default making additional debt riskier.

Thus our estimated model suggests that a 1% increase in aid will result in 0.5% increase in PPP investment, whilst an increase in external debt reduces PPP investment by 0.06%. It is also worth noting that whilst external debt seems to have negative results on PPP investments domestic credit to the private sector and the ability to lend has a positive relation with PPP investment, which speaks to a need to develop domestic financial markets.

A key result is the statistical significance of the government effectiveness as a determinant of PPP investment. A unit increase in government effectiveness results in a 19% increase in PPP investment, on the average, in the 10 countries. This highlights the sensitivity of PPP stakeholders to the ability of the government to deliver against its mandated obligations within a PPP framework.

The estimation does present counter intuitive results that will require further analysis. One of these is that market conditions have no significant impact on PPP investments for the top 10 countries. Previous literature as that of Mengistu, finds that countries that are more open to trade, countries with larger populations, and democracies, are more likely to receive PPP investment.

Table 4-2: Regression output for the Determinants of PPP Investment amounts, 2001 - 2014

Dependent Variable: Log of PPP Investment amount; Model: Fixed Effect – OLS				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-202.4679	214.1184	-0.945588	0.3474
AID	0.506132	0.245716	2.059823**	0.0428
External Debt	-0.061378	0.029763	-2.062205**	0.0426
Inflation	0.17037	0.118703	1.435259	0.1553
Fuel Export	0.110683	0.045148	2.451579**	0.0165
Domestic credit to private sector	0.193889	0.088399	2.193326**	0.0313
GDP Per Capita	-16.14158	9.858192	-1.637377	0.1057
Population	18.79823	15.40826	1.22001	0.2262
Government Effectiveness	19.73324	6.824212	2.891651***	0.0050
Stable Political Environment	-1.857236	2.497613	-0.743605	0.4594
Regulation Quality	-0.964546	5.338359	-0.180682	0.8571
R-Square	0.338855			
Observations	94			
* p<0.10, ** p<0.05, *** p<0.01				

Dependent Variable: Log of PPP Investment Amount Model: Fixed Effect - GLS				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-218.6137	192.718	-1.134371	0.2603
AID	0.734909	0.233223	3.151108***	0.0023
External Debt	-0.055389	0.027325	-2.027070**	0.0462
Inflation	0.192454	0.117112	1.643332	0.1045
Fuel Export	0.088994	0.041854	2.126266**	0.0368
Domestic credit to private sector	0.194034	0.140201	1.383972	0.1705
GDP Per Capita	-14.51287	9.220157	-1.574038	0.1197
Population	18.91728	13.8603	1.364854	0.1764
Government Effectiveness	18.33462	6.391881	2.868423***	0.0054
Stable Political Environment	-2.201283	2.227099	-0.988409	0.3261
Regulation Quality	0.692706	5.257094	0.131766	0.8955
R-Square	0.395420			
Observations	94			
* p<0.10, ** p<0.05, *** p<0.01				

To test for the sensitivity of outliers we run the same regressions with the exclusion of South Africa in the analysis. Government constraints together with Macroeconomic factors remain significant determinants of PPP investment amounts. However, the exclusion of South Africa seems to reveal a pronounced impact played by market conditions on PPP investments. Of significance is the negative relation of GDP Per Capita with PPP

Investment (i.e. a unit rise in GDP Per capita will result in a 24% reduction in PPP investment). Higher incomes are typically expected to attract higher levels of PPP (Kasri & Wibowo, 2015). Due to the high correlation between Aid and GDP per capita this result needs to be evaluated with caution as this maybe a misspecification error.

An expected result is that the political instability affects PPP investment negatively in the 9 countries and is associated with lower investment. Government effectiveness plays an important role with a unit rise resulting in an increase of 17% in PPP investment. It is worth noting that financial market depth as well as inflation levels seem to play no significant role in determining PPP investment within the 9 countries, however in the same vein monetary policy is an instrumental factor. South Africa follows an inflation targeting framework therefore there exists some correlation with M2 and Inflation which explains why it is insignificant in the joint pool analysis whilst it seems to impact the 9 other countries.

To check for robustness, a GLS model was also performed and the results did not deviate from the OLS model. The R^2 of 0.46 does suggest that a GLS model is a better fit than the OLS model with only 0.42 however this is only marginal. We also find that the constant has close significance in the GLS model, which suggests existence of fixed effects.

Table 4-3: Regression output the Determinants of PPP investment (excl. SA), 2001 - 2014

Dependent Variable: Log of PPP Investment amount, Model: Fixed Effect - OLS				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-292.445	213.122	-1.372196	0.1749
AID	0.553479	0.245599	2.253592**	0.0277
External Debt	-0.068814	0.03037	-2.265856**	0.0269
Inflation	0.186502	0.123669	1.508076	0.1365
Fuel Export	0.128349	0.044021	2.915643***	0.0049
M2 Money Supply	-0.641243	0.370288	-1.73174*	0.0882
Domestic credit to private sector	0.550636	0.34265	1.606995	0.1131
GDP Per Capita	-24.7053	10.09604	-2.447029**	0.0172
Population	28.33518	15.37024	1.84351*	0.0700
Government Effectiveness	17.92992	7.082539	2.531567**	0.0139
Stable Political Environment	-4.398099	2.602602	-1.689886*	0.0960
Regulation Quality	0.105772	5.822735	0.018165	0.9856
R-Square	0.428092			
Observations	81			
* p<0.10, ** p<0.05, *** p<0.01				

Dependent Variable: Log of PPP Investment amount, Model: Fixed Effect - GLS				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-314.0544	193.6199	-1.622015	0.1098
AID	0.747622	0.234923	3.18242***	0.0023
External Debt	-0.064163	0.028352	-2.26305**	0.0271
Inflation	0.187533	0.118308	1.585117	0.1179
Fuel Export	0.102185	0.043785	2.333796**	0.0228
M2 Money Supply	-0.661652	0.36432	-1.816129*	0.0741
Domestic credit to private sector	0.54511	0.343309	1.58781	0.1173
GDP Per Capita	-22.07595	9.816496	-2.248863**	0.0280
Population	28.35487	14.042	2.01929*	0.0477
Government Effectiveness	17.48006	6.519342	2.681261***	0.0094
Stable Political Environment	-4.752661	2.360377	-2.013518**	0.0483
Regulation Quality	-0.117498	5.68758	-0.020659	0.9836
R-Square	0.468677			
Observations	81			
* p<0.10, ** p<0.05, *** p<0.01				

4.1.2 Determinants of number of PPP Projects (Top 10 countries in SSA)

Table 4.4 provides a summary of the regression outputs of the estimated model for the number of completed PPP projects for the Top 10 countries in SSA between 1991 and 2014. It is worth noting that the correlation between the number of completed projects and dollar investment amount is low. The reason for this unexpected result is that the number of PPP projects relates to the completed projects in a particular year, which would relate to backdated investment commitments. Thus results of the outputs for dollar investment amounts and for project count are not expected to mirror each other.

Due to the presence of autocorrelation (implying that the number of PPPs attracted by a country in a given year might depend on the number of PPPs already running), we introduce a one period lag term of the number of PPP projects as an independent variable. We perform two regressions, with one excluding SA to control for the outlier effect. Our results indicate that previous success in completing a PPP project positively impacts the number of current implementations. Macroeconomic factors such as inflation and money supply seem to be strong determinants of the number of PPP projects, in the SA inclusive model, pointing to monetary policy being a significant determinant. Market conditions contribute significantly to through per capita income levels and populations to the number of PPP projects. Higher populations are associated with higher number of PPP projects, specifically a 10% rise in the population will increase the number of PPP projects by 9 units.

Though close to zero the number of PPP projects is positively associated with foreign aid, however this result does not hold when excluding South Africa from the analysis. Government budget government constraints through external debt are negatively related to the number of PPP projects, highlighting indebtedness as a constraint to completion. A government's ability to repay its debts may affect its ability to support PPP projects from beginning to completion. Surprisingly institutional factors seem to have no statistically significant role in determining the number of projects completed for the top 10 countries. This result is consistent even when we control for South Africa as an outlier.

Table 4-4: Regression output, the number of PPP projects, 2001 - 2014

Dependent Variable: Number of PPP Projects Model: Poisson				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Lag of Number of PPP Projects	0.040495	0.012934	3.13081***	0.0017
AID	0.076249	0.037333	2.042388**	0.0411
External Debt	0.000696	0.004724	0.147403	0.8828
Inflation	0.047612	0.01912	2.490136**	0.0128
Fuel Export	-0.000866	0.008362	-0.10354	0.9175
M2 Money Supply	-0.064589	0.021745	-2.970345***	0.0030
Domestic credit to private sector	0.043860	0.010075	4.353238***	0.0000
GDP Per Capita	-0.424778	0.586378	-0.724411	0.4688
Population	0.910389	0.246487	3.693452***	0.0002
Government Effectiveness	-0.689246	0.692739	-0.994958	0.3198
Stable Political Environment	0.361448	0.238514	1.515414	0.1297
Regulation Quality	0.070694	0.659646	0.10717	0.9147
C	-12.68693	5.859919	-2.165035**	0.0304
R-Square	0.279608			
Observations	94			
* p<0.10, ** p<0.05, *** p<0.01				

Table 4-5: Regression output, the number of PPP projects (excl. SA), 2001 - 2014

Dependent Variable: Number of PPP Projects Model: Poisson				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Lag of Number of PPP Projects	0.092935	0.031888	2.91439***	0.0036
AID	-0.020218	0.047871	-0.422332	0.6728
External Debt	-0.010455	0.00636	-1.643878*	0.1002
Inflation	0.050256	0.019995	2.513435**	0.0120
Fuel Export	0.012081	0.008823	1.369256	0.1709
M2 Money Supply	0.002843	0.05871	0.048422	0.9614
Domestic credit to private sector	-0.023868	0.061058	-0.390904	0.6959
GDP Per Capita	-1.820085	0.718928	-2.531664**	0.0114
Population	0.714133	0.261148	2.734596***	0.0062
Government Effectiveness	1.118765	0.89127	1.255249	0.2094
Stable Political Environment	0.176549	0.277769	0.635597	0.5250
Regulation Quality	-0.211912	0.726443	-0.291712	0.7705
C	2.301235	6.788233	0.339003	0.7346
R-Square	0.536092			
Observations	81			
* p<0.10, ** p<0.05, *** p<0.01				

CHAPTER 5. Conclusions

5.1 Policy Recommendations

The results presented provide an interesting base for policy framework discussions and associated implications. It is no mystery that key limitations to SSA's growth trajectory is intrinsically linked to its inadequate and fragmented infrastructure.

Institutional stability and quality provides an environment of predictability and certainty. Infrastructure finance is long-term in nature and investors are sensitive to the uncertainty premium caused by weak institutions. Whilst our results did not provide strong evidence for cross-institutional dependency for PPP investments it has been widely accepted that institutional factors are critical determinants for investor appetite (Asiedu, 2002; Basfilio, 2011; Hammami et al., 2006; Kasri & Wibowo, 2015). Building robust institutional capacity across government effectiveness is a critical requirement. This will not only accomplish government credibility but will also create an environment that fosters much needed critical innovation within the space of infrastructure finance. When a trusted environment is formed, a culture of innovation bred.

With constrained government budgets private participation in infrastructure finance is increasingly becoming a necessity. Investors seem to have a herd mentality with where they place their proverbial eggs. There is a significant positive relationship with foreign aid and private investors infrastructure placement. This highlights a dual need for government's ability to attract both aid and investment simultaneously. Aid in recent years has been channelled to countries that have perceptions of good economic governance (Dollar & Levin, 2006). Economic governance refers to a country's ability to support economic activity and transactions through stable policy frameworks and institutions. This study highlights a negative relationship between external indebtedness and investment. Prudent fiscal consolidation thus becomes a critical policy position for SSA countries to ensure stability of the national fiscus to promote aid and investment.

5.2 Concluding Remarks

This study explores the prevailing infrastructure finance methods in SSA. The infrastructure bottleneck has been an inhibitor to SSAs growth trajectory. Traditionally governments have been the main funders of infrastructure finance in SSA, however as government budgets become tighter and funding capacity wanes, there is a renewed need for more innovative sources of infrastructure financing. These sources will need to come from both the private sector through non-traditional sources such as institutional investors and project bonds, as well as the public sector in their fiscal policy structures to support the various social and economic needs. We have seen an emergence of the east through China as a significant funder in recent years, bringing a different philosophy to mutually beneficial structures of funding the infrastructure in the region.

This study through an analysis of the top 10 recipients of PPP investments in SSA between 1991 and 2014 finds that government budget constraints, macroeconomic conditions and institutional quality are significant determinants of PPP investments. Policy implications are that SSA governments need to focus on building and maintaining sound fiscal and monetary discipline. Institutional factors cannot be ignored in this process, as these are critical to creating an environment that is conducive to building trust and reducing risk perceptions for potential investors as well as providing the room for innovative solutions.

Whilst this area of study is plagued with limitations due to inadequate data and academic literature, findings in this analysis contribute to the ever-growing body of work on Infrastructure financing in SSA. This paper focused in PPP analysis however there is scope to further study other infrastructure financing mechanisms in SSA.

Definition of terms

ADF	African Development Fund
AfDB	African Development Bank
CADF	China Africa Development Fund
CDB	China Development Bank
EIB	European Investment Bank
EXIM Bank	Export-Import Bank
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HIPC	Highly Indebted Poor Countries
IATI	International Aid Transparency Initiative
IBRD	International Bank for Reconstruction and Development (World Bank)
ICA	Infrastructure Consortium for Africa
ICB	International Competitive Bidding
ICT	Information Communications Technologies
IDA	International Development Association (World Bank)

IEF	Index of Economic Freedom
IFC	International Finance Corporation (IFC)
IFI	International Finance Institution
LAC	Latin America and the Caribbean
LDC	Least Developed Countries
LMIC	Low and Middle Income Country
MDGs	Millennium Development Goals
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	The OECD Development Assistance Committee
PIU	Parallel implementation units (PIUs)
PPI	Private Participation in Infrastructure
PPP	Public Private Partnership
SOE	State Owned Enterprise
SSA	Sub Saharan Africa
WDI	World Development Indicators

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Appendix

Table 5-1: Correlation Table

	Log Investment Amount	Investment Count	Aid	External Debt	Inflation	Fuel	M2 Money Supply	Domestic Credit to private sector	Log GDP Per Capita	Log Population	Government Effectiveness	Stable Political Environment	Regulatory Quality
Log Investment Amount	1.000	0.178	-0.041	-0.217	0.099	0.176	0.082	0.061	0.115	0.255	0.016	-0.153	0.003
Investment Count	0.178	1.000	-0.092	-0.086	-0.007	-0.027	0.254	0.308	0.262	0.208	0.192	0.091	0.173
Aid	-0.041	-0.092	1.000	0.246	0.024	-0.409	-0.495	-0.505	-0.753	-0.407	-0.068	0.083	-0.026
External Debt	-0.217	-0.086	0.246	1.000	0.073	0.141	-0.257	-0.228	-0.283	-0.354	-0.165	-0.111	-0.314
Inflation	0.099	-0.007	0.024	0.073	1.000	0.074	-0.050	-0.174	-0.055	0.156	-0.089	-0.121	-0.084
Fuel	0.176	-0.027	-0.409	0.141	0.074	1.000	-0.273	-0.212	0.177	0.427	-0.646	-0.664	-0.703
M2 Money Supply	0.082	0.254	-0.495	-0.257	-0.050	-0.273	1.000	0.955	0.820	0.228	0.746	0.391	0.716
Domestic Credit to private sector	0.061	0.308	-0.505	-0.228	-0.174	-0.212	0.955	1.000	0.862	0.215	0.744	0.387	0.677
Log GDP Per Capita	0.115	0.262	-0.753	-0.283	-0.055	0.177	0.820	0.862	1.000	0.414	0.505	0.217	0.405
Log Population	0.255	0.208	-0.407	-0.354	0.156	0.427	0.228	0.215	0.414	1.000	-0.133	-0.394	-0.066
Government Effectiveness	0.016	0.192	-0.068	-0.165	-0.089	-0.646	0.746	0.744	0.505	-0.133	1.000	0.741	0.931
Stable Political Environment	-0.153	0.091	0.083	-0.111	-0.121	-0.664	0.391	0.387	0.217	-0.394	0.741	1.000	0.651
Regulatory Quality	0.003	0.173	-0.026	-0.314	-0.084	-0.703	0.716	0.677	0.405	-0.066	0.931	0.651	1.000

Table 5-2: Investment Count Variable Correlogram

Included observations: 240

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.315	0.315	24.110	0.000
		2	0.062	-0.041	25.063	0.000
		3	0.004	-0.004	25.067	0.000
		4	0.022	0.027	25.185	0.000
		5	-0.012	-0.030	25.222	0.000
		6	0.025	0.041	25.376	0.000
		7	0.039	0.022	25.752	0.001