

**BLUEPRINTS FOR INFRASTRUCTURE AND SERVICE
DELIVERY IN SUBSAHARAN AFRICA**

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ABSTRACT

The purpose of this investigation is to design a blueprint or framework for infrastructure and service delivery in sub-Saharan Africa. This involves a critical analysis of the interface between infrastructure services on the one hand and economic growth and development on the other, a critical identification and evaluation of the causes and effects of infrastructure deterioration, and a critical examination of the current framework for infrastructure and service procurement in sub-Saharan Africa. The country chosen to provide a case study was Nigeria. This was because its population makes up almost a quarter of that of sub-Saharan Africa, with about 504 ethnic nationalities comprising 774 local government areas and over 6,932 local communities. Nigeria also has one of the largest energy reserves in sub-Saharan Africa. Despite these advantages, Nigeria is also seen as suffering from one of the worst cases of dearth of infrastructure of any country in the region.

The interface between infrastructure, economic growth and development is not only theoretically evaluated but also empirically substantiated. It was found that there is a very strong correlation between private and public investment in infrastructure and gross domestic product on proxy for economic growth and development in sub-Saharan Africa.

A survey was then conducted to identify the perceived causes and effects of infrastructure failures in Nigeria. During the empirical analysis of this survey, a new generic model was generated called "Severity Index in Matrix Order" (SIMO) that helps to identify core variable factors in similar investigations of this magnitude. By using SIMO, the major perceived causes of infrastructure and service delivery failures in Nigeria were identified and then ranked in order of severity. It revealed that there was correlation between infrastructure service stability on the one hand and infrastructure maintenance, supply, quality, monthly bills and even the staffing of local infrastructure service providers on the other. Their various relationships were also assessed in order to assist the forecasting process in Nigeria. Subsequent empirical models were developed and validated based

on these results. The various effects of infrastructure service failures in Nigeria were also theoretically evaluated.

Also examined was the current framework for infrastructure procurement in Nigeria, The World Bank, The African Development Bank and the United Nations Commission for International Trade and Law (UNCITRAL) international best practice for procurement. These various methods were found to be difficult to adapt in view of distinctive local factors such as culture, beliefs and even value systems. The lower recognition accorded to users of infrastructure right from its conceptualisation to its actual delivery was found to be a major procurement failure. This thesis then presents a polycentric cultural model or framework for infrastructure and service delivery in Nigeria. It is believed that this model could also be applied to other parts of sub-Saharan Africa.

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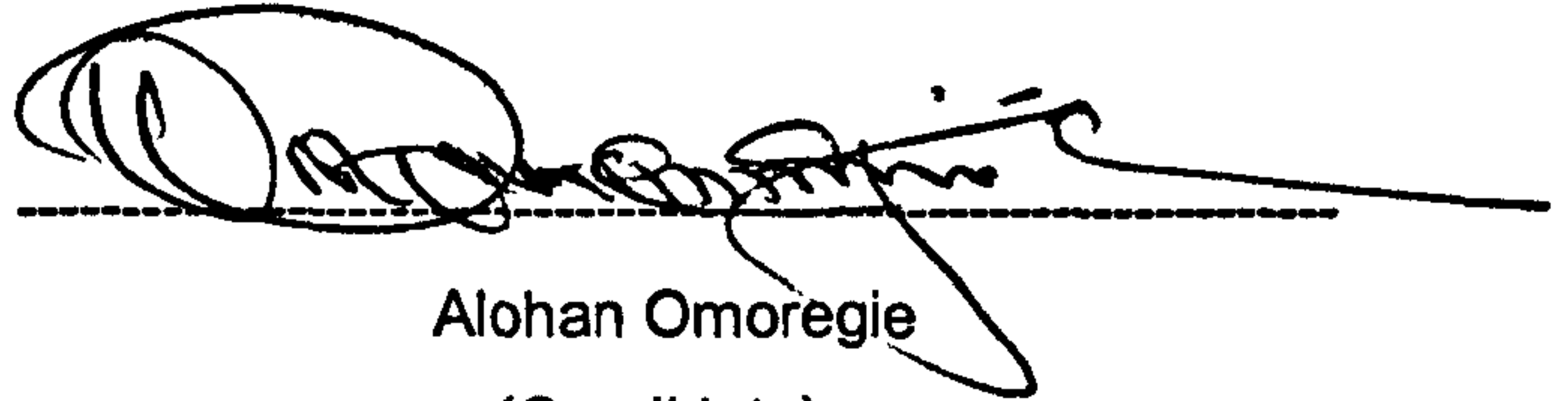
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DECLARATION

I hereby declare that the work presented in this thesis for the degree of Doctor of Philosophy is a work undertaken by myself. It has not previously been presented, either wholly or in part, for any other degree, and is not being concurrently submitted for any other degree.

A handwritten signature in black ink, appearing to read 'Alohan Omoregie', written over a horizontal dashed line. The signature is stylized with a large initial 'A' and a long horizontal stroke extending to the right.

Alohan Omoregie
(Candidate)

A handwritten signature in black ink, appearing to read 'Dennis Radford', written over a horizontal dashed line. The signature is in a bold, blocky, sans-serif style.

Professor Dennis Radford
(Research Supervisor)

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DEDICATION

Firstly, I dedicate this thesis to the all-attractive, all-compassionate, and all-powerful God. The God who has never disappointed me. He protected me and this work even at the most tempting and difficult times.

I also dedicated this work to my late father Engr B.A.O. Omoregie whose last wish and prayer for me before his demise was for me to attain the peak of my academic career. In his words: "Education is the only substantive material thing any father could bequeath a son". I wish my father had lived a little longer. Nonetheless, by benevolent Providence the submission date of this dissertation coincided with the very day he passed on. To God be the glory!

Chapter One

Introduction

Infrastructure provision is widely viewed as one of the major catalysts for growth in a developing economy. Regrettably, economic stagnation in sub-Saharan Africa has made it difficult to finance, maintain and replicate existing infrastructures in areas of need. Thus, the goal of a more productive economy appears to be impossible to attain. However, rates of deterioration and sometimes dearth of basic infrastructure has made life almost unbearable for the average poor. The lack of access to clean water and sanitation in sub-Saharan Africa has been traced to high mortality and morbidity rates, pollution and other public health-related problems. Similarly, the shortfall in construction and maintenance of roads and also the chronically poor transportation systems have contributed considerably to unemployment situation in the region. It is also a common sight in rural areas, where the majority of the population in sub-Saharan Africa dwells, to find people living in squatter settlements with no hope of any greatly improved housing.

Thus, this research entitled "Blueprints for Infrastructure and Service Delivery in sub-Saharan Africa" is a direct response to the high failure rates of infrastructure and service delivery, with specific reference to Nigeria. It is hoped that the findings of this research could also be applicable to other developing countries. This investigation aims to achieve the following: a critical evaluation of the interface between infrastructure delivery and economic growth and development; a critical evaluation of the causes and effects of infrastructure and service deterioration in sub-Saharan Africa; a critical evaluation of the current framework for infrastructure and service procurement in sub-Saharan Africa; to be a contribution to existing knowledge regarding infrastructure service delivery in developing countries, particularly in sub-Saharan Africa; and finally to finally design a blueprint or framework that could guide infrastructure and service delivery. The case study chosen for this investigation was Nigeria. These aims and objectives are thoroughly covered in the following chapters.

Parts of chapters two and four theoretically and empirically validate the interface between infrastructure delivery, economic growth and development. The political economy of infrastructure and service delivery in Nigeria was presented in chapter three of this work. The survey in this research presented in chapter five and further analysed in chapter six ascertains and examine the causes and effects of infrastructure and service failures in sub-Saharan Africa, taking Nigeria as a case study. However, the questionnaire was developed from facts gleaned from the literature review in chapter two. The current framework for infrastructure and service procurement in Nigeria was critically evaluated and the model for infrastructure blueprints was presented in chapter seven. Finally, the conclusion and recommendation for future work was presented in chapter eight. The thesis itself and four other academic papers (in Appendix B) presented at various conferences are expected to serve as original contributions to knowledge.

Chapter Two

Literature review on infrastructure delivery in sub-Saharan

Africa

2.0. Introduction

Infrastructure is a term for social over-head capital with subsequent potential for economies of scale and huge externalities (World Bank 2002; World Bank 1994). Economies of scale refers to the tendency for infrastructure to reduce the unit cost of production over a wide range, while huge externalities indicate the tendency for the effects of infrastructure to spill over from users to non-users. Infrastructure could also be defined as the capital stock which provides public goods and services with several outputs, ranging from production activities to quality of life, that permeate society (Yoshino and Nakahigashi 2000). In short, infrastructure provides the fundamental supporting framework or structure that enables any organization, system, city, state or country to function (Ostrom, et al. 1993). This framework includes physical infrastructure such as water supply, electricity, sanitation, housing, telecommunications, irrigation, drainage, accessible roads, railways, airports and ports. Facilities like markets, hospital and schools are classified as social infrastructure.

For clarity, the term “infrastructure delivery” or “provision”, refers to decisions made by collective choice mechanisms during the process of acquiring goods, works and services which may lead to the award and actual execution of contracts (Ostrom, et al. 1993). These decisions cover the type of goods, works and services to be provided by a designated group of people, the quantity supplied, the quality, stability and maintenance of goods, works and services to be provided, the degree to which private activities related to these goods and services are to be regulated, how to arrange for the production and financing of these goods works and services, and how to monitor the performance of those who produce them. The term “production” refers to the more

technical process of transforming inputs into outputs in making a product, or in many cases in rendering services (Ostrom, et al. 1993).

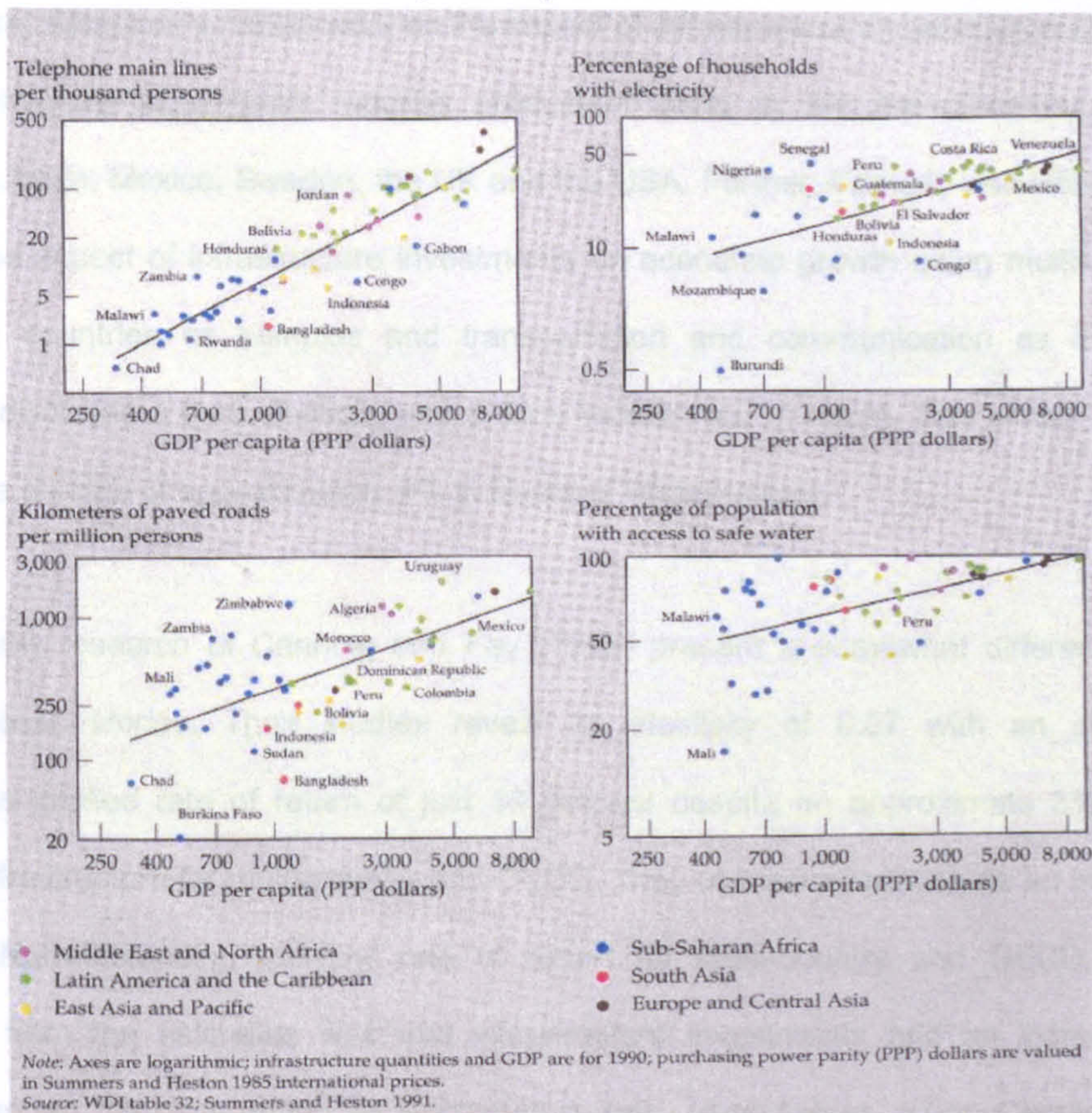
Once a government department or public enterprise or other collective decision making body decides to provide a particular type of infrastructure, it must then consider the relative advantages of inhouse production and outsourcing. If the latter alternative is chosen, governmental and non-governmental units might contract with private or perhaps public agencies to construct facility and even to operate it. On the other hand, governmental units could mandate other enterprises to produce the service or encourage its production by offering them financial incentives.

However, in the course of Ostrom's study of the sustainability of the physical infrastructure of developing countries, it was discovered that the economic and socio-political structures of any system cannot be sustained effectively if they are not supported by a sustainable physical infrastructure (Ostrom et al., 1993). Therefore, infrastructure has a profound impact on the economic development, production and consumption capacity of a nation. In this regard, this thesis focuses on the dearth of infrastructure in sub-Saharan Africa and the consequent implications for sustainable economic growth and development. The effects of this dearth are magnified by the inability to maintain the very sparse infrastructure that does exist and replicate it to areas of disamenity. In other words, existing infrastructure delivery models may have failed. As a result, the need for an alternative and sustainable infrastructure delivery model is overwhelming.

2.1. Impact of infrastructure on economic development

World Bank studies confirm that infrastructure growth and development has witnessed tremendous expansion over the years (World Bank 1994). In particular, the percentage of telecommunications, sanitation, water supply and power services to households and businesses have increased dramatically globally (see Fig. 1 in Appendix A). This development notwithstanding, the distribution of infrastructure throughout regions is to the disadvantage of low income countries, and the existence of a strong correlation between economic growth and infrastructure was revealed when the per capita provision of infrastructure services was compared across regions in a World Bank study (1994). This showed that the greatest improvement in infrastructure has been in East Asia, with sub-Saharan Africa recording the least (see Figure 2.1 in the next page). As implied above, this is because the average GDP per capita for sub-Saharan Africa ranks lowest in comparison to other regions; this is clearly shown in the regression analysis graphs of Figure 2.1. Though the four graphs were all linear, however, the association or correlation is evidence from their various intercepts and slopes; a stronger association or correlation is witnessed between available income levels or GDP per capita and telephone main lines per thousand persons and kilometres of paved roads per million persons. Thus, these regression analysis representations in Figure 2.1 reveal the existence of a direct relationship between income levels and availability of infrastructure. However, what remains unknown at this stage is whether the availability of infrastructure is responsible for economic growth or vice versa. This raises the question of whether it could justifiably be said, in view of the increase in number of infrastructures over the years, that there are concomitant improvements in the stability of infrastructure services. While both questions are hypothetical, the former is completely outside realm of this investigation. Indeed, the significance of infrastructure on economic growth and development has been theoretically and empirically validated in the works of Aschauer (1989), Easterley and Ravelo (1993), Pinnoi (1994), Buffie (1995), Barro (1997), Looney (1997), Canning (1998), Otto and Voss (1998), Rioja (1999), Delorme, Thompson et al. (1999), and Sagales-Roca and Pereira (2001)

Figure 2.1: Per capita availability of major infrastructure and income levels



Aschauer (1989), using non-military public capital in the United States of America, revealed an elasticity of 0.39. Elasticity measures the responsiveness of one variable in response to another, which means the ratio of output percentage change to percentage change in the level of infrastructure. He discovered that the impact of infrastructure investments on economic growth in the USA represents a high rate of return of almost 60% with about 1.5% change in levels of infrastructure. Aschauer's (1989) findings are further corroborated by Munnell (1990), who reveals a 0.34 elasticity and an implied rate of return from infrastructure investment of about 60%. Thus, with an elasticity of 0.34 and an investment return of 60%, it follows from these figures that the level of infrastructural change is certainly less than 2%. However, Munnell only measures non-military public capital in the USA.

Furthermore, Aschauer's (1993) work on the impact of infrastructure on production costs reveals that infrastructure significantly reduces production costs in the manufacturing sectors in Germany, Japan, Mexico, Sweden, the UK and the USA. Further, Easterly and Rebelo's (1993) study of the impact of infrastructure investments on economic growth using multi-country and developing countries as samples and transportation and communication as infrastructure measures disclosed a 0.16 elasticity and a 63% implied rate of return. This simply implies that there was a change of approximately 4% in levels of infrastructure.

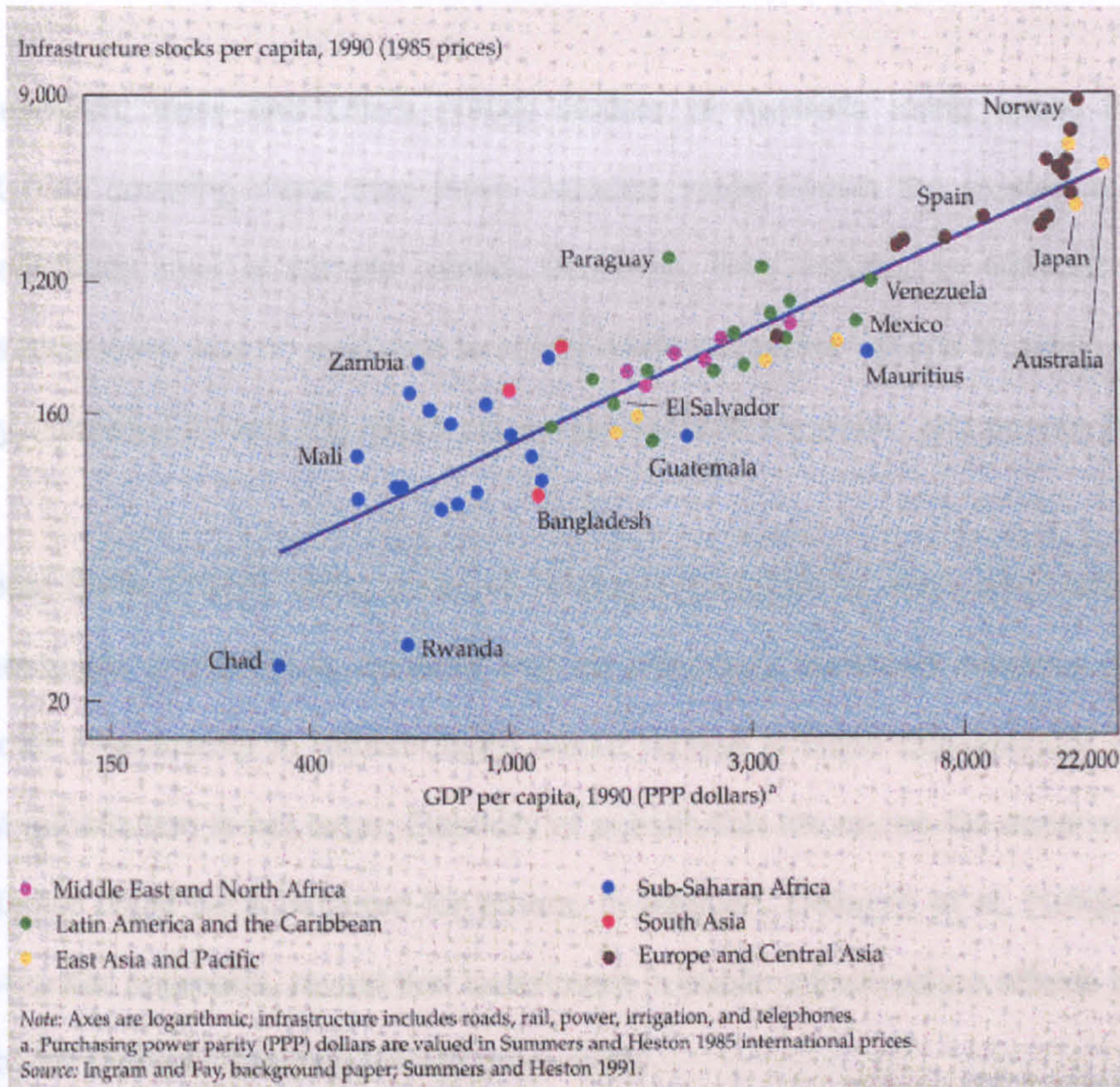
However, the research of Canning and Fay (1993) present a somewhat different picture to these success stories. Their studies reveal an elasticity of 0.07 with an infrastructure investments implied rate of return of just 19 percent despite an approximate 3% change in levels of infrastructure for multi-country and OECD. They use transportation as an infrastructure measure. Notwithstanding the low rate of return for multi-country and OECD, what was significant from the estimates was that infrastructure investments had an incremental and positive, though marginal, effect on economic growth. Nonetheless, when Canning and Fay (1993) carried out a similar study on multi-country and developing countries, an elasticity of 0.07 with an incremental return rate for infrastructure investments of over 95% was achieved. Invariably, a change of approximately 14% in the level of infrastructure resulted in this huge percent investment incremental return.

However, (Canning 1998) was able to establish, from a database of world infrastructure stock from 1950-1995, that there is a significant, stable and enduring relationship between infrastructure and economic growth. Additionally, the stock of infrastructure across countries was shown to vary significantly with population size, income level and geography. Using a number of telephone main lines, he was able to establish that infrastructure has a significant impact on per capita growth rate.

Canning's work is supported by the findings of the World Bank (1994). These show that as a country's income grows the amount and quality of infrastructure required also increases. This

conclusion is based on the findings of the World Bank's unit income elasticity for the demand for infrastructure. This implies a one-to-one relationship between infrastructure and gross domestic income – i.e. a 1% increase in the stock of infrastructure is associated with a 1% increase in gross domestic product across all countries (World Bank, 1994 – see Figure 2.2 below).

Figure 2.2 Income growth and infrastructure stock per capita



However, most of the work on the likely impact of infrastructure on the economy has been based on the experience of developed countries, with very little work on their developing counterparts. One exception is the work of Yoshino and Nakahigashi (2000). Their studies reveal that, apart from the direct impact on production and consumption capacity, infrastructure also confers huge indirect benefits by bridging income disparities through offering income and economic opportunities.

In another study carried out by Sagales-Roca and Pereira (2001) on infrastructure performance in Spain, reveal a positive crowding in of private inputs from public capital accumulation that had led to an encouraging level of private output. They argued that one peseta invested in public capital generates in the long term a return of as much as 5.5 pesetas of private outputs. In particular, their findings revealed also that infrastructure investments made services more capital intensive and the manufacturing sector more labour intensive.

In other research, Voss and Otto's (1998) studies of Australia using public infrastructure investment data covering more than three decades made known the existence of an inter-temporal efficiency over a sample period. However, they argued, in contrast to previous researches, that there was no evidence to substantiate excessive returns to public investments; rather, they estimated a mere 9% return per annum for both the public and private investments.

Nevertheless, Buffie (1995), using a simple foresight model in his work on public investment, private investment and inflation, contend that an effectively balanced increase of public and private sector investments in infrastructure would reduce inflation considerably provided the elasticity of substitution is not large. Elasticity of substitution measures the ease with which the changing factor could be substituted for others. In addition, Delorme et al. (1999), applying a stochastic-frontier approach, reveal that investment in public infrastructure affects the economy positively by its indirect impact on private productivity.

Furthermore, Pinnoi (1995) shows, from a translog production function with different types of services from public infrastructure for four census regions and four industries, that services from infrastructure like water supply and sanitation were productive factors of private production throughout the world. He argued however, that variations in research findings on the impact of infrastructure on economic growth had been predicated on the fact that different regions and industries react differently to various types of public infrastructure.

Though no consensus has been achieved regarding the level of infrastructure impact on economic growth, many studies have confirmed that infrastructure investments have substantial impact on economic growth, and these impacts are usually greater than other forms of capital in any viable economy. This development has had a tremendous effect on the quantum of resource allocation for infrastructure investments and policies worldwide (World Bank, 1994).

Therefore, one could argue that one of the prerequisites for viable and effective economic development and growth for any nation is undeniably the state: its quality, its quantity and the functionality of the infrastructure available to it. Moreover, it has been argued that the extent of economic problems in sub-Saharan Africa could also be demonstrated by relating the degree of its inadequate infrastructure to its chronically weak institutions (Hart 2001; Ebohon et al. 2002).

2.2. Effects of infrastructure deficiency in the developing world

The extent of infrastructure deficiency in the developing world is exemplified by the fact that the majority of the people in developing countries lack access to basic infrastructural services. For example, it has been reported that about 1.2 billion people currently lack access to safe potable water, making them vulnerable to water-borne diseases; 2.4 billion people lack adequate sanitation, thereby compromising their health and well-being (World Bank Group 2003). Also, about 900 million rural dwellers in developing countries live without adequate roads to markets, jobs and clinics (World Bank Group 2003).

Furthermore, an estimated 2.5 billion people remain without access to modern energy supplies, often meaning no electricity and total reliance on traditional fuel for heating and cooking, with major implications for respiratory illness (World Bank Group 2003). For example, an estimated 500,000 women and children die in India each year due to indoor air pollution-related diseases because of the use of traditional biomass fuels (World Bank Group 2003). These recurring examples call for more improvement and investment in infrastructure and service delivery throughout the developing world. To achieve this, however, a critical examination of the pattern

of investment in infrastructure in the developing world over the last decade, providing a perspective for a study of sub-Saharan Africa, would be vital.

2.2.1. Infrastructure investments pattern in sub-Saharan Africa

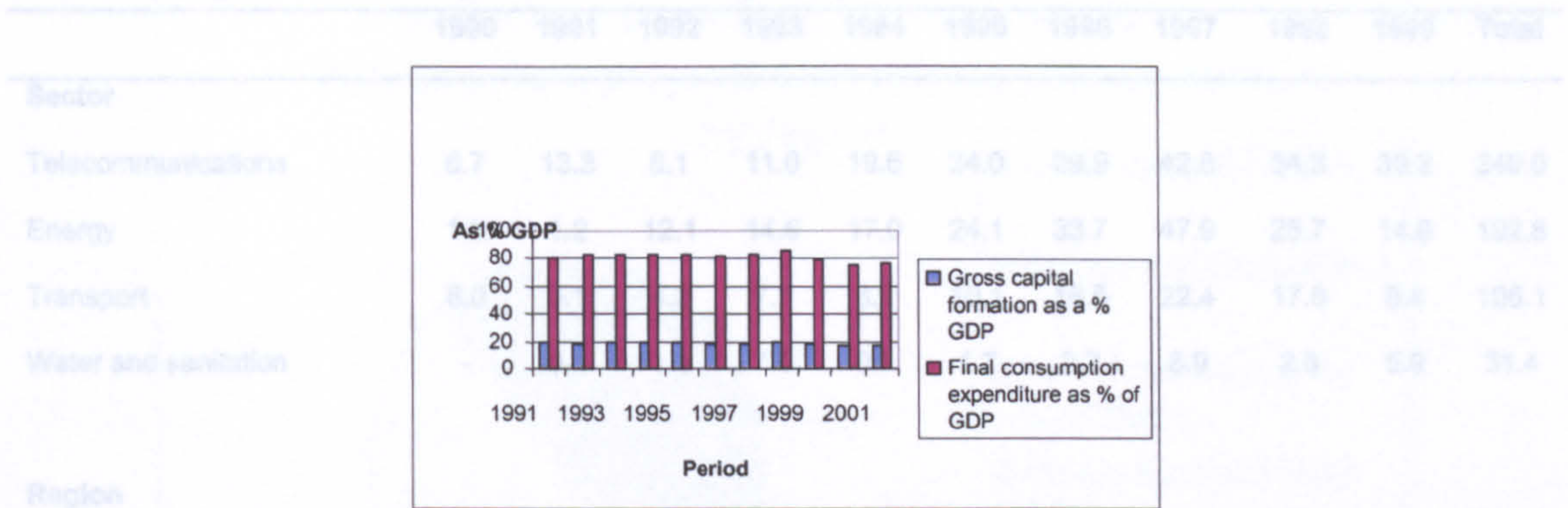
Data in Table 2.2.1 and the subsequent bar chart plot in Figure 2.2.1 collected from International Financial Statistics (2003) shows sub-Saharan African gross capital formation and final consumption expenditure over time. The table and chart show a very high consumption capacity when compared to investments in the region. This level of consumption certainly reflects the very high demand for infrastructure; this in turn is eventually transformed into the call for new investments. The high levels of these investments as fixed capital formation are subdivided into public and private investment.

Table 2.2.1: Gross capital formation and final consumption expenditure (1991-2001) for sub-Saharan Africa

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Gross capital Formation as a % GDP	19.6	18.8	19.1	20	19.2	18.4	18.1	19.1	18.4	17.1	17.5
Final consumption expenditure as % of GDP	80.6	83.3	83.7	83.6	83.2	82.1	82.7	85.6	79.2	75.2	77.1

Source: International Financial statistics (2003)

Figure 2.2.1.1: Sub-Saharan African gross capital formation and final consumption expenditure over time



A further study on private and public investments carried out by Omoregie and Ebohon (2005) applied a multiple regression analysis tool to the: per capita GDP annual growth rate, gross public capita formation and gross private capita formation of all sub-Saharan African countries. They were effectively able to quantitatively capture the relationship between gross domestic product (GDP) and gross public capita formation on the one hand and gross private capita

formation on the other. The findings from this study showed that sub-Saharan African gross private capital formation was seven times greater than public gross capital formation. These findings give credence to the fact that irrespective of private sector dominance in the area of investments, the inadequate infrastructure service delivery in the region must be due to investment and infrastructure supply not meeting demand and other extraneous factors. This

Figure 2.2.1.2: A plot of private sector infrastructure investment for developing further reinforces the correlation between infrastructure service stability and infrastructure supply. The table below from a World Bank study (2002) further elucidates this point.

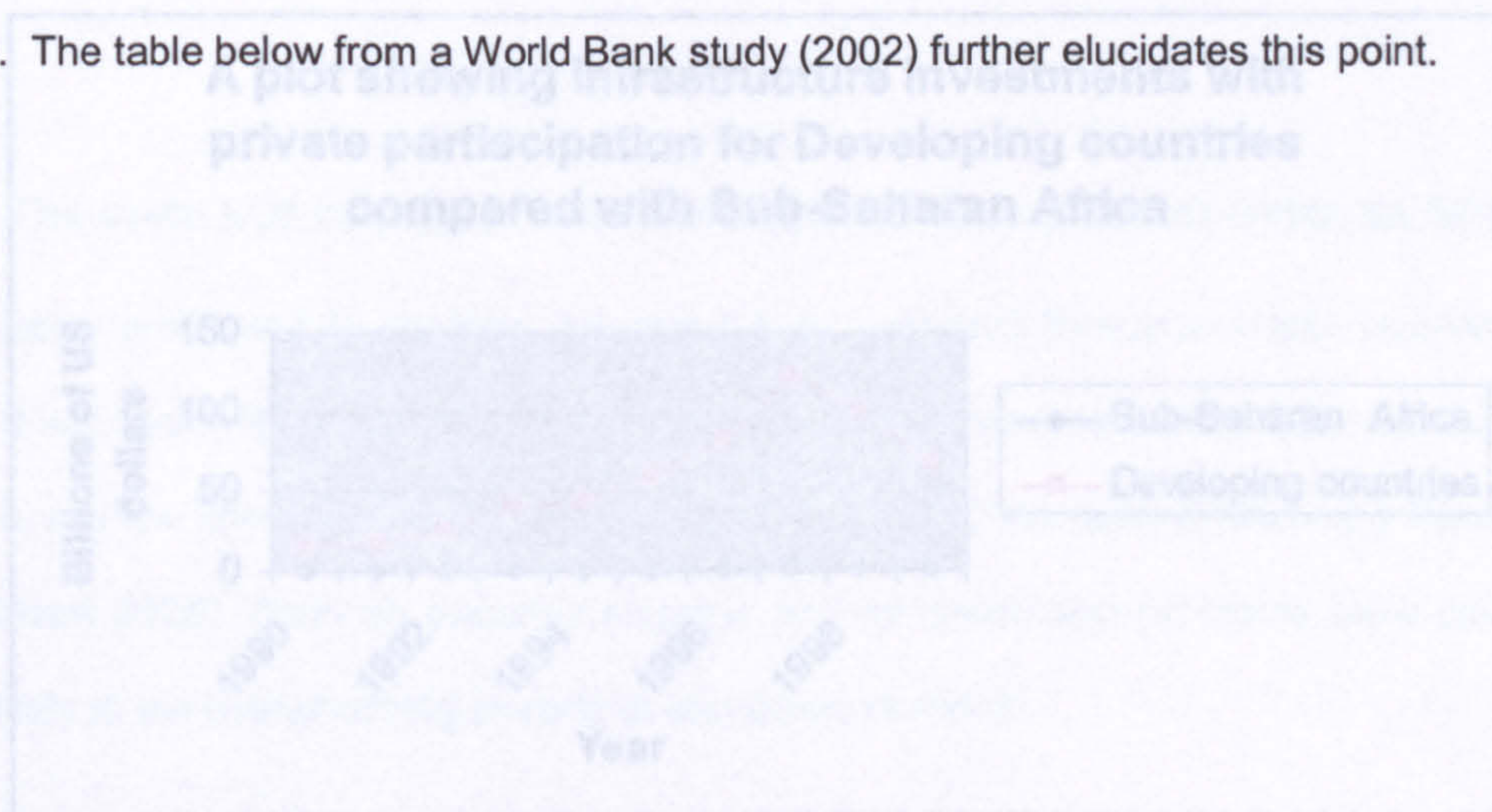


Table 2.2.1.2: Investment in infrastructure projects with private participation in developing countries by sector and region (1990-99)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Sector											
Telecommunications	6.7	13.3	8.1	11.0	19.6	24.0	29.9	42.8	54.3	39.2	249.0
Energy	1.6	1.2	12.1	14.6	17.0	24.1	33.7	47.9	25.7	14.9	192.8
Transport	8.0	3.1	4.2	7.7	8.2	10.1	16.5	22.4	17.6	8.4	106.1
Water and sanitation	-	0.1	1.9	7.5	0.7	1.7	2.2	8.9	2.6	5.9	31.4
Region											
East Asia and Pacific	2.6	4.1	8.9	16.2	17.7	23.4	33.4	38.8	9.5	14.1	168.6
Europe and central Asia	0.1	0.3	1.3	1.5	3.9	8.6	11.6	15.1	11.5	8.7	62.5
Latin America and Caribbean	13.2	12.6	15.8	18.5	18.9	19.4	28.8	51.1	71.0	36.3	285.6
Middle East and North Africa	0.0	-	0.0	3.4	0.3	0.1	0.4	5.3	3.5	2.4	15.3
South Asia	0.3	0.8	0.1	1.3	4.0	7.6	6.1	7.1	2.3	4.0	33.5
Sub-Saharan Africa	0.1	-	0.1	0.0	0.7	0.8	2.1	4.5	2.4	2.9	13.6
Total	16.3	17.8	26.1	40.9	45.5	59.9	82.3	121.9	100.2	68.5	579.3

Note: 0.0 means zero or less than half the unit shown (Billions of US dollars).

Source: World Bank, PPI Project database

Figure 2.2.1.2: A plot of private sector infrastructure investment for developing countries and sub-Saharan Africa

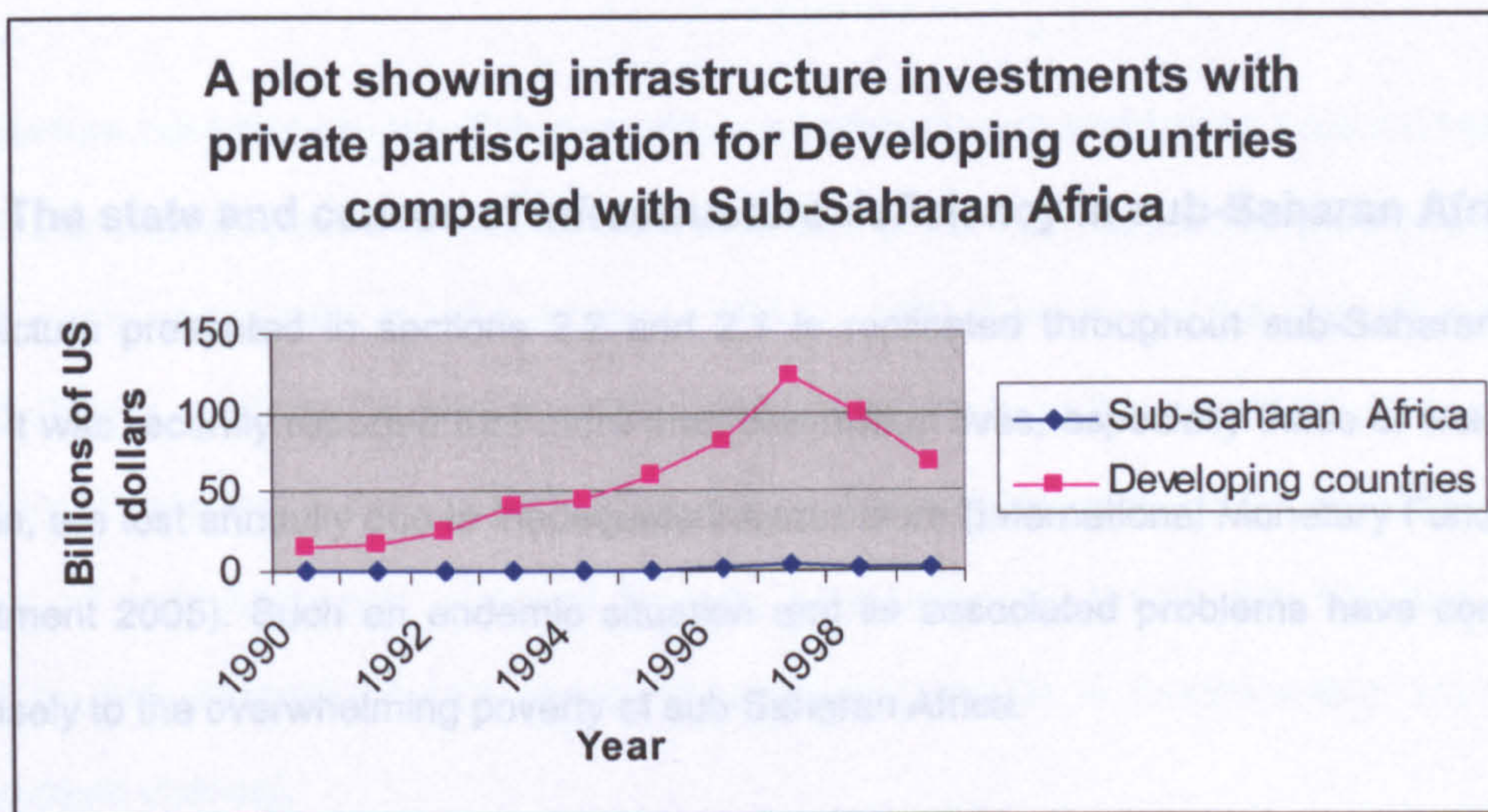
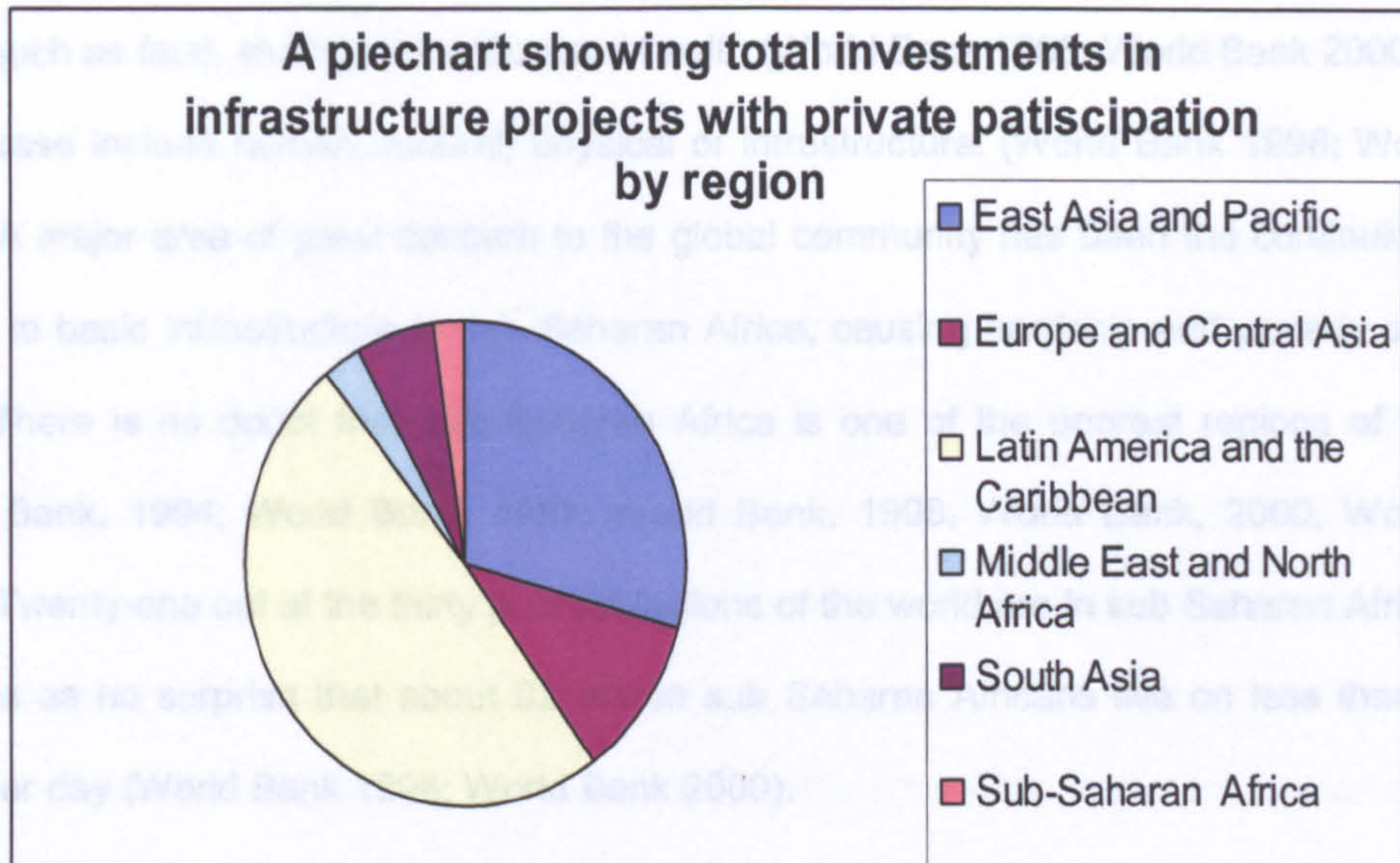


Figure 2.2.1.3: Private sector investment in infrastructure by region



From the Table 2.2.1.2 and Figures 2.2.1.2 and 2.2.1.3, it is evident that sub-Saharan Africa has the least investment in infrastructure globally, having a contribution of just 2.3% of the total infrastructure investment stocks of the six developing regions. If the population of a region is anything to go by, the demand for infrastructure would be quite high. By implication, sub-Saharan Africa is actually investing far less in infrastructure compared to its capacity to consume infrastructure services. Notwithstanding the poor investment climate of sub-Saharan Africa's infrastructure, a broader understanding of the current state of infrastructure in the region is overwhelming.

2.2.2. The state and causes of infrastructure deficiency in sub-Saharan Africa.

This picture presented in sections 2.2 and 2.1 is replicated throughout sub-Saharan Africa, where it was recently reported that more than one million lives, especially those of women and children, are lost annually due to inadequate infrastructure (International Monetary Fund African Department 2005). Such an endemic situation and its associated problems have contributed immensely to the overwhelming poverty of sub-Saharan Africa.

“Poverty” has been interpreted broadly to include lack of income and assets to meet basic needs such as food, shelter, education and health (World Bank 1998; World Bank 2000). Assets in this case include human, natural, physical or infrastructural (World Bank 1998; World Bank 2000). A major area of great concern to the global community has been the continuing lack of access to basic infrastructure in sub Saharan Africa, causing hardship and poverty on a huge scale. There is no doubt that Sub-Saharan Africa is one of the poorest regions of the world (World Bank, 1994; World Bank, 1997; World Bank, 1998, World Bank, 2000, World Bank, 2004). Twenty-one out of the thirty poorest regions of the world are in sub Saharan Africa. Thus, it comes as no surprise that about 92 million sub Saharan Africans live on less than one US dollar per day (World Bank 1998; World Bank 2000).

The World Bank (1994) study has shown that in sub-Saharan Africa the vast majority of the population is engaged in peasant agriculture and lack access to basic infrastructure. This shows the need for rural roads to link farms to markets and other infrastructure facilities and services such as rural schools, rural health centres, irrigation works, storage facilities and decent but affordable shelter, electricity, water supply and sanitation. Irrigation facilities are conspicuous by their absence, with the result that well over 90% of subsistence agriculture in sub-Saharan Africa is rain-fed (World Bank, 1994; Zawdie and Langford, 2001). The absence of rural facilities and the lack of social and economic opportunities has been a major factor contributing to rural-urban migration (World Bank, 1994).

Infrastructure deficiency in sub-Saharan Africa is further aggravated by the region’s heavy debt burden. For example, external debt as a share of total gross national product (GNP) was at 82% in 1994 compared to 36% in Latin America (USAID 1996). This means that only 18 per cent of current GDP is available to fulfil all the competing demands of the economy. As is often the case, this 18 percent is consumed in recurrent expenditure, leaving capital expenditure to the vagaries of multilateral and unilateral financial assistance. No doubt, this has had a major impact on sub-Saharan Africa’s construction capacity, which is fundamentally important to infrastructure delivery.

Although no direct link has been established, it can be safely argued that inadequate infrastructure in most of sub-Saharan Africa may explain the lack of basic infrastructural services. Indeed, Awotona (1987), Obudho (1997), Onibokun et al. (1989), Ogu (1999), Piermay (1997), Attahi (1991), Dubresson (1997) and Awortwi (2003) have all indicated a serious deterioration in service infrastructure in sub-Saharan Africa – for instance, no real achievement in the provision of piped water, central sewerage and drainage systems, roads, electricity, telephone services and housing (Awortwi 2003; Attahi 1991). Urban and rural roads are deteriorating rapidly during the rainy seasons; housing is overcrowded, the majority of the people live in un-serviced plots, domestic and industrial sewerage is still being discharged into ditches and open drains leading to hazardous emissions, and choked drains have resulted in floods in many towns and cities, while the electricity and water supply is erratic (Awortwi, 2003; Awotona, 1987). Refuse continues to be dumped at random and, where bins are provided, they are seldom emptied, with the result that they overflow and the rubbish forms unsightly heaps with severe health implications in most areas of villages, towns and cities (Awotona 1987).

In addition to these unsanitary conditions, serious health implications can also arise from the lack of other infrastructural services, for example, the quality and adequacy of the water and electrical supply, choked drains resulting in flooding, hazardous emissions from industrial wastes, accident risk from poor transportation, overcrowded housing and poor irrigation schemes (Obodho 1997; Ogu 1999). The figure below reveals a practical example in Nigeria. Therefore, the need to examine the extent to which infrastructure quality affects the stability of infrastructure services is also important.

Figure 2.2.2.1: A typical sanitary condition of a Market (Edaiken) in Benin City (2004)



It is important to articulate the reasons that have been given for the state of the infrastructure in sub-Saharan Africa as discussed so far. These reasons include misallocated investments, inadequate maintenance, non-responsiveness to user,, waste and inefficiency (World Bank, 1994; IMF, 2003): Misallocation of investments results when too much attention is paid to new investment and not enough to maintenance, and too much attention to low priority projects with less attention for essential services.

Furthermore, inadequate maintenance shortens the infrastructural life span, increases expenditure for new infrastructure and creates low capacity utilisation. For example, World Bank assisted projects on maintenance in sub-Saharan Africa revealed that a reconstruction cost of US\$45 billion would have been saved if timely maintenance expenditure of about US\$12 billion were invested. In another development, the World Bank (1994) revealed that power systems in sub-Saharan Africa work on average at less than 60 percent of their installed capacity, and water supply systems at less than 70 percent. Poor maintenance reduces service quality and also increases users' costs due to the installation of some back up facilities such as back up generators, water storage tanks and private wells. It is therefore imperative to investigate how and to what extent inadequate maintenance and the response rate to this bears on infrastructure service stability.

Technical inefficiency and outright waste have held back infrastructure and service delivery in sub-Saharan Africa. For example, outdated power plants consume more fuel, and transmission and distribution losses are two to four times greater than plants in power systems operating at best practice levels. Moreover, port facilities on average in sub-Saharan Africa are 60 percent less efficient in speed compared to more efficient ports in developed countries (World Bank 2000). Another aspect of inefficiency is misallocation of labour such as overstaffing (World Bank, 1994). Thus, one obvious implication on users of infrastructure emanating from wastage and inefficiency is the resultant high cost of infrastructure services. Recent studies have shown that poor users pay higher prices and often consume fewer infrastructure services than the more wealthy (World Bank, 2002; World Bank, 2000; World Bank, 1994; IMF, 2003). Hence, the need for infrastructure users to be well positioned in order to make their demands felt in the areas of planning and operation of new infrastructure investments.

In order for this to happen, there is need for an effective infrastructure service delivery within a market structure (Ostrom, 1996; World Bank, 2002). In a market structure, one dominating characteristic is competition, which is evidently absent in most of sub-Saharan Africa's infrastructure service delivery (World Bank, 1994). This is because most infrastructure services in sub-Saharan Africa are provided by government departments or centrally managed monopolistic public enterprises.

Almost all irrigation, water supply, sanitation, transport, power supply and drainage in sub-Saharan Africa is provided by the public sector (Ostrom, 1996; World Bank, 1994). Until a few years ago, telephone services in most of sub-Saharan Africa had been strict monopolies of the public sector's post, telephone and telegraph enterprises. Consequently, advantages that could come from the pressure competition could exert on all parties for maximum efficiency had been lacking.

In order to meet the challenges that could arise from a competitive climate in an effective market structure; there is need for some form of managerial and financial autonomy for those charged with the responsibility for delivering infrastructure services (Ajanlekoko, 2002; Akora, 2002; Olomola, 2002; World Bank, 2002; World Bank, 1994). Those charged with such responsibility in the public sector are often engaged with objectives completely at variance with the primary functions of efficient delivery of high quality infrastructure services. In addition, they are sometimes compelled to deliver services far below cost – i.e. they are not allowed to adjust prices for inflation (Independent policy group 2003; Alexandra 2002; Nwoye 2002).

Lack of financial and managerial autonomy notwithstanding, public providers (i.e. managers of public infrastructure services in sub-Saharan Africa) are rarely held accountable for their actions (IMF, 2003; Shafik, 2002; Wolfensohn, 2002; Hussain, 1999; Kessides, 1999; World Trade Organization, 1998; Schubeler, 1996). Thus, their inefficiency is occasionally compensated for by budgetary transfers rather than outright disapproval (Fischer et al., 2003). It is common knowledge that corruption thrives in the absence of transparency and accountability. Though accountability is essential if infrastructure service delivery is to be run purely on commercial principles, an effective cost recovery strategy is nonetheless vital.

Effective cost recovery for infrastructure and service provision in the developing world, most especially sub-Saharan Africa, has been very poor (Ostrom et al., 1993; Ostrom 1996; World Bank, 2002). This is due basically to the fact that infrastructures in the region are not being seen as service industries that provides goods that respond to consumer demands. Such commercial orientation is at variance with the situation currently existing in most public sector utilities or government departments. These state owned departments suffer from multiple and conflicting objectives and inadequate accounting for costs which put little emphasis on revenues collected and quality of service delivered (World Bank, 1994). For example, governments in sub-Saharan Africa are fond of siphoning revenues from infrastructures like telecommunications, power supply and water supply for other uses, leaving these sectors under funded (World Bank, 1994; World Bank 1992).

The lack of focused and explicit objectives has its roots in inconsistent government policies on infrastructure, policies which vary across the region (Dixon 2000; National integrity system 2004). World Bank (2002) studies have also revealed that inefficient infrastructure provision and poor infrastructure policies absorb scarce fiscal resources and damage microeconomic stability, because prices often fall below cost.

Furthermore, the lack of environmental consideration in policies that affect infrastructure in sub-Saharan Africa has contributed greatly to infrastructure failures in the region (Dixon 2000; Kubeyinje and Neziyanya 1999; Obadina 1999; Ostrom 1993). World Bank studies have shown that political trends in many low income countries towards democratization, pluralism and decentralization have engendered a concern for finding more affordable and environmentally friendly solutions to infrastructure failures. This trend has increase the need for greater commitment in consultation with local communities, the poor and groups affected by environmental factors (World Bank, 1994).

However, the need for consultation on environmental issues as it affects infrastructure provision has become imperative in sub-Saharan Africa due to the negative impact of the existing infrastructure on the environment. For example, some multilateral organisations are of the view that there are highly visible effects of some large-scale infrastructure projects such as dams, roads, power stations, crude oil drill, reservoirs in sensitive ecological areas (Dixon, 2000). Equally serious and more pervasive is the damage to the environment because of a failure to control unnecessary emissions, and wasteful consumption of infrastructure services. This is due in particular to under-pricing of power, vehicle fuels, and water for irrigation and municipal uses to outright maintenance neglect (Alexander, 1999; Dixon, 2000; World Bank, 1994).

Inadequate maintenance as previously explained has being responsible for large-scale energy-related pollution, as witnessed in power generation, transportation, handling of hazardous

cargos and inappropriate disposal of waste from ships, port dredging, unregulated and badly designed municipal water and sanitation infrastructure (World Bank, 1994; World Bank, 1992; Dixon, 2000). Analysis of the causes of infrastructure failures reveals that maintenance is not just a major problem of its own but also a causal factor for other variables contributing to infrastructure failures. Studies have shown that existing institutions for addressing this and other problems have been unsuccessful in sub-Saharan Africa and thus the need for effective and functional institutions (Ebohon et al., 2003; World Bank, 2002, Ostrom et al, 1996; Ostrom et al, 1993; World Bank, 1994, National integrity systems 2004).

2.2.3. The imperatives of institutions in infrastructure and service delivery in sub-Saharan Africa.

Institutions could be simply defined as rules, enforcement mechanisms and organisations (World Bank, 2002). In his detailed work on the relevance of institutions in service delivery, North (1991) perceived institutions as humanly devised constraints that outline human interactions; as a consequence they structure incentives in human exchange, be they political, social or economic. Moreover, institutional change has been described as being a way of shaping societal evolution, and thus as the means to understand and visualise the spectrum of historical change (North, 1991).

It follows that the lack of such an understanding underpinning the significance of appropriate and supportive institutions is one of the major causes of infrastructure and service delivery failures in the sub-Saharan Africa (Ebohon et al., 2003; World Bank, 2002, Ostrom et al, 1996; Ostrom et al, 1993; World Bank, 1994).

The World Bank (1994) analysis of infrastructure coverage compared to infrastructure performance and gross domestic product across countries revealed a significant correlation between infrastructure coverage and gross domestic product (see Figure 2.2). However, there was no correlation between infrastructure coverage when compared with performance or

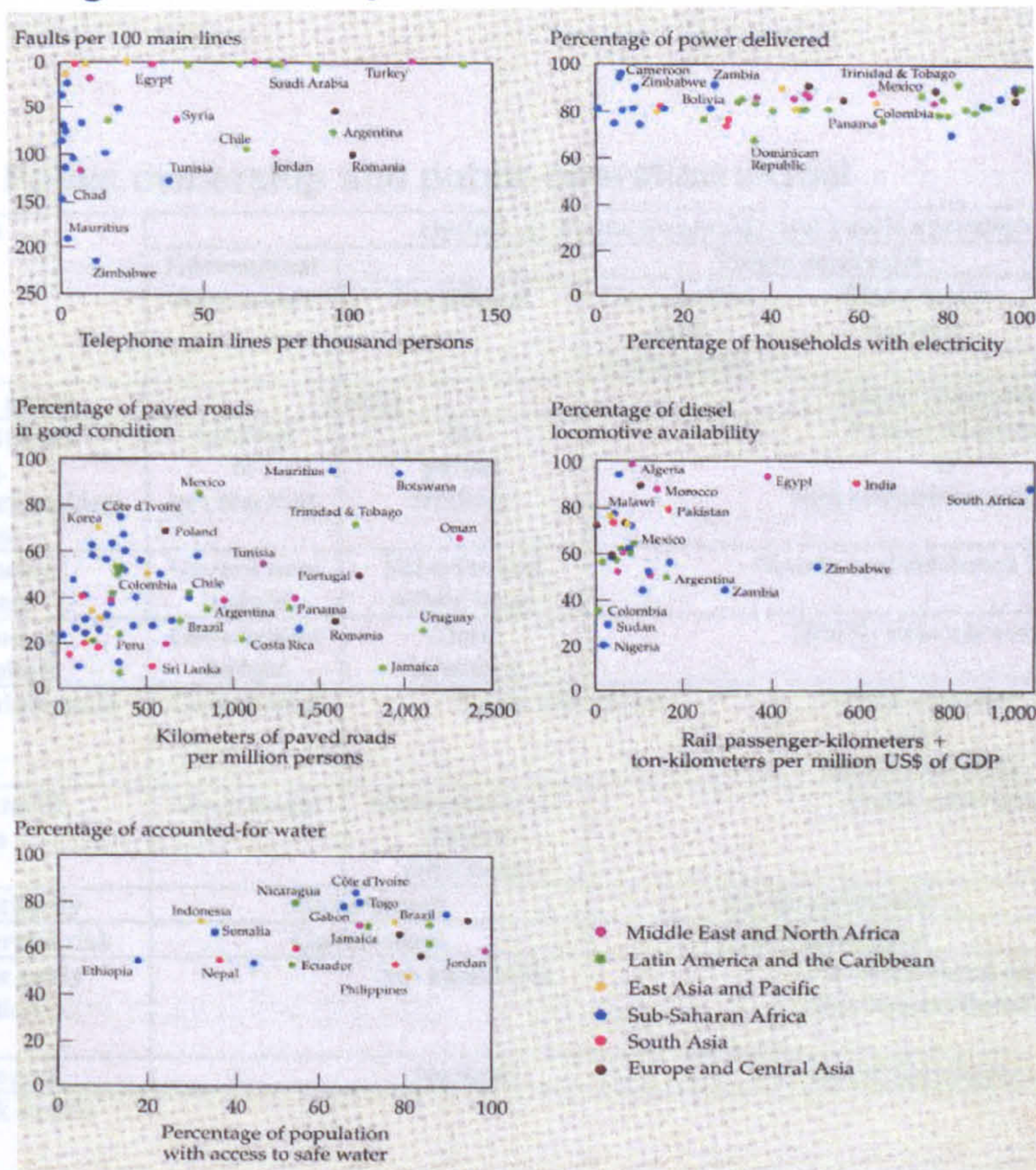
efficiency and effectiveness. In other words, infrastructure supply is not directly related to the quality of infrastructure services delivered.

Table 2.2.3.1: Country's infrastructure coverage and performance

Indicator	Low income Economies	Transition Economies	Middle income Economies	High growth Economies	OECD Economies
Coverage of infrastructure					
Main lines per thousand persons	3	95	73	122	475
Households with access to safe water (%)	47	95	76	86	99
Household with electricity (%)	21	85	62	61	98
Performance of infrastructure					
Diesel locomotives unavailable (%)	55	27	36	26	16
Unaccounted for water (%)	35	28	37	39	13
Paved roads not in good condition (%)	59	50	63	46	15
Power system losses (%)	22	14	17	13	7
Basic indicators					
GNP per capita, 1991 (US, dollars)	293	2,042	1,941	3,145	20,535
GNP per capita, average annual growth rate, 1980-91 (%)	-0.2	1	-0.6	5	2
Population average annual growth rate, 1980-91 (%)					
Urban	6	1	3	4	1
Total	3	0.3	2	2	05

Source: Appendix table A.1; WDI tables 1, 25, 31, 32

Figure 2.2.3.1: Efficient and effective delivery of infrastructure services and increased coverage or availability



From this table, it is apparent that coverage of services in the network is government dependent. Plots of coverage against performance in water, power, telecommunication, roads, and railway showed very little relationship between the two across a wide sample of low-income and middle-income countries (see Table 2.2.3.1 and Figure 2.2.3.1). Nonetheless, there was no close correlation between a country's efficiency of provision in one sector and its performance in another. The significance of these findings is an indication that the efficiency and effectiveness of infrastructure provision is never a function of economic growth and development but of the institutional environment, which often varies across sectors in individual countries. Hence, changes in the institutional environment can lead to improved performance notwithstanding levels of incomes and infrastructure coverage; this is true because in each sector, some lower income countries perform creditably well (World Bank, 2002, Ostrom et al, 1996; Ostrom et al, 1993).

Table 2.3.1: Public ownership and public operation model

Function	Option A: Public ownership and public operation				
	Government department	Public enterprise			
		Traditional	Corporative And commercial	With service contract	With management contract
Ownership of assets	Public		Public (majority)		
Sectoral investment, planning, Coordination, policy making, regulation	Internal to government	By parent ministry	Parent ministry or separate public authority		
Capital financing (fixed assets)	Government budget	Subsides and public loans	Mainly market-based financing		
Current financing (working capital)	Government budget	Main subsidies	Mainly internal revenues		
Operation and maintenance	Government	Public enterprise		Private operator and Specific services	Private operator
Collection of tariff revenues	Government	Government or Public enterprise	Public enterprise		
Managerial authority	Government		Public enterprise		Private operator
Bearer of commercial risk	Government		Public enterprise		Mainly public
Basis of private party Compensation	Not applicable			Fixed fee based on Services rendered	Based on services and results
Typical duration	No limit			Fewer than 5years	About 3-5years

Source: World Bank studies

From this table, it is apparent that ownership of assets in this option in government department and traditional public enterprise is 100 percent in the public sector. However, this cannot be said of the other types of public enterprise, given that majority asset though not all in the direction of the public. The implication of this structure is that the huge responsibilities of maintenance, operation, financing, policy making, planning and risk taking would be expected to be carried by the public sector or government.

The table also revealed, under the function of operation and maintenance, a temporal private sector involvement with the categories of public enterprise with service contract and public enterprise with management contract. This temporal involvement period is usually less than or equal to five years. Nevertheless, the temporal involvement of private contractors for specific services such as maintenance in public utilities generates experience that might gradually be extended to full operation by the private sector (World Bank, 1994). This gradual development

into full partnership is useful, but an understanding of how to realise useful achievements with this option is imperative.

Notable achievements from public infrastructure delivery have been centred on commercial principles and regulations which give managers control over operations and freedom from political interference, while the manager's accountability is often measured as spelt out in the performance agreements or the management contracts (Fischer et al. 2003, IMF 2003; World Bank 1994). Thus, subject to similar constraints as in private enterprise, successful public delivery strives through competition posed by private firms in the infrastructure market. Successes were achieved under this pattern by the water supply authorities in Togo and Botswana, highway authorities in Ghana and Sierra Leone and the restructured road agency in Tanzania (World Bank 1994).

In contrast, it is been argued that successes from this approach on many occasions are short-lived due to political and social interference in sub-Saharan Africa (Nwoye 2002; World Bank 1994). Moreover, Ostrom (1996) also criticises this model by arguing that centralisation of infrastructure and service delivery at the national level have actually kept municipalities and citizens from access to decision making responsibilities and resources. He goes on to say that citizens were themselves helpless at doing anything about their squalid conditions although they possessed skills and time that could have been applied towards a solution of the problems they faced.

However, it is further argued that public provision of social and physical infrastructure has choked the abilities of several governments in sub-Saharan Africa. For example, Akora (2002) argues that the governments within sub-Saharan Africa have more to do than they can handle, as they are in charge of education, defence, telecommunications, power supply, water supply, sanitation and drainage and irrigation schemes, with the onus of maintenance and operations resting solely on their shoulders. In consequence, suggested or existing options aimed at

supporting public provision are those of public-private partnership – i.e. public ownership and private provision or an outright private provision, or privatisation.

2.3.2. Option B: The public ownership and private operation option

This option is characteristically put into practice through lease and concession contracts by assigning full operation and maintenance, along with commercial risk and the responsibility of new investment in publicly owned infrastructure facilities, to the private sector. The following Figure 2.3.2 extracted from World Bank studies gives an insight into the processes and responsibilities within this option.

Table 2.3.2: Public ownership-private participation

Function	Option B: Public ownership and private operation	
	Leasing contract	Concession contract
Ownership of assets	Public (majority)	
Sectoral investment planning, Coordination, policymaking, Regulation	Public authority negotiated with Private operator	
Capital financing (fixed assets)	Public	Private operator
Current financing (working capital)	Private operator	
Operation and maintenance	Private operator	
Collection of tariff revenues	Private operator	
Managerial authority	Private operator	
Bearer of commercial risk	Private operator	
Basis of private party compensation	Based on results, net of fee paid by Operator for use of existing assets	
Typical duration	5-10 years	10-30 years

Source: World Bank studies

Thus, only through concession can the private operator typically assume all commercial risk of operation and shares in investment risk. Lease and concessions are working well for water supply in Guinea and port facilities in Ghana, and Nigeria is about to apply this option to electric power supply (Bureau of Public Enterprise 2002; World Bank 1994). Moreover, leases and concessions evidently consent to private sector management and financing without necessarily dismantling existing organizations or immediately crafting an exclusively new regulatory

framework. This system of concession is another form of partnership popularly referred to as public-private-partnership (PPP).

2.3.2.1. Public private partnerships (PPP)

This is a partnership between the public and private sectors for the purpose of designing, planning, financing, constructing, ownership and operating projects which would be regarded conventionally as falling within the responsibility of the public sector (Akintoye et al. 2006). PPP involves the sharing of responsibility between government and the private sector. For example design, construction, operation, maintenance, finance, and risks management skills are provided by the private sector while the government is responsible for strategic planning and industry structure, obtaining permits, customer's interface issues, regulation, community service obligations and sometimes payment on behalf of the service users (Australian council for Infrastructure development 2001; IRS 2003).

Simplistically, BOT arrangement is one where the private sector consortium, usually foreign, puts up sufficient funds and builds an infrastructure such as power supply whose output is later sold to a publicly owned infrastructure company of the same type in the host country for a franchised period of between 10 and 30 years before transfer to the host government for a token (David and Fernando, 1995; Haley, 1992).

Nevertheless, a slightly different explanation of BOT arrangement is given by Tam (1999), McCarthy and Tiong (1991): the arrangement grants the franchisee (project sponsor) the sole right to generate revenue from the infrastructure for a specified period, having already been responsible for financing, construction and operation of the facility. After the concession period, the infrastructure is transferred at no cost to the franchiser, which is usually the government.

Similarly, arrangement for build-own-operate-transfer (BOOT) involves a private developer financing, building, owning and operating a facility for a specified contract period. At the end of this period the facility is given back to the government (IRS, 2003; World Bank, 1994)

However, the BOO arrangement is different from the BOT/BOOT arrangement because the ownership of infrastructure remains in perpetuity with the private developer (David and Fernando, 1995). This arrangement subjects the developer to regulatory constraints on operations and pricing, and significant financial incentives for capital investment is derived from long term right of operation of the facility (IRS, 2003).

The notable advantages of BOT/BOOT/BOO arrangements from studies conducted by Tam (1995 and 1999) and David and Fernando (1995) shows that the host government need not spend public funds but still could excel in the provision of public facilities for its citizens, while the franchisee makes huge profits from a successful BOT/BOO/BOOT project. This arrangement also is fast becoming the most suitable interface for mobilizing private foreign capital while selling production output to a local monopoly purchaser, while BOO is a semblance of foreign investment into the manufacturing and service sector with a very huge capacity for risk.

However, researches have revealed that the requirements for effective and efficient delivery using BOT or BOO approaches are an experienced, equitable and simple governing body and structure, honest and incorruptible political regime, an intact contractual agreement, a structured set of BOT regulations and legal system, a large and reliable consortium, an experienced construction organisation and last (and most important), no political intervention (Tam, 1999; David and Fernando, 1995).

These factors above are not easily achieved, judging by the current situation in sub-Saharan Africa. Thus, the success of these approaches in sub-Saharan Africa on a long term appears doubtful. Other forms of public-private partnerships are as follows:

Operation and maintenance contract (O & M): this involves the private sector operating a publicly owned infrastructure subject to the terms of contract with the government.

In Traditional Design and Construction (TDC), the principal, notably the government, prepares the brief that sets out project requirements before the invitation of tenders for design and construction. Private developers produce designs in accordance with the brief and construct it for an agreed fee which may be fixed or subject to escalation.

Lease-develop-operate (LDO) involves the expansion and operation of an existing facility by a private developer who is granted a long-term lease. The private developer agrees to invest in infrastructure improvement, recover investments and make returns.

Build-own-maintain (BOM) are arrangements that involve the private sector developer building, owning and maintaining the infrastructure on lease from the government. The government operates it through sector staff.

2.3.3. Option C: The private ownership and private operation option

Private (including cooperative) ownership and private operation is attracted by new private firms in the infrastructure market and outright divestiture of public ownership (World Bank, 1994). This option is known for its simple nature and the tendency to flourish in a more competitive climate. Success stories have been recorded from most developing countries that have allowed telephone services and electricity to be competitively provided with little or no economic regulation beyond those applied to all private firms (World Bank, 1994).

However, considerable constraints to this model are prevalent in the developing world, most especially in sub-Saharan Africa. These include an inappropriate competitive climate or restructuring for business, practical and statutory barriers to private entry, and involvement and failing regulation that is incapable of protecting the public interest when competitive discipline is insufficient (World Bank, 2004; World Bank, 2002; World Bank, 1994).

2.3.4. Option D: Community and User provision

This option is most relevant for the delivery of municipal and local services that provide small-scale infrastructure such as village feeder roads, water supply, sanitation and small-scale power generation off the national grid. When those who contribute towards the cost are basically the primary beneficiaries, effective and efficient service is guaranteed. World Bank supported projects have shown that community self help schemes should be selected, designed, and implemented locally without outside imposition. Several authorities have supported this proposition.

This community demand-driven approach with variable levels of service has been successfully practiced in South Africa (Abbott 1996). In this model the emphasis is on developing the community in its widest sense rather than focusing on capacity building. The central issue is the community's right to choose, and this right is not governed solely by the criterion of affordability alone (Abbott, 1996; World Bank, 1994; World Bank, 2002). In this model, services are designed to meet specific needs and are not related to a structural hierarchy of incremental improvements with long-term implications (Abbott, 1996).

In another supporting instance, in his discussion on urban management policies in sub-Saharan Africa as reported by Abbot (1996), Mabogunje (1994) argues that governmental structures and processes imported into African countries by the various colonial administrations represent no more than the level of responses to the evolving free market economy of their home countries up to, at best, the beginning of the second world war. To overcome this particular hurdle entails a deeper appreciation of societal reality, and the recognition that it is quite easy to induce societal change by working through institutional forms like the community and by using provisions with which the majority of the people are familiar and to which they can relate. Mabogunje's proposal on institutional reforms for infrastructure provision in urban regeneration has given birth to several institutional concepts for infrastructure provision. Chief amongst these is the co-production concept by Ostrom (1996).

The co-production concept implies that citizens can play an active role in producing public goods and services of consequence to them (Ostrom 1996). The term co-production model was developed by Ostrom (1996) to describe the potential relationships that could exist between regular producers (street level police officers, schoolteachers and health workers) and clients who want to be transformed by the service into safer, better educated, or healthier persons. The realization is that the production of a service, as opposed to a good, is difficult without the active participation of those supposedly receiving the service (Ostrom 1996).

2.3.4. Option E: Bottom up participatory stakeholder partnership

Schubeler (1996) and Ogu (2002) have stressed that this “bottom-up” participatory stakeholder partnership represented the strategy capable of enlisting the financial, material resources and expertise of various sectors of the urban community towards the improvement of the urban environmental infrastructure.

In addition, international organizations such as UNDP, UNCHS and UN-Habitat / UNEP have subsequently initiated strategies to evolve a participatory approach to development and management of the urban environment (Ogu, 2000; UNDP, 1999; UNCH, 2003). One of these strategies is the sustainable city program SCP, which aims to provide municipal authorities and city stakeholders in the public, private and community sub-sector with an improved capacity for building in the urban environment and for planning and management (Ogu, 2000; UNDP, 1999; UNCH, 2003).

For example, the Sustainable Ibadan City Project (SIP) from SCP took a systematic approach to the mobilisation of a cross-section of institutions, community, public and private agencies, NGOs, professionals and business groups and multilateral organizations in Ibadan. Mobilization activities were initiated to ensure that these groups or institutions participated in the identification and prioritization of environmental problems, formulation of environmental improvement and development and execution of such strategies. It also provided an avenue for

the building of partnerships (Ogu, 2000). Thus, the project promoted public and private sector partnership approaches to the planning and management of the environment, emphasising the involvement of the communities in planning and management of their environment, including the identification of environmental problems, and the choice and strategy for environmental development (Ogu and Ogbuozobe 2001; Taiwo 1999). In spite of the excellent studies carried out by leading authorities on the relevance and types of institutions that underpin effective infrastructure and service delivery, there are still some arguments to the contrary.

For example, Van der Vaeren (2004) differs completely from the standpoint that the setting up and managing of the right public institutions are the sole key to infrastructure development. He argues that cultural factors are as important as institutional ones - sometimes even more important. Furthermore, he maintains that the efficiency of public institutions is dependent on or determined by its association with existing culture, because these institutions are run by people even more than by law or regulations. For example, in sub-Saharan Africa, researches have shown that cultural factors remain a major impediment to development, though existing practice appears effective by western standards.

2.4. An overview of some existing infrastructures in Nigeria

As at the year 2000, Nigeria had ten power plants with a total capacity of less than 6000MW, which supplied power to less than 50% of the populace; only 3000km of obsolete rail system with outdated locomotive engines; abandoned waterway systems; and 150,000km of abandoned road network due to cost escalation (Adenikinju, 2003; Adenikinju; 2000; Matthews; 2001).

2.4.1. Telecommunications services

The world has become smaller than ever because of the power of telecommunications (Alabi 1996; Arzika 2000; Chukwudebe 2001; Dajab 2001). Access to telecommunications is regarded

as a basic necessity for social and economic development. Apart from contributing directly to a nation's GDP, it enhances economic growth because everyone can have easy access to any part of the world instantly (Alabi 1996; Arzika 2000; Chukwudebe 2001; Dajab 2001; Matthews 2001). Improved telecommunications services not only support economic development and industrial growth, but also encourage foreign investment, create job opportunities, enhance national security and reduce the need to travel.

Sadly, however, after implementing the second phase of the United Nations transport and communications decade in Africa (1978-1988), Africa attained an average telephone penetration of only 0.72/100 as against the projected 1/100 penetration (Alabi, 1996; Matthews, 2001). To date, Nigeria has about one million lines connected with about a quarter of them idle, thus giving a teledensity :telephone penetration of less than one. Only two countries in sub-Saharan Africa have a teledensity greater than one. However, developed economies have a teledensity of up to 45 (Matthews 2001). World telecommunications infrastructure investment in 1992 amounted to US\$120 billion with a meagre 17% coming from developing nations, where it is most needed (Matthews, 2001).

2.4.3. Power supply

The Manufacturers Association of Nigeria, MAN (Ikeja branch) reported that in 1997, 65% of the working hours of the companies in Lagos were lost to power outages (Adenikinju, 2002). The average Nigerian firm experiences power failure or voltage fluctuations about seven times a week, each lasting about two hours without benefit of prior warning.

Due to this phenomenon, the cost of manufacturing has increased, and there is also a considerable increase in the cost of privately owned standby generators which are sources of environmental pollution (Adenikinju 2000; Matthews 2001; Ilori, Adeniyi et al. 2002; Adenikinju 2003).

At one time, Nigeria possessed one of the most advanced power systems in the whole of sub-Saharan Africa. Today, however, the system is plagued with problems ranging from vandalism and lack of maintenance to complete breakdown and the non-payment of three billion naira in debt owed by the consumers. The recent government policy on deregulation is a welcome idea. However, one implication of the existing electricity market structure is that Nigeria electric power authority(NEPA) has completely monopolised the huge economies of scale in the industry (Matthews 2001; Oruye 2001; Adenikinju 2003; Ikeme and Ebohon 2003). Adenikinju (2003) observed that 36% of installed capacity in NEPA is over twenty years old; 48% of NEPA installed capacity is over fifteen years old; and (c) 80% of installed capacity is over ten years old. Thus most of the machinery is in dire need of refurbishment.

2.4.4. Transportation

For economic growth, air, road, rail and water transport must be efficient, safe and customer friendly.

2.4.4.1. Air travel services

It has been shown that no parameter associated with air transport in Nigeria meets international standards, and local air transportation is not cheap, safe and efficient (Matthews 2001). An assessment of Nigerian Airways depicts a sad story of under-performance (BBC, 2003), and an excruciating debt burden and corruption – one example of which is the purported embezzlement of US\$400 million of unaccounted-for Nigerian Airways funds (BBC, 2003; Guardian, 2003). The national carrier has been comprehensively overhauled with a view to making it operate efficiently (BBC 2002; BBC 2001; Matthews 2001).

2.4.4.2. Road transportation

At least 70% of Nigerians and goods are transported by road (Matthews 2001). Within the last decade, this transport sector has nearly ground to a halt due to lack of maintenance of the

roads and vehicles, and travelling by road to some parts of the country has become a nightmare (Matthews, 2001). Some striking illustrations showing the damage resulting from inadequate maintenance in Nigeria are shown below:

Figure 2.4.4.2.1: A portion of the Ugbowo Benin-Lagos Highway (2005)



Figure 2.4.4.2.3: A typical access road in Owerri, Nigeria (2004)

Though majority of the households in Nigeria do not have a car, they still require access roads that are suitable for public transportation because many of the residents are traders who need to move goods within the areas close to where they live (Olanrewaju 2000).

Figure 2.4.4.2.2: A typical access road in Benin City, Nigeria (2004)



Figure 2.4.4.2.3: A typical access road in Owerrei, Nigeria (2004)

Figure 2.4.4.2.5: A failed portion of Uwanota road in Benin City (2005)



Figure 2.4.4.2.4: A typical access road in Effunrun, Nigeria (2004)



The causes of failure of Nigerian roads vary from poor maintenance to indiscriminate heavy axle loading resulting from the collapse of the railway system and the total abandonment of waterways which are best suited for bulk and heavy haulage (Matthews 2001). Good quality and safe roads are necessary for economic development, as they will ensure comfort and safety in travelling.

Figure 2.4.4.2.5: A failed portion of Uwasota road in Benin City (2005)



Figure 2.4.4.2.6: Part of a failed portion of a road in Ojota, Nigeria (2004)



The causes of failure of Nigerian roads vary from poor maintenance to inordinately heavy axle loading resulting from the collapse of the railway system and the total abandonment of waterways which are best suited for bulk and heavy haulage (Matthews 2001). Good quality roads are necessary for economic development, as they will ensure comfort and safety in travelling.

2.4.4.3. Rail transport

One of the cheapest means of transportation in Nigeria, with large carrying capacities, is rail. This means of transportation was neglected during the last decade, bringing high axle load pressures to bear on the highways, resulting in the rapid deterioration of road network as outlined above (Matthews, 2001). With the present state of development in Nigeria, it has been suggested that three important cities in the nation ought to be operating metro rail systems. The building of new railroads can be done by direct labour, considering the abundant human resources unemployed in the nation (Matthews, 2001). The Indian government built most of its railroads through direct labour or joint venture operations, and the slide below reveals how the first railway was built through by this means.

Figure 2.4.4.3: Labour intensive construction of the first Railroad in Nigeria



Source: unknown

Furthermore, Matthews (2001) suggested that the concrete sleepers for railroads can be contracted out to local engineering contractors, and the rolling stock manufactured in Ajaokuta steelworks instead of patronizing foreign steel companies. This strategy will ensure sustainability: maintenance can easily be carried out since spares will be locally available.

2.4.5. Water supply

In Nigeria, fewer than 40% of the population are provided with adequate potable water. For economic development, an adequate potable water supply should be available in every town in the country. The national per capita water consumption is still below the WHO specification of as least 20 litres per day (Matthews, 2001). BBC (2005) reported that United Nations water experts were of the view that the quality of water supplied to millions of Nigerians was below standard and that majority of the population has no access to potable water. The figure below is a typical example of a Lagos resident seriously in search of water.

**DIAGRAM ON THIS
PAGE EXCLUDED
UNDER INSTRUCTION
FROM THE
UNIVERSITY**

2.4.6. Housing

In the fifties, about 10.6% of the total population in Nigeria, lived in the cities and this significantly increased with increase in population to 19.1% in 1963, 24.5% in 1985 and 30% in the nineties (Ajanlekoko 2001). The implication of this growth rate on housing infrastructure in the urban centres is huge going by the national housing requirement. The national housing requirements as cited by Ajanlekoko (2001) are between the range of 500,000 to 600,000 units considering the prevailing occupancy ratio of three to four persons per room. Thus, the cost to provide housing excluding other physical infrastructure amounts to about 300 trillion naira at a conservative estimate of 500,000 naira per unit. Nonetheless, the rise in population has manifested in acute shortage of dwelling units resulting in overcrowding, high rents, poor urban living conditions and high crime rate.

Okpalla (1986) was of the view that the current trend of private sector involvement or participation in infrastructure provision should evolve into a systematic method for the integration of local communities at the background level. This process of bringing in people and communities would to a sizeable extent prioritise the types and locations of infrastructure to be provided to address the immediate needs of the people (Zawdie and Langford, 2001; Mabogunje, 1994; Abbott, 1996).

On housing as reported by Ogu and Ogbuezuobe (2001), Okpalla (1986) has stressed in his discussion on housing strategy in sub-Saharan Africa that the house of the poor may have to be built by the poor. Okpalla (1986) had maintained that it is a recognisable fact that though Nigeria is a rich country over 70% of the population are low earners, thus majority of the households in Nigeria fall within low-income category.

These low-income earners nonetheless use whatever resources are currently available to seek and secure shelter. Advancing this category of developer, or the private sector, to produce housing units is very important, as observed in Ghana's informal sector housing - a housing supply strategy for low earners involving the use of local or easily available materials (Tipple and Korboe 1998; Tiwari and Parikh 2000).

2.5. Privatisation in Nigeria

Growth empirical models and estimations made revealed that the influences of the private production sector on public infrastructure were higher (Ramirez 2000; Wang 2002). This implied that keeping a balance between infrastructure expansion and private sector growth is crucial for rapid economic development (Ramirez 2000; Wang 2002)

In line with this objective, the Nigerian government under President Olusegun Obasanjo inaugurated the National Council on Privatisation (NCP), under the chairmanship of vice president Atiku Abubakar, tasked with the timely supervision of the programme in a transparent

manner (Bureau of Public Enterprises 2002.). The Bureau of Public Enterprise (BPE) is accountable to the Council for implementation of the programme under the general policy oversight and other directions of the Council. The BPE (2002) highlighted the primary goals of the Nigerian privatisation and commercialisation programme as follows:

- To send a clear message to the local and international community that a new transparent Nigeria is now open for business.
- To restructure and rationalise the public sector in order to substantially reduce the dominance of unproductive government investment in the sector.
- To change the orientation of all public enterprises engaged in economic activities towards a new horizon of performance improvement, viability and overall efficiency.
- To raise funds for financing socially oriented programmes in such areas as poverty eradication, health, education and infrastructure.
- To ensure positive returns on public sector investments in commercialised enterprises, through more efficient private sector-oriented management.
- To check the present total dependence on the treasury for funding by otherwise commercially parastatals, and so encourage their approach to the Nigerian and international capital markets to meet their funding needs.
- To initiate the process of gradual cession to the private sector of public enterprises which are better operated by the private sector.
- To create jobs, acquire new knowledge, skills and technology, and expose Nigeria to international competition.

2.6. Regional integrated approach to infrastructure delivery

The cost of infrastructure provision is not only huge but continues to escalate, due largely to the fact that all inputs to infrastructure provision (materials, technology and expertise) are largely imported by developing countries (Page and Bilal, 2001; World Bank, 1994). Thus, the financial constraints have become too onerous a burden to be easily shouldered by countries on an individual basis. The integrated approach remains one of the most feasible ways to proceed. This is where countries within a regional grouping pool their resources together in the areas of common interest, and address common problems.

This type of body already exists in sub-Saharan Africa, examples being the South African Development Community (SADC) and the Economic Community of West African States (ECOWAS). Collier (1995) argues that due to the condition of the smaller southern African economies and the extent of inadequate infrastructure provision, a country-by-country approach to the problem might be cosmetic and piecemeal. Only an integrated approach, he maintains, is capable of providing the construction capacity needed to bridge the gap in southern Africa.

Furthermore, he continues, a regionally integrated approach to the development of the construction industry will avoid the duplication and waste of scarce resources, spread investment risks, encourage more direct foreign investments and facilitate technology transfer and managerial efficiency. Above all, the lives of the individuals in those countries which are presently impoverished will be enriched by the quality and quantity of infrastructure and service provision which will be possible through an integrated approach.

Reflecting on the importance of industrial development relative to its origins, Page and Bilal (2001) were of the view that regional infrastructure projects in transport, energy, water and other areas are important to regions like ECOWAS. It has supported the building of roads: about 87% :3894Km out of 4460Km of the trans-Sahelian highway linking Dakar to Djamena and about 83% of the trans-coastal highway from Lagos to Nouakchott have been completed (Page and Bilal 2001). It has projects for rail links and a coastal shipping line. It has ambitious projects for

the development of hydroelectric and thermal power, interconnected electricity, and the construction of a gas pipeline from Nigeria to Ghana and eventually to Cote d'Ivoire (Page and Bilal 2001).

Collier (1995) further observed that global recession coupled with the redirection of aid to former communist countries and the Middle East has drastically reduced the flow of aid to Africa and other developing countries. External borrowings from capital markets have been substituted for aid, and these have brought their own additional problems in terms of massive debts and interest rates (Haupt 1996). The consequence for development has been that a greater proportion of output and export proceeds are now devoted to debt servicing. He continues, with Collier (1995), on the need for regional cooperation, as there is an increasing global trend towards regional integration. The industrialised countries are organising themselves into three giant trading groups, namely NAFTA, the EC and the Pacific trading alliance (Collier 1995; Haupt 1996). Haupt (1996) is of the view that, if developing countries fail to respond by negotiating collectively, but do so individually, they will be further marginalised. Economic cooperation, he maintained, has become an absolute necessity for meaningful growth and development.

In addressing the problems surrounding the regional integration approach to infrastructure provision (demonstrated when differing structures and political institutions seek integration), Collier (1995) argues that these arrangements would definitely create the scenario of gainers and losers. An example was the defunct East African Economic Community (EAEC), in which Kenya became the dominant exporter and by 1966 apparently accounted for 66% of total exports from this common market. For this reason, it is advocated that there should be a smaller degree of economic integration where selected and vital sectors are integrated across member countries. Given that, these sectors would be fundamental to the development of each country.

From the foregoing, it is clear that the regional approach to infrastructure provision is somewhat complementary to the efforts of individual countries. The prevalent problems militating against

infrastructural provision in sub-Saharan Africa, highlighted in the models discussed previously, include those envisaged and experienced from the regional integration pattern. However, the integrative strategy still remains indispensable as a complementary process for infrastructural provision in sub-Saharan Africa. The board of executive directors of the World Bank group recently approved a new Infrastructure action plan which involves the application of a spectrum of public-private partnerships and project financing at regional, national and sub-national levels (World Bank Group 2003).

2.7. Summary

At the beginning of this chapter, the definition of infrastructure and the concept of infrastructure and service delivery were introduced and discussed. Further, infrastructure dearth and its implication to sustainable economic growth were emphasised. Also reviewed was the impact of infrastructure on economic growth. Several of the views reviewed emphasised both theoretically and empirically the critical role of infrastructure in economic growth and development. The effects resulting from infrastructure deficit in the developing world were also critically evaluate along the following lines: infrastructure investment patterns, the present state and causes of infrastructure deficiency in sub-Saharan Africa, importance of institutions in infrastructure and service delivery in sub-Saharan Africa, the various existing models for delivering infrastructure and services to the people. Lastly, an overview of some of the existing infrastructures in Nigeria was presented.

Chapter Three

The Political Economy of Infrastructure Delivery in Nigeria

3.0. Introduction

The objective of this chapter is to have an overview of the political and economic systems, their behaviour (relationships) and how they affect infrastructure and service delivery in Nigeria. Nigeria is the most populous country in Africa, comprising thirty-six states and a centrally located federal capital territory situated at Abuja. Its characteristic political, economic and social strata cut across all its frontiers (Ayogu 2000b; Utomi 2000; The Nigeria Congress online 2003; Mohammed 2004).

Figure 3.0. Map of Nigeria showing its 36 states and Federal capital territory



Demographic studies bear out the universality of these characteristics across Nigeria (Nigerian Federal Office of Statistics 1992 as cited in Adebuseye and Kritz 1997). Notwithstanding the contentiousness of Nigeria's population statistics among demographers, it is possible to state unequivocally that available statistics put Nigeria's population at about 130 million as at 2000 with an annual growth rate of about 2.54% (Ayogu 2000b; Directorate of central Intelligence 2002). Tribes include the Fulani and Hausa in the north, the Ibo in the southeast and the Yoruba in the southwest, who together constitute 65% of the population; the others, of equal importance, are the Edo, Ibibio, Kanuri, Nupe, Tiv, Chamba, Ekoi, and Ijaw (Ayogu 2000b). Similar to the ethnic fragmentations within the country are the religious divisions, which are equally significant. Islam accounts for 47 percent of the population, Christianity 30 percent, and the rest of the population holds traditional beliefs (Ayogu 2000b). Islam is dominant in the north, Christianity in the south. However, a thorough understanding of this chapter from this point demands firstly an overview of Nigeria's political and economic profile.

3.1. Nigeria's political profile

At independence in 1960, Nigeria adopted a parliamentary system of government and became a federation comprising three regions, the northern, western and eastern; each of the three major political parties that emerged had its power base in one of the regions (Ayogu 2000b; Erediauwa 2004), the Northern Peoples Congress (NPC) in the north, the Action Group (AG) in the west and the National Convention of Nigerian Citizens (NCNC) in the east. The NPC under the leadership of Abubakar Tafawa Balewa (a northerner) as the Prime Minister formed the first post-independence government (Ayogu 2000b).

Attempts by the NPC to use its control at the federal level to alter the balance of power decisively to its favour increased the problems, even if it did not provide the immediate cause of Nigeria's first military intervention (Joseph (1997) as cited by Ayogu (2000b)). The NPC crucially abused its federal powers by producing a highly disputed census count favourable to itself in 1962-1963, imposing a minority faction of the Action Group party on the Western region in

1962-1964, and manipulating the results of the 1964 federal election, especially in the north (Ayogu 2000b).

On January, 13, 1966, a group of army officers under the command of a southerner, Major Nzeogu, attempted to oust the government of Tafawa Balewa. However, troops loyal to that government, under the leadership of a southern Major General Aguiyi-Ironsi, General Officer Commanding (GOC) the Nigerian Army, succeeded in foiling the coup attempt. Nonetheless, a combination of events forced the council of ministers to decide on a voluntarily handover of the federal government to the armed forces (Ayogu 2000b). These events included the failure of the coup attempt, especially in the west, the general loss of control in the north, and the absence of the president (a southerner) who was out of the country for medical treatment (Ayogu 2000b; Erediauwa 2004). The decision of the council of ministers was made known in a radio broadcast on January 16, 1966 by the acting president, Dr. Nwafor Orizu, a southerner and the senate president (Ayogu, 2000). Six months later, another coup placed Lieutenant Colonel Yakubu Gowon (a northerner) in command. In 1967, the eastern region under the leadership of Lieutenant Colonel Odumegwu Ojukwu seceded as the republic of Biafra. This rebellion was put down after 30 months of a bloody civil war (Ayogu 2000b).

After a successful period of eight years, the government of General Gowon was finally overthrown in 1975 by yet another northerner, Major General Murtala Mohammed; who was later assassinated in a failed coup attempt led by Major Dimka in 1976. Lieutenant General Olusegun Obasanjo, a southerner, took over the leadership of Mohammed's regime and presided over the transfer of power to an elected civilian administration of Shehu Shagari (a northerner) under a new constitution that came in to force in 1979 (Ayogu 2000b).

Alhaji Shehu Shagari was re-elected in 1983; nevertheless his administration was overthrown by another northerner, Major General Buhari (Ayogu, 2000). Buhari's government worked at ending corruption and instilling discipline. Unfortunately, he was removed from power in August 1985 in a bloodless coup led by Major General Ibrahim Babangida, yet another northerner.

Babangida promised a return to civilian rule under a new constitution approved in 1989. Nine new states were created in 1991 and six more in 1996 (Ayogu 2000b).

Legislative elections were held in 1992 and the presidential election in June 1993. Unfortunately, Babangida annulled the result of the presidential election of June 1993 but public resentment forced him to step down as scheduled in August of the same year. An appointed interim southern civilian president, Ernest Shonekon was ousted on November 17, 1993 by General Sani Abacha (a northerner) who initiated another period of military rule (Ayogu 2000b).

Abacha promised elections in 1998 but wanted afterwards to succeed himself as a civilian president. He died unexpectedly in June 1998 and was succeeded by General Abubakar (a northerner) (Ayogu 2000b). Abubakar's regime organized a nationwide election which returned a former military dictator, Lieutenant General Olusegun Obasanjo as a civilian president to head the new republic. On a promise of strong moral leadership, General Olusegun Obasanjo was sworn in as the president in May 1999.

Thirteen years of military rule between the first and second republics led to many changes in the federal structure of Nigeria. Chief amongst these was the dominance of the federal government over the other tiers of government, made possible by the vast concentration of wealth from petroleum resources, particularly in the 1970s (Ayogu 2000b).

3.2: Nigeria's economic profile

Nigeria has the second largest economy in sub-Saharan Africa (behind South Africa) and by no means the fourth largest in the African continent (Ayogu 2000b; The Nigeria Congress online 2003; Ayogu 2000a) . The economy is agrarian, with about half to three quarters of the total population employed in agriculture; though basically at the subsistence level, it nevertheless contributes over 25 percent of the national output (Ayogu 2000b; Ayogu 2000; Adedipe 2004). However, the relative proportion of agriculture, livestock, forestry and fishing in the early 1960's

was 65.6 percent, with the agriculture subsector accounting for 56.6 percent, although it has declined to only 32 percent per annum in the 1990's (The Nigeria Congress online 2003). The structure of the economy revolves not only around agriculture but also on crude oil sales which account for a sizeable portion of its foreign exchange earnings.

Oil accounts for approximately 70-90 percent of government revenues and 95 percent of foreign exchange earnings (The Nigeria Congress online 2003; Elekwa et al. 2004). Despite this, Nigeria is still one of the poorest oil producing countries in the world and its oil has been a major source of political strife. This is ironic, because Nigeria is the seventh largest oil producer and the sixth most important oil exporter in the world (The Nigeria Congress online 2003). At the same time, the management of the revenue accruing from crude oil is solely in the hands of the federal government, which has generated a huge controversy owing to the exclusion of other stakeholders i.e. disgruntled local oil producing communities. Notwithstanding Nigeria's status as a major exporter of oil, it frequently suffers from internal shortages, which contribute to the reason 34 percent of the population with access to electricity are prone to interruptions (Standard Bank of South Africa (2002)). Manufacturers and businesses that need to maintain a reliable power supply are forced to rely on expensive generators, thereby raising the cost of production (Standard Bank of South Africa 2002). The trends of the rising cost of production and rising population growth in Nigeria run counter to the economy, which keeps contracting year by year. (Obadina 1999; Ayogu 2000b; The Nigeria Congress online 2003)

In addition, the economy in the 1980s and early 1990s witnessed a substantial appreciation in Nigeria's foreign exchange rate. This development has resulted in a steady decline in competitiveness of the non-oil sector, with a resultant decrease in food production and agriculture exports (The Nigeria Congress online 2003). Nigeria became a food deficit country, with rapidly mounting food imports bills which rose from 57.7 million naira in 1970 to 1.4 billion in 1980; it peaked at 1.7 billion naira in 1987 after a fall between 1984 and 1986 (The Nigeria Congress online 2003). It has steadily increased since then, reaching 88 billion naira in 1996 and now roughly about 10 percent of the country's total import values.

According to the World Bank (1982) as reported by the Nigerian congress online (2003) and the World Trade Organization (1998), Nigeria's GDP in 1980 was US\$91.13 billion, which has placed Nigeria 20th in world GDP ranking. In 1983, it fell to US\$64.57 billion and rose to US\$73.45 billion between 1984 and 1985. Nigeria's world ranking in those two years was 23rd and 21st positions (The Nigeria Congress online 2003). From 1986 onward, the country began to experience political instability, economic stagnation and the pursuit of inappropriate and ill-fated structural adjustment programmes which has consequently necessitated an extreme devaluation of its currency (The Nigeria Congress online 2003; Adedipe 2004). This in turn devalued all its assets, its productive resources and its output successively by factors of 1:4, 1:8, 1:22, 1:45, 1:89, 1:126 and 1:256. In all, the collective effect on the country's GDP in 1987 has crashed to US\$24.39 billion and its ranking to 44th. In 1999 it rose to US\$35.045 billion – i.e. about 26.2 percent of what it was in 1980 (The Nigeria Congress online 2003). Devaluation in Nigeria either explicitly or in effect scared away foreign investments and promoted macroeconomic instability, unemployment and poverty (World Trade Organization 1998; The Nigeria Congress online 2003).

This structural economic adjustment made the Nigerian industrial policy inward-looking, with a heavy emphasis on protection and government controls, which led to an uncompetitive manufacturing sector (Obadina 1999; World Trade Organization 1998). Nonetheless Nigeria's economy has remained one of the most dominant in Africa (National Centre for Economic Management and Administration (NACEMA) 2003).

Though Nigeria's economy has aspired to sub-Saharan African superpower status, its performance has fallen far short of the potential needed to fulfil this ambition. Since 1987, Nigeria's external debt service ratio has average between 4 and 5 percent of GDP, and since 1958 the World Bank has approved 98 loans and credit for a total commitment of US\$6.8 billion, the largest aggregate infrastructure in any country in sub-Saharan Africa (Ayogu 2000a)

Moreover, Nigeria's economy is presently overburdened with the biggest external debt in Africa, while its heavy dependence is on oil revenue has left it vulnerable to plummeting prices over years (Obadina 1999a; African IT Exhibitions and Conferences (AITEC) and CIT Research Group 2003). According to the World Bank (1998) as cited in Obadina (1999a) its per capita gross national product (GNP) was \$260 in 1997, compared with an average of \$500 for sub-Saharan Africa and \$350 for low income countries.

3.3. The political economy of the influence of political positions and infrastructure delivery in Nigeria

Since independence in 1960, criteria for allocation of infrastructure by federal administrations to states and their constituent regions have been based on ethnic and political considerations in contrast to economic efficiency (Ayogu 2000b; National Integrity system 2004). Furthermore, political expediency rather than economic viability govern key project parameters such as plant location, capacity planning, implementation timeframe, employment and product or service pricing. Some large scale projects, especially agriculture ones, have been on the drawing board for periods ranging from 10 to 35 years (Afeikhena 2003). Political influences on decisions associated with distribution of infrastructure to the geopolitical regions have resulted in an uneven development of the federating states, leading to huge political crises like the prevalent internal social conflicts in Nigeria (Ayogu 2000b). Further, the lopsided distribution of infrastructure has also been associated with the dominance of political power by the Nigerian military institutions which have ruled postcolonial Nigeria for 30 of its 40 years of independence from Britain (Adu-Asare 2001).

However, Ayogu (2000) maintained that the distortions resulting from infrastructure allocations have not been due to the pervasive military influence in the Nigerian political landscape; it is rather the dominance of northerners in Nigeria's military that gave rise to undue political influence and the associated economic dilemmas.

From the beginning of the postcolonial period in Nigeria to May 1999, Nigeria had seven military heads of state, of which five were from the north and two from the south. The two southern heads of state rule for a cumulative period of just four years, while the five northerners accounted for the remaining 25 years. Moreover, both southern heads of states came to power by accidents of history: Aguiyi Ironsi on the heels of the failed 1966 coup and Obasanjo upon the assassination of Murtala Mohammed (Ayogu 2000b). The dominance of northerners in the Nigerian military since independence is demonstrated by the fact that in post-independence Nigeria, the military has produced 14 chiefs of Army Staff, out of which 12 were northerners and two came from the south (with a collective term of 5 years and 2 months (Ayogu 2000b). In addition, a southerner has held the position Minister of Defence just once, and even then it was a combined portfolio with the then Head of State, General Olusegun Obasanjo (Ayogu 2000b).

In the political life of Nigeria, the Defence portfolio is so sensitive that it is given only to trusted loyalists, or otherwise the serving Head of States integrates it into his office. In fact, in all cases except Gowon and Babanbiga's regimes, when the portfolio was held by someone other than the Head of State, there have always been either actual or attempted coups d'etat (Ayogu 2000b).

In a further development, Ayogu (2000) in his empirical analysis on the influence of public office on infrastructure allocation, discovered that data do not support the oft-claimed influence of the northern political caucus called "Arewa". His work demonstrates that the direction of influence points specifically to positions of authority but not to group coalition, like "Arewa" (otherwise referred to as the Arewa consultative forum).

From Ayogu's (2000) findings that the power associated with a particular public position has a tendency to influence political decision making regarding infrastructure distribution, it is therefore feasible to deduce that the more people in a particular region or state hold significant political appointments, the greater the transfer of infrastructure to that region.

Other public positions outside the military establishment with influence bearing on federal public sector decision making in Nigeria include the Ministry of Economic Development, Agriculture and Natural Resources, Trade and Industry, Communications, Finance, Foreign Affairs, Mine, Power and Steel as well as Works and Housing. Holders of the positions of Secretary to the Federal government, Managing Director of the National Electric Power Authority, Governor of Central Bank and Inspector General of Police have also influenced decisions affecting infrastructure allocation in significant ways (Ayogu 2000b).

Furthermore, Ayogu (2000b) showed that there is a very weak correlation between the quality of allocated infrastructure and political influence. This led him to the conclusion that many of the political positions that would otherwise assume prominence fail to do so in most cases because infrastructure delivered was not sustainable. By implication, the assumption that certain political positions come with influence on infrastructure decision making is not absolute" (Ayogu 2000b). This means that influencing maintenance and quality is an equally important dimension in the process of infrastructure allocation especially in sub-Saharan Africa, where most societies experiences problems rooted in poor sustainability of infrastructure (Ayogu 2000b).

Ayogu (2000b) found that some public positions in Nigeria , by virtue of the role played by the departmental unit in national budget decision making and policy implementation, tend to hold more sway relative to infrastructure projects allocation. He maintained that the Head of State, the Minister of Agriculture and Natural Resources, the Minister of Communications, and the Minister of Finance, were all found to be influential at conventional significance levels (between 5 and 1 percent). At the 6 percent significance level, the Governor of Central bank and the Inspector General of Police (both non ministerial members) become influential. Ayogu (2000b) provided several examples of how significant infrastructure projects were built in certain regions and at some locations without economic relevance.

Besides the wielding of influence by individual office holders, some important staff of significant ministries managed to include their preferred projects into developmental plans through the

manipulations of approved budgets. The way such projects are included derives from the fact that ministries are forced, almost regularly, to select and eliminate some projects due to budget shortfalls. This is when the selector and cohorts thus acquire strong influence (Ayogu 2000b; N).

Another way in which staff influence infrastructure allocation is to fraudulently falsify a small project of interest to a bigger one, again as a result of managing budget shortfalls (TI Source Book 2000; National Integrity system 2004). Ayogu (2000b) cited road construction as typical examples of such fraudulent practices that enable the implementation of “false” projects. Through such perennial tendencies, it becomes possible for a short country road, for example, to be upgraded to a dualized trunk roadway when “fastened” unto the budget for a major highway (Ayogu 2000b).

Ayogu provides a graphic spatial profile of the distribution of economic distortion in terms of gains and losses relative to the siting of infrastructure projects on a regional basis. The spatial profile was arrayed by geographical zones beginning with the South-south region and moving on through the South-east, South-west, Central and North-east to the North-West regions. A striking pattern emerged showing that the North and South-west regions are gainers under the status quo, with this trend most evident in the north (with Oyo state as the biggest single gainer) (Ayogu 2000b). On the other hand, the South-south and South east were seen to be losers.

Ayogu (2000b) notes that these losses are concentrated on a small number of states, and on examination, these losses are more extreme than the apparent advantages, which are shared amongst many more states. It is possible that this lopsidedness could make the gainer less sensitive to the cruelty of the burden imposed on the losers. These disparities in infrastructure delivery became so obvious that Ken-Saro Wiwa, one of the foremost intellectuals from the South-south Nigeria, began the call for equity in resource and infrastructure distribution. However, things took a violent turn leading to his unfortunate, politically-motivated hanging by the then northern military administration.

There is a chance that if more Nigerians understood the social harm that such a disparity in federal allocation of regional infrastructure could create, there might be less pressure exerted by constituents and political parties on office holders and top bureaucrats. (Ayogu 2000b). It should not be going too far to suggest that the tendency of ethnic constituents and political parties to pressure favourite sons (and occasionally daughters) with political positions and top bureaucrats to “do something” at home, have had a corrupting influence on such individuals to act contrary to their best judgement (Ayogu 2000b). The resultant effect tends to institutionalise corruption and fraudulent practices, as no geopolitical region would want to be left out of its share of the national cake. This is not surprising because economic attitudes in humans are deeply rooted in inequality, the state of poverty and the degree of economic peril suffered historically (Galbraith 1977)

Ayogu’s findings put forward the thesis that the political clout of individual office holders and staff, more so than power blocs or pressure groups, have accounted for the nature and level of allocation of infrastructure projects and resources from the Federal Government of Nigeria to the states and regions. In the same vein, it is plausible to say that individual office holders do not act in a state of vacuum; they do so in response to pressure from social forces such as political parties, local constituents and opinion leaders (Ayogu 2000b).

3.4. Political Economy of infrastructural neglect and revenue sharing in Nigeria

Nigeria gets about 90 percent of its petroleum from the Niger delta in the south, an area inhabited by minority ethnic groups such as the Itsekiris, Urhobos, Ijaws, Ibibios, Ogonis, Kalabaris, Efiks, Ikwerres. In spite of the enormous resources generated from this region, the Niger delta is perhaps the least developed area of the country (Dixon 2003). Less than 5 percent of the oil revenue is spent directly on the oil producing areas (Kubeyinje and Nezianya

1999). The Niger delta therefore lacks good roads, electricity, potable water and good schools. Unemployment is high because the rivers, creeks and streams which provide people with their main source of livelihood – fishing - have been extensively polluted through the activities of over a dozen oil companies operating in the area (Kubeyinje and Neziyanya 1999, Dixon 2003).

Moreover, political insensitivity and the exploitation of these resident communities contribute immensely to frequent delays and dangerous changes in the environmental conditions in these regions, with enormous potential to stall project development. A practical example of this is the effects resulting from protests and repression of affected communities or regions plagued by environmental pollution, as in the Niger delta region. Such environmental pollution ranges from drinking water containing levels of petroleum hydrocarbons that are 350 times that allowed in European Union and an average of four oil spills per week, to an estimated 1.1 billion cubic feet of natural gas flaring each day between 1976 and 1991 causing acid rain that destroys crops and sickens residents. (Dixon, 2003). The human cost attributed to gas flaring and oil spillage is unclear, but doctors have found an unusually high incidence of asthma, bronchitis, skin and breathing problems in resident communities of oil producing areas (Obadina 1999b). Figures 3.3.1 to 3.3.4 are clear depictions of the hazards resulting from cases of poorly maintained infrastructure, accidents and sometimes outright sabotage.

Figure 3.3.1. Polluted stream “Kpean” in Ogoni , Nigeria in 2002; formerly drinking source for locals

Figure 3.3.3. A pair of children in Ogoni, Nigeria



Source: Sophia Evans (2002)

Source: Sophia Evans (2002)

Figure 3.3.2. Leaking Oil well head at “Kpor”, Ogoni , Nigeria in 2003

Figure 3.3.4. Oil spill and fire caused by rupture in high pressured pipe line in Eikpokwudu community, Ikpoken in Obio / Akpor Local government area of Rivers State, Nigeria



Source: Tim Nunn (2004)

Source: International Drinking Water Supply

Nevertheless, the Nigerian Ministry of the Environment recognizes the importance of addressing

Figure 3.3.3. A pair of sandals in spilled oil at Bormu flow station in 2002, Tai, Ogoni, Nigeria



Source: Sophia Evans (2002)

Figure 3.3.4. Oil spill and fire caused by rupture in high pressured pipe line in Elikpokwudu community, Rukpokwu in Obio / Akpor Local government area of Rivers State, Nigeria



Source: Stakeholders democracy network (2003)

Nevertheless, the national strategy for the environment recognizes the importance of arresting the rapid degradation of the natural environment. An important institutional reform already carried out by the present administration is the establishment of the Federal Ministry of Environment responsible for ensuring protection of the environment and conservation of its fragile natural resource base (World Bank Document 2002). The impact of this ministry is far below expectation, however.

3.3.1. Revenue sharing

Up to this point, any review of the sharing scheme had to be linked to a revision of the constitution, which is not easily practicable (Ehtisham and Raju 2002). The Raisman Commission suggested that the federal government appoint a review commission from time to time, whether the constitution was being reviewed or not. The Binns Commission (1964) was therefore appointed under section 164 of the 1963 republican constitution to review the pooled account. The principle of derivation was abandoned, and regional allocations were based instead on regions own efforts to mobilize revenue, and on the quality of services they were providing. The Commission's work was carried out in secret, leading to doubt and mistrust concerning its proposed distributions. Soon after the Binns report, the military took over and a process of recentralization started (Ehtisham and Raju 2002). The demand of the oil-producing regions to keep all the revenues from natural resources contributed to the Biafran civil war (Ehtisham and Raju 2002).

After the civil war, Decree No 13 (1970) allocated the bulk of federally collected revenue to the Federal Government. The derivation principle was put aside and regional allocation was based on need, measured by population and a lump sum transfer to cover the fixed costs of running an administration. By Degree No 9 (1971), the federal Government appropriated all offshore rents and royalties. Decree No 6 (1975) channelled all revenues to be shared through a distributable pool account, with the exception of the 20 percent of on-shore mining rents and royalties, which went to the states of origin on the principle of derivation. Again the process was marred by lack of clarity and certainty in the transfer mechanism (Ehtisham and Raju 2002).

The Aboyade Technical Committee (1977) was set up to prepare for a distribution of resources during the transition to democratic rule. This Commission recommended a clear division in tax jurisdiction to provide all tiers of Government with a tax base. It also recommended that all federally-collected revenues, without exception, be paid into the pool account, thus becoming the Federation Account. The proceeds of this account were to be shared among the Federal Government, the states and – for the first time – the local government councils. The allocation for the States was based on the need to provide for minimum standards, but taking into account their absorption capacity. These recommendations were perceived as too radical and the constituent assembly (1978) declined to accept them (Ehtisham and Raju 2002).

The Okigbo Commission (1980) was set up to pursue the work. It retained the idea that all federally collected resources be transferred to the federation account and that local councils should also have a share in this revenue. To distribute resources among the states, however, demands a focus on needs, defined by their population, the social services they provide and a lump sum transfer to run their administration. The Okigbo Commission recommended putting aside the principle of derivation. The recommendation was, however, rejected by the Federal Government, which preferred to introduce a special fund for mineral producing areas. This fund would receive a share of the transfers from the federation account and would redistribute it to the producing states according to the derivation principle (Ehtisham and Raju 2002).

The subsequent Decree 36 (1984) and the Danjuma Commission (1989) did not significantly change this structure. A further step towards the derivation principle was made by the 1999 constitution. Currently, not less than 13 percent of oil revenue is to be transferred to the oil producing states according to their production. Since January 2000, the practice has been to apply this derivation to on-shore oil production only (Ehtisham and Raju 2002).

3.4. The Nigerian political economy and infrastructure: a globalize perspective

The attempts made after the Second World War to achieve political independence and decolonisation merely aggravated and strengthened the existing structures of dependence (The Nigeria Congress online 2003). Thus, the stage was set for neo-colonialism. This structure of dependence was based on the dispossession that began during the slave trade period from the sixteenth to the nineteenth centuries (The Nigeria Congress online 2003). Today this dependence manifests itself in different ways, and their categorization provides an indispensable background to the political economy of infrastructure in sub-Saharan Africa particularly Nigeria.

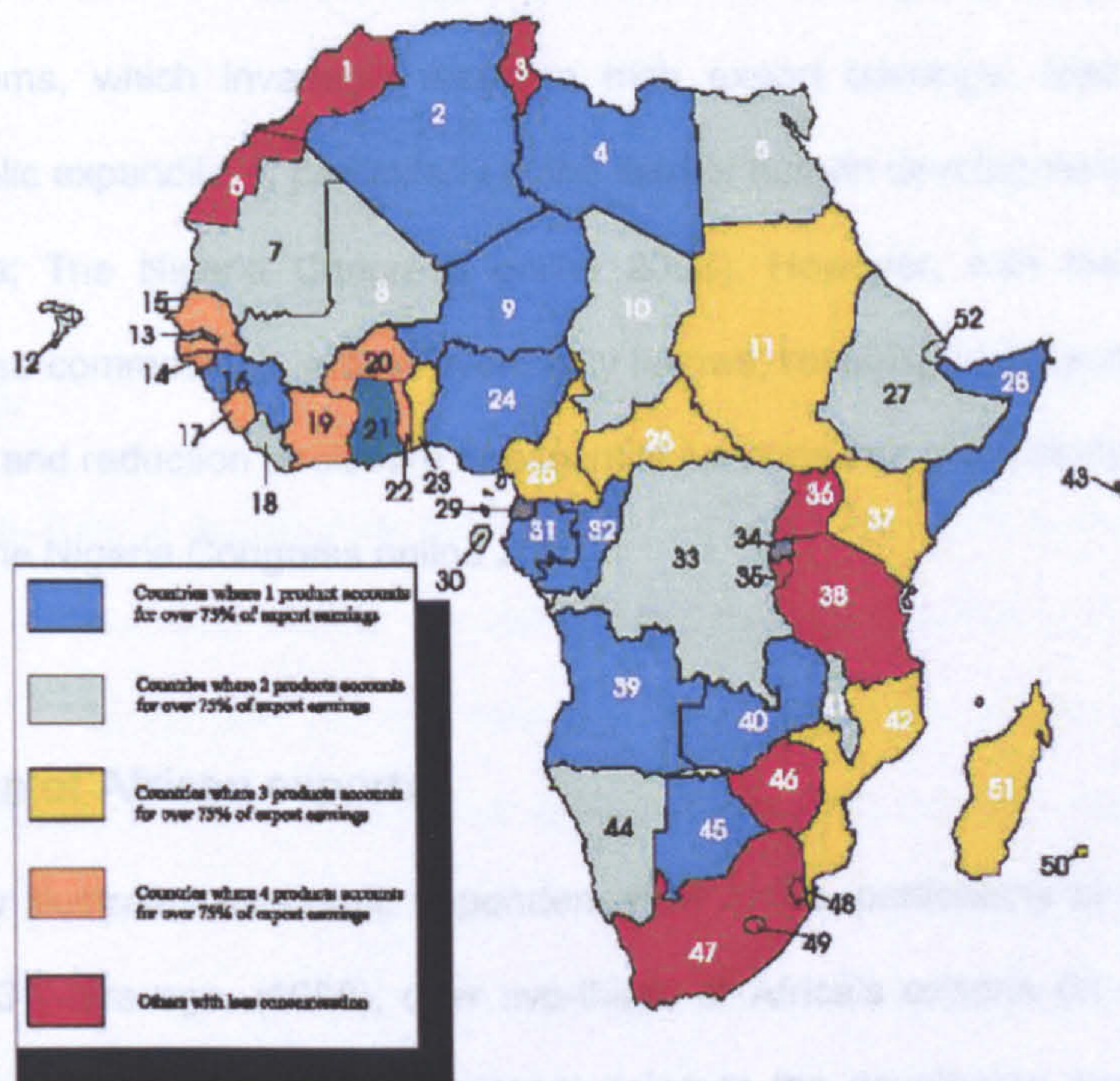
3.4.1. Uneven distribution of international trade

Export trade accounted for 34 percent of GDP in 1999, whilst the corresponding figure for the United States was 12.2 percent. This is because the US economy has become more open than ever before in its history (The Nigeria Congress online 2003). In 1960, US international trade stood at only 4.6 percent of GDP; in spite of the great advances in opening up the US economy, it is still insular (The Nigeria Congress online 2003). This is in contrast to the long-established opening of the African economies in general and Nigeria's in particular. Indeed, Nigeria's monoculturalism, like the rest of the sub-Saharan Africa, has hindered its effective participation in international trade which has resulted in the slow growth of the rest of the economy (World Trade Organisation 1998; Obadina 1999a; Olawoye et al. 2002; The Nigeria Congress online 2003). A wide range of export motivation has failed to offset the country's import regime, failing infrastructure and cumbersome export procedures (World Trade Organisation 1998). The uneven distribution of international trade resulting from inappropriate public policies has contributed to the continued dilapidation of the crude and refined oil infrastructure resulting to serious shortages of petroleum products in the domestic market and inefficiencies that have adversely affected transportation, telecommunications, electricity, chemicals, coal and bitumen production, steel and aluminium production (World Trade Organisation 1998).

3.4.2. Uncertainty of existing institutions and the monoculture economy

The persistence of political and institutional uncertainty in Nigeria and the weakening of the rule of law have discouraged foreign direct investment in infrastructure and trade flows outside the oil export sector (World Trade Organisation 1998). Another significant failure of the Nigerian and indeed sub-Saharan African economy is its monocultural nature. A World Trade Organisation report also has it that the Nigerian economy remains structurally vulnerable to the fluctuations in oil prices in the relatively unstable oil sector. Figure 3.4.2.1 reveals the monoculture nature of the Nigerian economy and the other African countries.

Figure 3.4.2.1 Africa's dependence on limited range of commodity



Source: J. Forbes Munro, *Africa and the International Economy, 1800 - 1960* (London, 1976); p86

The monocultural nature of the African economies has made them be more dependent on primary commodities for their export earnings than any other region in the world. In east and south-east Asia only 8 out of 19 countries have a similar ratio, compared to 47 out of 53 African countries' primary commodities (The Nigeria Congress online 2003). Thus, the fluctuations in

the oil sector considerably affect all aspects of resource distribution. This situation is systematically transferred to funding for infrastructure maintenance and delivery.

3.4.3. Price elasticity and income elasticity of African exports

A third principal feature of Africa's commodity exports is that the demand for them is highly income-inelastic while their supply is price-elastic (The Nigeria Congress online 2003). This has been traced to global inequalities and trade barriers in developed countries (World Bank 2006). Furthermore, because of the monoculture nature of their economies, producers expend a lot of scarce resources to produce more and more of these commodities in order to make ends meet, with the inevitable price instability, made worse during the period of global economic recession and crises (The Nigeria Congress online 2003). The boom-and-bust cycles that accompany commodity exports are inimical to African economies (The Nigeria Congress online 2003). Commodity booms, which invariably result in high export earnings, lead to much-needed increases in public expenditure, particularly in the field of human development and infrastructure (Obadina 1999a; The Nigeria Congress online 2003). However, with the continuous price instability of these commodities, a bust eventually follows, resulting in a dearth and dilapidation of infrastructure and reduction or closure of essential services that are grossly inadequate at the best of times (The Nigeria Congress online 2003).

3.4.4. Direction of African exports

The table below illustrates economic dependence on Africa, particularly in the direction of its exports. Only 13 years ago, (1988), over two-thirds of Africa's exports (in value) went to the industrialised countries, with only 16.2 percent going to the developing world. Of these latter figures, only 6.2 percent was within Africa, with 4.5 percent, 1.6 percent and 1.4 percent exported to Asia, Latin America and the Middle East respectively.

Table 3.4.4.1. Direction of exports from 1988 to 1996

Destination of African Exports (in value), 1988 and 1996 (Percentages)

Export From	Year	Industrial Countries	Developing Countries	Africa	Developing Asia	Middle East	Latin America
Africa	1988	67.6	12.7	6.2	4.5	1.4	1.6
	1996	64.7	23.9	10.1	9.1	1.9	2.8
Nigeria	1988	88.1	11.3	6.5	0.5	0.1	4.2
	1996	79.9	19.7	8.5	7.5	-	3.7

Source: UNCTAD, *Trade and Development Report, 1998 (Geneva)*; table 56 p. 205.

In 1996 the industrial countries still received the majority of Africa's exports, about 64.7 percent. However, the share of the developing countries has since improved considerably to 24 percent. It is significant that although Africa's exports to Asia are still relatively small (9.1 percent) it has doubled as a proportion of the total between 1988 and 1996. In the case of Nigeria the increase has been exponential (from 0.5 to 7.5 percent), while its intra-African trade has remained more or less stagnant.

3.5. Summary

The first three sections of this chapter were used to introduce the political and economic profile of Nigeria. The political economy of the influence of political positions on infrastructure and service delivery in Nigeria was critically examined and revelations showed a disproportionate spread since Nigeria got her independence from Great Britain. Also presented in this chapter was the picture of the political economy of infrastructure neglect, and revenue sharing in Nigeria. Lastly, the political economy of the effects of globalisation on infrastructure in Nigeria was presented.

Chapter Four

An empirical validation of the interface between infrastructure economic growth and development in sub-Saharan Africa

4.0. Introduction

The chronic poverty in sub-Saharan Africa is exacerbated not only by natural catastrophes but also by the obvious cases of stagnation in most economic processes meant to alleviate poverty in the region, as revealed in the literature review. This chapter will address the paramount need to critically and empirically validate this assertion, employing the method of descriptive statistics and multiple regression analysis to do so. Such validation would also establish the relationship between infrastructure, economic growth and development in the region. To this end, the dominant role between public and private infrastructure in the economic growth of sub-Saharan Africa will be established. The objective of this chapter is to reveal the nature of the stagnant economic processes and to empirically validate the interface between infrastructure, economic growth and development in sub-Saharan Africa. The model employed for the multiple regression analysis is explained in the next paragraph.

This investigation employed the modified “ad hoc conventional approach” model used in Wang (2002), which is based on the conventional neoclassical one-sector aggregate production function, where the public and private infrastructure constitute an input directly to the production function, It took the form of the following function:

$$Y_t = f(L_t, W_t, X_t) \dots \dots \dots (1)$$

where Y_t is GDP per capita, W_t is public sector gross capital formation (Public Investments) and X_t , L_t private sector gross capital formation (Private Investments) and labor services respectively. The subscript t denotes time series. Firstly, the initial application of this model is based on the assumption that L_t has negligible effect on GDP. This is because its relative size as a subset of GDP is speculatively seen to be very small in comparison to the other independent variables in the model. Moreover, the initial exclusion of variable L_t would assist the primary focus of this investigation, which reveals the effects of the interrelationships between variables X_t and W_t on GDP (i.e. testing the dominance on GDP between variable X_t and variable W_t). Furthermore, the accuracy of the assumption that labor services are of negligible effect in the preceding function of equation (1) will be verified. Thus, it is hoped that two substantive empirical models from the secondary data collected on sub-Saharan Africa validating the interface between infrastructure, economic growth and development will be developed, with the first model excluding variable L_t and the second including this variable.

4.1. Data and methodology used

Data was collected from the Africa statistics year book (2003) and International Monetary Fund (IMF) (2003). Some of this data was re-modified on proxy to meet the required expectation. In particular, data that could have been used on proxy for labor services from the International Labor Organization (ILO) only covered fewer than 10 countries within sub-Saharan Africa. As an alternative, surrogate data was sourced from the World Bank (2005) and the United Nations development program (UNDP) (2004). However, data collected from the International Monetary Fund (IMF) (2003) was from international financial statistics, which include gross capital formation as a percentage of GDP and final consumption expenditure as a percentage of GDP for sub-Saharan Africa (1991- 2001). Others gleaned from the African Statistical Yearbook include per

capita GDP (with a 1995 constant) in dollars, gross public capita formation and gross private capita formation (1995 -2002).

Thus, percentage data for labour services as a percentage of GDP covering 1990 to 2002 was obtained by mid point range representation from the World Bank (2005). The proportion of the various percentages per capital GDP in dollars for each country was derived. The proportion for each of these countries was eventually multiplied by their relative income index value derived from the Human Development Report of the United Nations Development Program (UNDP) (2004). The eventual data was used on proxy as labor services in dollars for sub-Saharan Africa (see Table 4.1.1).

Table 4.1.1 Average GDP per capita, public and private investments and labor services

S/N	COUNTRY	Ave GDP Per capital (dollars) Y	Public investment (dollars) X	Private investment (dollars) W	Labour services(dollars) L
1	Angola	499	41	122	92
2	Benin	392	29	42	79
3	Botswana	3207	407	491	1065
4	Burkina- faso	228	32	35	47
5	Burundi	151	11	3	13
6	Cameroun	639	9	96	136
7	Central Afr.Rep	345	19	16	33
8	Chad	213	20	18	39
9	Congo	811	51	177	123
10	Congo Dem.Rep	107	12	4	11
11	Cote d' Ivoire	817	39	69	182
12	Eritrea	161	46	2	34
13	Ethiopia	113	10	8	16
14	Gabon	4396	233	936	1231
15	Gambia	355	25	37	94
16	Ghana	396	47	42	76
17	Guinea	527	39	81	110
18	Guinea Bissau	250	28	18	16
19	Kenya	329	21	38	75
20	Lesotho	522	175	84	115
21	Madagascar	232	17	14	44
22	Malawi	160	14	8	17
23	Mali	260	24	33	36
24	Mauritania	176	24	13	43
25	Mauritius	4100	299	816	1871
26	Mozambique	163	20	25	28
27	Namibia	2306	182	357	907
28	Niger	202	12	9	33
29	Nigeria	286	25	31	26
30	Rowanda	321	24	25	53
31	Senegal	584	38	65	165
32	Sierra Leone	194	6	0	9
33	South Africa	3901	101	554	1803
34	Sudan	290	5	51	30
35	Swaziland	1704	95	252	431
36	Tanzania	176	6	24	19
37	Togo	341	11	45	62
38	Uganda	322	19	37	55
39	Zambia	370	35	23	52
40	Zimbabwe	616	59	42	178

However, data collected from the international financial statistics was used to show the gulf between consumption and investment patterns in the sub-Saharan Africa¹. This was achieved by means of the descriptive analysis mentioned earlier and a bar chart showing both sub-Saharan African and industrialized countries' gross capital formation as a percentage of GDP, and final consumption expenditure as a percentage of GDP². Moreover, in Table 4.1.1 above, the average GDP per capita is the dependent variable while public investment, private investment and labor services are the independent variables in the regression analysis.

To test the extent to which the independent variable predicts the dependent variable in the model, several measures of variation were developed as illustrated in Levine et al. (1999). The first measure is the total sum of squares (*SST*), which measures the variation of the Y_i values around their mean \bar{Y} and equals the sum of the squared differences between each observed Y and \bar{Y} which is the mean value of observed "Y"³. The second is the variation or regression sum of squares (*SSR*), this explains the relationship between X and Y and equals the sum of the squared differences between each predicted value of Y and the mean value of Y ⁴. The unexplained variation or error sum of squares (*SSE*) attributable to factors other than the relationship between X and Y is equal to the sum of the squared differences between each observed values of Y and each predicted value of Y (Levine et al. 1999)⁵.

$$SST = SSR + SSE \dots \dots \dots (2)$$

Where:

$$SST = \sum_{i=1}^n (Y_i - \bar{Y})^2 \dots \dots \dots (3)$$

¹ See Table 4.1.2; Table 4.1.3; Table 4.1.4; and Table 4.1.5.
² See Figure 4.1.1 and Figure 4.1.2
³ See equation 2 and equation 3.
⁴ See equation 4
⁵ See equation 5

$$SSR = \sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2 \dots\dots\dots(4)$$

$$SSR = SST - SSE$$

$$SSE = \sum_{i=1}^n (Y_i - \hat{Y}_i)^2 \dots\dots\dots(5)$$

The coefficient of multiple determination r^2 obtained represents the proportion of the variation in Y that is explained by the set of explanatory variables selected (Levine et al. 1999) and are expressed thus:

$$r^2 = \frac{SSR}{SST} \dots\dots\dots(6)$$

The coefficient of correlation r to test the strength of the relationship or association between two variables was carried out. It values range between -1 for a perfect negative correlation up to +1 for a perfect positive correlation (Levine et al. 1999). It is expressed thus:

$$r = \sqrt{r^2} \dots\dots\dots(7)$$

Residual analysis was then carried out to make sure that the multiple linear regression model is appropriate for the available data. Furthermore, to determine whether there is a significant relationship between the dependent variable and a set of explanatory variables, the F-test was carried out. Since there was more than one explanatory variable, the null and the alternative hypotheses were set up as follows:

$H_0 : \beta_1 = \beta_0 = 0$ (There is no linear relationship between the dependent variable and the explanatory variables)

$H_1 : \text{At least one } \beta_j \neq 0$ (there is a linear relationship between the dependent variable and at least one of the explanatory variable.

The F statistic is equal to the regression mean square (MSR) divided by the error mean square (MSE).

$$F = \frac{MSR}{MSE} \dots\dots\dots(8)$$

where

P = number of explanatory variable in the regression model

F = test statistic from an F distribution with p and $n-p-1$ degrees of freedom.

The decision rule is:

Reject H_0 if $F > F_U$

The upper tailed critical value of an F distribution with p and $n-p-1$ degrees of freedom; other wise do not reject H_0 .

In other to determine the contribution of each of the explanatory variables, the Partial F test criterion was applied. "It is a process of determining the contribution to the regression sum of squares made by each explanatory variable after all the other explanatory variable has been included in the model" (Levine et al. 1999). This process for testing the portions of the multiple regression models involves the following:

$$SSR (X_K / \text{all variable except } K) = SSR (\text{all variables including } K) - SSR (\text{all variables except } K) \dots\dots\dots(9)$$

The contribution of variable X_1 given X_2 has been represented thus:

$$SSR(X_1 | X_2) = SSR(X_1 \text{ and } X_2) - SSR(X_2) \dots\dots\dots(10)$$

The contribution of variable X_2 given X_1 has been represented thus:

$$SSR(X_2 | X_1) = SSR(X_1 \text{ and } X_2) - SSR(X_1) \dots\dots\dots(11)$$

The terms $SSR(X_2)$ and $SSR(X_1)$ respectively represent the sum of squares that is due to regression for a model that includes only the explanatory variable X_2 and only the explanatory variable X_1 .

To have a better understanding of the statistics of the numerical data for gross capital formation and final consumption expenditure for sub-Saharan Africa and the industrialised countries, the central tendency, variation and shape of the data were computed for each set. For central tendency the mean and median were of relevance while the mode, midrange and mid-hinge were not necessary for this investigation.

To understand the variation within the data, the following computations were made:

The first quartile, Q_1 , is a value such that 25 percent of the observations are smaller and 75 percent of the observations are larger. The third quartile, Q_3 , is a value such that 75 percent of the observations are smaller and 25 percent of the observations are larger. The range, inter-quartile range, variance and standard deviations were also included in the computation but the coefficient of variation was left out because it was not necessary for the investigation. The equations used are as follows:

$$Range = X_{Largest} - X_{Smallest}$$

$$Q_1 = \frac{(n+1)}{4} \dots\dots\dots(12)$$

$$Q_3 = \frac{3(n+1)}{4} \dots\dots\dots(13)$$

$$Inter\text{-}quartile\ range = Q_3 - Q_1 \dots\dots\dots(14)$$

Sample variance:

$$S^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1} \dots\dots\dots(15)$$

Standard deviation:

$$S = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}} \dots\dots\dots(16)$$

All the analysis in this chapter was carried out using the PH statistical software.

Table 4.1.2. Gross capital formation and final consumption expenditure (1991-2001) for sub-Saharan Africa

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Gross capital formation as a % GDP	19.6	18.8	19.1	20	19.2	18.4	18.1	19.1	18.4	17.1	17.5
Final consumption expenditure as % of GDP	80.6	83.3	83.7	83.6	83.2	82.1	82.7	85.6	79.2	75.2	77.1

Source: International Financial statistics (2003)

Table 4.1.3. Gross capital formation and final consumption expenditure (1991-2001) for Industrial countries

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Gross capital formation as a % GDP	21.1	20.4	19.7	20.3	20.5	20.5	20.9	21.2	21.5	21.8	20.5
Final consumption expenditure as % of GDP	78.7	79.2	79.5	79	78.7	78.7	78.1	78.1	78.8	78.9	80

Source: International Financial statistics (2003)

Table 4.1.4. Industrial countries and the sub-Saharan Africa gross capital formation comparison

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Gross capital formation as a % GDP(industrial countries)	21.1	20.4	19.7	20.3	20.5	20.5	20.9	21.2	21.5	21.8	20.5
Gross capital formation as a % GDP(sub-Saharan Africa)	19.6	18.8	19.1	20	19.2	18.4	18.1	19.1	18.4	17.1	17.5

Source: International Financial statistics (2003)

Table 4.1.5. Industrial countries and the sub-Saharan Africa final consumption expenditure comparison

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Final consumption expenditure as % GDP(industrial countries)	78.7	79.2	79.5	79	78.7	78.7	78.1	78.1	78.8	78.9	80
Final consumption expenditure as a % GDP(sub-Saharan Africa)	80.6	83.3	83.7	83.6	83.2	82.1	82.7	85.6	79.2	75.2	77.1

Source: International Financial statistics (2003)

4.2. Discussion of Results

Figure 4.1.1. Sub Saharan Africa Gross capital formation and final consumption expenditure against period

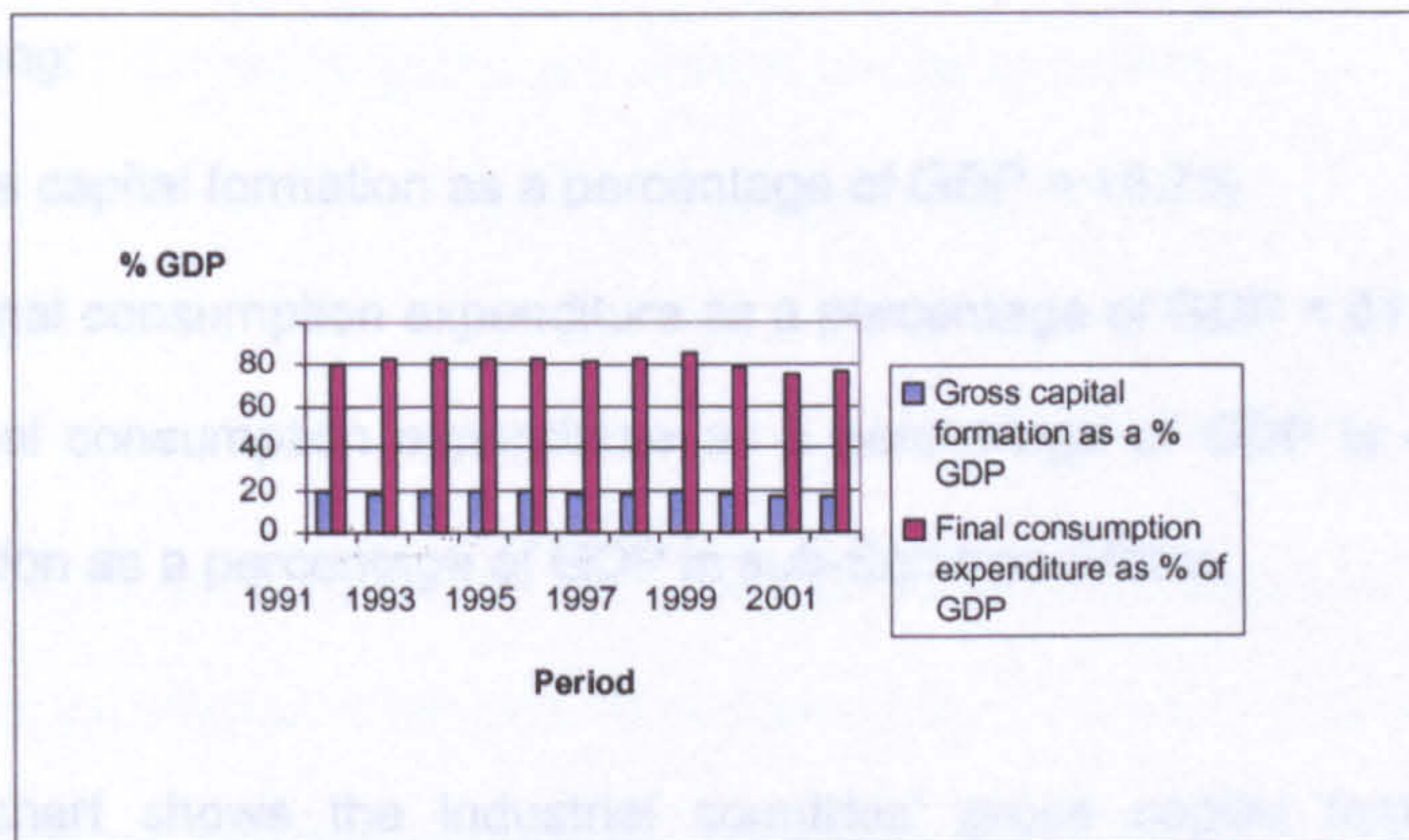
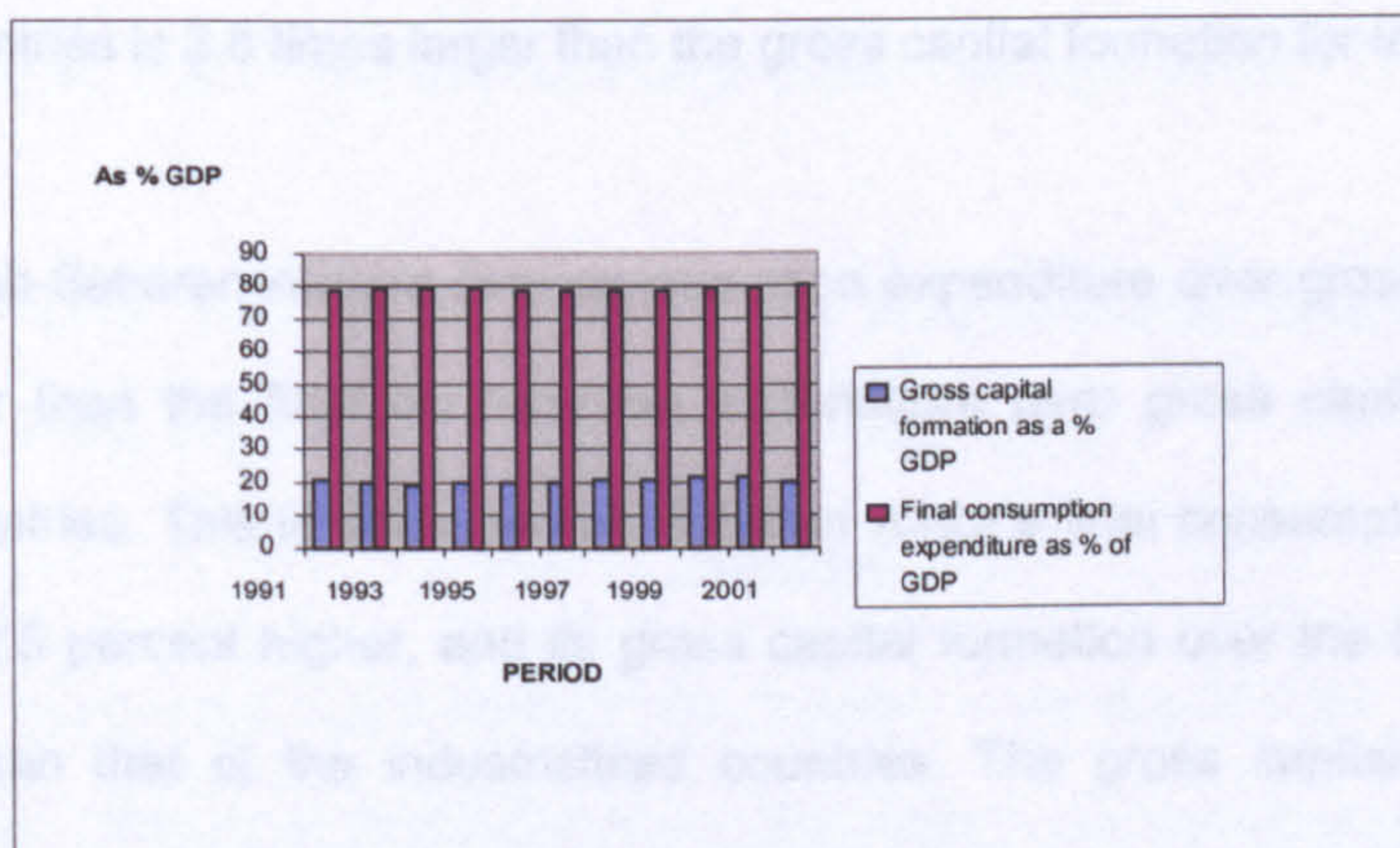


Figure 4.1.2. Industrial countries Gross capital formation and final consumption expenditure against period



4.2. Discussion of Results

The first bar chart plot shows sub-Saharan African gross capital formation and the final consumption expenditure against period and Table 4.1.2 and Table 4.1.3 revealed, from descriptive statistics, the following:

- mean gross capital formation as a percentage of GDP = 18.7%
- mean for final consumption expenditure as a percentage of GDP = 81.5%

Thus, the mean final consumption expenditure as a percentage of GDP is 4.4 times larger than gross capital formation as a percentage of GDP in sub-Saharan Africa.

The second bar chart shows the industrial countries' gross capital formation and the final consumption expenditure against period and Table 4.1.4 and Table 4.1.5 also revealed, from descriptive statistics, the following:

- mean gross capital formation as a percentage of GDP = 20.8 percent
- mean final consumption expenditure as a percentage of GDP = 79 percent

In addition this implies that the mean final consumption expenditure as a percentage of GDP for industrialised countries is 3.8 times larger than the gross capital formation for these countries.

By implication, sub-Saharan Africa's final consumption expenditure over gross capital formation is 1.15 times larger than the final consumption expenditure over gross capital formation for the industrialised countries. This is because sub-Saharan Africa's final consumption expenditure from 1991-2001 was 2.5 percent higher, and its gross capital formation over the same period was 2.1 percent lower, than that of the industrialised countries. The gross capital formation and final consumption expenditure data for sub-Saharan Africa and the industrial countries revealed greater homogeneity, as the range, inter-quartile range, sample variance and standard deviation were relatively very small for each.

However, the following multiple linear regression model for the data in Table 4.1.1, excluding labour services (L) as explained in the preceding section, was derived for sub-Saharan Africa:

$$Y = 3.37X + 3.22W = 169.85 \dots \dots \dots (17)$$

WHERE: X = Public Investments (public gross fixed capital formation)

W = Private Investments (private gross fixed capital formation)

Y = GDP

The coefficient of multiple determination r^2 computed for the above model was 0.9235, meaning that 92.35 percent of the variation in GDP can be explained by the variation in public investment (i.e. public gross fixed capital formation) and those in private investment (i.e. private gross fixed capital formation). The value obtained for r^2 was satisfactory. The coefficient of multiple correlations showing the relative association between variables in the model was 96 percent, which is also considered satisfactory. This is shown in Table 1 of Appendix A. To check the validity of the model further, the residual plot was also examined, and there was little or no pattern in the relationship between the residual and the values of X (public investments) and W (private investments). Thus, it was concluded that the multiple regression model was appropriate.

Testing the linear relationship between the dependent variable and the explanatory or independent variables with the F test, the null hypothesis H_0 was rejected since:

$$F > F_U \text{ (critical value).}$$

Therefore a linear relationship exists between the dependent variable and the explanatory variables in the model (see Table 1 of Appendix A). In determining the contribution of the explanatory variable, the partial F-test criterion was used and the stages employed are as follows:

- Two simple linear regression model partial outputs with each having one of the mentioned explanatory variables were derived (see Table 2 and 3 in Appendix A).

- To determine whether X significantly improves the model after W is included, the following was derived using Table 1 and Table 2 in Appendix A.

$$SSR(X/W) = 80568662.6 - 78949647 = 1619015.6$$

$$F = \frac{1619015.6}{141999.4} = 11.40 > F_{critical}$$

Therefore the addition of variable X after W has been included, significantly improving the model.

- To determine whether W significantly improves the model after X has been included:

$$SSR(W/X) = 80568662.6 - 68933355 = 11635307.6$$

$$F = \frac{11635307.6}{141999.4} = 82 > F_{critical}$$

In addition, variable W significantly improves the model after variable X has been included.

Thus, it has been possible to show that each of the explanatory variables significantly improves the model. However, the proportion of W (i.e. private gross fixed capital formation) was significantly greater, since 82 is greater than 11.40. Finally, the second multiple linear regression model, considering all the explanatory variables in Table 4.1.1, was derived (see equation 18 and Table 4 in Appendix A).

$$Y = 151 + 3W + L \dots\dots\dots (18)$$

WHERE: L = Labour services

W = Private Investments (private gross fixed capital formation)

Y = GDP

The variable X (i.e. public investment) was excluded from the model in equation (18) because it was not statistically significant in comparison to the others (i.e. it was not significantly related to GDP as evidenced from the t statistics in Table 4 in Appendix A). Nonetheless, before checking the t-statistics, the multiple correlation coefficient (R), coefficient of determination (R square) and the F-statistics were all satisfactory shown in Table 4 in Appendix A.

4.3. Summary

This investigation has been able to establish the following:

- The sub-Saharan Africa final consumption expenditure (FCE_{SSA}) was 4.4 times larger than the region's gross capital formation (GCF_{SSA}) i.e.

$$FCE_{SSA} = 4.4(GCF_{SSA}) \dots \dots \dots (19)$$

- The industrialised countries' final consumption expenditure (FCE_{IC}) was 3.8 times larger than their gross capital formation (GCF_{IC}). i.e.

$$FCE_{IC} = 3.8(GCF_{IC}) \dots \dots \dots (20)$$

- (FCE_{SSA}) is 2.5% greater than (FCE_{IC})
- (GCF_{SSA}) is 2.1% less than (GCF_{IC})

These results are derived from the fact that, as the findings above have shown, the sub-Saharan African region consumes so much and invests so little in comparison to the industrialised countries.

- With the following assumptions, it was possible to deduce an inference relation for measuring and comparing the economic stability of any country or region. These assumptions are as follows: we assumed a negative sign for final consumption expenditure as a percentage of GDP (FCE) and a positive sign for gross capital formation as a percentage of GDP (GCF). The inference relationship for economic stability:

$$S_E = GCF + FCE \dots \dots \dots (21)$$

S_E is the inference relationship for economic stability, and the higher its value in comparison to that of the industrialized countries (reference value), the higher the economic stability of that region or country.

Industrialized countries:

$$S_E = 20.8 - 79 = -58.2\%$$

Sub-Saharan Africa:

$$S_E = 18.7 - 81.5 = -62.8\%$$

Since: $-58.2 > -62.8$

⇒ The industrialised countries are economically more stable than the sub-Saharan Africa, with a 4.6% margin of stability.

- This investigation was able to show empirically that the private fixed capital formation (W) has a greater effect on GDP than the public fixed capital formation (X) in sub-Saharan Africa. The most striking revelation was that the effect of W on GDP was seven times greater than the effect of X . The implication of this finding is that the sub-Saharan African domestic economy is now in the hands of the private sector seven times over. This no doubt reflects a view contrary to the wide spread notion that the region's domestic economy is controlled by the public sector. This positive imbalance also reflects the private sector's much higher efficiency .Hence, the need for more privatization in sub-Saharan Africa. The positive imbalance revealed that the economic predicament of the sub-Saharan African region was not really about the balance between public and the private sectors, but rather about the size of the region's GDP.
- The inclusion of labour services as an independent variable in the production function revealed that the relationship between the public infrastructure and economic growth and development in sub-Saharan Africa was quite negligible. In addition, the final interface model in equation (18) further reaffirmed the dominant role of private investment or private infrastructure in sub-Saharan Africa.

Chapter Five

Methodology of the Survey

5.0. Introduction

This investigation seeks to identify the causes and effects of infrastructure failures in Nigeria. It is clearly impossible with any conceivably available resources of time, money and people, to interview every one of the 150 million inhabitants (World Bank 2005) in a country of 923,768 km². There is therefore a need for an effective sample that could adequately estimate the facts and predict an outcome for the population of Nigeria. A sample could therefore be defined as a subgroup of a study population (Kumar 1999).

Though, sampling saves time and resources, it does not give a full picture but only an estimate or prediction (Kumar 1999; Gay 1996; Leedy and Ormrod 2001). By implication, estimating a situation in the total population leaves a possibility for an error. On the concept of sampling, Kumar (1999), as further observed by Leedy and Ormrod (2001), is of the view that the tolerance factor for errors is an important consideration in the selection of a sample.

The sample size adopted for this investigation was 600. This size was chosen because one of the basic principles of sampling is that the larger the sample size, the higher the level of accuracy of the sample statistics or findings (Kumar 1999; Gay 1996; Leedy and Ormrod 2001). Nevertheless, Gay (1996) as observed by Leedy and Ormrod (2001) were of the view that beyond a population size of 5000, a sample size equal or greater than 400 is adequate. From the sample size, the next stage is the sampling technique. A sampling technique can only be chosen after the adoption of a sampling type i.e. either random / probability sampling, non- random / non-probability sampling or a mixture sampling design.

5.1. Types of sampling

A framework of sampling types and strategies can be found in Appendix A. They are briefly explained in the following paragraphs.

5.1.1. Mixed sampling design

This type of sampling design consists of just one sampling strategy called “systematic sampling”. It is classed under mixed sampling because it exhibits the characteristics of both the random or probability sample design and the non-random or non-probability sample design. Kumar (1999) delineated the stages of systematic sampling as follows:

- The listing of all the elements in the study population
- Working out and deciding the sample size
- The determination of interval width (K) i.e. the ratio of total or study population divided by sample size
- The total population is subdivided into “K” number of segments or intervals
- Using simple random sampling, an element is selected from the first interval
- Other elements are selected using the width of the interval “K”. For example, if $K = 5$ and the first element selected by random sampling, the second and subsequent elements are selected bearing in mind the derived interval width of 5 – i.e. the second element would then be the sixth element counting from the first selected element in the list of the total population; the third element to be selected would be the twelfth in the list counting from the first selected element, and so on

Leedy and Ormrod (2001) described systematic sampling as the selection of clusters or strata in a predetermined sequence which originates by chance. For example, if a population is divided into 12 clusters and each of these clusters numbered, the selection of a predetermined sequence could either be the selection of clusters numbered in odd numbers (i.e. 1, 3, 5, 7, 9 and 11) or those in even numbers (i.e. 2, 4, 6, 8, 10 and 12). Thus with the aid of a tossed coin a particular predetermined sequence of numbers is chosen.

This procedure is carried out continuously until the required sample size is achieved. However, this strategy was not adopted for this survey because it was not practical to get a list of all the elements in the study population running over a hundred million. Nonetheless, the non-probability technique later employed in the selection of elements makes it impossible to apply statistical tests based upon the theory of probability, which is vital to an investigation of this type.

5.1.2. Non- random / probability sampling designs

This sampling design consists of the following sampling techniques:

- Quota sampling
- Accidental sampling
- Judgemental or purpose sampling
- Snowball sampling

These sampling techniques do not follow the theory of probability in selecting the elements making up the sample size from the sampling population (Kumar 1999; Gay 1996; Leedy and Ormrod 2001). Non-random or non-probability sampling design is used when the sampling characteristics are rare i.e. when the number of elements in a population is unknown or very difficult to identify. Thus, the selection of elements is based on other considerations quite independent of the theory of probability. However, these strategies were not used in this investigation, because the sampling characteristics in question are not rare and are incapable of representing the sampling population. In addition, the inferences drawn from these sampling techniques can not be generalized for the total sampling population (Kumar 1999; Gay 1996; Leedy and Ormrod 2001), while statistical tests based on the theory of probability can not be applied.

5.1.3. Random or Probability sampling designs

These were the sampling strategies adopted for this investigation. They consist of the following:

- Simple random sampling
- Stratified random sampling
- Cluster sampling

The sampling technique adopted for this investigation was the double stage stratified random sampling design. This sampling technique was adopted bearing in mind another basic rule of sampling which states that the higher the variation with respect to the characteristics under consideration in the study population, the greater the uncertainty or error for a given sample size (Kumar 1999). By implication, the more identical all the elements are in a population, the more accurate the sample estimates irrespective of the chosen sample size. For example, if geographical location in Nigeria is the characteristic under study, the error margin is higher if samples are drawn from each of the 36 states as opposed to the stratification of Nigeria into its six geopolitical zones. Alternatively, a sample drawn at random without considering stratification would give heterogeneous data with a high level of uncertainty compared with any sample stratification either by states or geographical location.

However, questionnaire distribution was the method adopted for data collection in this survey. A questionnaire is a written list of questions that are read, interpreted and answered in writing by respondents. It takes into consideration the need for clarity and the questions being easy to assimilate. This method of data collection was chosen because it is cost effective and ensures anonymity (Kumar 1999). However, it is cost effective because potential respondents are expected to cover a wide geographical area, and anonymity must be guaranteed because the questionnaire covers some issues impinging on personal finances and corruption (see Appendix A for the questionnaire design). The questionnaire was administered to a sample drawn from a study population in Nigeria.

Another reason for adopting the stratified random sampling technique was that this survey aims to achieve an aggregate cross-section of the study population. Nevertheless, stratified random sampling is a method whereby the sample size is subdivided into segments, otherwise referred to as strata, which are based on some unique or specified characteristics, before each of the segments is subjected to random sampling. Random sampling is a selection technique that gives equal and independent chance to each element within the study population. The method used to construct this random sample in this survey was the application of a table of random numbers. For a

thorough understanding of this method and how it was used in the survey, it is necessary to have an overview of the methodological framework.

Figure 5.1.3.2 Figure 5.1.3.1 Methodological frame work of survey

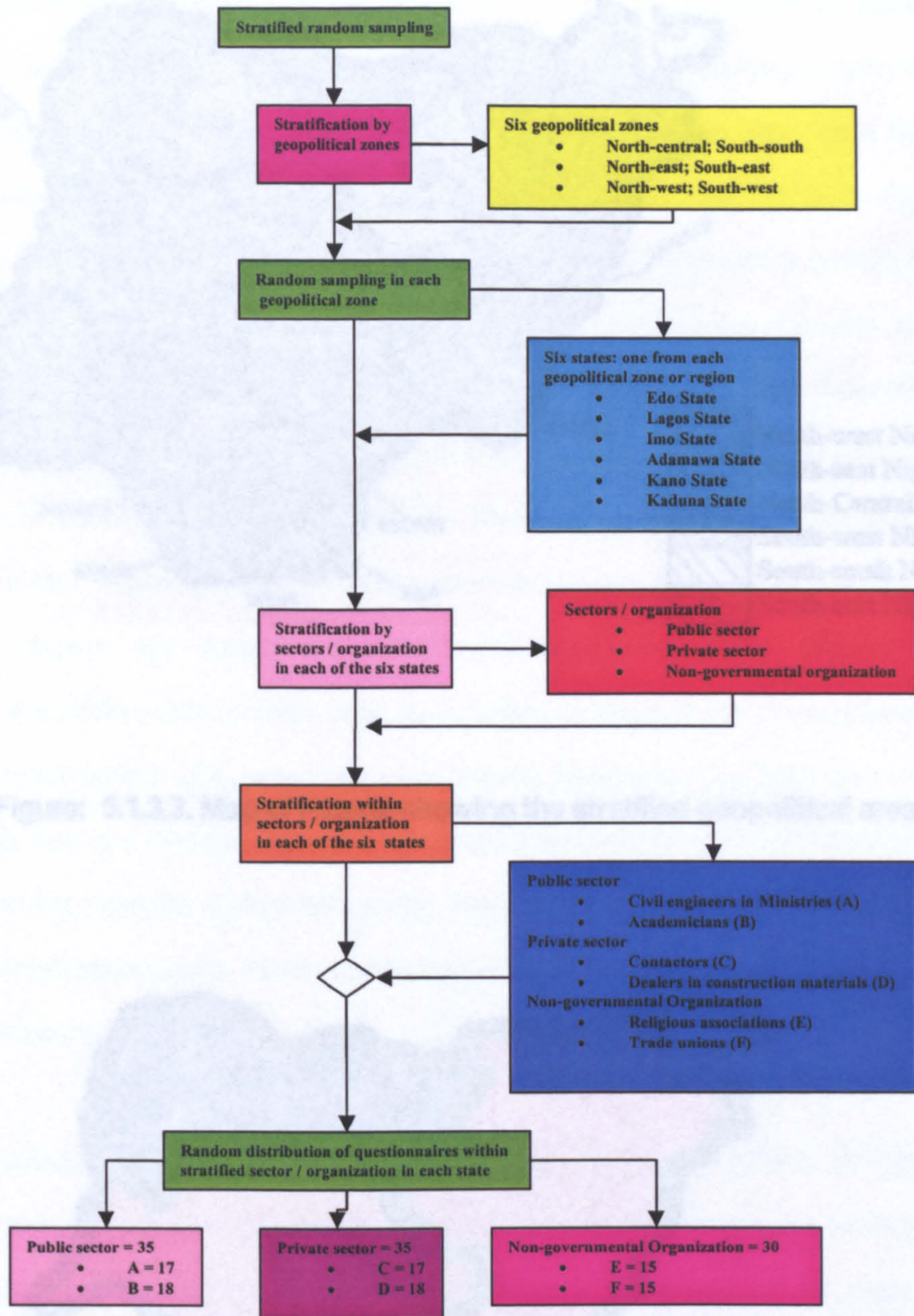


Figure: 5.1.3.2. Map of Nigeria showing the stratified geopolitical zones and states

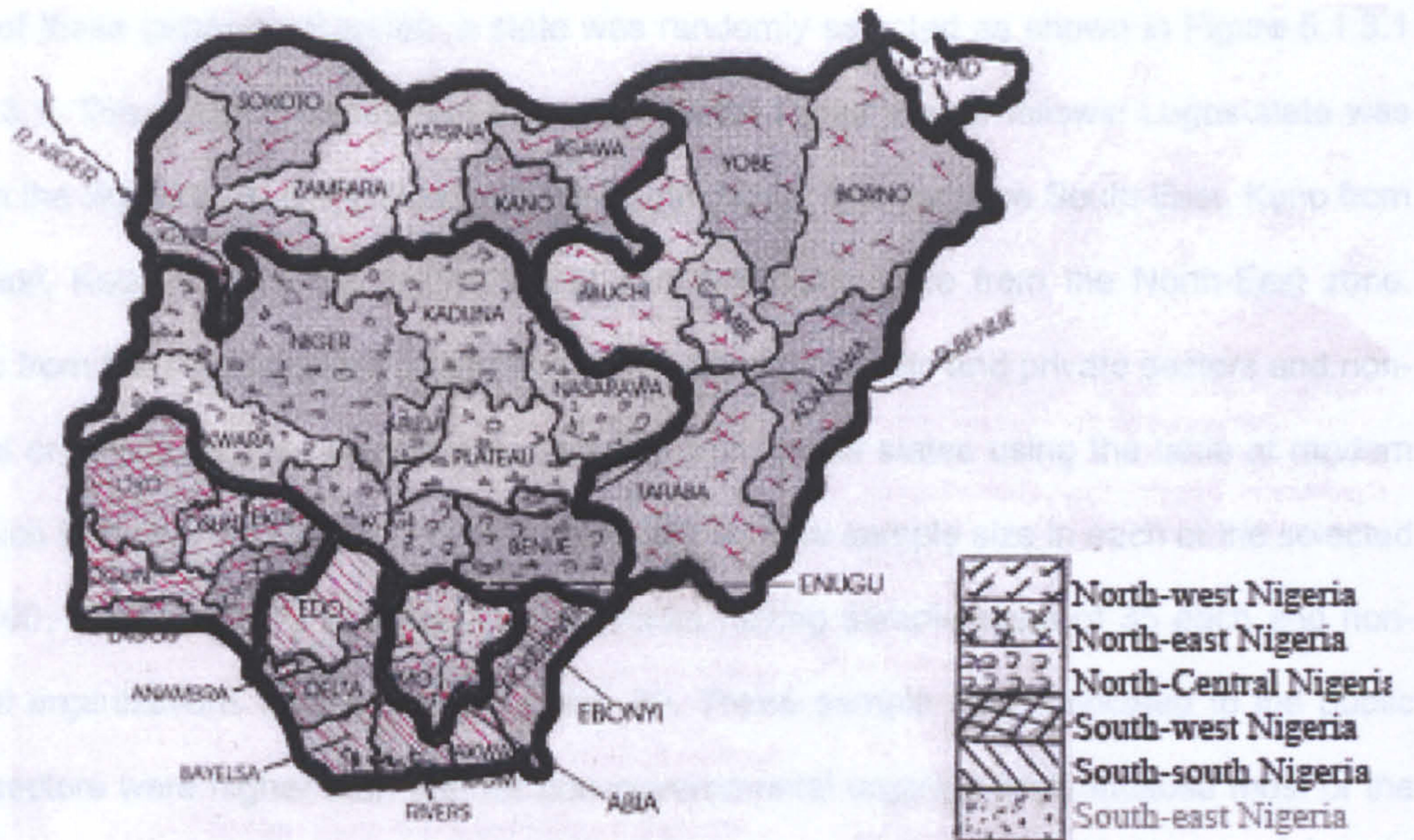
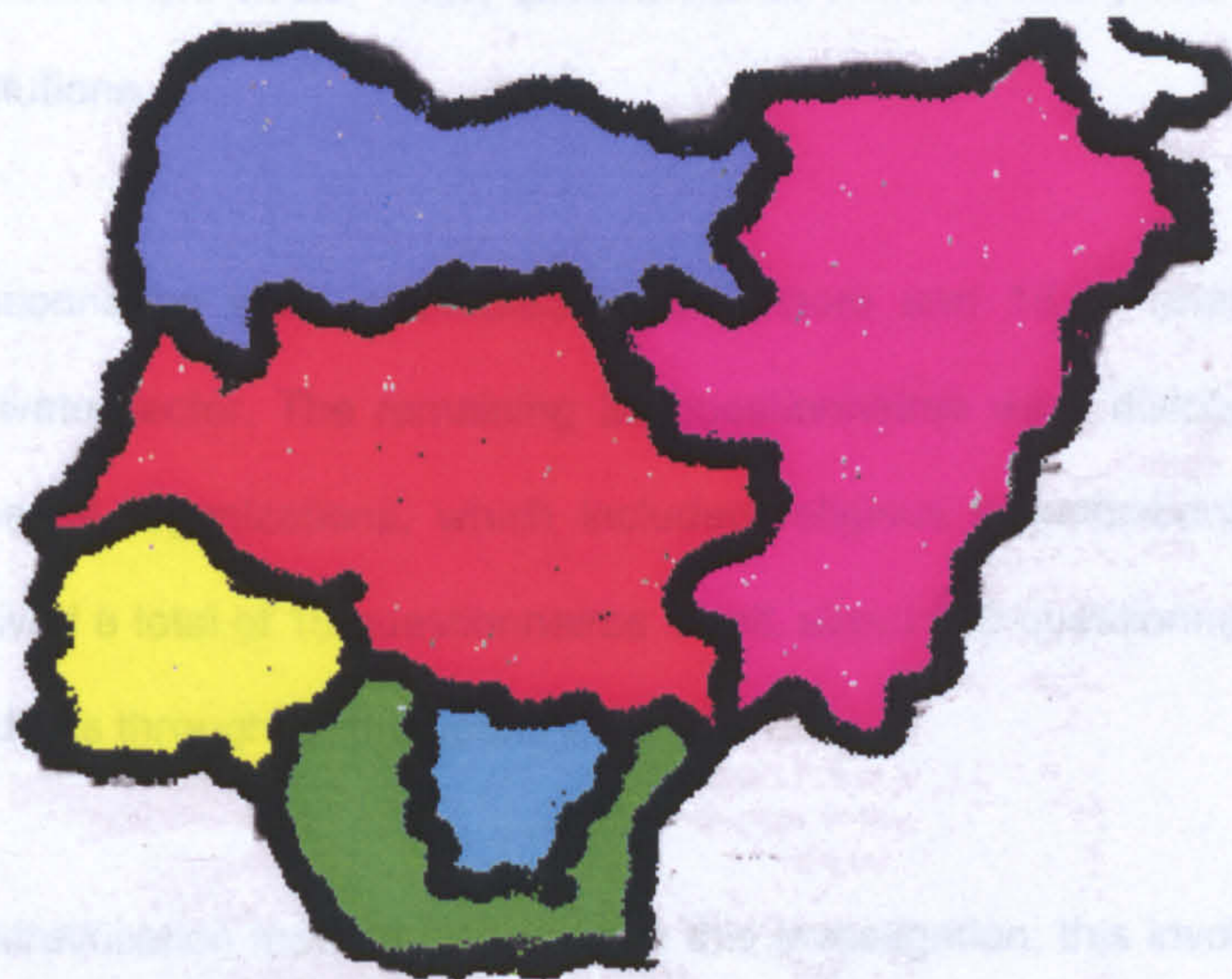


Figure: 5.1.3.3. Map of Nigeria showing the stratified geopolitical area



From the framework in Figure 5.1.3.1, the six geopolitical zones in Nigeria are the first six strata and in each of these geopolitical zones, a state was randomly selected as shown in Figure 5.1.3.1 and Table 5.3.1. The selected states and their geopolitical zones are as follows: Lagos state was selected from the South-West zone, Edo from the South-South, Imo from the South-East, Kano from the North-West, Kaduna state the North-Central and Adamawa state from the North-East zone. Respondents from the second specified stratum, comprising the public and private sectors and non-governmental organizations, were eventually selected from these states using the table of random numbers, which is shown with its procedure in Appendix A. The sample size in each of the selected states was 100, with the public and the private sectors having sample sizes of 35 each and non-governmental organizations having a sample size 30. These sample sizes allocated to the public and private sectors were higher than that for non-governmental organizations because most of the infrastructures in Nigeria are usually provided by the public or private sectors. The 35 questionnaires for the public sector in each state were further subdivided into 17 questionnaires for civil engineers in ministries and 18 for academics in reputable institutions. Civil engineers were used for the reason that they are directly involved in the production and provision of infrastructures in Nigeria. To balance the views from the public sector, there was the need to have respondents that could represent infrastructure users. Thus, questionnaires were randomly distributed to academics from reputable institutions.

Similarly, 17 questionnaires were distributed to contactors and 18 to retailers of construction materials in the private sector. The remaining 30 questionnaires were distributed to respondents from non-governmental organizations, which included religious organizations and trade unions, each of which received a total of 15 questionnaires. In all, about 600 questionnaires were distributed to potential respondents throughout the country.

The double-stage stratification method was used in this investigation; this involved the stratification of Nigeria into its six geopolitical zones and of each of the selected states into six segments, namely civil engineers in ministries, academics from reputable institutions, contractors, dealers in construction materials, members of trade unions and religious organizations. This amounts to a

double-stage stratified random sampling technique. However, this technique is not significantly different from the double-stage cluster sampling. Cluster sampling is when the sampling population is divided into groups called clusters from which elements are then selected by simple random sampling (Kumar, 1999).

Table 5.1.3: States within Geopolitical zones and the selected states

S / N	Geopolitical zones	States	Selected states
1	North western Nigeria	Jigawa	Kano
		Kano	
		Katsina	
		Kebbi	
		Sokoto	
		Zamfara	
2	North central Nigeria	Benue	Kaduna
		Kaduna	
		Kogi	
		Kwara	
		Nasarawa	
		Niger	
		Plateau	
3	North eastern Nigeria	Adamawa	Adamawa
		Bauchi	
		Borno	
		Gombe	
		Taraba	
		Yobe	
4	South western Nigeria	Oyo	Lagos
		Ogun	
		Lagos	
		Ondo	
		Osun	
		Ekiti	
5	South south Nigeria	Akwa Ibom	Edo
		Edo	
		Delta	
		Rivers	
		Bayelsa	
		Cross river	
6	South eastern Nigeria	Abia	Imo
		Imo	
		Anambra	
		Enugu	
		Ebonyi	

5.2. Problems and experiences during data collection

One of the major problems experienced during fieldwork was limitation of funds: there were no special grants made available for this purpose. All trips made to the six states from which data was collected were privately financed. Hence, road travel was used as being the cheapest method of

travel. Although the logistics were very poor, this afforded an opportunity for a first hand experience of the people and the state of the infrastructure, including roads, telecommunication, electricity, water supply, sanitation and housing in Nigeria.

The people were highly receptive towards the aims of the research data collection team in all the cities visited. The research data collection team comprised the author, five final year students of Civil and Structural Engineering at the University of Benin, and two year four students of the same department and university in each of the six geopolitical regions. These year four students were on industrial training in these regions, and were used to assist the research data collection team in finding their way round the region, as well as to bridge communication gaps when the need arose. They proved very useful in this role. The success of the data collection was partly due to their unmitigated support and dedication. For example, in the North-West geopolitical zone, prospective respondents were initially very reluctant to communicate with the research data collection team. However, this reluctance was overcome because the research data collection team understood their culture, religion and language.

Another notable experience was at St. Saviours Road in Benin City, South-south Nigeria. The research data collection team observed a scene along the failed portion of this road involving some commercial bike riders (Scooter drivers). This road was in a complete state of disrepair and the research data collection team decided to take a photograph of it before thinking of a way to circumvent the failed portion. While the picture was being taken, some of the Scooters riders objected violently, demanding to know why the picture was being taken. They damaged one camera beyond repair and seized the other. They were of the view that members of the research data collection team were journalists out to report their activities on the failed portion of the road. Because the failed portion of this road was seriously waterlogged and could not be traversed by four-wheeled motor vehicles, the Scooter riders were making a lucrative amount of money by transporting people across the failed section.

Figure: 5.2.1: Part of the failed Portion of St. Savior's Road in Benin City (2004)



However, the seized cameras were later released after they were convinced that the team was made up of students and the information collected was purely for research purposes. Some of the Scooter riders confided to the team that their means of sustenance depends on failed infrastructure such as the one in St. Saviors Road to survive the prevalent poverty and unemployment. It was learnt that similar activities take place in parts of the City such as Ugbowo area, Ogida quatres, Uselu quatres, Upper Mission and Okhoro areas.

Due to serious income disparity and unemployment some people have to take solace in failed structures like the one at St Saviors Road to survive. It was not surprising to find the Scooter drivers apparently ready to fight anything that could compromise their only means of sustenance. This is anecdotal evidence of the degree to which failed infrastructure can affect the thinking and behavior of the poor.

Figure 5.2.2: A failed portion of Uwelu road, Ogida Quarters in Benin City (2004)



Figure 5.2.3: Part of the failed portion of Upper Mission Road in Benin City during the dry season (2004).



Another interesting event during field work occurred in Imo State, South-east Nigeria. The local council barred team from taking any photographs in the town. Nonetheless, the level of infrastructure in this part of the country was the worst experienced in the survey, at least according to our observation.

The people of Imo State were eventually very hospitable to the research data collection team. Initially, there were difficulties of data collection in the town as the response rate was extremely low (less than 10%). Potential respondents were very unwilling to return their questionnaires, which resulted in the extension of our stay in the town by three days. However, a similar technique used by the team in Kano State in North-west Nigeria produced the response the team had wanted and needed. It was observed that the people of this region respond quickly to anyone who could speak their language and understand their way of life. This observation was noticed throughout the team's stay in Imo town. Surprisingly, even the literate and enlightened amongst them exhibited these traits. While some respondents in this region demanded gratification for the return of the questionnaire during the first data collection exercise, these same persons became very accommodating during the follow-up. Their cooperation must have been due to the technique of bridging the communication gap with the use of their language and value system. However, extreme care was taken by the team not to interfere in the respondents' response to the questionnaire.

5.3. Summary

In this chapter, the theory of sampling was discussed. Also addressed were the various types of sampling procedures and probability sampling was adopted as the most relevant for the survey. The two-stage stratified random sampling method was presented. Thus the desire to have an aggregate cross-section of the study population prompted the adoption of the two stage stratified random sampling. The estimated sample size was 600. In the chapter, reasons were given for accepting questionnaire as the method of data collection and the questionnaire distribution replicated in a framework. Some very unique experience gathered during the field work was reported.

Chapter Six

Analysis and Explanation of Survey results

6.0. Introduction

The data for this survey was collected through the distribution of questionnaires. This method of data collection was chosen because it is cost effective and ensures anonymity. The questionnaire (please see Appendix A, page 249) was sub-divided into three sections: section "A" comprised six personal questions; section "B" consisted of 13 questions aimed at knowing the present "state of infrastructure provision in Nigeria" and section "C" contained two questions addressing the "causes of infrastructure failures in Nigeria". Each of these sections and the analyses carried out on the results of the data obtained from them are explained in the following paragraphs.

In section A, the personal questions give an insight into the personal circumstances of the prospective respondents, and encompass areas such as "willingness to respond to the questionnaire", "geopolitical regions or zones of respondents", "sector / organization of respondents", "respondent's rank or class in organization", "respondents range of monthly income" and the "age range of respondents". This collated data distribution was examined and further crosstabulation within the same section was carried out. For example, data on "geopolitical region" was crosstabulated with "sector / organization of respondents", "respondents' class or rank in organization" and "respondents monthly income". This was in order to reveal the distribution of respondents using the various criteria in the questionnaire.

Section "B" of the questionnaire covered "stability of infrastructure services"; "infrastructure supply"; "quality of infrastructure"; "infrastructure maintenance"; "the response rate to infrastructure maintenance"; "staffs of local infrastructure service providers" and "infrastructure monthly bills". A similar crosstabulation to the one in the

preceding paragraph was also carried out between data obtained in section “A”, such as “geopolitical regions” and “range of monthly income”, and those from section “B”. The purpose of crosstabulating data from both sections was to see whether there were varying views on the state of infrastructure in Nigeria across “geopolitical regions” and “range of monthly income”. The analysis carried out for each crosstabulation and subsequent correlation is presented in this chapter.

Correlations between variables from section “B” of the questionnaire and the subsequent empirical models were developed using the ordinal data collected as a way of critically evaluating basic assumptions and hypothesis made on infrastructure failures in sub-Saharan Africa and Nigeria in particular, as revealed in the literature review. For example, relationships between “stability of infrastructure services¹” and “infrastructure supply”, “stability of infrastructure services” and “quality of infrastructure”, “stability of infrastructure services” and “infrastructure maintenance”, “stability of infrastructure services” and “response rate to infrastructure maintenance”, “stability of infrastructure services and “staffs of local infrastructure service providers” were all confirmed. The empirical models developed from the data were through the means of multiple regression analysis. Each of these empirical models was validated using responses from 40 respondents selected at random specifically for this purpose.

Data collected from section C of the questionnaire, covering the causes of infrastructure failures in Nigeria, was analyzed using a severity index in matrix order (SIMO) model (Omoregie et al. 2005). This model was applied taking into consideration the peculiarity of the data collected in this section. The causes of infrastructure failures in Nigeria were revealed in order of severity using this model. These factors were analyzed against the severity expressed for each of them across the six geopolitical zones, and a coefficient of variation for each factor was calculated in order to establish its relative spread across geopolitical zones or regions. This is important because, while some factors in a survey

¹ This refers to the constancy of infrastructure services in Nigeria.

could be significant in one or two geopolitical regions and not in others, they could still affect significantly the total national result. For this reason, measuring the variations of spread alongside severity of factors was very important.

This chapter consists of:

- Section 6.0: Introduction.
- Section 6.1: Respondents distribution: Geopolitical regions and Sector / Organization.
- Section 6.2: Respondents class or rank distribution
- Section 6.3: Respondents range of monthly income distribution
- Section 6.4: Respondents age range distribution
- Section 6.5: Stability of infrastructure services
- Section 6.6: Infrastructure supply
- Section 6.7: Quality of infrastructure
- Section 6.8: Rate of infrastructure maintenance
- Section 6.9: Response rate to infrastructure maintenance
- Section 6.10: Stakeholders impression of staffs of local infrastructure service providers
- Section 6.11: Respondents rating of average infrastructure monthly bills
- Section 6.12: Correlation coefficients and Modeling of notable variable factors
- Section 6.13: Observations of results tables on factors responsible for infrastructure failures
- Section 6.14: Explanation of results on the causes of infrastructure failures in Nigeria

6.1. Respondents distribution: Geopolitical regions and Sectors / Organization

The stratified random sampling technique adopted for this investigation meant that respondents were asked to identify their geopolitical region and the sector / organization to which they belong. The aim was to ensure that the population within each stratum (i.e. geopolitical region or sector) was homogenous, thereby giving estimates greater accuracy . The questionnaire distribution and responses within each of the geopolitical regions and sector / organization are as follows:

Table 6.1.1: Questionnaire distribution and responses within each Geopolitical zone

	Number of questionnaires	Number of respondents	Valid Percent	Cumulative Percent
No response	0	2.0	.5	.5
South west	100	59.0	14.6	15.1
North west	100	70.0	17.4	32.5
South east	100	61.0	15.1	47.6
North east	100	54.0	13.4	61.0
South south	100	99.0	24.6	85.6
North central	100	58.0	14.4	100.0
Total	600	403.0	100.0	

Table 6.1.2: Questionnaire distribution and responses within each Sector / organization

	Number of questionnaires	Number of respondents	Valid Percent	Cumulative Percent
no response	0	6.0	1.5	1.5
Public	210	133.0	33.0	34.5
Private	210	130.0	32.3	66.7
Non Governmental Organization	180	97.0	24.1	90.8
Not applicable	0	37.0	9.2	100.0
Total	600	403.0	100.0	

The “non-response” in first row of Table 6.1.1 and Table 6.1.2 above represents the number and percentage of respondents that failed to give an answer. However, percentages in both tables were derived from the proportion of respondents in each geopolitical region or sector / organization relative to the total number of 403 respondents. For example, the proportion of 59 respondents from

southwest region in the total of 403 in Table 6.1.1 was 14.6 percent, and the proportion of 133 respondents from the public sector in the total of 403 respondents in Table 6.1.2 was 33 percent. In addition, the cumulative percentages in both Table 6.1.1 and Table 6.1.2 effectively totalled 100 percent in the last option in each of the tables. This indicates validity in the percentage computation. On the other hand, the “Not applicable” option in Table 6.1.2 falls amongst the given alternatives in the question from which respondents were asked to choose. Moreover, it was an option meant for those respondents not willing to indicate their sector / organization. Furthermore, in order know how respondents were distributed within each sector / organization in each geopolitical region, there was a need to carry out a cross-tabulation between geopolitical regions and sector / organization.

Table 6.1.3: Crosstabulation between Geopolitical region and Sector / organization

			Sector / Organization					Total
			no response	Public	Private	Non Governmental Organization	Not applicable	
Geo-Political Region in Nigeria	No response	Count	1	0	0	1	0	2
		% within Geo-Political Region in Nigeria	50.0%	.0%	.0%	50.0%	.0%	100.0%
	South west	Count	0	24	22	13	0	59
		% within Geo-Political Region in Nigeria	.0%	40.7%	37.3%	22.0%	.0%	100.0%
	North west	Count	0	27	19	19	5	70
		% within Geo-Political Region in Nigeria	.0%	38.6%	27.1%	27.1%	7.1%	100.0%
	South east	Count	0	19	21	16	5	61
		% within Geo-Political Region in Nigeria	.0%	31.1%	34.4%	26.2%	8.2%	100.0%
North east	Count	3	14	21	5	11	54	
	% within Geo-Political Region in Nigeria	5.6%	25.9%	38.9%	9.3%	20.4%	100.0%	
South south	Count	1	35	32	30	1	99	
	% within Geo-Political Region in Nigeria	1.0%	35.4%	32.3%	30.3%	1.0%	100.0%	
North central	Count	1	14	15	13	15	58	
	% within Geo-Political Region in Nigeria	1.7%	24.1%	25.9%	22.4%	25.9%	100.0%	
Total	Count	6	133	130	97	37	403	
	% within Geo-Political Region in Nigeria	1.5%	33.0%	32.3%	24.1%	9.2%	100.0%	

In Table 6.1.3, “count” simply represents the number or frequency of occurrence, and it should be viewed both horizontally and vertically. A horizontal view reveals the number of respondents across the various sectors in a particular geographical region (for example, the second row shows the distribution of respondents across all the sectors in South West Nigeria) while a vertical view reveals the number of respondents across the various geopolitical regions within a particular sector /

organization (for example, the second column shows the number of respondents in the public sector across the various geopolitical regions). However, “percent within geo-political region in Nigeria” indicates the percentage of frequency count of a particular occurrence in the total horizontal frequency counts. For example, in the second row and third column within the North-Central region, 24.1 percent represents the percentage of frequency count 14 in the total count of 58 respondents for that region.

6.2. Respondents class or rank distribution

The class or rank of respondents elicited the relative distribution of views across social class or status. The extent to which any particular view cuts across all strata or classes in an organization or falls within a class could also give an indication of its relative spread or restriction. However, Table 6.2.1 shows the total respondents’ distribution within each class of rank in the organization they indicated.

Table 6.2.1: Respondents class or rank in the organization

	Number of respondents	Valid Percent	Cumulative Percent
no response	9	2.2	2.2
low class	57	14.1	16.4
middle class	200	49.6	66.0
high class	61	15.1	81.1
not applicable	76	18.9	100.0
Total	403	100.0	

From Table 6.2.1 above, about nine respondents left the question of indicating their class or rank in the organization unanswered. However, about 76 respondents answered the question by indicating the option “not applicable”, which implies that they were not willing to disclose their class or rank in the organization. About 57 respondents, or 14.1 percent of the total, were “low class” while another 61 (15.1 percent) were higher class, making a difference of only one percent. Approximately, 49.6 percent, or about 200 respondents, fell within the “middle class”. The percentage difference between the higher and low class respondents and the 200 respondents in the middle class indicates a relatively good spread across the sample population. Moreover, the cumulative percent

effectively added up to 100 percent at the last option (“not applicable”) in the Table. Furthermore, to reveal how respondents were distributed within each class or rank within sector / organization in each geopolitical region, it was necessary to carry out a cross-tabulation between the geopolitical regions and the class or rank of respondents. Table 6.2.2 revealed a constant pattern of respondent distribution within specified strata or class in each of the geopolitical regions. It is evident that a sizeable percentage of respondents falls within the middle class stratum, with the upper and lower class respondents maintaining an acceptable difference in all the geopolitical regions. Thus, the distribution of respondents by class or rank could be considered acceptable.

Table 6.2.2: Crosstabulation between Geopolitical region and class of respondents

			Class in Organization					Total
			no response	low class	middle class	high class	not applicable	
Geo-Political Region in Nigeria	No response	Count	2	0	0	0	0	2
		% within Geo-Political Region in Nigeria	100.0%	.0%	.0%	.0%	.0%	100.0%
	South west	Count	2	14	28	8	7	59
		% within Geo-Political Region in Nigeria	3.4%	23.7%	47.5%	13.6%	11.9%	100.0%
	North west	Count	2	7	49	5	7	70
		% within Geo-Political Region in Nigeria	2.9%	10.0%	70.0%	7.1%	10.0%	100.0%
	South east	Count	0	18	19	13	11	61
		% within Geo-Political Region in Nigeria	.0%	29.5%	31.1%	21.3%	18.0%	100.0%
	North east	Count	2	3	26	10	13	54
	% within Geo-Political Region in Nigeria	3.7%	5.6%	48.1%	18.5%	24.1%	100.0%	
South south	Count	1	5	62	17	14	99	
	% within Geo-Political Region in Nigeria	1.0%	5.1%	62.6%	17.2%	14.1%	100.0%	
North central	Count	0	10	16	8	24	58	
	% within Geo-Political Region in Nigeria	.0%	17.2%	27.6%	13.8%	41.4%	100.0%	
Total	Count	9	57	200	61	76	403	
	% within Geo-Political Region in Nigeria	2.2%	14.1%	49.6%	15.1%	18.9%	100.0%	

6.3. Respondents range of monthly income distribution

The range of monthly income ascertained whether respondents' income levels are of any significance. This is very important in view of the direct relationship between income levels and infrastructure, as revealed in the literature review. The Table 6.3.1 below has not only shown the range of monthly income distribution in each of the geopolitical regions but also the total summary of income distribution for the country. This summary can be found in the last row of the table.

Table 6.3.1: Crosstabulation between Geopolitical regions and Range of monthly income.

			Range of montly income					Total
			No response	under fifty thousand naira	Between fifty thousand and one hundred thousand naira	One hudred thousand naira and above	Not applicable	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	2	24	17	8	8	59
		% within Geo-Political Region in Nigeria	3.4%	40.7%	28.8%	13.6%	13.6%	100.0%
		% of Total	.5%	6.0%	4.2%	2.0%	2.0%	14.6%
	North west	Count		12	44	4	10	70
		% within Geo-Political Region in Nigeria		17.1%	62.9%	5.7%	14.3%	100.0%
		% of Total		3.0%	10.9%	1.0%	2.5%	17.4%
South east	Count		23	17	8	13	61	
	% within Geo-Political Region in Nigeria		37.7%	27.9%	13.1%	21.3%	100.0%	
	% of Total		5.7%	4.2%	2.0%	3.2%	15.1%	
North east	Count	7	11	3	6	27	54	
	% within Geo-Political Region in Nigeria	13.0%	20.4%	5.6%	11.1%	50.0%	100.0%	
	% of Total	1.7%	2.7%	.7%	1.5%	6.7%	13.4%	
South south	Count	3	32	22	14	28	99	
	% within Geo-Political Region in Nigeria	3.0%	32.3%	22.2%	14.1%	28.3%	100.0%	
	% of Total	.7%	7.9%	5.5%	3.5%	6.9%	24.6%	
North central	Count		20	5	7	26	58	
	% within Geo-Political Region in Nigeria		34.5%	8.6%	12.1%	44.8%	100.0%	
	% of Total		5.0%	1.2%	1.7%	6.5%	14.4%	
Total	Count	14	122	108	47	112	403	
	% within Geo-Political Region in Nigeria	3.5%	30.3%	26.8%	11.7%	27.8%	100.0%	
	% of Total	3.5%	30.3%	26.8%	11.7%	27.8%	100.0%	

It can be seen from the last row in the table above that the number of respondents decreases with an increase in income level. A similar trend is found in each of the six geopolitical regions in the country. Nonetheless, about 27.8 percent of the total 403 respondents declined to indicate their range of monthly income. However, to check the significance of income levels to the views expressed on the stability of infrastructure services in Nigeria, the following cross-tabulation between range of monthly income and the stability of infrastructure services in Nigeria was carried out:

Table 6.3.2: Respondents Range of monthly income and stability of infrastructure services in Nigeria.

			Stability of Infrastructure and service delivery in Nigeria					Total
			No response	Very Stable	Stable	Unstable	Very Unstable	
Range of montly income	No response	Count	5		1	6	2	14
		% within Range of montly income	35.7%		7.1%	42.9%	14.3%	100.0%
		% of Total	1.2%		.2%	1.5%	.5%	3.5%
under fifty thousand naira		Count		3	4	64	51	122
		% within Range of montly income		2.5%	3.3%	52.5%	41.8%	100.0%
		% of Total		.7%	1.0%	15.9%	12.7%	30.3%
Between fifty thousand and one hundred thousand naira		Count		2	23	38	45	108
		% within Range of montly income		1.9%	21.3%	35.2%	41.7%	100.0%
		% of Total		.5%	5.7%	9.4%	11.2%	26.8%
One hudred thousand naira and above		Count	1	2	2	20	22	47
		% within Range of montly income	2.1%	4.3%	4.3%	42.6%	46.8%	100.0%
		% of Total	.2%	.5%	.5%	5.0%	5.5%	11.7%
Not applicable		Count			4	42	66	112
		% within Range of montly income			3.6%	37.5%	58.9%	100.0%
		% of Total			1.0%	10.4%	16.4%	27.8%
Total		Count	6	7	34	170	186	403
		% within Range of montly income	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%
		% of Total	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%

A careful study of Table 6.3.2 above reveals that irrespective of the range of monthly income, a large number of respondents were of the view that infrastructure service delivery in Nigeria was either “unstable” or “very unstable”. For example, about 52.5 percent of respondents under the “fifty thousand naira” monthly income maintained that infrastructure service delivery in Nigeria was “unstable”, while another 41.8 percent with the same income observed that it was “very unstable”. Adding both percentages gave a total dissatisfaction response of 94.3 percent. Similarly, respondents between “fifty thousand and one hundred thousand naira” monthly income and those above “one hundred thousand naira” monthly income gave approximately 77 percent and 89 percent dissatisfaction rating respectively. The 77 percent dissatisfaction breakdown for respondents between “fifty thousand and one hundred thousand naira” monthly income are as follows: 35.2 percent indicated that infrastructure service delivery was “unstable” and 41.7 percent saw it as “very unstable”. For the 89 percent of respondents above “one hundred thousand naira” monthly income who showed dissatisfaction, 42.6 percent pointed out that it was “unstable” while 46.8 percent maintained it was “very unstable”.

Respondents who left the question on range of monthly income unanswered but answered the question on stability of infrastructure services are represented as “no response” in the first row of Table 6.3.2. About 42.9 percent of these respondents indicated that infrastructure service delivery was “unstable” in Nigeria while 14.7 percent maintained that it was “very unstable”. Some respondents ticked the option “not applicable” when answering the question on range of monthly income, which indicates that the particular question was not applicable to them or that they were not willing to specify the range of their monthly income. These respondents are coded “not applicable” in the last row of Table 6.5.1.2. About 37.5 percent of these respondents observed that infrastructure service delivery in Nigeria was “unstable” and 58.9 percent of them were of the view that it was “very unstable”, giving a total dissatisfaction response for this group of 96.4 percent. Consequently, the frequency analysis so far proves that income levels have not significantly affected the views expressed by respondents on the matter of infrastructure stability in Nigeria, because a similar trend of dissatisfaction can be observed in the whole range of monthly incomes. Having analyzed if income affected the views expressed by respondents, the next stage is to examine if respondents’ ages impacted on views expressed.

6.4. Respondents age range distribution

Respondents were asked their age range in the survey in order to ascertain the level of similarity or dissimilarity of views across age groups and to check if the age range of respondents affects their responses.

Table 6.4.1 : Crosstabulation of Geopolitical region and Age range of respondents

			Age Range					Total
			No response	Under 30 years	30-60 years	60-65 years	65 years and above	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	1	15	31	9	3	59
		% within Geo-Political Region in Nigeria	1.7%	25.4%	52.5%	15.3%	5.1%	100.0%
		% of Total	.2%	3.7%	7.7%	2.2%	.7%	14.6%
	North west	Count	1	33	24	8	6	70
		% within Geo-Political Region in Nigeria	1.4%	47.1%	34.3%	8.6%	8.6%	100.0%
		% of Total	.2%	8.2%	6.0%	1.5%	1.5%	17.4%
South east	Count		15	36	8	2	61	
	% within Geo-Political Region in Nigeria		24.6%	59.0%	13.1%	3.3%	100.0%	
	% of Total		3.7%	8.9%	2.0%	.5%	15.1%	
North east	Count	2	41	10	1		54	
	% within Geo-Political Region in Nigeria	3.7%	75.9%	18.5%	1.9%		100.0%	
	% of Total	.5%	10.2%	2.5%	.2%		13.4%	
South south	Count		27	66	4	2	99	
	% within Geo-Political Region in Nigeria		27.3%	66.7%	4.0%	2.0%	100.0%	
	% of Total		6.7%	16.4%	1.0%	.5%	24.6%	
North central	Count		8	29	12	9	58	
	% within Geo-Political Region in Nigeria		13.8%	50.0%	20.7%	15.5%	100.0%	
	% of Total		2.0%	7.2%	3.0%	2.2%	14.4%	
Total	Count	6	139	196	40	22	403	
	% within Geo-Political Region in Nigeria	1.5%	34.5%	48.6%	9.9%	5.5%	100.0%	
	% of Total	1.5%	34.5%	48.6%	9.9%	5.5%	100.0%	

The last row in Table 6.4.1 revealed that the highest number of respondents was within the age range of 30–60 years, making about 48.6 percent of the total, followed by those under the age of 30 (34.5 percent). However, it should be emphasized that the questionnaire was not administered to anyone below the age of 25 years. About 83 percent of respondents fell within the age bracket 25–60 years when both percentages are added. The percentage of respondents within the age bracket of 60–65 years was just 9.9 percent. The cross-tabulation shown in Table 6.4.2 demonstrates the

levels of similarity or dissimilarity of views across age ranges and the effect (if any) of age on response.

Table 6.4.2: Cross-tabulation of Age Range and Stability of Infrastructure in Nigeria

			Stability of Infrastructure and service delivery in Nigeria					Total
			No response	Very Stable	Stable	Unstable	Very Unstable	
Age Range	No response	Count	4			1	1	6
		% within Age Range	66.7%			16.7%	16.7%	100.0%
		% of Total	1.0%			.2%	.2%	1.5%
Under 30 years		Count		4	22	54	59	139
		% within Age Range		2.9%	15.8%	38.8%	42.4%	100.0%
		% of Total		1.0%	5.5%	13.4%	14.6%	34.5%
30-60 years		Count	1	1	8	97	89	196
		% within Age Range	.5%	.5%	4.1%	49.5%	45.4%	100.0%
		% of Total	.2%	.2%	2.0%	24.1%	22.1%	48.6%
60-65 years		Count		2	1	17	20	40
		% within Age Range		5.0%	2.5%	42.5%	50.0%	100.0%
		% of Total		.5%	.2%	4.2%	5.0%	9.9%
65 years and above		Count	1		3	1	17	22
		% within Age Range	4.5%		13.6%	4.5%	77.3%	100.0%
		% of Total	.2%		.7%	.2%	4.2%	5.5%
Total		Count	6	7	34	170	186	403
		% within Age Range	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%
		% of Total	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%

The “no response” row in Table 6.4.2 represents those respondents that were not willing to indicate their age. It was generally observed that across all ages, the number of respondents indicating that infrastructure service delivery in Nigeria was “very unstable” and “unstable” far exceeded those respondents that believed infrastructure service delivery was “very stable” or “stable”. The last row summarizes the whole table: about 46.2 percent of all respondents indicated that infrastructure service delivery in Nigeria was “very unstable” and 42.2 percent said “unstable”, giving a total dissatisfaction level of 88.4 percent. However, this percentage was not different from the percentage of respondents that earlier expressed their dissatisfaction in Table 6.3.2.

6.5. Stability of infrastructure services in Nigeria

Respondents were asked to rate the level of stability of infrastructure services in Nigeria. This is important because of the literature review's strong emphasis on the erratic nature of infrastructure service delivery in Nigeria. Results obtained can be seen in Table 6.5.1.

Table 6.5.1 Crosstabulation of Geopolitical region and Stability of infrastructure services in Nigeria

			Stability of Infrastructure and service delivery in Nigeria					Total
			No response	Very Stable	Stable	Unstable	Very Unstable	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	1	4	3	20	31	59
		% within Geo-Political Region in Nigeria	1.7%	6.8%	5.1%	33.9%	52.5%	100.0%
		% of Total	.2%	1.0%	.7%	5.0%	7.7%	14.6%
	North west	Count	1		19	26	24	70
		% within Geo-Political Region in Nigeria	1.4%		27.1%	37.1%	34.3%	100.0%
		% of Total	.2%		4.7%	6.5%	6.0%	17.4%
South east	Count			2	18	41	61	
	% within Geo-Political Region in Nigeria			3.3%	29.5%	67.2%	100.0%	
	% of Total			.5%	4.5%	10.2%	15.1%	
North east	Count	1	3	2	24	24	54	
	% within Geo-Political Region in Nigeria	1.9%	5.6%	3.7%	44.4%	44.4%	100.0%	
	% of Total	.2%	.7%	.5%	6.0%	6.0%	13.4%	
South south	Count	1		3	57	38	99	
	% within Geo-Political Region in Nigeria	1.0%		3.0%	57.6%	38.4%	100.0%	
	% of Total	.2%		.7%	14.1%	9.4%	24.6%	
North central	Count			5	25	28	58	
	% within Geo-Political Region in Nigeria			8.6%	43.1%	48.3%	100.0%	
	% of Total			1.2%	6.2%	6.9%	14.4%	
Total	Count	6	7	34	170	186	403	
	% within Geo-Political Region in Nigeria	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%	
	% of Total	1.5%	1.7%	8.4%	42.2%	46.2%	100.0%	

From the total 403 respondents in Table 6.5.1, about 46.2 percent were of the view that infrastructure service delivery in Nigeria was "very unstable" and another 42.2 percent that it was "unstable", giving a total of 88.4 percent. 8.4 percent said the infrastructure was "stable" and 1.7 percent "very stable" yielding a total of just 9.8 percent.

A regional breakdown is as follows. Results from the South-west region in Table 6.5.1 showed a total number of 59 respondents, about 52.5 percent of whom held the view that infrastructure

service delivery in Nigeria was “very unstable” and a further 33.9 percent “unstable”, giving a total dissatisfaction rate of 86.45 percent – a difference of approximately 2 percent with the national figure. This is hardly a significant difference. On the other hand, 5.1 percent proportion of respondents from the South-west region maintained that infrastructure service delivery in Nigeria was “stable” and 6.8 percent proportion “very stable”, giving a total satisfaction level of just 11.9 percent. These are shown in Figures 6.5.1 and 6.5.2. 1.7 percent proportion of respondents for South-west did not respond at all.

Results collated from North-west region, revealed 70 respondents for the region out of a total of 100. About 34.3 percent of these respondents observed that infrastructure service delivery in Nigeria was “very unstable” and 37.1 percent “unstable”, giving a total of 71.4 percent. This figure is 17 percent less than the level of dissatisfaction expressed nationwide. An additional 27.1 percent proportion of respondents maintained that infrastructure service delivery in Nigeria was “stable”. No responses were recorded for the “very stable” option. Thus, the total satisfaction response was just 27.1 percent. These are shown in Figure 6.5.1 and 6.5.2. 1.4 percent of respondents failed to respond to this question.

A review of the results collated from South-east Nigeria revealed that there were a total of 61 respondents, about 67.2 percent of whom were of the view that infrastructure service delivery in Nigeria was “very unstable” and another 29.5 percent “unstable” totalling 96.7 percent. This figure is about 8.3 percent higher than the national one, 10.25 percent higher than that of the South-west region and 25.3 percent higher than in North-west Nigeria. 3.3 percent of respondents were of the view that infrastructure service delivery in Nigeria was “stable”. There was no response for the “very stable”.option. These figures are carefully shown in Figure 6.5.1 and 6.5.2.

Results from the North-east region gave a total of 54 respondents, and of this number 44.4 percent affirmed that infrastructure service delivery was “very unstable” while another 44.4 percent were of the view that it was “unstable”, amounting to a dissatisfaction rate of about 88.4 percent. This figure is identical to the national one. Meanwhile, about 3.7 percent of respondents were of the view that

infrastructure service delivery in Nigeria was “stable” and another 5.6 percent that it was “very stable”, giving a total satisfaction rate of about 9.3 percent (about 1.9 percent failed to respond). This level of dissatisfaction was 1.95 percent higher than that of South-west region and a full 17 percent higher than North-west Nigeria, although it was less than that of the South-east region by 25.3 percent. Figures 6.5.1 and 6.5.2 clarify these comparisons.

Results from South-south Nigeria in the Table 6.5.1 are based on a total of 99 respondents. Of this number 38.4 percent maintained that infrastructure service delivery in Nigeria was “very unstable” while another 57.6 percent said “unstable”, giving a total dissatisfaction rate of 96 percent. This was approximately 8 percent higher than the national average. It was higher than the equivalent figures for the South-west, North-west and North-east regions by 9.55 percent, 24.6 percent and 7.6 percent respectively. Only 3 percent scored infrastructure service delivery in Nigeria as “stable” and no one said “very stable”. These are shown in Figure 6.5.1 and 6.5.2. There was a 1 percent non-response rate to this question.

Results from the North-central Nigeria revealed a total of 58 respondents; of this number, 48.3 percent were of the view that infrastructure service delivery in Nigeria was “very unstable” and 43.1 percent “unstable”, resulting in a total dissatisfaction response of 91.4 percent – about 3 percent higher than the national figure. 8.6 percent were of the view that infrastructure service delivery in Nigeria was “stable” while none of the respondents said that it was “very stable”. The level of dissatisfaction expressed for North-central Nigeria by respondents was greater than that expressed in South-west, North-west and North-east by 4.95 percent, 20 percent and 3 percent respectively. It was however less than the level of dissatisfaction articulated in South-east and South-south Nigeria. These figures are shown in Figure 6.5.1 and 6.5.2.

Figure 6.5.1 Dissatisfaction levels by respondents on stability of infrastructure and service delivery

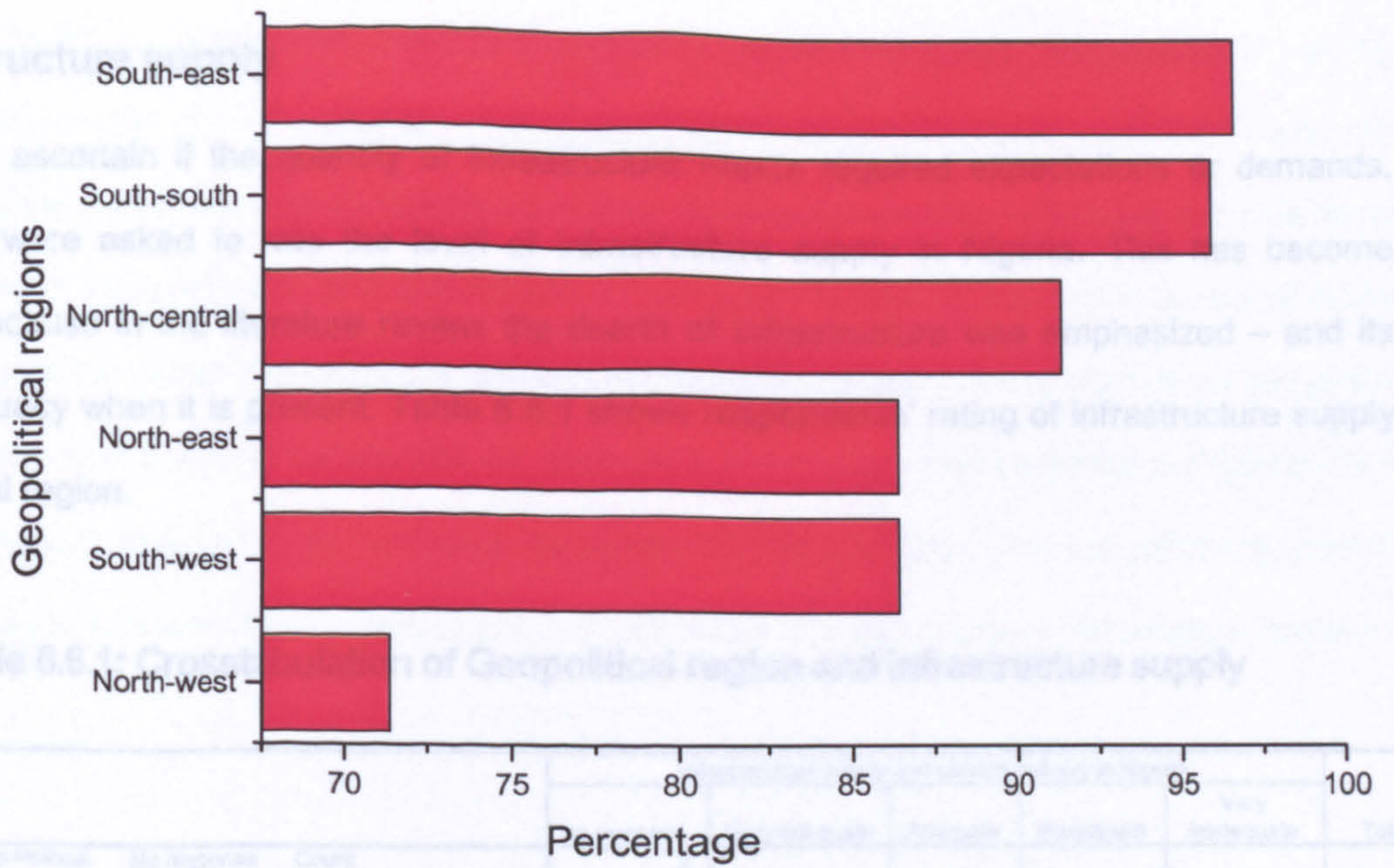
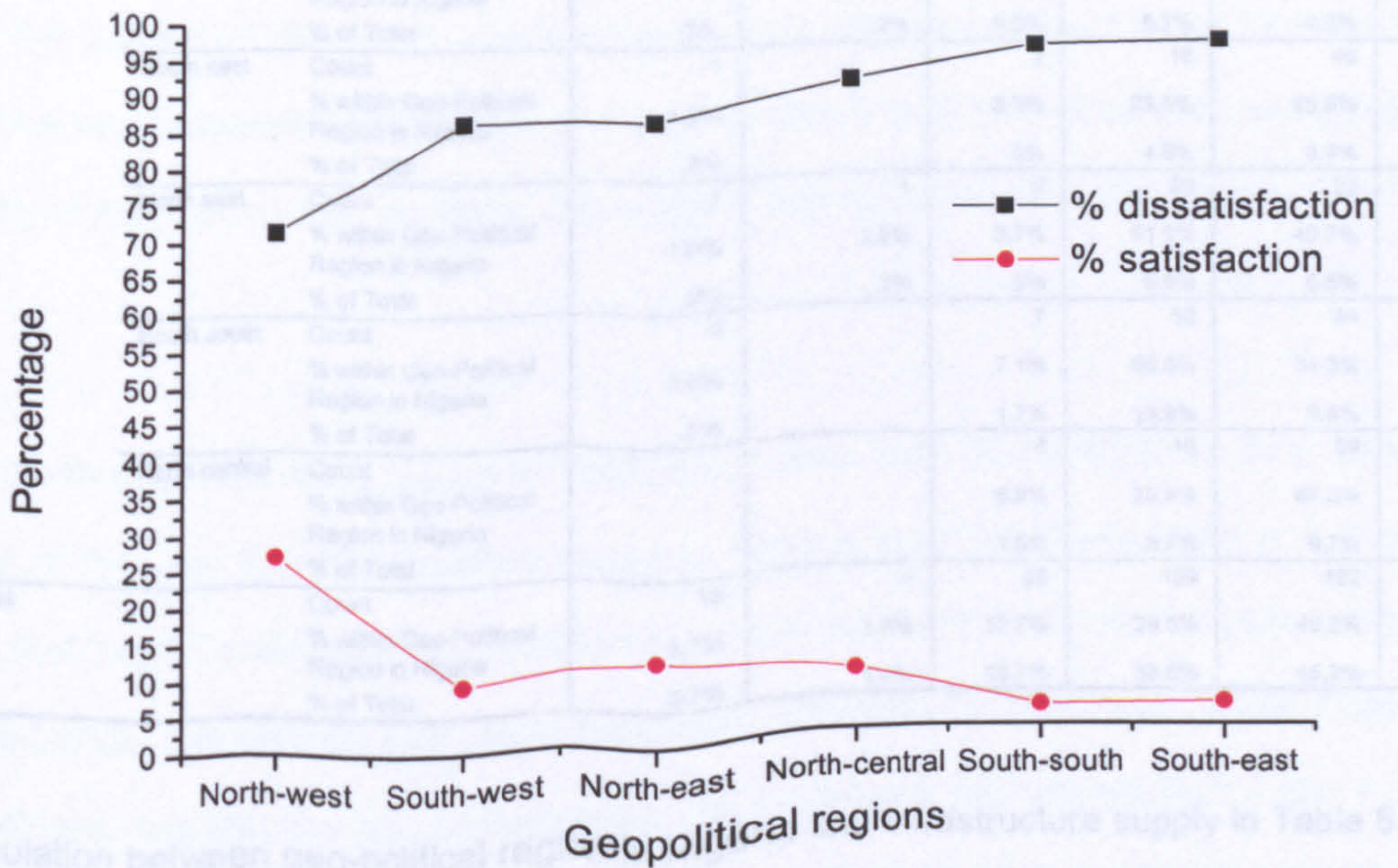


Figure 6.5.2. Stability of infrastructure and service delivery



The analysis and results of this section so far apparently support the views expressed in the literature review on the matter of the “stability of infrastructure services in Nigeria”.

6.6. Infrastructure supply

In the bid to ascertain if the quantity of infrastructure meets required expectations or demands, respondents were asked to rate the level of infrastructure supply in Nigeria. This has become necessary because in the literature review the dearth of infrastructure was emphasized – and its gross inadequacy when it is present. Table 6.6.1 shows respondents' rating of infrastructure supply by geopolitical region.

Table 6.6.1: Crosstabulation of Geopolitical region and infrastructure supply

			Infrastructure supply and service delivery in Nigeria					Total
			no response	Very adequate	Adequate	Inadequate	Very inadequate	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	6	2	2	19	30	59
		% within Geo-Political Region in Nigeria	10.2%	3.4%	3.4%	32.2%	50.8%	100.0%
		% of Total	1.5%	.5%	.5%	4.7%	7.4%	14.6%
	North west	Count	3	1	26	23	17	70
		% within Geo-Political Region in Nigeria	4.3%	1.4%	37.1%	32.9%	24.3%	100.0%
		% of Total	.7%	.2%	6.5%	5.7%	4.2%	17.4%
South east	Count	1		2	18	40	61	
	% within Geo-Political Region in Nigeria	1.6%		3.3%	29.5%	65.6%	100.0%	
	% of Total	.2%		.5%	4.5%	9.9%	15.1%	
North east	Count	1	1	2	28	22	54	
	% within Geo-Political Region in Nigeria	1.9%	1.9%	3.7%	51.9%	40.7%	100.0%	
	% of Total	.2%	.2%	.5%	6.9%	5.5%	13.4%	
South south	Count	2		7	56	34	99	
	% within Geo-Political Region in Nigeria	2.0%		7.1%	56.6%	34.3%	100.0%	
	% of Total	.5%		1.7%	13.9%	8.4%	24.6%	
North central	Count			4	15	39	58	
	% within Geo-Political Region in Nigeria			6.9%	25.9%	67.2%	100.0%	
	% of Total			1.0%	3.7%	9.7%	14.4%	
Total	Count	15	4	43	159	182	403	
	% within Geo-Political Region in Nigeria	3.7%	1.0%	10.7%	39.5%	45.2%	100.0%	
	% of Total	3.7%	1.0%	10.7%	39.5%	45.2%	100.0%	

The cross-tabulation between geo-political region in Nigeria and infrastructure supply in Table 6.6.1 revealed that 45.2 percent of the total 403 respondents received were of the view that infrastructure supply in Nigeria was “very inadequate” and 39.5 percent “inadequate”, giving a total dissatisfaction

of 84.7 percent. On comparison to the analysis in the preceding section, the level of dissatisfaction expressed was 88.4 percent - 3.7 percent higher than the level of dissatisfaction expressed now by respondents. Meanwhile about 10.7 percent proportion of respondents were of the view that infrastructure supply in Nigeria was "adequate" and just 1 percent felt it was "very adequate", giving a total satisfaction rate of 11.7 percent - 1.6 percent higher than the level of satisfaction with the stability of infrastructure services as analyzed in the previous section. Nevertheless, the difference between levels of dissatisfaction and satisfaction in this analysis was 73 percent in favour of those respondents that felt dissatisfied with the levels of infrastructure supply. A critical look at the levels of dissatisfaction and levels of satisfaction for each geopolitical region as revealed in Figures 6.6.1 and 6.6.2 showed that, with an increase in levels of dissatisfaction by respondents across geopolitical regions, there was a corresponding decrease in their various percentage levels of satisfaction.

Regionally, the results from South-west Nigeria revealed that of the 59 respondents, about 58.8 percent were of the view that infrastructure supply in Nigeria was "very inadequate" and 32.2 percent proportion that it was "inadequate", giving a dissatisfaction rate of approximately 83 percent. This is 1.7 percent lower than the national one – not significant enough to raised concern on this issue. About 3.4 percent of the same total for South-west Nigeria maintained that infrastructure supply in Nigeria was "adequate" and another 3.4 percent that it was "very adequate", giving a total satisfaction rate of just 6.8 percent. However, there was a non-response rate of about 10 percent.

Results from North-west Nigeria as shown in Table 6.6.1 were from 70 respondents, 24.3 percent of whom were of the view that infrastructure supply in Nigeria was "very inadequate" and another 32.9 percent that it was "inadequate". 37.1 percent maintained that infrastructure supply in Nigeria was "adequate" while 1.4 percent said "very adequate". the total dissatisfaction rate is therefore about 57.2 percent, and the total satisfaction rate is 38.5 percent. This dissatisfaction rate is 27.5 percent less than that of the whole country, and 25.8 percent less than in South-west Nigeria. 4.5 percent of respondents from North-west Nigeria did not answer the question. This great difference in

response rate relative to the other regions can probably be accounted for by the fact that most infrastructures supplied in Nigeria were slightly skewed during the second republic in favour of this region (Ayogu, 2001). The investigation discovered a significant correlation between states of origin of political office holders in Nigeria and the amount of infrastructure supplied (Ayogu, 2001).

Of the 61 respondents in South-east Nigeria, 65.6 percent said that infrastructure supply in Nigeria was “very inadequate” and 29.5 percent said it was “inadequate”, giving a total dissatisfaction rate of 95.1 percent – 10.4 percent greater than the response nationally. It exceeded the proportion of dissatisfaction expressed in South-west Nigeria by 12.1 percent and North-west Nigeria by 38.1 percent. Meanwhile, 3.3 percent from this region were of the view that infrastructure supply in Nigeria was “adequate”. No one said “very adequate”. This development is understandable since the level of dissatisfaction expressed by respondents earlier in South-east was very high. This goes a long way in revealing the feeling of the people in South-eastern Nigeria on the matter of infrastructure supply in the region. 1 percent did not respond at all to the question.

About 40.7 percent of the 54 respondents from North-east Nigeria, as shown in Table 6.6.1, were of the view that infrastructure supply in Nigeria was “very inadequate” and 51.9 percent said “inadequate”, giving a total dissatisfaction rate of 93.1 percent. This was 8.4 percent higher than the national figure, but 2 percent less than the South-east, 10.1 percent greater than the South-west and 36.1 percent greater than the North-west. 3.7 percent proportion of respondents for North-east Nigeria was of the view that infrastructure supply in Nigeria was “adequate”, while another 1.9 percent said “very adequate”; making a total satisfaction of 5.5 percent. These are plotted in Figures 6.6.1 and 6.6.2.

About 34.3 percent of the 99 respondents from South-south Nigeria said that infrastructure supply was “very inadequate” and 56.6 percent “inadequate”, totaling 90.9 percent. This was 6.2 percent higher than the national figure, 7.9 percent higher than that for South-west Nigeria, 33.9 percent higher than North-west Nigeria, 3.1 percent less than North-east Nigeria and 5.1 percent less than South-east Nigeria. 7.1 percent of respondents were of the view that infrastructure supply in

Nigeria was “adequate”, and no one felt that it was “very adequate”. These are shown in Figures 6.6.1 and 6.6.2. The very high dissatisfaction rate for infrastructure supply in South-south Nigeria explains why the option “very adequate” was not used by respondents. There was a non-response rate of about 2 percent.

A total of number of 58 respondents for North-central Nigeria, as shown in Table 6.6.1, was broken down into about 67.2 percent who said that infrastructure supply in Nigeria was “very inadequate” and 25.9 percent who said that it was “inadequate”, giving a total dissatisfaction rate of 93.1 percent. The level of dissatisfaction for this region was the second highest of all the regions and, and is exactly the same as that for North-eastern Nigeria. It was 2 percent higher than North-central Nigeria, and less than South-south Nigeria, South-west and North-west Nigeria by 3.1 percent, 10.1 percent and 36.1 percent respectively. 6.9 percent of respondents were of the view that infrastructure supply in Nigeria was “adequate” with none of the respondents holding the view that it was “very adequate”. These are shown in Figures 6.6.1 and 6.6.2.

Finally, the literature review's second hypothesis that there exists a ‘severe’ dearth of infrastructure supply in Nigeria is validated by this section's analysis. Over 95 percent of respondents in the survey asserted that there is a dearth of infrastructure supply in Nigeria.

Figure 6.6.1. Dissatisfaction in infrastructure supply and service delivery in Nigeria

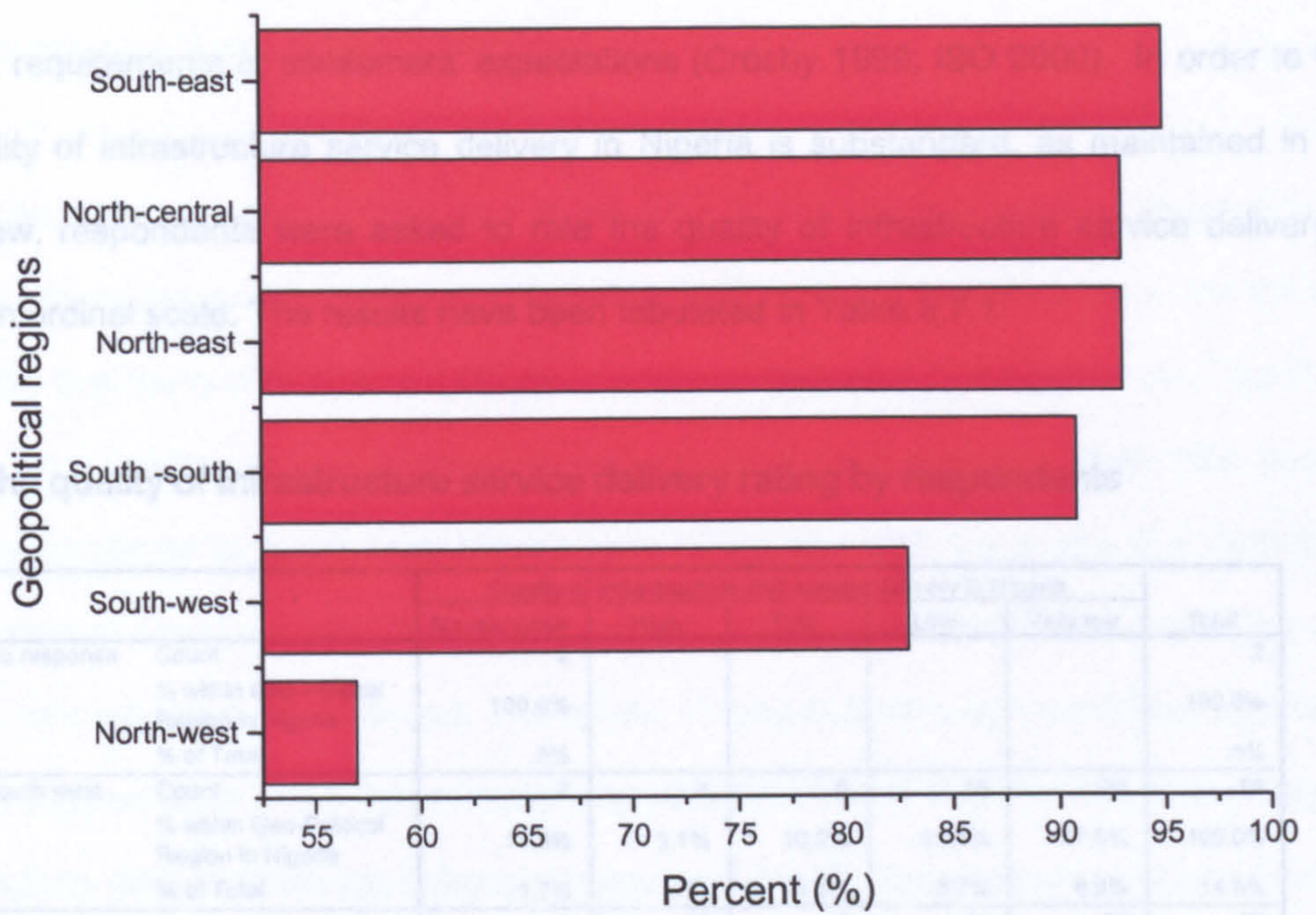
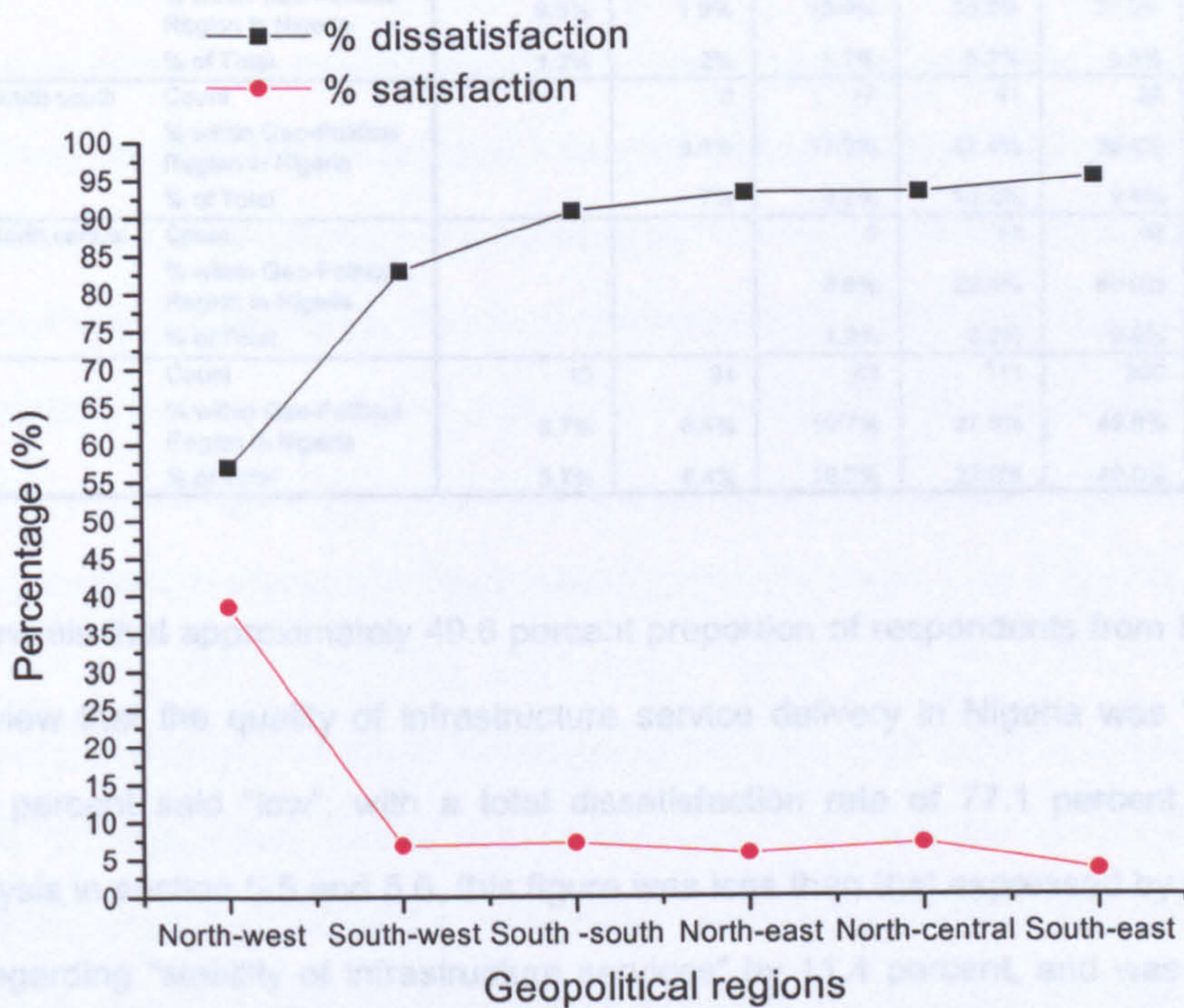


Figure 6.6.2. Rating of infrastructure supply and service delivery



6.7. Quality of infrastructure

Quality of infrastructure service delivery as used in this survey refers to the degree of conformity to set objectives, requirements or consumers' expectations (Crosby 1999; ISO 2000). In order to find out if the quality of infrastructure service delivery in Nigeria is substandard, as maintained in the literature review, respondents were asked to rate the quality of infrastructure service delivery in Nigeria over an ordinal scale. The results have been tabulated in Table 6.7.1.

Table 6.7.1: The quality of infrastructure service delivery rating by respondents

			Quality of Infrastructure and service delivery in Nigeria					Total
			No response	High	Fair	Low	Very low	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	7	3	6	15	28	59
		% within Geo-Political Region in Nigeria	11.9%	5.1%	10.2%	25.4%	47.5%	100.0%
		% of Total	1.7%	.7%	1.5%	3.7%	6.9%	14.6%
	North west	Count	1	27	6	14	22	70
		% within Geo-Political Region in Nigeria	1.4%	38.6%	8.6%	20.0%	31.4%	100.0%
		% of Total	.2%	6.7%	1.5%	3.5%	5.5%	17.4%
South east	Count			2	7	52	61	
	% within Geo-Political Region in Nigeria			3.3%	11.5%	85.2%	100.0%	
	% of Total			.5%	1.7%	12.9%	15.1%	
North east	Count	5	1	7	21	20	54	
	% within Geo-Political Region in Nigeria	9.3%	1.9%	13.0%	38.9%	37.0%	100.0%	
	% of Total	1.2%	.2%	1.7%	5.2%	5.0%	13.4%	
South south	Count		3	17	41	38	99	
	% within Geo-Political Region in Nigeria		3.0%	17.2%	41.4%	38.4%	100.0%	
	% of Total		.7%	4.2%	10.2%	9.4%	24.6%	
North central	Count			5	13	40	58	
	% within Geo-Political Region in Nigeria			8.6%	22.4%	69.0%	100.0%	
	% of Total			1.2%	3.2%	9.9%	14.4%	
Total	Count		15	34	43	111	200	403
	% within Geo-Political Region in Nigeria		3.7%	8.4%	10.7%	27.5%	49.6%	100.0%
	% of Total		3.7%	8.4%	10.7%	27.5%	49.6%	100.0%

Table 6.7.1 reveals that approximately 49.6 percent proportion of respondents from the total of 403 were of the view that the quality of infrastructure service delivery in Nigeria was "very low" and another 27.5 percent said "low", with a total dissatisfaction rate of 77.1 percent. Compared to previous analysis in section 5.5 and 5.6, this figure was less than that expressed by respondents in section 5.5 regarding "stability of infrastructure services" by 11.4 percent, and was also less than that of section 5.6 on "infrastructure supply" by 18 percent. 10.7 percent of the total number of

respondents were of the view that the quality of infrastructure service delivery in Nigeria was “fair” while another 8.4 percent maintained it to be “high”, giving a total satisfaction response of 19.1 percent. The remaining 3.7 percent left did not respond.

From South-west Nigeria, about 11.9 percent of the total 59 respondents failed to respond to the question on “quality of infrastructure service delivery” in Nigeria. Approximately 5 percent of the total were of the view that the quality of infrastructure and service delivered to Nigerians was “high” and 10.2 percent “fair”, yielding a total satisfaction rate of about 15.3 percent. About 25.4 percent proportion of respondents for South-west Nigeria were of the view that the quality of infrastructure services delivered to Nigerians was “low” while another 47.5 percent said “very low”. The total dissatisfaction rate was thus 72.9 percent. The levels of dissatisfaction by geopolitical region are represented in Figures 6.7.1 and 6.7.2. Although the results obtained from the South-west Nigeria has not significantly deviated from the general summary explained above, results received from the North-west region show some measure of difference.

Responses from the North-west Nigeria showed that 1.4 percent of the total 70 respondents failed to respond to the question on “quality of infrastructure service delivery in Nigeria”. 20 percent of respondents were of the view that the quality of infrastructure and service delivered to Nigerians was “low” and another 31.4 percent said that it was “very low”, making a total dissatisfaction rate of 51.4 percent. The level of dissatisfaction expressed by respondents in this region was 21.5 percent less than that of South-west Nigeria. About 38.6 percent of the total said “high” and another 8.6 percent saying “fair”, making a total of 47.2 percent. This result differed somewhat from the national result in that it was much higher than those for the other geopolitical regions. This development has been noted in the previous analysis for North-west Nigeria; and reasons for it are the same.

About 85.2 percent proportion of the 61 respondents from the South-east region were of the view that the quality of infrastructure service delivery in Nigeria was “very low” and 11.5 percent that it was “low”, making about 96.7 percent of dissatisfied respondents. The remaining 3.3 percent said that it could be rated “fair”. A slight variation from the national summary can be observed from these

results, in that about 85.2 percent of South-eastern respondents rated the quality “low” as against 49.6 percent nationally. This must have been due to the fact that this region had been worst hit by dearth of infrastructure; where it is provided, the quality is very poor (Ayogu 2001). The gross dissatisfaction expressed in these results for South-east Nigeria was similar to those expressed in the previous analysis (sections 6.5 and 6.6). The level of dissatisfaction for this region was 23.8 percent higher than that expressed in the South-west and 45.3 percent higher than those expressed in North-west Nigeria. However, this slight deviation from the national picture as evident in the previous two geopolitical regions was not observed from the results for North-east Nigeria.

About 37 percent of the total 54 respondents for North-east Nigeria were of the view that the quality of infrastructure service delivery was “very low”, while about 38.9 percent rated it as “low”. These results gave a total dissatisfaction response of about 75.9 percent, consistent with the national figure (the difference in levels of dissatisfaction was barely 1 percent). Compared with the South-western and North-western regions, the level of dissatisfaction for North-east Nigeria was 3 percent higher than that of the former and 24.5 percent higher than for the latter. It was also 20.8 percent lesser than the level of dissatisfaction expressed in South-east Nigeria. Meanwhile, 13 percent felt that the quality of infrastructure service delivery was “fair” and another 1.9 percent that it was “high”, making a total satisfaction level of 14.9 percent. These are plotted in Figures 6.7.1 and 6.7.2. The non-response rate was about 9.3 percent.

38.4 percent of the 99 respondents from the South-south region (Table 6.7.1) were of the opinion that the quality of infrastructure service delivery was “very low” and another 41.4 percent maintained that it was “low”, giving a total dissatisfaction response level of 79.4 percent. About 17.2 percent and 3 percent of respondents were of the view that the quality of infrastructure service delivery was “fair” and “high” respectively, giving a total satisfaction level of 20.2 percent.. The level of dissatisfaction expressed by respondents in South-south Nigeria was higher than those of the South-western, North-western and North-eastern regions by 6.5 percent, 28 percent and 3.5 percent respectively. These are plotted in Figures 6.7.1 and 6.7.2. No deviation was observed from the national figures given earlier.

North-central Nigeria had a total of 58 respondents; about 69 percent of them maintained that the quality of infrastructure service delivery in Nigeria was “very low”, with another 22.4 percent saying “low”, giving a total dissatisfaction response of 91.4 percent. This level of dissatisfaction was higher than the national one by 14.3 percent, and than the South-west, North-west, North-east and South-south by 18.5 percent, 40 percent, 15.5 percent and 12 percent respectively, although it was less than that for South-east Nigeria by 5.3 percent. 8.6 percent thought that the quality of infrastructure services in Nigeria was “fair”. These have been shown in Figures 6.7.1 and 6.7.2.

Figure 6.7.1. Dissatisfaction in quality of infrastructure and service delivery in Nigeria

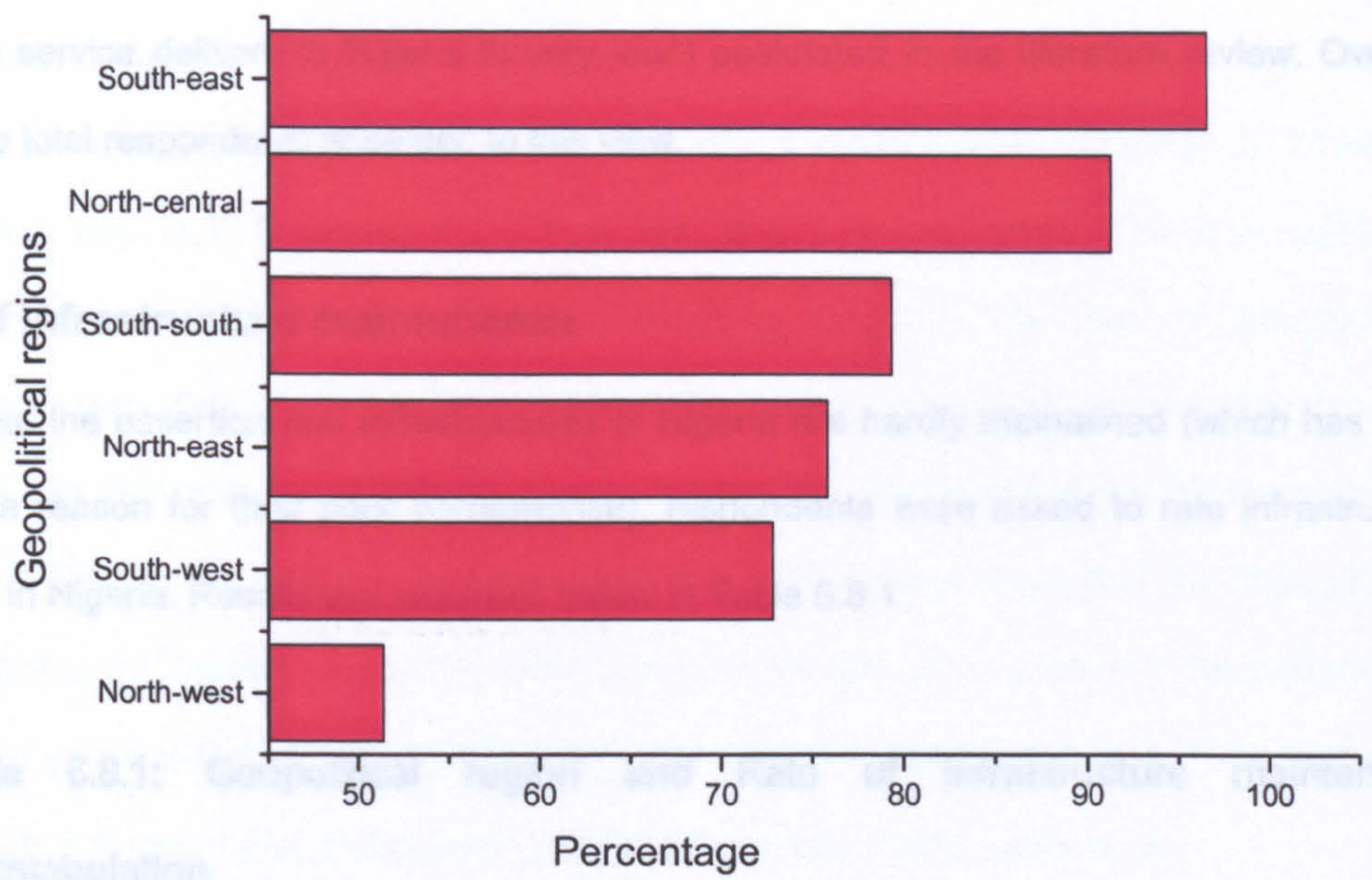
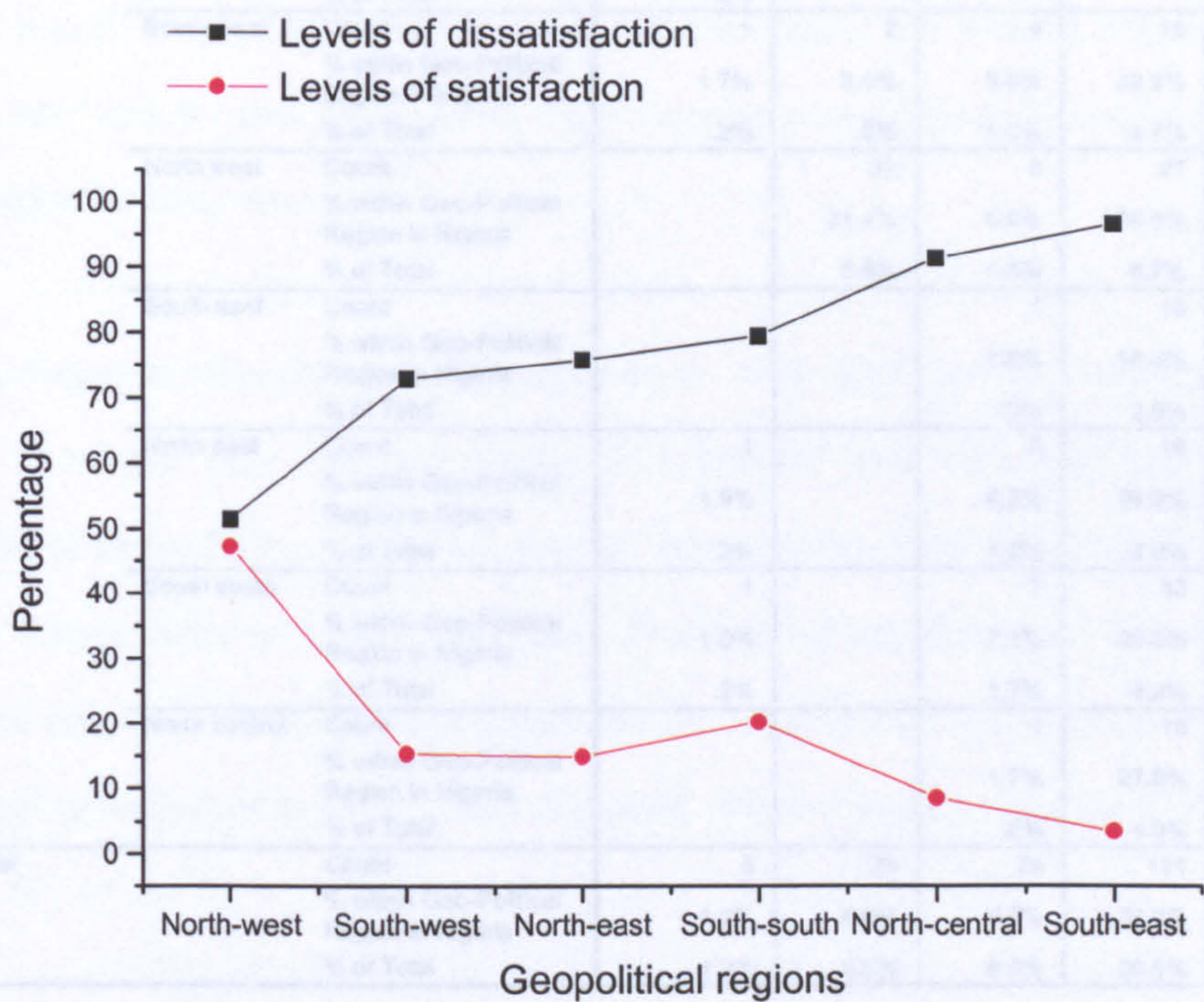


Figure 6.7.2. Rating of infrastructure quality and service delivery



The results and analysis in this section have also validated the third hypothesis (the “quality of infrastructure service delivery in Nigeria is very low”) postulated in the literature review. Over 70 percent of the total respondents assented to this view.

6.8. Rate of infrastructure maintenance

In order to test the assertion that infrastructures in Nigeria are hardly maintained (which has been adduced as a reason for their poor performance), respondents were asked to rate infrastructure maintenance in Nigeria. Results are tabulated below in Table 6.8.1.

Table 6.8.1: Geopolitical region and Rate of infrastructure maintenance crosstabulation

			Rate of Infrastructure Maintenance in Nigeria					Total
			No response	High	fair	low	very low	
Geo-Political Region in Nigeria	No response	Count % within Geo-Political Region in Nigeria % of Total	2 100.0% .5%					2 100.0% .5%
	South west	Count % within Geo-Political Region in Nigeria % of Total	1 1.7% .2%	2 3.4% .5%	4 6.8% 1.0%	19 32.2% 4.7%	33 55.9% 8.2%	59 100.0% 14.6%
	North west	Count % within Geo-Political Region in Nigeria % of Total		22 31.4% 5.5%	6 8.6% 1.5%	27 38.6% 6.7%	15 21.4% 3.7%	70 100.0% 17.4%
	South east	Count % within Geo-Political Region in Nigeria % of Total			1 1.6% .2%	10 16.4% 2.5%	50 82.0% 12.4%	61 100.0% 15.1%
	North east	Count % within Geo-Political Region in Nigeria % of Total	1 1.9% .2%		5 9.3% 1.2%	16 29.6% 4.0%	32 59.3% 7.9%	54 100.0% 13.4%
	South south	Count % within Geo-Political Region in Nigeria % of Total	1 1.0% .2%		7 7.1% 1.7%	33 33.3% 8.2%	58 58.6% 14.4%	99 100.0% 24.6%
	North central	Count % within Geo-Political Region in Nigeria % of Total			1 1.7% .2%	16 27.6% 4.0%	41 70.7% 10.2%	58 100.0% 14.4%
	Total	Count % within Geo-Political Region in Nigeria % of Total	5 1.2% 1.2%	24 6.0% 6.0%	24 6.0% 6.0%	121 30.0% 30.0%	229 56.8% 56.8%	403 100.0% 100.0%

Table 6.8.1 shows the cross-tabulation between geopolitical regions in Nigeria and the rate of infrastructure maintenance. The table also revealed an average dissatisfaction rate of 86.8 percent. This level of dissatisfaction could be subdivided (as in the cross-tabulation in Table 6.8.1) into 56.8 percent who maintained that there exists a “very low” rate of infrastructure maintenance, 30 percent who held that it was “low”, 6 percent that it was “fair” and 6 percent “high”. The total satisfaction level was thus 12 percent. About 1.2 percent failed to respond. The level of dissatisfaction expressed by respondents on rate of infrastructure maintenance was comparable to those expressed in the preceding analysis. For example, it was just 2.4 percent higher than that expressed for “stability of infrastructure services”; 8.3 percent less than that for “infrastructure supply” and about 9.7 percent higher than for “quality of infrastructure services”. Responses from the North-west and South-east regions slight deviated from the national figure, but the North-east, North-central, South-south and South-west’s results were similar to the national one.

Of the 59 respondents from the South-west, 55.9 percent said that the rate of infrastructure maintenance was “very low” and 32.2 percent that it was “low”. The resulting dissatisfaction rate of 88.1 percent is just 1.4 percent higher than the national figure. 6.8 percent scored infrastructure maintenance “fair” and 3.4 percent scored it “high”, making a total satisfaction rate of 10.2 percent. About 1.7 percent failed to respond.

Similarly, North-central Nigeria had 58 respondents with 70.7 percent scoring infrastructure maintenance in Nigeria “very low” and another 27.6 percent “low”, making a total dissatisfaction response level of about 98.3 percent. 1.7 percent respondents were of the view that the rate of infrastructure maintenance in Nigeria was “fair”. The level of dissatisfaction expressed in North-central Nigeria was about 11.3 percent higher than the national figure and 10 percent higher than that expressed by respondents in South-west Nigeria. These results can be seen in Figures 6.8.1 and 6.8.2.

About 59.3 percent of the 54 respondents for North-east Nigeria scored the rate of infrastructure maintenance “very low” while another 29.6 percent scored it “low”. This gives a total dissatisfaction

response level of 88.9 percent, exceeding the national figure by 2.1 percent. This percentage was less than that for North-central Nigeria by 9.2 percent. Another 9.3 percent maintained that the rate of infrastructure maintenance was at least “fair”, leaving 1.9 percent not responding.

The situation in South-south region was similar, with about 58.6 percent of the total 99 respondents being of the view that the rate of infrastructure maintenance was “very low” and another 33.3 percent “low”. The resulting dissatisfaction rate of 91.9 percent was higher than that for South-west Nigeria, North-east Nigeria by 3.8 percent and 3 percent respectively. The dissatisfaction response expressed in North-central Nigeria was higher than that of South-south Nigeria by 6.2 percent, as can be seen in Figures 6.8.1 and 6.8.2. Another 7.1 percent scored the rate of infrastructure maintenance in Nigeria “fair” and 1 percent failed to respond.

Out of 70 respondents from North-west Nigeria, about 21.4 percent were of the view that the rate of infrastructure maintenance was “very low” while another 38.6 percent scored it “low”. Thus, the total dissatisfaction rate was 60 percent. As can be seen in Table 6.8.1, another 8.6 percent were of the view that the rate of infrastructure maintenance in Nigeria was “fair” while 31.4 percent response said “high”, which gives a satisfaction rate of 40 percent for North-west region. This figure is different slightly from the national one. The reasons for this are the same as those for the figures given in the preceding analysis. On comparison to the other geopolitical regions, the level of dissatisfaction expressed by respondents for North-west Nigeria was the least.

Results as given in Table 6.8.1 revealed that of a total of 61 respondents from the South-east region, 82 percent scored the rate of infrastructure maintenance “very low” while another 16.4 percent scored it “low”. The resulting dissatisfaction level of 98.4 percent was the highest expressed in the survey. 1.6 percent proportion of respondents was of the view that the rate of infrastructure maintenance in Nigeria was “fair”, as can be seen in Figures 6.8.1 and 6.8.2. This also slightly deviated from the national result.

The analysis of this section validates the fourth hypothesis of the literature review (that the rate of infrastructure maintenance in Nigeria is very low). Over 86 percent of respondents in the survey were of this view.

Figure 6.8.1. Dissatisfaction in rate of infrastructure maintenance in Nigeria

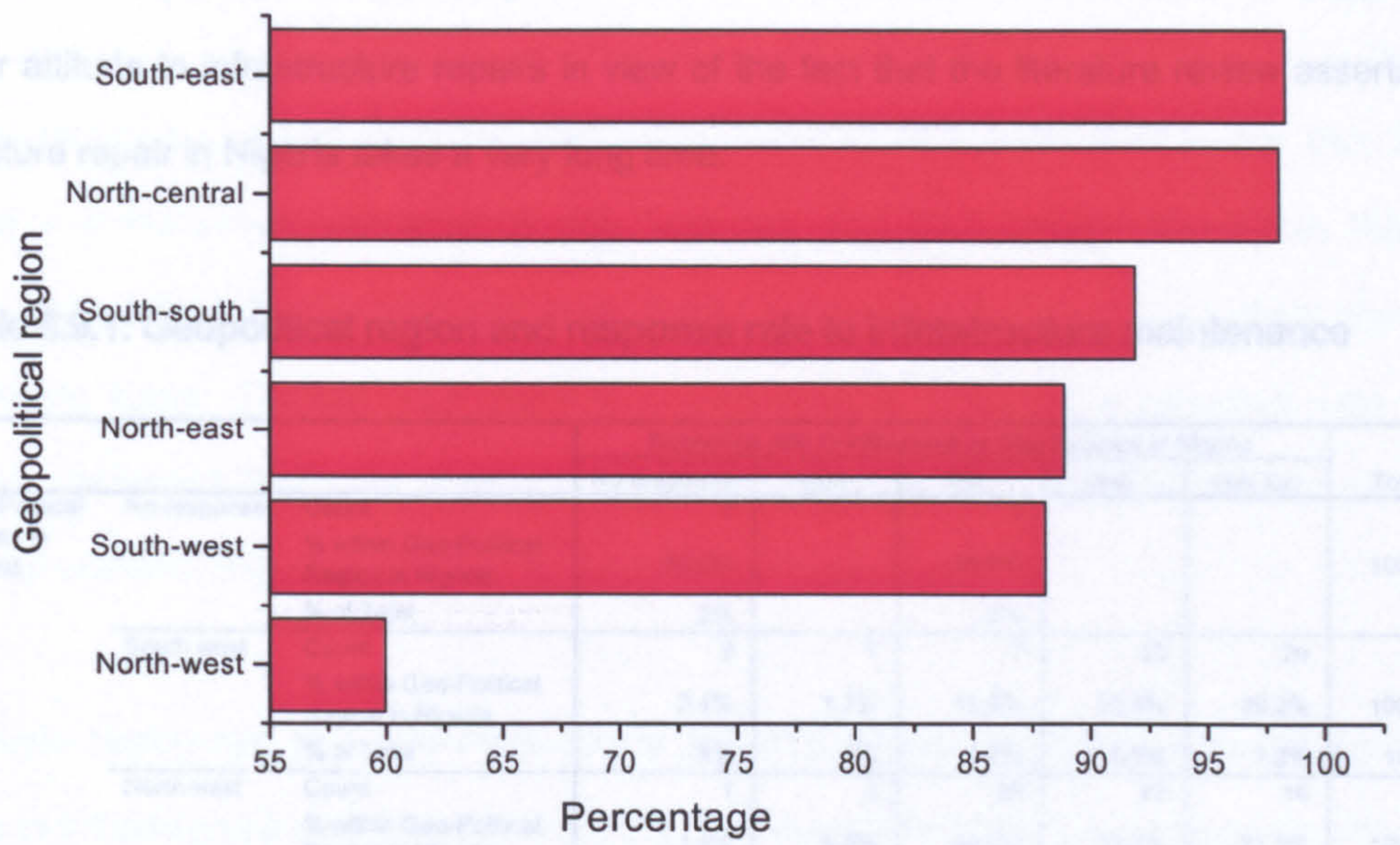
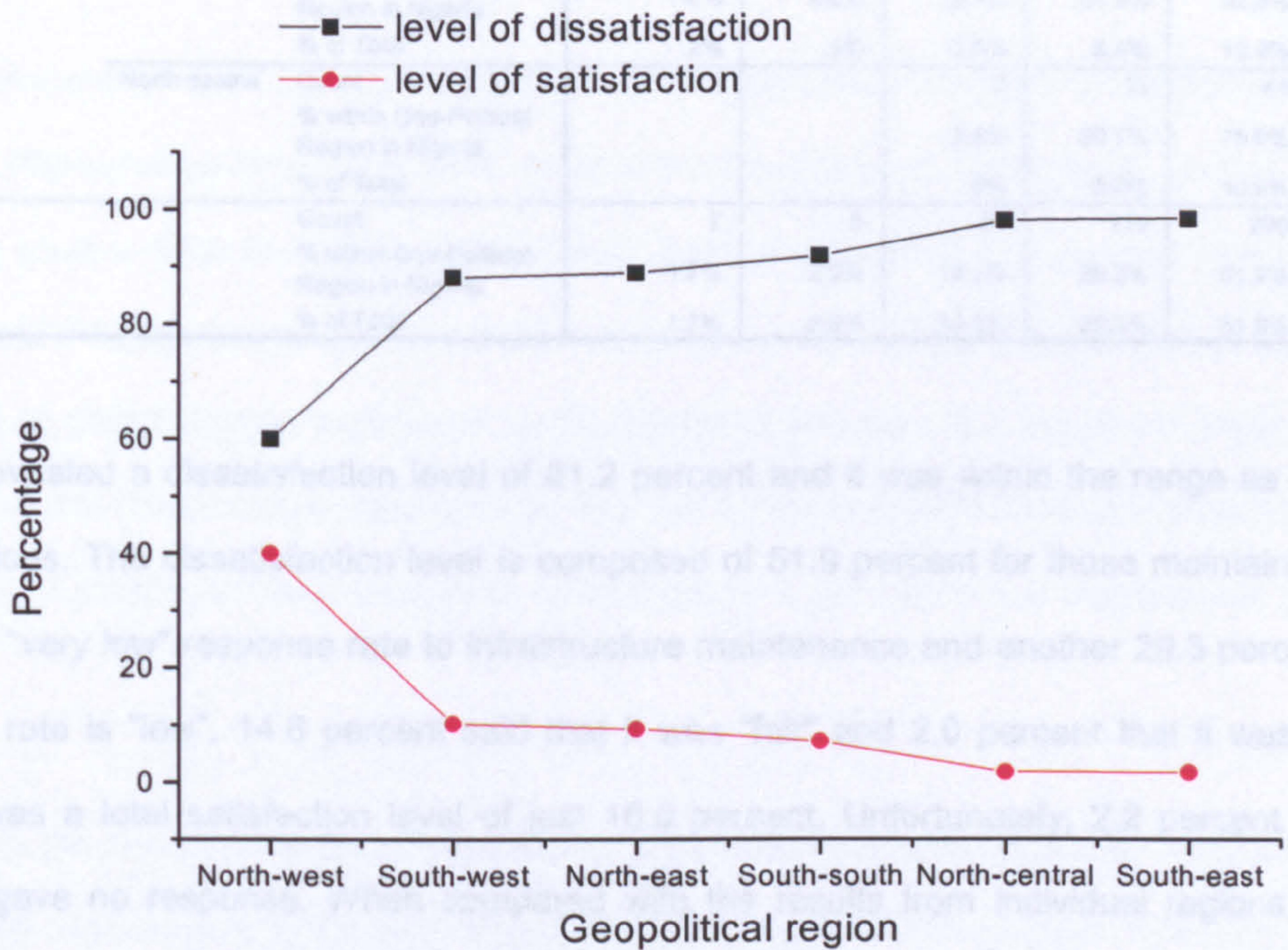


Figure 6.8.2. Rate of infrastructure maintenance



6.9. The response rate to infrastructure maintenance

Respondents were requested to rate “response rate to infrastructure maintenance” in order to establish their attitude to infrastructure repairs in view of the fact that the literature review asserted that infrastructure repair in Nigeria takes a very long time.

Table 6.9.1: Geopolitical region and response rate to infrastructure maintenance

			Response rate to Infrastructure Maintenance in Nigeria					Total
			No response	high	fair	low	very low	
Geo-Political Region in Nigeria	No response	Count	1		1			2
		% within Geo-Political Region In Nigeria	50.0%		50.0%			100.0%
		% of Total	.2%		.2%			.5%
	South west	Count	2	1	7	20	29	59
		% within Geo-Political Region In Nigeria	3.4%	1.7%	11.9%	33.9%	49.2%	100.0%
		% of Total	.5%	.2%	1.7%	5.0%	7.2%	14.6%
	North west	Count	1	3	28	22	16	70
		% within Geo-Political Region In Nigeria	1.4%	4.3%	40.0%	31.4%	22.9%	100.0%
		% of Total	.2%	.7%	8.9%	5.5%	4.0%	17.4%
	South east	Count			3	8	50	61
% within Geo-Political Region In Nigeria				4.9%	13.1%	82.0%	100.0%	
% of Total				.7%	2.0%	12.4%	15.1%	
North east	Count	2	2	10	22	18	54	
	% within Geo-Political Region In Nigeria	3.7%	3.7%	18.5%	40.7%	33.3%	100.0%	
	% of Total	.5%	.5%	2.5%	5.5%	4.5%	13.4%	
South south	Count	1	2	10	34	52	99	
	% within Geo-Political Region In Nigeria	1.0%	2.0%	10.1%	34.3%	52.5%	100.0%	
	% of Total	.2%	.5%	2.5%	8.4%	12.9%	24.6%	
North central	Count			2	12	44	58	
	% within Geo-Political Region In Nigeria			3.4%	20.7%	75.9%	100.0%	
	% of Total			.5%	3.0%	10.9%	14.4%	
Total	Count	7	8	61	118	209	403	
	% within Geo-Political Region In Nigeria	1.7%	2.0%	15.1%	29.3%	51.9%	100.0%	
	% of Total	1.7%	2.0%	15.1%	29.3%	51.9%	100.0%	

Table 6.9.1 revealed a dissatisfaction level of 81.2 percent and it was within the range as seen in previous sections. The dissatisfaction level is composed of 51.9 percent for those maintaining that there exists a “very low” response rate to infrastructure maintenance and another 29.3 percent that the response rate is “low”. 14.6 percent said that it was “fair” and 2.0 percent that it was “high”. Thus, there was a total satisfaction level of just 16.6 percent. Unfortunately, 2.2 percent of total respondents gave no response. When compared with the results from individual regions, it was observed that responses from North-west and South-east regions deviated slightly from the national

figure. However, results from North-east, North-central, South-south and South-west were similar to the national result.

Out of 59 respondents received from the South-west Nigeria, 49.2 percent observed that the response rate to infrastructure maintenance was "very low" and 33.9 percent that it was "low". These made a total dissatisfaction response level of 83.1 percent for the region, 2 percent higher than the national figure. Another 11.9 percent of respondents scored the response rate to infrastructure maintenance "fair" and another 1.7 percent "high", making a satisfaction response level of just 13.6 percent. 3.4 percent failed to respond to the question.

The North-central region had about 58 respondents and 75.9 percent of this number scored the response rate to infrastructure maintenance in Nigeria "very low", while 20.7 percent scored it "low", giving a total dissatisfaction response level of about 96.6 percent. 3.4 percent of respondents were of the view that the response rate to infrastructure maintenance in Nigeria was "fair". The level of dissatisfaction expressed in this region was 15.4 percent higher than that for the whole country and about 13.5 percent higher than that for South-west

About 33.3 percent of the 54 total respondents for North-east scored the response rate to infrastructure maintenance "very low" while another 40.7 percent of respondents scored it "low". These values gave a total dissatisfaction response level of 74 percent, 7.2 percent less than the national figure and about 9.1 percent less than that for South-west Nigeria. It was 22.6 percent less than the level of dissatisfaction expressed for North-central Nigeria. 16.7 percent maintained that the response rate to infrastructure maintenance was "fair" while another 3.7 percent scored it "high". This gave a total satisfaction response level of 20.4 percent. 5.6 percent of respondents gave no reply.

The situation in the South-south region was similar, about 52.5 percent of the total 99 respondents received for the region being of the view that the response rate to infrastructure maintenance was "very low" and another 33.3 percent saying it was "low", giving a total dissatisfaction level of 85.8

percent. About 10 percent of the respondents scored the response rate to infrastructure maintenance in Nigeria “fair” and about 2 percent “high”, giving a total satisfaction response level of 12 percent. 1 percent did not respond. The national dissatisfaction level was 4.6 percent less than that of South-south Nigeria, that for North-central Nigeria was more by 15.8 percent, and those of the North-east and South-west were less by 11.8 percent and 2.7 percent respectively. These results are shown in Figures 6.9.1 and 6.9.2.

Out of the 70 respondents for North-west Nigeria, 22.9 percent were of the view that the response rate to infrastructure maintenance was “very low” while another 31.4 percent scored it “low”, giving a total of 54.3 percent. A further 40 percent of respondents were of the view that the response rate was “fair” and 4.3 percent respondents of the same total for this region scored it “high”. The satisfaction response level of 44.3 percent deviated slightly from the national results, quite clearly not a survey error but a real difference of opinion among the respondents from this region. This difference could be due to the actual state of infrastructure maintenance in the region. The level of dissatisfaction expressed in North-west Nigeria was the least of all the country’s regions. These results are shown in Figures 6.9.1 and 6.9.2.

A total of 61 responses were received from South-east Nigeria; 82 percent scored the response rate to infrastructure maintenance “very low” and 13.1 percent scored it “low”, yielding a total dissatisfaction level of 95.1 percent 4.9 percent scored it “fair”. The level of dissatisfaction expressed for this region was 13.9 percent higher than the national figure. It was also higher than what was expressed in South-west Nigeria, North-west Nigeria, North-east Nigeria and South-south Nigeria by 12 percent, 40.8 percent, 21.1 percent and 9.3 percent respectively. These results are shown in Figures 6.9.1 and 6.9.2.

In summary, the fifth hypothesis advanced in the literature review (that the response rate to infrastructure maintenance is very poor in Nigeria) has also been validated from this analysis. Over 80 percent of the total respondents in the survey were in support of this view.

Figure 6.9.1. Dissatisfaction in response rate to infrastructure maintenance

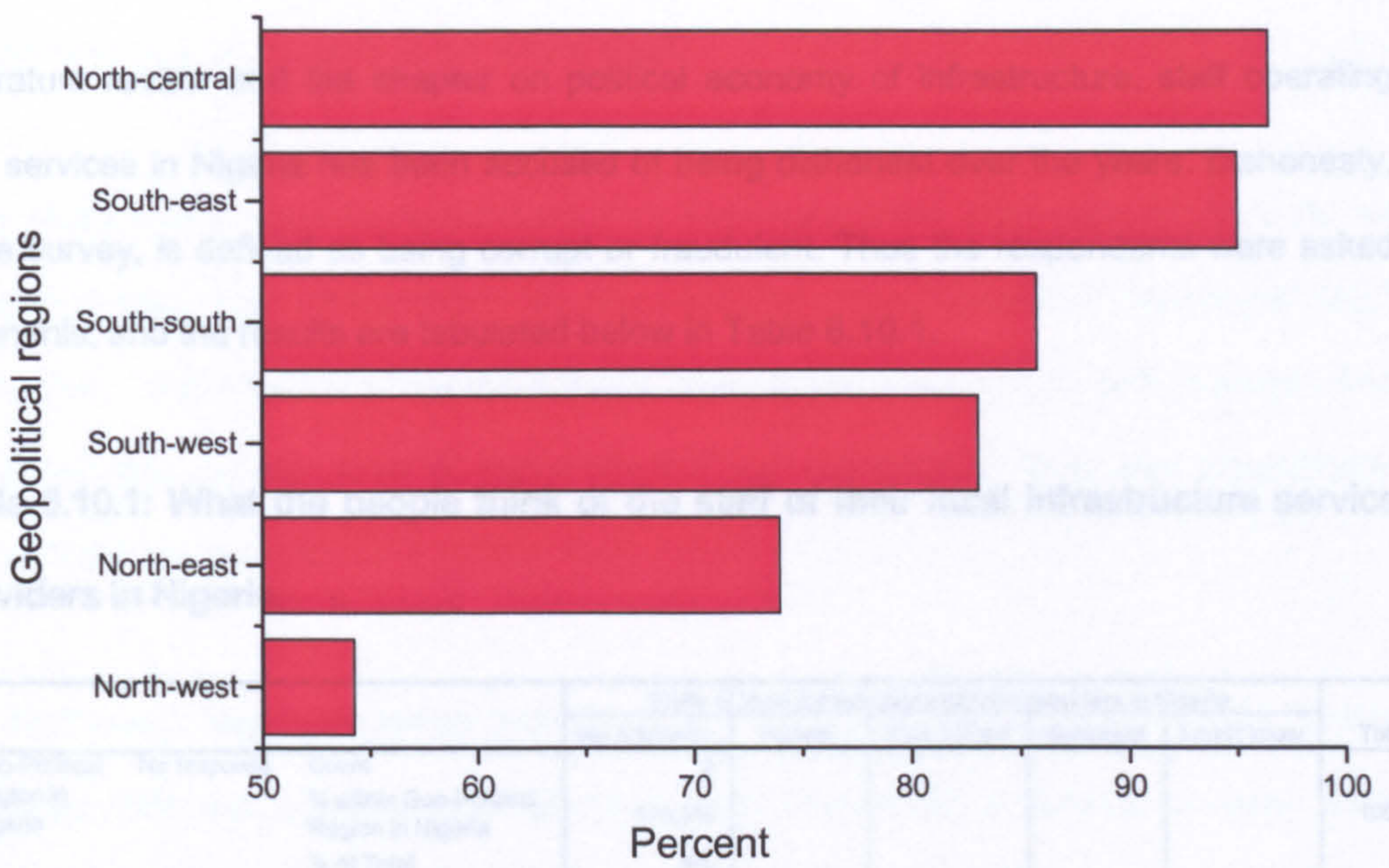
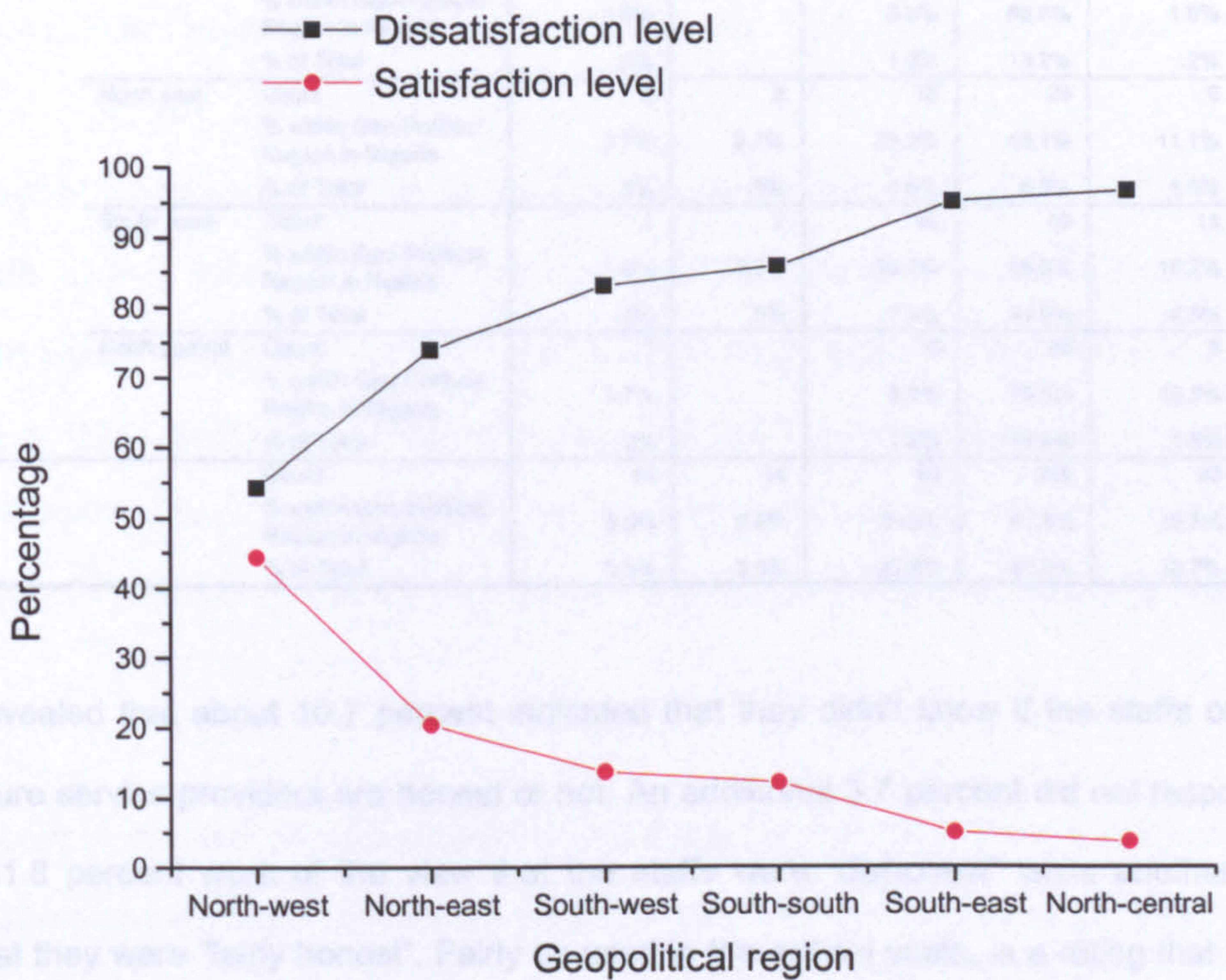


Figure 6.9.2. Response rate to infrastructure maintenance



6.10. Stakeholders impression of staffs of local infrastructure and service providers

From the literature review and the chapter on political economy of infrastructure, staff operating infrastructure services in Nigeria has been accused of being dishonest over the years. Dishonesty, as used in the survey, is defined as being corrupt or fraudulent. Thus the respondents were asked to comment on this, and the results are tabulated below in Table 6.10.1.

Table 6.10.1: What the people think of the staff of their local infrastructure service providers in Nigeria.

			Staffs of local infrastructure service providers in Nigeria					Total
			No response	Honest	fairly honest	dishonest	I don't know	
Geo-Political Region in Nigeria	No response	Count	2					2
		% within Geo-Political Region in Nigeria	100.0%					100.0%
		% of Total	.5%					.5%
	South west	Count	4	2	8	35	10	59
		% within Geo-Political Region in Nigeria	6.8%	3.4%	13.6%	59.3%	16.9%	100.0%
		% of Total	1.0%	.5%	2.0%	8.7%	2.5%	14.6%
	North west	Count	2	8	17	41	2	70
		% within Geo-Political Region in Nigeria	2.9%	11.4%	24.3%	58.6%	2.9%	100.0%
		% of Total	.5%	2.0%	4.2%	10.2%	.5%	17.4%
South east	Count	2		5	53	1	61	
	% within Geo-Political Region in Nigeria	3.3%		8.2%	86.9%	1.8%	100.0%	
	% of Total	.5%		1.2%	13.2%	.2%	15.1%	
North east	Count	2	2	18	26	6	54	
	% within Geo-Political Region in Nigeria	3.7%	3.7%	33.3%	48.1%	11.1%	100.0%	
	% of Total	.5%	.5%	4.5%	6.5%	1.5%	13.4%	
South south	Count	1	2	30	48	18	99	
	% within Geo-Political Region in Nigeria	1.0%	2.0%	30.3%	48.5%	18.2%	100.0%	
	% of Total	.2%	.5%	7.4%	11.9%	4.5%	24.6%	
North central	Count	1		5	46	6	58	
	% within Geo-Political Region in Nigeria	1.7%		8.6%	79.3%	10.3%	100.0%	
	% of Total	.2%		1.2%	11.4%	1.5%	14.4%	
Total	Count	14	14	83	249	43	403	
	% within Geo-Political Region in Nigeria	3.5%	3.5%	20.6%	61.8%	10.7%	100.0%	
	% of Total	3.5%	3.5%	20.6%	61.8%	10.7%	100.0%	

Table 6.10.1 revealed that about 10.7 percent indicated that they didn't know if the staffs of their local infrastructure service providers are honest or not. An additional 3.7 percent did not respond to the question. 61.8 percent were of the view that the staffs were "dishonest" while another 20.3 percent held that they were "fairly honest". Fairly as used in the ordinal scale, is a rating that lies in between 40 percent to 49 percent. 3.7 percent affirmed the honesty of their local staff. The total

dissatisfaction level was thus 61.8 percent while the satisfaction level was 24 percent. This was a lower level of dissatisfaction than any of the preceding analyses. A similar pattern was witnessed in the other geopolitical regions, notably in the South-west.

Approximately 16.9 percent of the 59 respondents from this region were of the view that they did not know if the staff of their local infrastructure service providers were “honest” or “dishonest”. 59.3 percent called them “dishonest”, 13.6 percent “fairly honest” and only 3.4 percent “honest”. The difference between this regional level of dissatisfaction and the national level was insignificant. About 6.8 percent did not respond.

Results from North-west Nigeria revealed that about 58.6 percent of the 70 respondents for this region maintained that the average staff of their local infrastructure service provider were “dishonest”, 24.3 percent “fairly honest” and 11.4 percent “honest”, giving a satisfaction level of 35.7 percent. 2.9 percent made no response. The dissatisfaction level was just 2.2 percent higher than that in North-west Nigeria. However, the level of satisfaction was 11.7 percent higher than the national level. Differences between dissatisfaction levels in this region and in South-west Nigeria were negligible: less than 1 percent. Satisfaction levels, however, were 15.7 percent higher.

About 1.6 percent of the total 61 respondents from the South-east region observed that they do not know if the staffs of their local infrastructure service providers were honest or dishonest. 86.9 percent said they were dishonest and only 8.2 percent that they were “fairly honest”. The level of dissatisfaction (i.e. those who saw staff as dishonest) was 25.1 percent higher than the national figure, and 27.6 percent and 28.3 percent, higher than for South-west Nigeria and North-west Nigeria respectively. Figures 6.10.1 and 6.10.2 show these figures. About 3.3 percent provided no response.

About 11.1 percent of the total 54 respondents for North-east region did not know if the staffs of their local infrastructure service providers were honest or not; 48.1 percent called them dishonest, 31.5 percent “fairly honest” and 3.7 percent of respondents “honest”. Not counting a non-response

rate of 5.6 percent, the satisfaction level was 32.2 percent. The dissatisfaction level for this region was about 13.7 percent less than the national level, and less than that for the South-west, North-west and South-east. This is shown in Figures 6.10.1 and 6.10.2. The reasons for these comparative levels are the same as before.

18.2 percent of the total 99 respondents from the South-south region were of the view that they did not know if the staff of their local infrastructure service providers were honest or not. 48.5 percent respondents called them “dishonest”, 30.3 percent “fairly honest” and 2 percent “honest” with a non-response rate of about 1 percent. These results were similar to those of North-east Nigeria.

Of the 58 respondents for North-central Nigeria, about 10.3 percent did not know if the staff honest, another 79.3 percent of respondents said that they were “dishonest”, about 8.6 percent said “fairly honest”, and about 1.7 percent did not respond. This level of dissatisfaction was higher than the national level by 17.5 percent. Regional levels of dissatisfaction revealed that that for South-west Nigeria was 20 percent less, while that for North-west Nigeria was 20.7 percent less than the proportion expressed for North-central. Similarly, the level of dissatisfaction expressed by respondents in North-east Nigeria was 31.2 percent less than North-central Nigeria and in South-south Nigeria it was 30.8 percent less than North-central Nigeria. These are shown in Figures 6.10.1 and 6.10.2.

Summarily, the view as expressed in the literature review, that the “average staff of local infrastructure service providers in Nigeria is fraudulent or corrupt, is supported by the analysis in this section. Over 61 percent of respondents nationwide agreed.

Figure 6.10.1. Dissatisfaction levels in staffs of infrastructure service providers

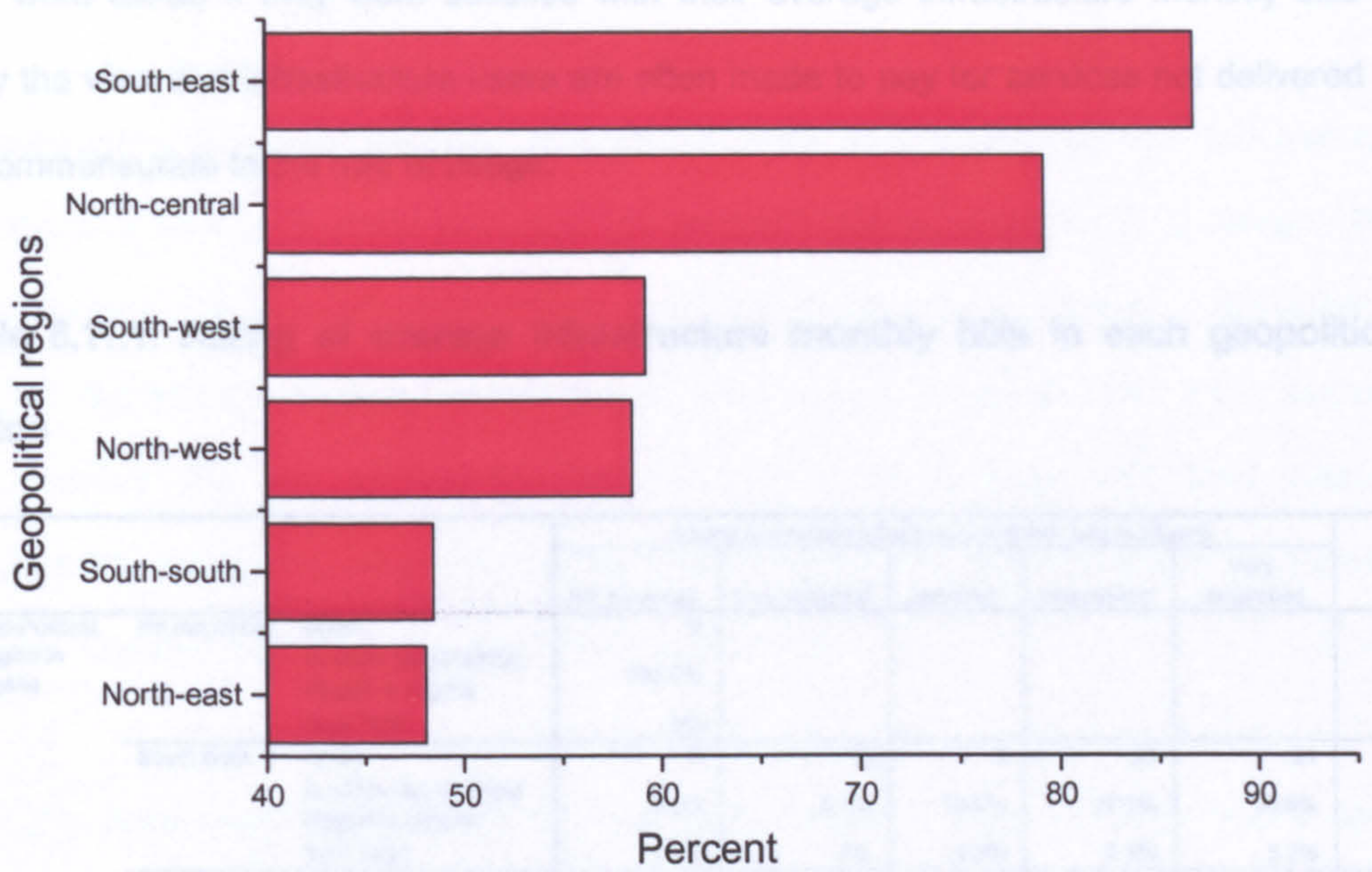
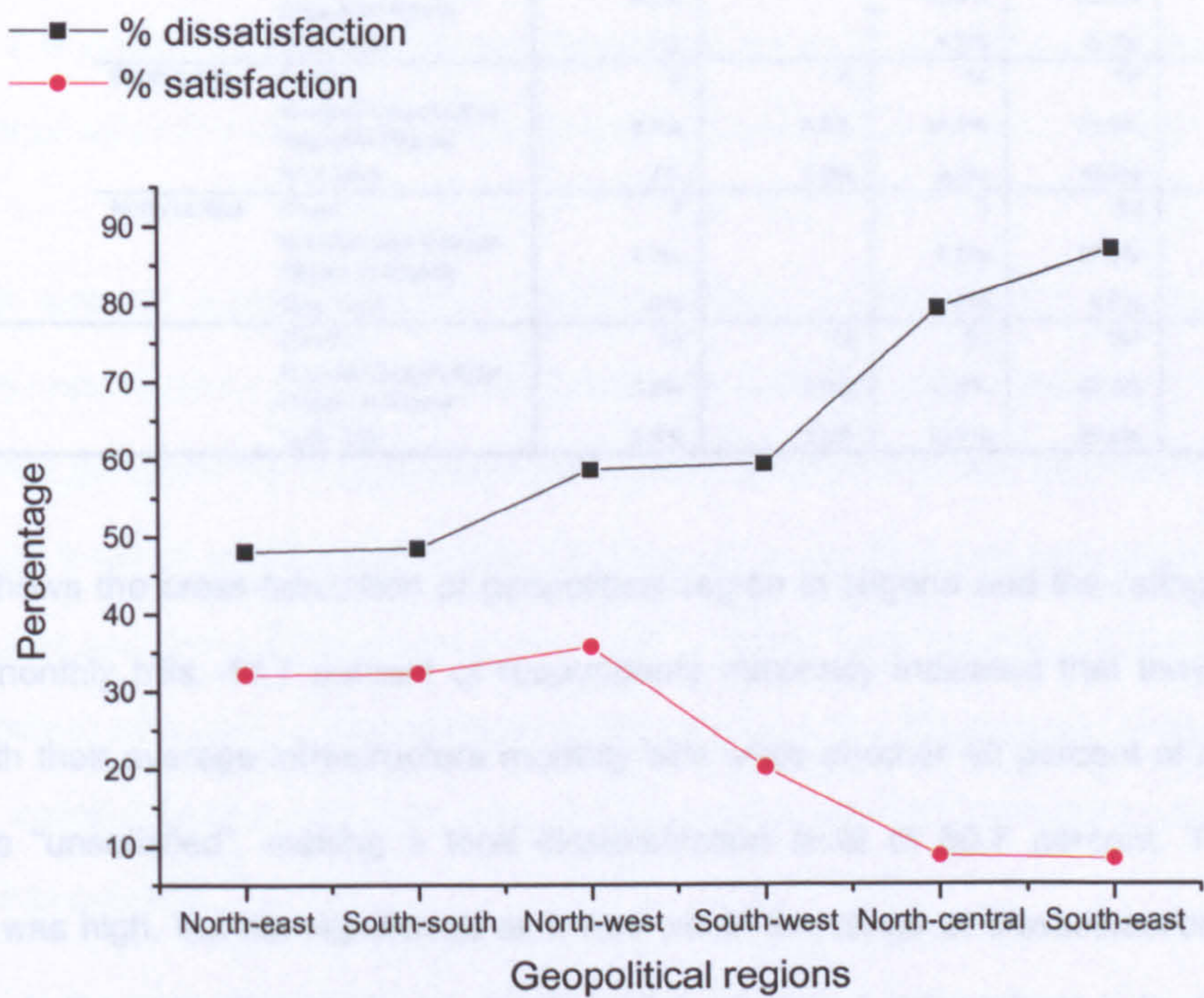


Figure 6.10.2. Rating of staffs of infrastructure service providers



6.11. Respondents rating of average infrastructure monthly bills

Respondents were asked if they were satisfied with their average infrastructure monthly bills in order to verify the view that infrastructure users are often made to pay for services not delivered to them or not commensurate to the rate of usage.

Table 6.11.1: Rating of average infrastructure monthly bills in each geopolitical region

			Rating of average Infrastructure montly bills in Nigeria					Total
			No response	Very satisfied	satisfied	Unsatisfied	Very unsatisfied	
Geo-Political Region in Nigeria	No response	Count % within Geo-Political Region in Nigeria % of Total	2 100.0% .5%					2 100.0% .5%
	South west	Count % within Geo-Political Region in Nigeria % of Total	5 8.5% 1.2%	3 5.1% .7%	8 13.6% 2.0%	22 37.3% 5.5%	21 35.6% 5.2%	59 100.0% 14.6%
	North west	Count % within Geo-Political Region in Nigeria % of Total		5 7.1% 1.2%	17 24.3% 4.2%	24 34.3% 6.0%	24 34.3% 6.0%	70 100.0% 17.4%
	South east	Count % within Geo-Political Region in Nigeria % of Total			3 4.9% .7%	15 24.6% 3.7%	43 70.5% 10.7%	61 100.0% 15.1%
	North east	Count % within Geo-Political Region in Nigeria % of Total	3 5.6% .7%		7 13.0% 1.7%	23 42.6% 5.7%	21 38.9% 5.2%	54 100.0% 13.4%
	South south	Count % within Geo-Political Region in Nigeria % of Total	3 3.0% .7%	4 4.0% 1.0%	14 14.1% 3.5%	55 55.6% 13.6%	23 23.2% 5.7%	99 100.0% 24.6%
	North central	Count % within Geo-Political Region in Nigeria % of Total	1 1.7% .2%		3 5.2% .7%	22 37.9% 5.5%	32 55.2% 7.9%	58 100.0% 14.4%
	Total	Count % within Geo-Political Region in Nigeria % of Total	14 3.5% 3.5%	12 3.0% 3.0%	52 12.9% 12.9%	161 40.0% 40.0%	164 40.7% 40.7%	403 100.0% 100.0%

Table 6.11.1 shows the cross-tabulation of geopolitical region in Nigeria and the rating of average infrastructure monthly bills. 40.7 percent of respondents nationally indicated that they were “very unsatisfied” with their average infrastructure monthly bills while another 40 percent of respondents said they were “unsatisfied”, making a total dissatisfaction level of 80.7 percent. This level of dissatisfaction was high, but not significant, as it was within the range of dissatisfaction expressed by respondents in the preceding analyses. Another 12.9 percent of respondents indicated that they

were “satisfied” with their average infrastructure monthly bills and 3 percent “very satisfied”, making a satisfaction response level of 15.9 percent. 3.5 percent did not respond.

Out of 59 respondents in South-west Nigeria, 35.6 percent were “very unsatisfied” with their average infrastructure monthly bill and 37.3 percent were “unsatisfied”, making a total of 72.9 percent. The national dissatisfaction level was 7.8 percent higher than that of South-west Nigeria. 13.6 percent of respondents for South-west Nigeria indicated that they were “satisfied” with their average infrastructure monthly bills and another 5.1 percent were “very satisfied” with their average infrastructure monthly bill, giving a satisfaction response level of 18.7 percent. About 8.5 percent failed to respond. These are shown in Figures 6.11.1 and 6.11.2.

Results from the North-west Nigeria showed that 34.3 percent of the 70 respondents were “unsatisfied and 34.3 percent were “very unsatisfied”, giving a total dissatisfaction level of 68.6 percent – less than the national level by 12.1 percent. By contrast, 7.1 percent of respondents indicated that they were “very satisfied” with their average infrastructure monthly bill and 24.3 percent “satisfied” with their average infrastructure monthly bills, giving a total of 31.4 percent who were satisfied. The level of dissatisfaction expressed by respondents in South-west Nigeria was 4.3 percent higher than what was expressed for North-west Nigeria (see Figures 6.11.1 and 6.11.2).

The South-east revealed a slight deviation from the pattern for this question so far: about 70.5 percent of the 61 respondents were “very unsatisfied” with their average infrastructure monthly bills and a further 24.6 percent were “unsatisfied”, making a total dissatisfaction response level of 95.1 percent. This was a full 15 percent higher than the national figure, 22.2 percent higher than that for South-west Nigeria and about 26.5 percent higher than for North-west Nigeria. 4.9 percent held that they were “satisfied” with their average infrastructure monthly bills. The reasons given in previous sections could account for the very high level of 70.5 percent level of those who answered “very unsatisfied” to this question.

Table 6.11.1 reveals that, of 54 respondents from North-east, 42.6 percent were “unsatisfied” with their average infrastructure monthly bill while another 38.9 percent of the 54 respondents for the region were “very unsatisfied”, yielding a total dissatisfaction level of 81.5 percent, less than 1 percent higher than the national figure. Regional comparisons show that it was 9 percent less than South-west Nigeria and 12.9 percent less than North-west Nigeria. However, it was less than in the figure for South-east Nigeria, only 13 percent of whom were “satisfied” with their average infrastructure monthly bills; 5.6 percent did not respond.

Of the 99 respondents from South-south Nigeria, 55.6 percent were “very unsatisfied” with their average infrastructure monthly bills and another 23.2 percent of respondents indicated that they were “unsatisfied” with their average infrastructure monthly bill giving a total dissatisfaction level of 78.8 percent. This was 1.9 percent less than the national figure, 16.3 percent less than that for South-east Nigeria, and 2.7 percent less than the North-east. It was, however, greater than that for the South-west region by 5.9 percent, and by 10.2 percent for North-west Nigeria. 14.1 percent of respondents in the South-south region were “satisfied” with their average infrastructure monthly bills and 4 percent were “very satisfied”, totaling 18.1 percent. These are shown in Figures 6.11.1 and 6.11.2. 3.0 percent failed to respond to the question.

Table 6.11.1 shows that, of 58 respondents in North-central Nigeria, 55.2 percent were “very unsatisfied” with their average infrastructure monthly bill and 37.9 percent were “unsatisfied”, giving a total of 93.1 percent - 12.4 percent higher than the national figure. It was higher than the figures for South-west Nigeria, North-west Nigeria, North-east Nigeria and South-south Nigeria, but less than those for South-east Nigeria by 2 percent. About 5.2 percent of the total respondents for North-central Nigeria were of the view that they were “satisfied” with their average infrastructure monthly bills, while 1.7 percent of respondents did not respond. These are clearly shown in the graph plot of Figures 6.11.1 and 6.11.2.

From this analysis it is evident that consumers in Nigeria are not satisfied with their average infrastructure monthly bills, proposed in the literature review. Over 80 percent of respondents throughout Nigeria supported this view.

6.12. **Figure 6.11.1. Dissatisfaction response level on infrastructure monthly bill**

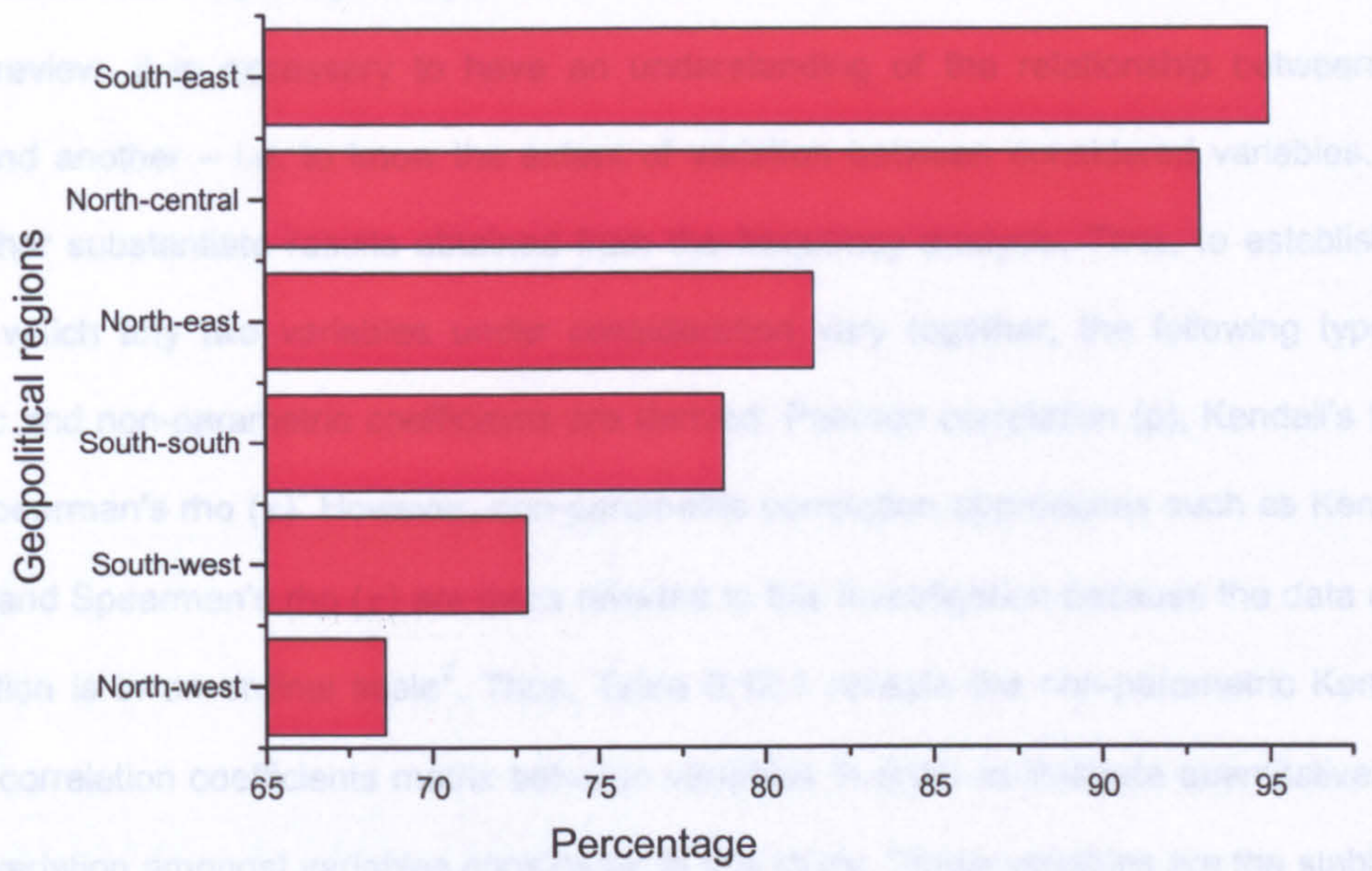
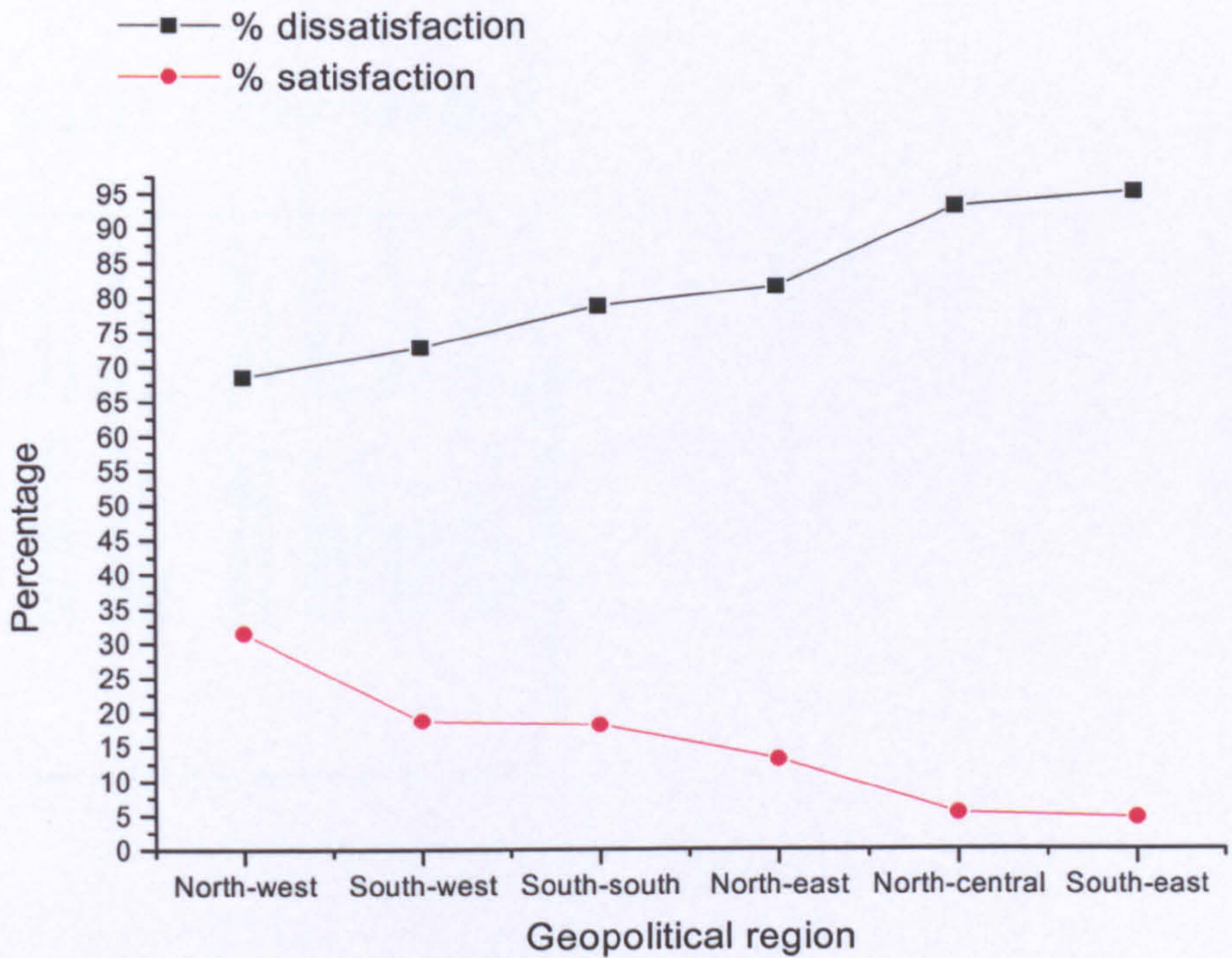


Figure 6.11.2. Ratings of infrastructure monthly bills.



² Ordinal scale places different responses in an order to each other, but does not measure the magnitude of each value. It shows the strength of one response over another.

6.12. Correlation coefficients and modeling of notable variables

Having carried out frequency analysis to validate the several hypotheses drawn from the literature review, it is necessary to have an understanding of the relationship between one variable and another – i.e. to know the extent of variation between considered variables. This would further substantiate results obtained from the frequency analysis. Thus, to establish the extent to which any two variables under consideration vary together, the following types of parametric and non-parametric coefficients are derived: Pearson correlation (ρ), Kendall's tau_b (τ) and Spearman's rho (r). However, non-parametric correlation approaches such as Kendall's tau_b (τ) and Spearman's rho (r) are more relevant to this investigation because the data under consideration is in an ordinal scale². Thus, Table 6.12.1 reveals the non-parametric Kendall's tau_b (τ) correlation coefficients matrix between variables in order to illustrate quantitatively the extent of variation amongst variables considered in this study. These variables are the stability of infrastructure services, infrastructure supply, quality of infrastructure service delivery, rate of infrastructure maintenance, response rate to infrastructure maintenance, conduct of staff of local infrastructure service providers, and average infrastructure monthly bills.

² Ordinal scale places different respondents in relation to each other in terms of the intensity of their attitude towards an issue. It shows the strength of one respondents view in relation to another.

Table 6.12.1: Non-parametric Correlation coefficients (Kendall's tau_b) matrix

Kendall's tau_b	Stability of infrastructure service delivery in Nigeria	Infrastructure supply and service delivery in Nigeria	Quality of infrastructure and service delivery in Nigeria	Rate of infrastructure Maintenance in Nigeria	Response rate to Infrastructure Maintenance in Nigeria	Staffs of local infrastructure service providers in Nigeria	Rating of average infrastructure monthly bills in Nigeria
	1.000 Sig. (2-tailed) N	.510** .000 403	.445** .000 403	.386** .000 403	.391** .000 403	.201** .000 403	.332** .000 403
		1.000 Sig. (2-tailed) N	.543** .000 403	.459** .000 403	.483** .000 403	.181** .000 403	.285** .000 403
			1.000 Sig. (2-tailed) N	.533** .000 403	.472** .000 403	.243** .000 403	.359** .000 403
				1.000 Sig. (2-tailed) N	.593** .000 403	.229** .000 403	.364** .000 403
					1.000 Sig. (2-tailed) N	.264** .000 403	.355** .000 403
						1.000 Sig. (2-tailed) N	.321** .000 403
							1.000 Sig. (2-tailed) N

** . Correlation is significant at the .01 level (2-tailed).

In the correlation Table 6.12.1 there were 7 variables, and the correlation coefficients between a particular variable and the other six with itself to make seven has been tabulated. For example, in the first row of the Table 6.12.1, the variable “stability of infrastructure service delivery in Nigeria” was correlated with itself and the other variables as shown in the first row. The results of each of these seven correlations are expressed in the corresponding cell found in the second row – i.e. the first cell shows the correlation results between “Stability of infrastructure service delivery in Nigeria” and itself, the second cell shows the correlation results between “stability of infrastructure services in Nigeria” and “infrastructure supply” , the third cell reveals the correlation results between “Stability of infrastructure services in Nigeria” and “quality of infrastructure service delivery in Nigeria”. Similarly, results for the others can be found in their various corresponding cells.

Results found in each cell comprise the correlation coefficient, the sig (significance) value and the total number of respondents in the survey. The correlation is significant at 0.01 level (2-tailed), and if the sig (significance) value is less than 0.01 the correlation is statistically significant. However, the results in Table 6.12.1 are carefully explained in the following sections.

6.12.1. Relationship between Stability of Infrastructure Services and Infrastructure Supply.

From Table 6.12.1, correlation between stability of infrastructure service delivery and infrastructure supply gave the following results coefficients using Kendall's tau_b (τ):

$$\text{Kendall's tau}_b (\tau) = 0.510; N = 403; P < 0.01; r^2 = (0.510)^2 = 0.2601$$

Where N is the total number of respondents, P is the significant level and r^2 is the co-efficient of determination which indicates how much of the variance or changes in one variable are explained by the variance or changes in another. For example, 0.2601 (26 percent) of the variance or changes in respondents' responses for "stability of infrastructure service delivery" could be explained by the variance or changes in responses given by respondents for "infrastructure supply". Nonetheless, a careful examination of the scatter diagram of these variables gave an indication that we could reasonably assume the existence of a linear relationship. This is shown in Figure 6.12.1. Consequently, the best fitted (regression) line model was drawn between the variables to represent this relationship, with "Stability of infrastructure service delivery" (Y) as the dependent variable while "infrastructure supply" (S) was the independent variable. This is shown in Figure 6.12.1. The "F" statistics which confirm the existence of a significant linear relationship and the "t" statistics which show whether the independent variable or explanatory variable is capable of predicting the dependent variable beyond or greater than chance level were all statistically significant, thus, confirming both the existence of a linear relationship, and that the independent variable could predict the dependent variable beyond or greater than chance level. The derived mathematical model showing the relationship between the two variables from the collected data is:

$$Y = 2.022 + 0.397S \dots \dots \dots (1)$$

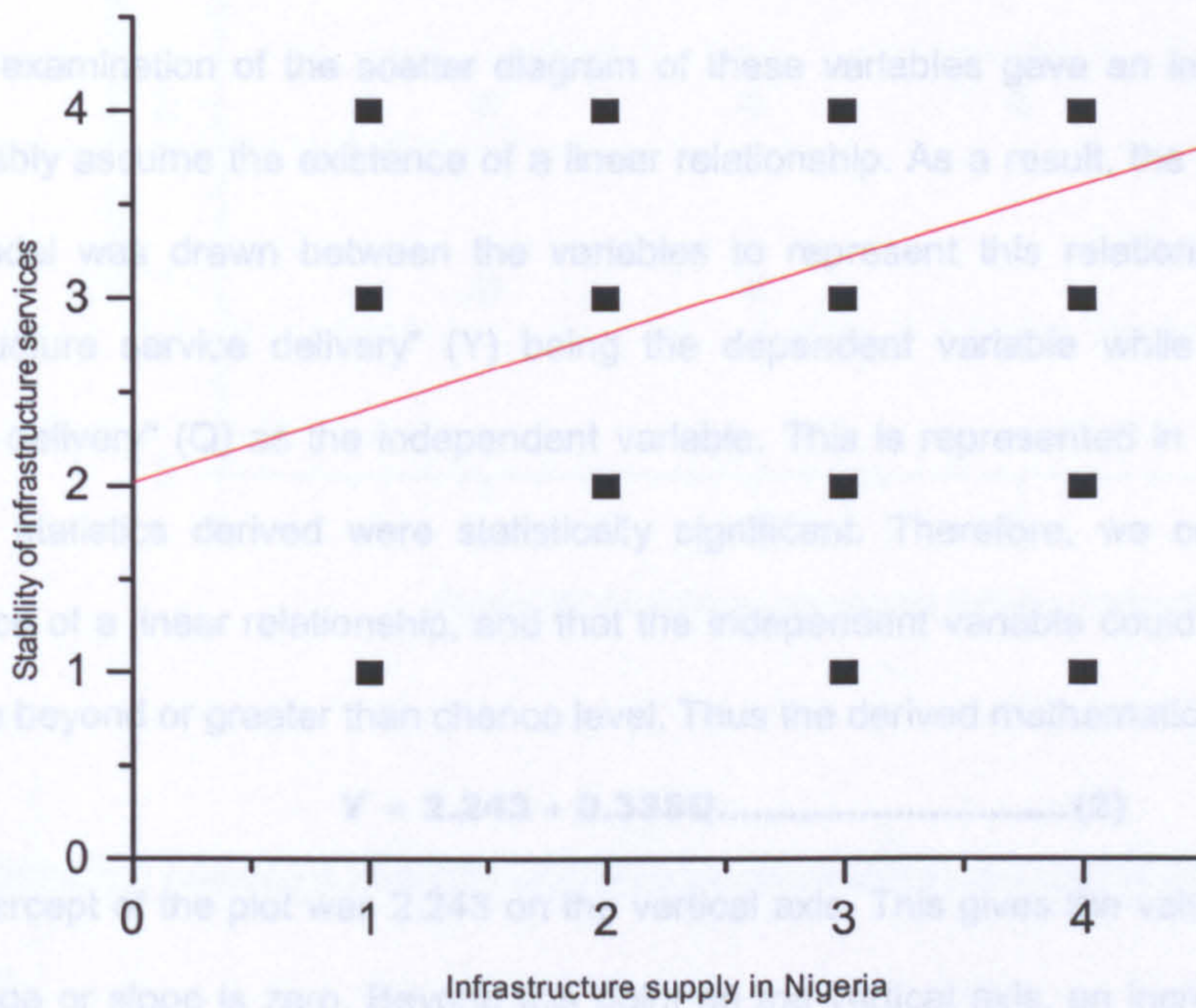
This has been carefully represented in Figure 6.12.1. The graph had a positive orientation and an intercept of 2.022 on the vertical axis; beyond this point of intercept, it could be positively said that an increase in "infrastructure supply" corresponds to an increase in the "stability of infrastructure services". The slope is 0.397, which could be approximated 0.4. The slope tells the rate at which the value of "Y" (dependent variable) changes relative to changes in the value of "S" (independent variable) i.e. it tells the change in the value of "Y" if "S" increases by one unit. Thus, it could be said from equation (1) that for every one percent increase in infrastructure supply is a corresponding 0.4 percent increase in the stability of infrastructure services. In other words, to increase infrastructure supply in Nigeria by one percent, there is the need to improve on the stability of existing infrastructure

services by at least 0.4 percent. However, this model was validated by 21 respondents out of a total of 40 randomly selected for this purpose. This implies that the calculated value for variable “Y” using equation (1) corresponded practically by 52.5 percent to the actual options chosen by respondents. It should be clearly stated that these respondents were not part of those used to generate the model.

coefficients

$$\text{Kendall's tau}_b(t) = 0.445; N = 403; P < 0.01; r^2 = (0.445)^2 = 0.1980$$

Figure 6.12.1. Regression line between stability of infrastructure services and infrastructure supply



6.12.2. Relationship between Stability of Infrastructure Services and Quality of Infrastructure.

Similarly, from the correlation Table 6.12.1, the correlation between “stability of infrastructure service delivery” and “quality of infrastructure service delivery in Nigeria” gave the following coefficients:

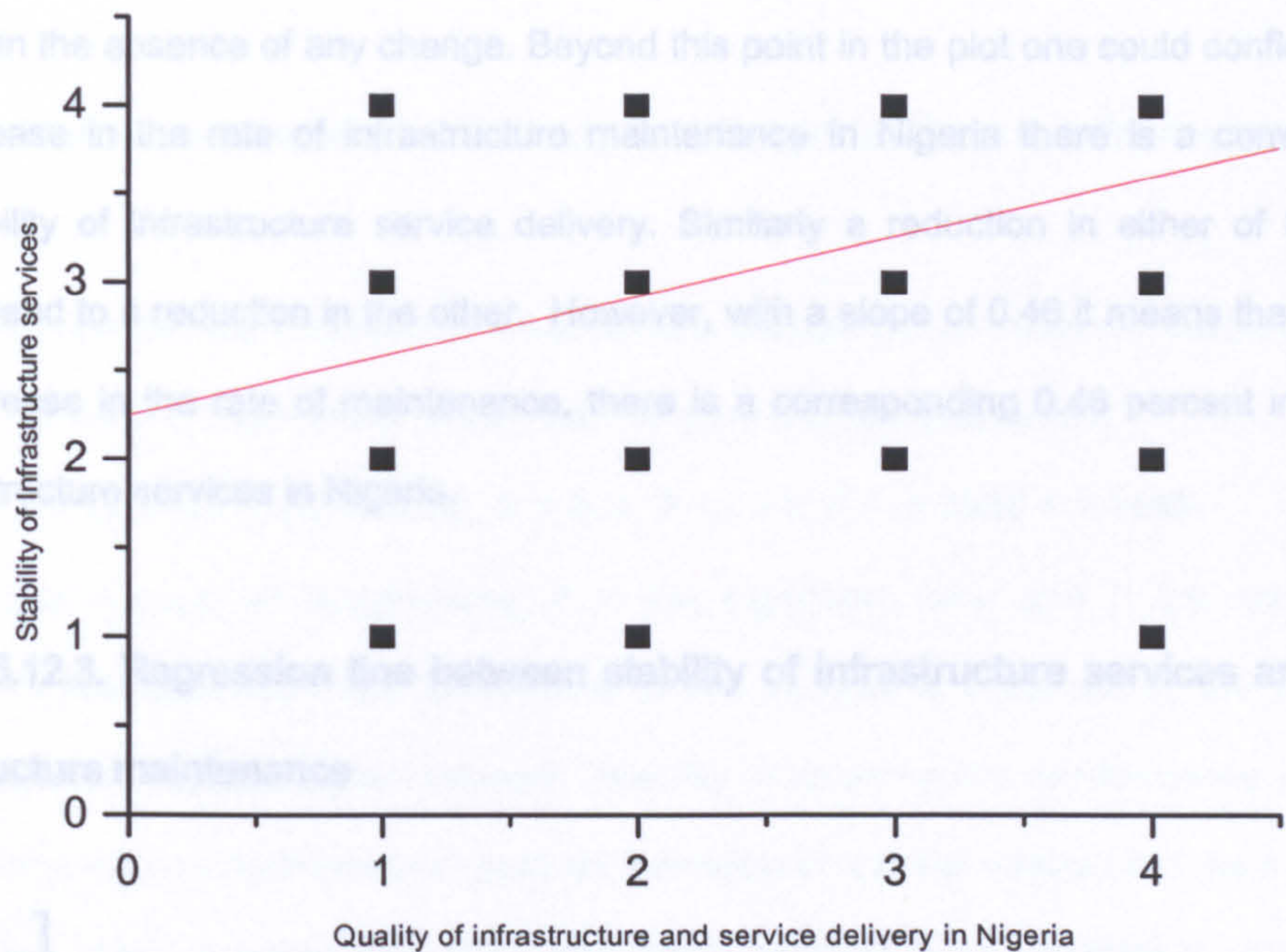
$$\text{Kendall's tau}_b (\tau) = 0.445; N = 403; P < 0.01; r^2 = (0.445)^2 = 0.1980$$

where N is the total number of respondents, P is the significant level and r^2 is the coefficient of determination. Thus, 0.1980 (20 percent) of the variation in “stability of infrastructure service delivery” is explained by the variation in “quality of infrastructure service delivery”. However, a careful examination of the scatter diagram of these variables gave an indication that we could reasonably assume the existence of a linear relationship. As a result, the best fitted (regression) line model was drawn between the variables to represent this relationship; with “Stability of infrastructure service delivery” (Y) being the dependent variable while “quality infrastructure service delivery” (Q) as the independent variable. This is represented in Figure 6.12.2. The “F” and “t” statistics derived were statistically significant. Therefore, we could confirm both the existence of a linear relationship, and that the independent variable could predict the dependent variable beyond or greater than chance level. Thus the derived mathematical model is:

$$Y = 2.243 + 0.338Q \dots \dots \dots (2)$$

The intercept of the plot was 2.243 on the vertical axis. This gives the value of “Y” when the rate of change or slope is zero. Beyond this point on the vertical axis, an increase in the “stability of infrastructure service delivery” will lead to an increase in the “quality of infrastructure service delivery” at a rate of 0.338 (approximately 0.34). Therefore, a one percent change in quality of infrastructure services would mean a 0.34 percent change in stability of infrastructure services or vice visa. The rate of change in the empirical model of equation (2) was less than that of equation (1). This indicates that improving infrastructure supply in Nigeria is of more impact to the stability of infrastructure services. This model was validated to practical trend at the rate of 42.5 percent i.e. only 17 responses out of 40 respondents set aside for this purpose validated this model.

Figure 6.12.2. Regression line between Stability of infrastructure services and quality of infrastructure and service delivery



6.12.3. Relationship between Stability of Infrastructure Services and Rate of Infrastructure Maintenance.

The correlation between stability of infrastructure services and the rate of infrastructure maintenance in Nigeria gave the following coefficients:

$$\text{Kendall's tau}_b (\tau) = 0.386; N = 403; P < 0.01; r^2 = (0.386)^2 = 0.1490$$

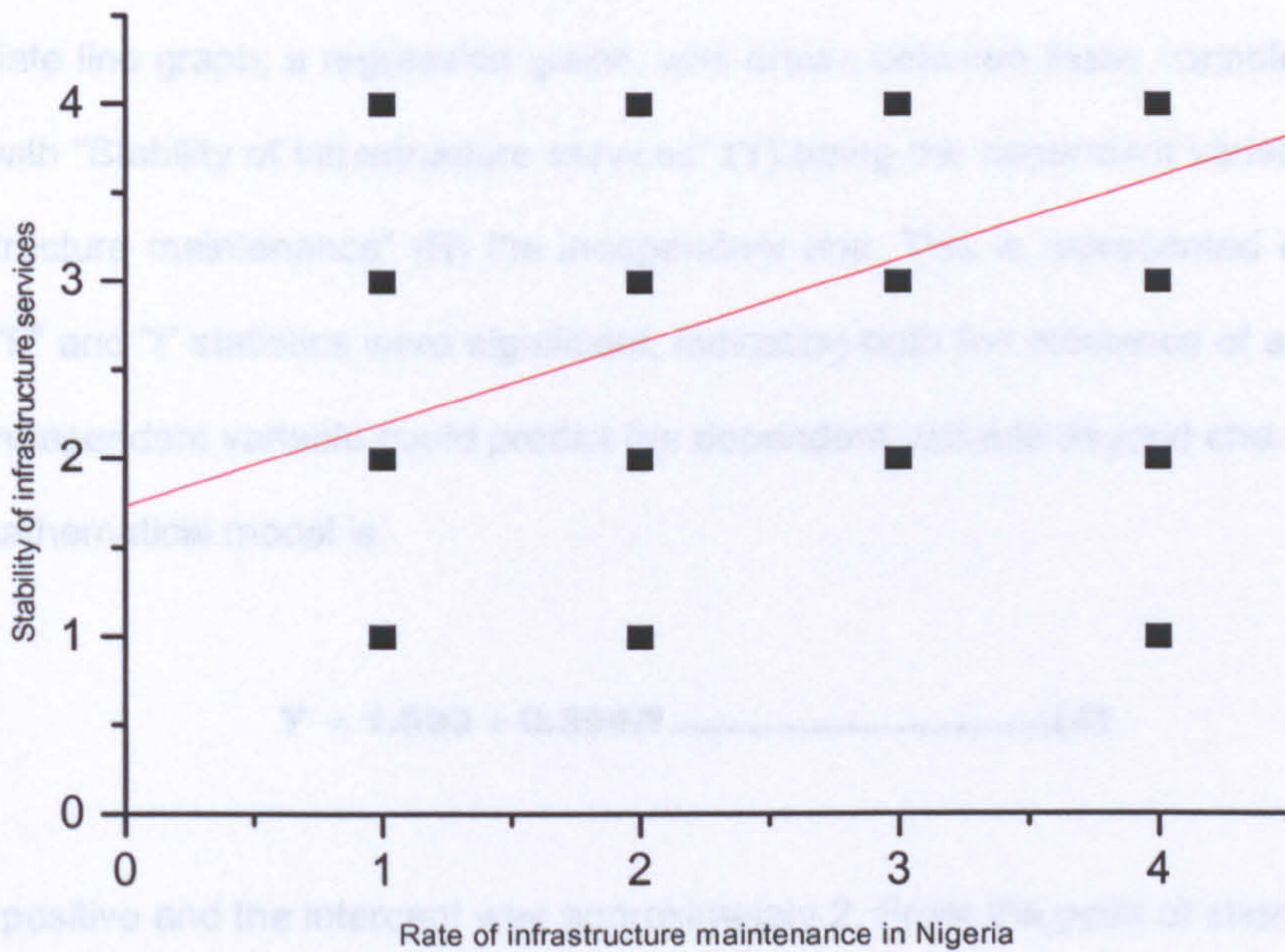
where N is the total number of respondents, P is the significant level and r^2 the coefficient of determination. The scatter diagram of the plot between “Stability of infrastructure services” and “the rate of infrastructure maintenance” nonetheless gave an indication of a linear relationship. This is represented in Figure 6.12.3. Consequently, the best fitted (regression) line model was drawn between the variables to represent this relationship; with “Stability of infrastructure services” (Y) being the dependent variable while “rate of infrastructure maintenance” (M) is the independent variable. This has been carefully represented in Figure 6.12.3. The “F” and “t” values from both the “F” and “t”

statistics were statistically significant, substantiating both the existence of a linear relationship and that the independent variable could predict the dependent variable beyond or greater than chance level. Therefore derived model is:

$$Y = 1.735 + 0.463M \dots \dots \dots (3)$$

The plot is represented in Figure 6.12.1.3. From the model in equation (3), the intercept is 1.735 i.e. the value for “y” in the absence of any change. Beyond this point in the plot one could confidently say that for an increase in the rate of infrastructure maintenance in Nigeria there is a corresponding increase in stability of infrastructure service delivery. Similarly a reduction in either of these two variables would lead to a reduction in the other. However, with a slope of 0.46 it means that for every one percent increase in the rate of maintenance, there is a corresponding 0.46 percent increase in stability of infrastructure services in Nigeria.

Figure 6.12.3. Regression line between stability of infrastructure services and rate of infrastructure maintenance



However, the slope was steeper or higher than the previous plots in Figure 6.12.1 and 6.12.2 for equation (1) and (2) respectively. As mentioned earlier, the higher the slope of the plot, the stronger the relationship between the variables under consideration. Thus, respondents supported more strongly in comparison to previous plots that with increasing “infrastructure maintenance in Nigeria”, would

certainly lead to an increase in the “stability of infrastructure services”. Thus, improving infrastructure maintenance is of greater impact in the stability of infrastructure services compared to the improvement of infrastructure supply or the quality of infrastructure services in Nigeria. Lastly, this model was validated at 57.5 percent of the 40 selected respondents exclusively set aside for this purpose.

6.12.4. Stability of Infrastructure Service Delivery and Response Rate to Infrastructure Maintenance.

An additional correlation between stability of infrastructure service delivery and the response rate to infrastructure maintenance in Nigeria was performed and gave the following results:

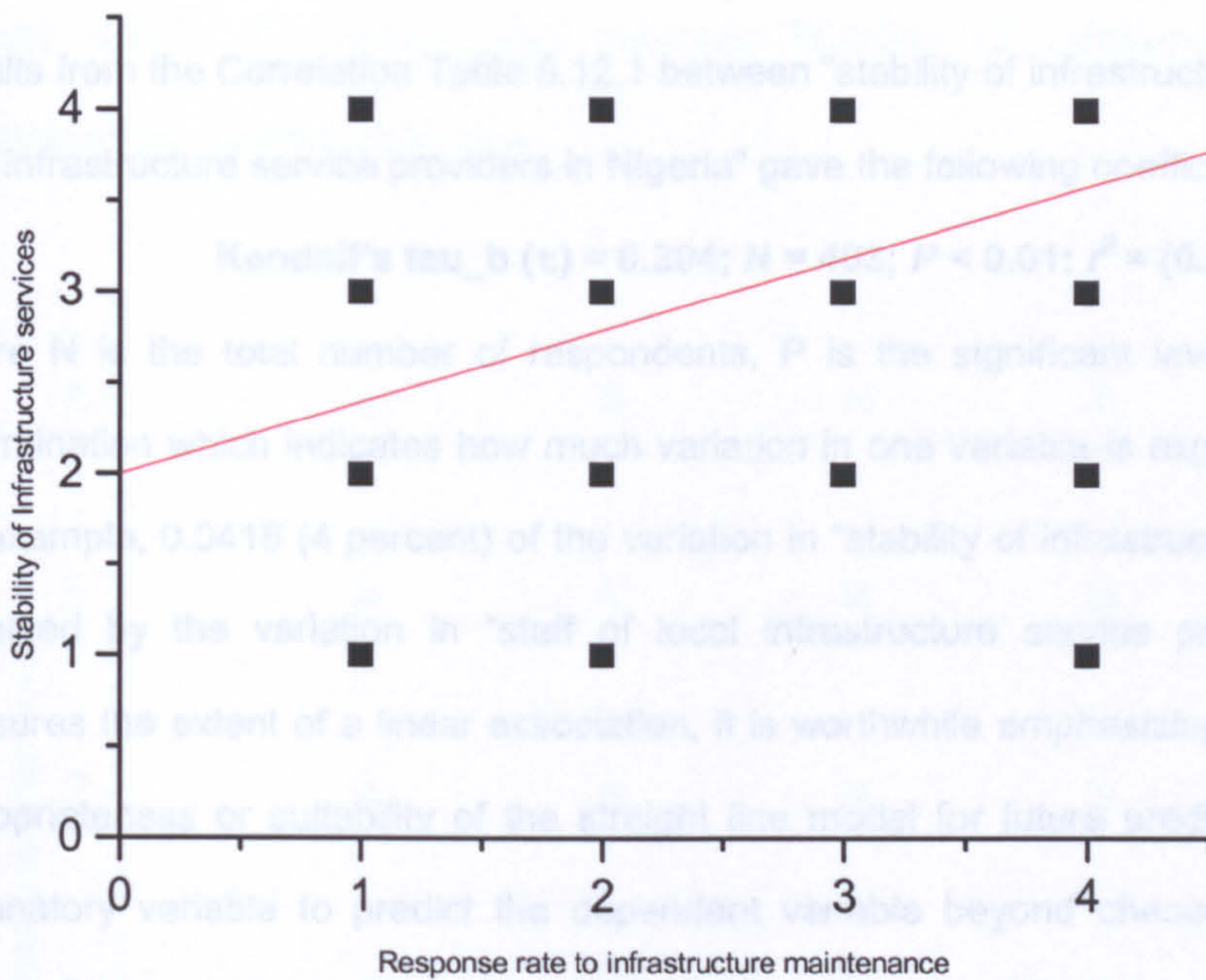
$$\text{Kendall's tau}_b (t) = 0.393; N = 403; P < 0.01; r^2 = (0.393)^2 = 0.1545$$

where N is the total number of respondents, P is the significant level and r^2 the coefficient of determination which indicates how much of variance in one variable is explained by the variance in another. From the plotted scatter diagram between “Stability of infrastructure service delivery” and “the response rate to infrastructure maintenance” gave an indication of a linear relationship. As a result, the most appropriate line graph, a regression graph, was drawn between these variables to represent this relationship, with “Stability of infrastructure services” (Y) being the dependent variable while “response rate to infrastructure maintenance” (R) the independent one. This is represented in Figure 6.12.4. In addition, the “F” and “t” statistics were significant, indicating both the existence of a linear relationship, and that the independent variable could predict the dependent variable beyond chance level. Therefore the derived mathematical model is:

$$Y = 1.999 + 0.394R \dots \dots \dots (4)$$

The plot was positive and the intercept was approximately 2. From the point of intercept, the plot reads that an increase in “response rate to infrastructure maintenance” corresponds to an increase in the “stability of infrastructure service delivery in Nigeria”. Similarly, a decrease in any of these would definitely lead to a decrease in the other. This model was validated at 45 percent response rate of the 40 respondents set aside for this purpose.

Figure 6.12.4. Regression line between stability of infrastructure services and response rate to infrastructure maintenance



Kendall's tau_b (t) = 0.204; N = 16; P < 0.01; $r^2 = (0.204)^2 = 0.0416$

Results from the Correlation Table 5.12.1 between "stability of infrastructure services" and the "staffs of local infrastructure service providers in Nigeria" gave the following coefficients: Kendall's tau_b (t) = 0.204; N = 16; P < 0.01; $r^2 = (0.204)^2 = 0.0416$. When N is the total number of respondents, P is the significant level and r^2 is the coefficient of determination which indicates how much variation in one variable is explained by variation in another. For example, 0.0416 (4 percent) of the variation in "stability of infrastructure service delivery" could be explained by the variation in "staff of local infrastructure service providers in Nigeria". While, r^2 measures the extent of a linear association, it is worthwhile emphasizing that it does not measure the appropriateness or suitability of the fitted line model for future predictions – i.e. the ability of the explanatory variable to predict the dependent variable beyond chance level. However, the plotted scatter diagram between "Stability of infrastructure service delivery" and "staffs of local infrastructure service providers in Nigeria" gave an impression of a linear relationship. As a result, the most appropriate (i.e. regression) line model was drawn between the variables to represent this relationship, with "Stability of infrastructure service delivery" (Y) being the dependent variable while "staffs of local infrastructure service providers in Nigeria" (X) the independent variable. These are shown in Figure 6.12.5. The "P" and "T" statistics were significant, thus, confirming both the existence of a linear relationship, and the confidence that the independent variable could predict the dependent variable beyond chance level. Therefore the derived mathematical model is:

$$Y = 2.495 + 0.201X \quad (5)$$

Analyzing this plot reveals that the point of intercept on the vertical axis was higher than previous plots and the slope was less steep compared to previous plots. The slope of the model in equation (5) was the least in comparison to the others previously analysed. It shows that though the activities of staffs of local infrastructure services providers are important but not as significant as improving the quality supply, maintenance of infrastructure. The model reveals that for every one percent change in the

6.12.5. The Relationship between Stability of Infrastructure Services and Staff Infrastructure Service Providers

Results from the Correlation Table 6.12.1 between “stability of infrastructure services” and the “staffs of local infrastructure service providers in Nigeria” gave the following coefficients:

$$\text{Kendall's tau}_b (\tau) = 0.204; N = 403; P < 0.01; r^2 = (0.204)^2 = 0.0416$$

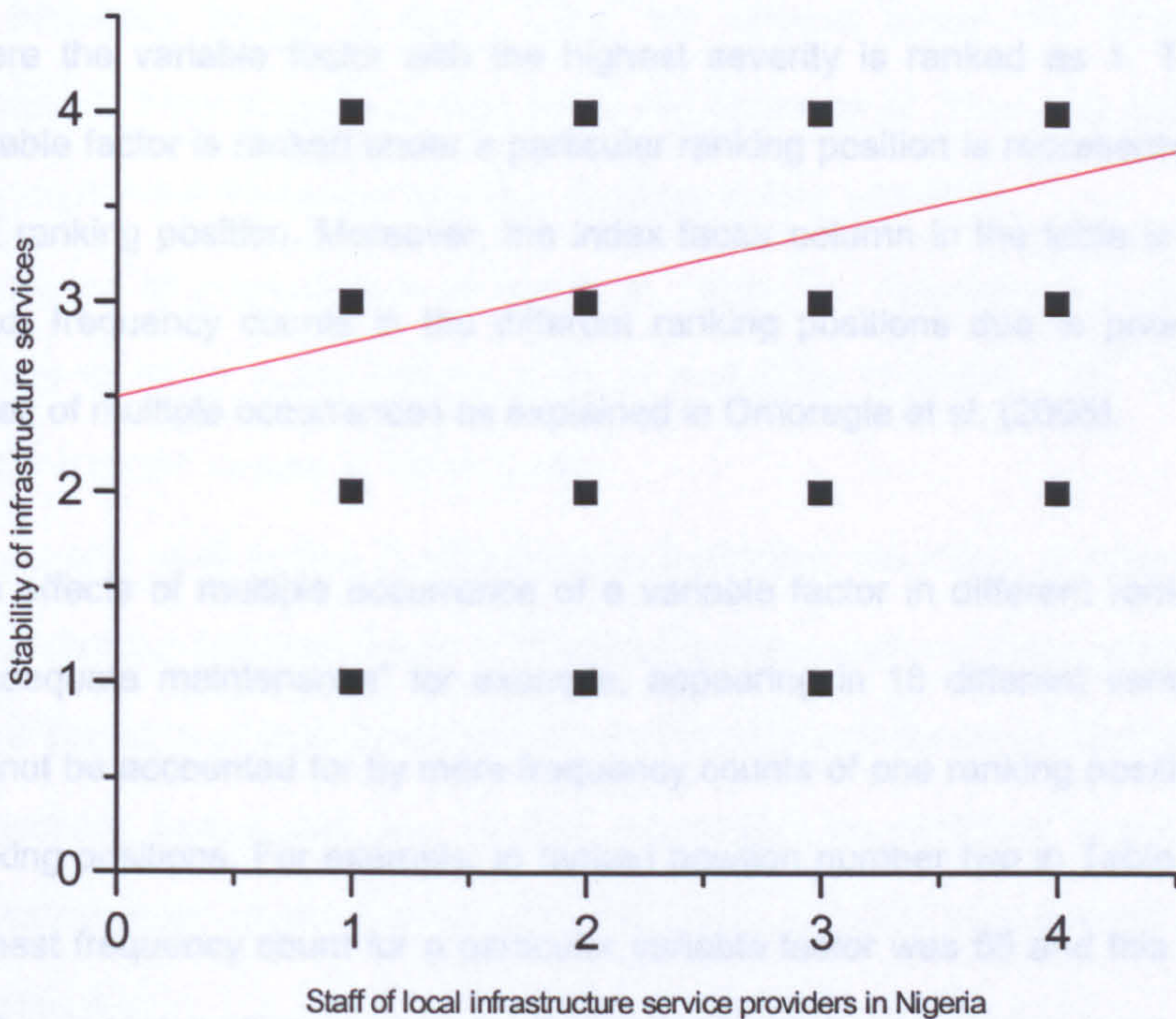
Where N is the total number of respondents, P is the significant level and r^2 is the coefficient of determination which indicates how much variation in one variable is explained by variation in another. For example, 0.0416 (4 percent) of the variation in “stability of infrastructure service delivery” could be explained by the variation in “staff of local infrastructure service providers in Nigeria” While, r^2 measures the extent of a linear association, it is worthwhile emphasizing that it does not measure the appropriateness or suitability of the straight line model for future predictions – i.e. the ability of the explanatory variable to predict the dependent variable beyond chance level. However, the plotted scatter diagram between “Stability of infrastructure service delivery” and “staffs of local infrastructure service providers in Nigeria” gave an indication of a linear relationship. As a result, the most appropriate (i.e. regression) line model was drawn between the variables to represent this relationship, with “Stability of infrastructure service delivery” (Y) being the dependent variable while “staffs of their local infrastructure service providers in Nigeria” (P) the independent variable. These are shown in Figure 6.12.5. The “F” and “t” statistics were significant, thus, confirming both the existence of a linear relationship, and the confirmation that the independent variable could predict the dependent variable beyond chance level. Therefore the derived mathematical model is:

$$Y = 2.499 + 0.291P \dots \dots \dots (5)$$

Analyzing this plot reveals that the point of intercept on the vertical axis was higher than previous plots and the slope was less steep compared to previous plots. The slope of the model in equation (5) was the least in comparison to the others previously analyzed. It shows that though the activities of staffs of local infrastructure services providers are important but not as significant as improving the quality, supply, maintenance of infrastructure. The model reveals that for every one percent change in the

services offered by staffs of the local infrastructure service providers there is a corresponding change of 0.29 percent in the stability of infrastructure services.

Figure 6.12.5. Regression line between Stability of infrastructure services and Staffs infrastructure service providers



The plot reveals a positive orientation which indicates that as “staff of local infrastructure service providers in Nigeria” improves their dedication to duty and put aside fraudulent and corrupt practices, it will lead to improvements in the “stability of infrastructure services” in Nigeria. However, this model was validated by just 5 (12.5 percent) of the total 40 respondents set aside for this purpose.

6.13. Observations of Results on Factors Responsible for Infrastructure Failures

Excluding non-response values, the first set of Tables³ in Appendix A shows the questionnaire distribution and response, while Table 5 shows the variable factors responsible for the causes of infrastructure service delivery failures in Nigeria as revealed from the literature review. The third set of Tables⁴ shows the frequencies of variable factors in their various different ranking positions in the order of priority accorded by respondents. This order of priority is in a decreasing arithmetic pattern, where the variable factor with the highest severity is ranked as 1. Thus, the number of times a variable factor is ranked under a particular ranking position is represented as its frequency counts for that ranking position. Moreover, the index factor column in the table is used to multiply the variable factor frequency counts in the different ranking positions due to prioritization and the reoccurring cases of multiple occurrences as explained in Omoregie et al. (2005).

The effects of multiple occurrence of a variable factor in different ranking positions (variable factor “inadequate maintenance” for example, appearing in 18 different variable factor ranking positions) cannot be accounted for by mere frequency counts of one ranking position independently of the other ranking positions. For example, in ranked position number two in Table 7 in Appendix A, the second highest frequency count for a particular variable factor was 55 and this variable factor reappeared in all the ranked positions numbering from 1 to 18 with the frequency counts of 22, 55, 39, 41, 25, 11, 14, 9, 9, 1, 3, 4, 1, 1, 1, 1, 2, and 1 respectively. Thus, ranking this variable factor “inadequate maintenance” solely with the highest frequency count magnitude of 55 without considering the effects of the frequency counts in other ranking positions undervalues the severity of this variable factor (Omoregie et al. 2005).

To consider all frequency counts in all the variable factor ranking positions for a particular variable factor without due consideration for the preference of ranking or ranking positions accorded it by respondents negates the actual severity of this variable factor. As a way of tackling these problems or observations, the Severity Index in Matrix Order (SIMO) model for ranking procedures was applied (Omoregie et al. 2005).

³ Table 6; Table 8; Table 10; Table 12; Table 14; Table 16 and Table 18

⁴ Table 7; Table 9; Table 11; Table 13; Table 15; Table 17 and Table 19

6.13.1. Severity Index in matrix order (SIMO)

The following are the steps employed in building the model:

- The factors were coded from 1 to 18 i.e. F(1), F(2), F(3),.....,F(18) (see Table 5 in Appendix A).
- Ranking positions are created in decreasing order of severity corresponding to the number of factors under consideration i.e. P1, P2, P3,....,P18 (see Table 7 in Appendix A).
- The frequency counts of each factor are entered under the various ranking positions respondents have given them (see Table 7 in Appendix A). Thus, it is expected that a particular factor could have frequency counts in multiple ranking positions.
- The column of index factors as shown in Table 7 in Appendix A is derived by each of the numbers or items in the inverse array of arithmetic numbers – i.e. 18, 17, 16, 15, 14,....,1 multiplied by the inverse of 18 or (1/18).
- The severity of all factors is calculated by multiplying the matrix of frequency counts under the various ranking positions (i.e.18 X 18 matrix) by the column of index factors (i.e. 1X18 matrix) to give an the array of severity magnitudes in first matrix as shown in Table 20 in Appendix A.
- The variable factors and their severity magnitudes as explained above are re-arranged in a decreasing order of severity i.e. p(1), p(2), p(3),.....,p(18) (see second matrix in Table 20 in Appendix A).
- The threshold value or demarcation point is the midhinge of Table 20 in Appendix A (see equation 7 to 10)

These processes could also be represented in a mathematical format (see equation (1))

$$F(j) = \sum_{i=1, j=1}^{i=n, j=n} \mu_{ij} \frac{\sigma_i}{n} \dots\dots\dots(1)$$

where: $\sigma_i = (n + 1) - i$

j is the variable factor under consideration: for j = 1,2,3,....,n-1, n

σ_i is the factor for ranked position of the variable factor under consideration:

for i = 1, 2, 3,....., n-1, n

Thus:

σ_1 : represent variable factor position 1; σ_2 : represent variable factor position 2....,

σ_n : represent n^{th} variable factor position.

$\frac{\sigma_i}{n}$ = Severity index factor, for $i = 1, 2, 3, \dots, n$

μ_{ij} = is the frequency of variable factor j under ranked variable factor position i . Thus, equation (1) becomes

$$f(1) = \mu_{11} \frac{\sigma_1}{n} + \mu_{12} \frac{\sigma_2}{n} + \mu_{13} \frac{\sigma_3}{n} + \dots + \mu_{1n} \frac{\sigma_n}{n} \dots\dots\dots(2a)$$

$$f(2) = \mu_{21} \frac{\sigma_1}{n} + \mu_{22} \frac{\sigma_2}{n} + \mu_{23} \frac{\sigma_3}{n} + \dots + \mu_{2n} \frac{\sigma_n}{n} \dots\dots\dots(2b)$$

$$f(3) = \mu_{31} \frac{\sigma_1}{n} + \mu_{32} \frac{\sigma_2}{n} + \mu_{33} \frac{\sigma_3}{n} + \dots + \mu_{3n} \frac{\sigma_n}{n} \dots\dots\dots(2c)$$

· · ·
· · ·
· · ·

$$f(n) = \mu_{n1} \frac{\sigma_1}{n} + \mu_{n2} \frac{\sigma_2}{n} + \mu_{n3} \frac{\sigma_3}{n} + \dots + \mu_{nn} \frac{\sigma_n}{n} \dots\dots\dots(3)$$

transferring from equations (2) to equations (3) gives :

$$\begin{bmatrix} f(1) \\ \cdot \\ \cdot \\ f(n) \end{bmatrix} = \begin{bmatrix} \mu_{11} & \cdot & \cdot & \mu_{1n} \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \mu_{n1} & \cdot & \cdot & \mu_{nn} \end{bmatrix} \begin{bmatrix} \sigma_1/n \\ \cdot \\ \cdot \\ \sigma_n/n \end{bmatrix} \dots\dots\dots(\text{SIMO})$$

Actual variable ranking position matrix (AVARP)

$$= \begin{bmatrix} P(1) \\ \cdot \\ \cdot \\ P(n) \end{bmatrix} \dots\dots\dots(4)$$

And :

$$\begin{bmatrix} P(1) \\ \cdot \\ \cdot \\ P(n) \end{bmatrix} = \begin{bmatrix} f(1) \\ \cdot \\ \cdot \\ f(n) \end{bmatrix} \dots\dots\dots(5)$$

$$\Leftrightarrow f(1) \geq f(2) \geq f(3) \geq \dots \geq f(n)$$

$$\text{Otherwise : } \begin{bmatrix} P(1) \\ \cdot \\ \cdot \\ P(n) \end{bmatrix} = \begin{bmatrix} f(1) \\ \cdot \\ \cdot \\ f(n) \end{bmatrix} \uparrow \dots\dots\dots(6)$$

where :

" \uparrow " implies an ascending order of magnitude in $\begin{bmatrix} f(1) \\ \cdot \\ \cdot \\ f(n) \end{bmatrix}$

p(1) is the highest severity position

p(2) is 2nd highest severity position

-
-
-

P(n) is the least severe position.

Stage 2 : Threshold value (Demarcation point) :

The Threshold value (Midhinge) in the matrix of equation (6) = $\left[\frac{h_1 + h_2}{2} \right] \dots\dots\dots(7)$

where:

h_1 is the corresponding value to D_1

h_2 is the corresponding value to D_3

$$D_1 = \frac{n+1}{4} \dots\dots\dots(8)$$

$$D_3 = \frac{3(n+1)}{4} \dots\dots\dots(9)$$

n is the total number of observations or variable factors under consideration in equation (6)

D_1 and D_3 are specified observations within the matrix of equation (6).

Rules for D_1 and D_3 :

1. If D_1 or D_3 is an integer, the numerical observation or item corresponding to the position of that integer in the matrix is chosen for either D_1 or D_3
2. If D_1 or D_3 is halfway between two integers, the average of the corresponding items or observations is chosen.
3. If D_1 or D_3 is not an integer or halfway between two integers then the resulting value should be approximat

to the nearest integer

and the corresponding item or observation is chosen.

N.B: All the variable factors (elements) in the matrix of equation (6) above cannot be accounted for in policy formulation as most severe at the same time. In order to over come this problem, variable factor's magnitude greater than or equal to the threshold value are to be considered most severe.

See equation (10)

Thus : $\prod_{a=1,2..}^n P(a) = \text{Threshold value}.....(10)$

6.14. Explanation of results on the causes of infrastructure failures in Nigeria

From the overall results received for Nigeria as shown in Table 20 in Appendix A after applying the threshold value⁵ of the SIMO model, the following variable factors were identified as critical to the causes of infrastructure service delivery failures in Nigeria: corruption; misallocation of investments; inadequate maintenance; lack of transparency and accountability; insufficient funding for infrastructure; lack of supportive institutions; inconsistent political, social and economic policies; and lack of suitable technical and managerial skill.

Corruption:

The survey revealed that corruption⁶ is the most prevalent variable factor responsible for infrastructure service delivery failures in Nigeria. This is because responses received from most geopolitical regions in the country upheld the view that corruption was most severe compared to the other variable factors responsible for infrastructure service delivery failures. For example, corruption came foremost in regions such as South-eastern Nigeria, North-eastern Nigeria, North-central Nigeria and South-western Nigeria. (Refer to the relevant Tables⁷ in Appendix A). However, corruption was ranked second in South-south Nigeria and third in the North-western region of Nigeria. (See the relevant Tables⁸ in Appendix A). It is important to note that these variations in the actual ranking position of this factor from one geopolitical region to the other was not due to any known survey errors like sampling errors, coverage errors or non-response errors, but as a result of the choice or severity accorded variable factors by respondents in these regions. Thus, the need to understand the relative spread of choices or positions accorded variable factors from one region to another as a means of validating the relative positions they were accorded. Furthermore, to establish these variations in quantitative terms and measure the uniformity or levels of agreement in the choices accorded variable factors by respondents from one geopolitical region to another, the coefficient of variation (CV) was derived for each variable factor. This was carefully tabulated in Table 27 of Appendix A.

⁵ Threshold value as used in this survey defines the critical variable factors. If a numerical magnitude of any variable factor in the matrix is equal or greater than this value; that variable factor is to be considered critical.

⁶ Corruption in the context used is the abuse of public office or public trust for private gain.

⁷ Table 21; Table 22; Table 24; and Table 26.

⁸ Table 25; Table 23.

From results in Table 27 of Appendix A, the coefficient of variation (CV) for corruption was approximately 33 percent when compared to other variable factors under consideration across the geopolitical regions. The CV for Corruption in this context defines the average spread of choice accorded by respondents relative to the factor's (corruption) mean or average score. The higher its percentage, the more varied or less homogenous the choices accorded the variable factor across all the geopolitical regions. However, the 33 percent was the third prevalent least in the table, which gives an indication that corruption was the third most homogenous variable factor or third least varied amongst the eighteen considered. Thus, the average severity of corruption across the six geopolitical regions in Nigeria from responses received was relatively uniform.

Besides, one could make significant comparisons between the responses given by respondents from the North-western Nigeria in Table 6.10.1 on "people's impression of staffs of local infrastructure service providers" with the present ranking accorded corruption in the North-western region in Table 23 in Appendix A. Approximately 36 percent of the responses received from North-western Nigeria in Table 6.10.1 were satisfied with the staff of their local infrastructure service providers. The 36 percent comprises 11.4 percent asserting that staff were honest, and 24.3 percent maintaining they were fairly honest. It is notable that this 36 percent was the highest regional level of support received for the staffs of local infrastructure service providers. Thus, it is not surprising to find that the response received from North-western Nigeria ranked other variable factors: misallocation of investments and lack of adequate maintenance before corruption. By implication, respondents did not rank corruption as highly as those from other regions did. Since, North-western Nigeria could be classed as one of the regions with the highest amount of public infrastructure due to the fact that this region has produced the highest number of key public officers in successive military governments in the country (Ayogu, 2002) one could argue that this development must have affected the responses received from this region.

Nevertheless, the same line of argument do not holds true for the South-south region. Corruption was accorded the second highest position, a result which must have being due to glaring evidence

of the effects of failed or abandoned infrastructure projects. Infrastructure, seldom provided in this region, often fail to address the immediate needs and yearnings of the peoples of these region.

Misallocation of investments:

Misallocation of investments was next in order of severity when compared to other variable factors responsible for infrastructure service delivery failures in Nigeria (see Table 20 in Appendix A). Though second in severity, however there was a much wider variation of views from one region to another. For example, the severity of “misallocation of investments” as a variable factor came topmost in South-south Nigeria and North-western Nigeria in comparison to other variable factors⁹ as shown in Appendix A. However, in terms of severity, it came second in South-eastern Nigeria, fourth in North-eastern Nigeria and North-central Nigeria. It also came ninth in the South-western Nigeria (see the relevant Tables in Appendix A¹⁰).

To measure its average spread across all the geopolitical regions relative to its average mean, its coefficient of variation (CV) was derived. This coefficient would reveal if the present second position in terms of severity accorded this variable factor in Table 20 in the Appendix A is lopsided or largely uniform across all geopolitical regions. Surprisingly, the coefficient of variation was 87 percent (see Table 27 in Appendix A). This percentage indicates that “misallocation of investment” was the least homogenous or most varied variable factor amongst the eighteen under consideration across all the geopolitical regions in the country. Thus, the view that misallocation of investments was the second most severe variable factor responsible for infrastructure service delivery failures was uneven between geopolitical regions. This unevenness was not due to survey error, but was predominantly because of the very high responses to the ranking of this variable factor from both the North-western Nigeria and the South-south Nigeria. Moreover, misallocated investments results when too much attention is paid to low priority projects with less attention to essential services and adequate cost recovery. Misallocated investment also results when too much attention is also being paid to new investments and not sufficient attention to maintenance.

⁹ Table 23 and Table 25.

¹⁰ Table 24; Table 22; Table 21; and Table 26.

Inadequate maintenance

The third most severe variable factor ranked as being responsible for infrastructure and service delivery failures in Nigeria was inadequate maintenance (see Table 20 in Appendix A). The ranking accorded “inadequate maintenance” in both the South-western and North-western regions was second most severe amongst the variable factors¹¹. It was third most severe in the other four geopolitical regions¹². Thus, this variable factor fluctuates between two consecutive positions regionally. A coefficient of variation (CV) of 28 percent was derived (see Table 27 in Appendix A). This value indicates that the level of variation of this variable factor across all regions was the least amongst the variable factors. Consequently, inadequate maintenance as the third most severe variable factor was a widely held or uniform view across all geopolitical regions in the country.

It is also appropriate to know that inadequate maintenance shortens the infrastructural life span and increases expenditure for new infrastructure, as well as creating low capacity utilization. For example, World Bank assisted projects on maintenance in sub-Saharan Africa revealed that a reconstruction cost of US\$45 billion would have been saved if timely maintenance expenditure of about US\$12 billion were invested (World Bank, 2002); The World Bank (1994) also revealed that power systems in sub-Saharan Africa work on the average less than 60 percent of their installed capacity, and water supply systems function at less than 70 percent of installed capacity due to inadequate maintenance. Poor maintenance reduces service quality and also increases users’ costs due to the installation of backup facilities. When facilities are not adequately maintained, vandals, dishonest staff and users of infrastructure services takes advantage of the situation to engage in some sort of rent-seeking behavior or outright vandalism of facilities. In such situations, it would be very difficult to make users and even staff accountable for their excesses.

Lack of transparency and accountability

This was the fourth identified variable factor responsible for infrastructure service delivery failures in Nigeria (see Table 20 in Appendix A). In examining the ranking of this factor across the six geopolitical regions, it was found that in North-eastern Nigeria the “lack of transparency and

¹¹ Please refer to Table 26 and Table 23 in Appendix A

¹² Please see Table 21; Table 22; Table 24; and Table 25 in Appendix A

accountability” was ranked second¹³ to corruption as the cause of infrastructure service failures. However, in South-western Nigeria, “lack of transparency and accountability” was ranked in third position, while it was ranked fifth in the South-south Nigeria¹⁴, sixth in South-eastern and North-central Nigeria¹⁵ and eighth in North-western Nigeria¹⁶. These variations were measured relative to its mean average using the coefficient of variation (CV), and it was found to be approximately 37 percent (Refer to Table 27 in Appendix A). This percentage placed the ranking of this variable factor as the fifth most homogenous or uniform amongst eighteen considered variable factors.

Insufficient funding for infrastructure

The fifth most severe factor of the eighteen was “insufficient funding for infrastructure” (see Table 20 in Appendix A). The ranking accorded this variable factor in each of the six geopolitical regions in Nigeria is as follows: South-western Nigeria ranked it fourth, South-eastern, North-central and North-eastern Nigeria fifth, South-south Nigeria sixth and North-western Nigeria ranked it eleventh.(see the relevant Tables in Appendix A¹⁷). In order to measure the variation in ranking relative to the mean of this variable factor, a coefficient of variation of approximately 34 percent (CV) was derived (see Table 27 in Appendix A). This value is an indication that the level of variation of this factor across regions was not high. Nonetheless, it was fourth when its variation across regions was compared to other variable factors. Thus, there was a much higher uniformity in the ranking position accorded this variable factor by respondents across regions.

Furthermore, insufficient funding of infrastructure must have been due to the very limited financial resources available. For example, World Bank (1994) and United Nations (1996) studies classed Nigeria in the second half of the 1990s as one of the world poorest countries with an average per capita income of \$0.72 per day and an average per capita consumption of \$0.57 per day. Hence, only \$0.15 a day is left on the average to spend on private capita formation, public investment in infrastructure and the running of vital public services. Moreover, insufficient funding for infrastructure

¹³ Please see Table 24 in Appendix A .

¹⁴ Please see Table 26 and Table 25 in Appendix A .

¹⁵ Please see Table 24 and Table 21 In Appendix A.

¹⁶ Please see Table 23 in Appendix A.

¹⁷ Tables 26, 24, 21, 22, 25, and 23

in Nigeria could also be accounted for or aggravated by the country's heavy debt burden. For example, external debt as a share of the total gross national product (GNP) was almost 82 percent in the first half of the 1990's (USAID, 1996). This means that only 18 percent of current GDP is available to fulfill all competing demands in the economy. As often as it is the case, this 18 percent is consumed in recurrent expenditure, leaving capital expenditure to the vagaries of multilateral and unilateral financial assistance. Some of these limited funds available for infrastructure are often wasted due to corruption or to other areas of immediate need. Lastly, indiscriminate diversion of financial resources from intended purposes without recourse to the conventional checks and balances is an identifiable institutional lapse (North, 1990; Ostrom et al, 1996).

Lack of supportive institutions

Lack of supportive institutions was identified as the sixth most severe factor. This is clearly revealed in Table 20 in Appendix A. However, lack of supportive institutions was ranked fourth most severe in both South-south Nigeria and North-western Nigeria¹⁸, eighth in south-western Nigeria and north-eastern Nigeria¹⁹, and tenth and twelfth most severe in North-central Nigeria and South eastern Nigeria respectively²⁰.

Measuring the proportion of variation in ranking relative to the mean average of this variable factor as described earlier, the coefficient of variation (CV) derived was approximately 64 percent. This value indicates that the level of variation across all the regions was very high – fourteenth out of the eighteen factors. This is shown in Table 27 of Appendix A. Consequently, lack of supportive institutions as the sixth most severe variable factor in this survey was not a uniformly strong view across all the geopolitical regions within the country. The variation in this variable factor nationwide was purely a function of respondents views, and was not due to any known survey errors. The reason for this variation could be that several institutional strategies to address the dearth of growth inducing infrastructure and services to check the growing level of poverty in Nigeria have been very unsuccessful, as they have failed to provide the enabling supportive framework for development.

¹⁸ Please see Table 25 and Table 23 in Appendix A.

¹⁹ Please refer to Table 26 and Table 22.

²⁰ Please see Table 21 and Table 24 in Appendix A .

Another argument is that institutional support has been slow at meeting required expectation. Thus, the slow pace or failure might be due partly to poor enforcement mechanisms which stem from the insincerity at actualizing set objectives and corruption.

Further, when corruption becomes more or less the norm as evidenced in Nigeria, the constitutional rule of law and its enforcement mechanisms becomes subverted. As a consequence, transparency and accountability in governance becomes void. However, subverted rule and its enforcement mechanisms are core institutional problems with enormous potential for crippling any existing system or organization. Nevertheless, the whole idea of institutionalization in most cases is stereotyped or fashioned along the lines of established models elsewhere without bearing in mind the singular conditions of those to be served. To this end, the uniqueness of cultures and value systems could be suggested as parameters that should form the framework for building effective and supportive institutions in Nigeria. Once there is an enabling supportive institutional framework the hope for consistency in political, social and economic policies is high.

Inconsistent political, social and economic policies

“Inconsistent political, social and economic policies” was ranked the seventh most severe. This is shown in Table 20 in Appendix A. It was ranked fourth in South-eastern Nigeria and in South-western Nigeria it was ranked seventh²¹. In South-south Nigeria and North-central Nigeria ninth, in North-eastern Nigeria twelfth and in North-western Nigeria fourteenth²².

In order to measure the proportion of variation in ranking positions of this variable factor relative to its mean, the coefficient of variation (CV) for the variable factor was derived as 47 percent. This percentage value gives an indication of a relative fair spread across country. However, it was the seventh most homogenous or widely spread view amongst the eighteen variable factors considered. It is interesting to note that “inconsistent political, social and economic policies” was practically the only variable factor amongst those identified to be major causes of infrastructure failures that

²¹ Please see Table 24 and Table 26 in Appendix A

²² Please see Table 25 and Table 21 in Appendix A

achieved a balance between the level of spread and the level of severity across geopolitical regions. This is because it occupied the seventh position as the most homogenous factor and seventh position in level of severity.

Policy can be classified as any rule set by an organization to govern its operations (Cummine, 1999). In most cases these come as programs intended to lessen or resolve social, economic or physical problems. Thus, it also defines the boundaries of an organization or individual in any field of endeavor. However policies as a rule are themselves institutions and they are also product of an institutional arrangement with the aim to foster effective management and development (World Bank, 2002; Ostrom et al, 1993; North, 1990). To this end the inconsistent political, social and economic policies plaguing infrastructure and service deliveries in Nigeria is also due to the institutional failures earlier identified.

Lack of suitable technical and managerial skill:

Lack of suitable technical and managerial skills is the last in severity of the major factors responsible for infrastructure service delivery failures in Nigeria. It was ranked sixth in North-eastern and South-western Nigeria, ninth in the North-west and south-east Nigeria, eighth in South-south Nigeria and twelfth in the North-central region²³. In order to check the variation of spread of this variable factor relative to its average mean from one region to another its coefficient of variation (CV) was derived at approximately 44 percent. This is shown in Table 27 in Appendix A. From the Table, it can be seen that it was the fifth most uniformly spread factor.

²³ Please see Tables 20, 21, 22, 23, 24, 25 and 26 in Appendix A

6.15. Summary

1. In this chapter, the following distributions and cross-tabulations in the survey were analyzed:

- Questionnaire distribution and responses within each geopolitical region and sector / organization of respondents
- Crosstabulation between geopolitical region and sector / organization of respondents
- Class or rank distribution of respondents.
 - Crosstabulation between geopolitical region and class or rank of respondents
- Respondents range of monthly income distribution
 - Crosstabulation between geopolitical regions and range of monthly income
 - Crosstabulation between respondents' ranges of monthly income and stability of infrastructure services in Nigeria
- Respondents age range distribution
 - Crosstabulation of geopolitical region and age range of respondents
 - Crosstabulation of age range and stability of infrastructure in Nigeria
- Respondents rating of the Stability of infrastructure service delivery in Nigeria
 - Crosstabulation between geopolitical region and stability of infrastructure services in Nigeria
- Respondents rating of Infrastructure supply in Nigeria
 - Crosstabulation of geopolitical region and infrastructure supply in Nigeria
- Respondents rating of the quality of infrastructure in Nigeria
 - Crosstabulation of geopolitical region and quality of infrastructure in Nigeria
- Rate of infrastructure maintenance in Nigeria
 - Crosstabulation of geopolitical region and rate of infrastructure maintenance in Nigeria
- Response rate to infrastructure maintenance in Nigeria.

- Crosstabulation of geopolitical region and response rate to infrastructure maintenance in Nigeria
 - Respondents impression of the staffs of their local infrastructure service providers
 - Crosstabulation of geopolitical region and staffs of infrastructure service providers
 - Respondents rating of their average infrastructure monthly bills
 - Crosstabulation of geopolitical region and average infrastructure monthly bills
2. In this chapter, the correlations and subsequent mathematical models from regression analysis between the following variables were developed:
- Stability of infrastructure services and supply in Nigeria
 - Stability of infrastructure services and rate of maintenance in Nigeria
 - Stability of infrastructure services and the people's response rate to infrastructure maintenance in Nigeria
 - Stability of infrastructure services and conduct of staff of service providers in Nigeria
 - Stability of infrastructure services and average monthly bills in Nigeria
3. The analysis of the collected data in this survey gave rise to a new mathematical model called Severity Index in Matrix Order (SIMO) to aid the analysis and identification of core variable factors in future investigation of this kind.
4. Finally, this survey was also able to identify unambiguously the following as the major causes of infrastructure service delivery failures in descending order of severity in Nigeria:
- Corruption
 - Misallocation of investments
 - Inadequate maintenance

- **Lack of transparency and accountability**
- **Insufficient funding for infrastructure**
- **Lack of supportive institutions**
- **Inconsistent political, economic and social policies**
- **Lack of technical and managerial skills**

Chapter Seven

Infrastructure Procurement

7.0. Introduction

Another major objective of this research was to examine the existing procurement framework for infrastructure and service delivery in sub-Saharan Africa, taking Nigeria as a case study. Firstly, it is necessary to understand the meaning and concept of the term “procurement”. This refers to the process used for the acquisition of goods, works and related services (e.g. transport, insurance, installation, training and maintenance) required in the execution of a project, excluding consultancy services (UNCITRAL 1994; African Development Bank 1997a). Before discussing this subject matter, it would be appropriate to have a clear understanding of the meaning of the terms “works”, “goods” and “services” relative to infrastructure procurement.

The United Nation Commission on International Trade Law (UNCITRAL) in its twenty-sixth and twenty-seventh sessions in Vienna (1993) and New York (1994) defined goods, works and services as follows: a “good” is an object of any kind or description either in solid, liquid or gaseous form, including raw materials, products, equipment, electricity and services required to supply the goods, so long the value of such incidental services does not exceed the value of the goods. “Works” refers to all construction, reconstruction, demolition, repair or renovation of buildings, structures, site preparation, excavation, erection, building, installation of equipments or materials, decoration and finishing, as well as services incidental to construction such as drilling, mapping, satellite photography, seismic investigations and similar services provided pursuant to the procurement contract, so long the value of these services does not exceed that of the construction itself. In addition to the UNCITRAL 1994 definition of services, this term is also defined by the World Bank Group (2003) and African Development Bank (1997a) as any object of procurement other than goods or works. A brief overview of international best practice for procurement follows.

International best practice for procurement as spelt out by UNCITRAL, otherwise referred to as the “UNCITRAL Model law” on procurement of goods, works and services, is to serve as a model for evaluation and the modernisation of procurement laws, practices and the setting out of procurement legislation where none exists within member countries. This model legislation on procurement by UNCITRAL was a direct response to outdated and inadequate legislation governing procurement in member countries that has resulted in inefficiency, ineffectiveness, abuse and the failure to obtain value in return for the expenditure of public funds. Thus, the reform of the procedure and practices of the public procurement system is the foundation for the application of the “Model law” (Yearbook of the UNCITRAL 1994).

However, the inadvertent disregard for procurement procedures and best practice for procurement has been identified as one of the major root causes of infrastructure delay and cost escalation in sub-Saharan Africa, and indeed in developing countries in general (World Bank Group, 2003; Omoregie et al. 2005; Omoregie and Radford 2006).

7.1. Procurement Objectives

This apparent disregard for the procurement process as evident in sub-Saharan Africa negates basic international principles or policy underpinning procurement of works and services. These basic principles as cited in the Yearbook of the UNCITRAL (1994), the World Bank Group (2003) and the African Development Bank (1997a) include in summary the following:

- The need for economy and efficiency in procurement of works, goods and services
- The importance of transparency, accountability, responsibility and objectivity in the procurement process
- Equal opportunity aimed at maximising competition for all eligible contractors and suppliers from the developing and developed countries
- To encourage the development and participation of indigenous contractors and suppliers in the procurement process

The procurement process could be subdivided into four major parts: the mode of procurement, prequalification process, bidding process and the awards of contracts. These processes are briefly explained in the following sections.

7.2. The modes of procurement

The mode of procurement is simply the method or type of procurement pattern chosen for the project or services (African Development Bank, 1997a; Webster's reference, 2003). It is important to note that certain differences exist between procurement of works and goods and procurement of services. This is due because procurement of services usually involves the supply of intangible objects that are difficult to quantify in terms of exact content and quality (UNCITRAL 1994). Therefore the quality of services provided is largely a function of the skill and expertise of suppliers or contractors. Unlike the procurement of works and goods where the governing criterion is price, the price of services is often not considered as important in the evaluation and selection process as the quality and competence of contractors and suppliers (Year Book of the UNCITRAL 1994).

However, in the procurement of goods and works, the UNCITRAL Model law mandated the use of tendering otherwise referred to as bidding under normal conditions. As a method of procurement, tendering is widely reputed for its ability to promote competition, economy and efficiency, objectivity, transparency and accountability in the procurement process (UNCITRAL 1994; Aniekwu and Nwanchukwu 1996; World Bank Group 2003). Similarly, under normal circumstance in the procurement of services, the Model law prescribes the use of "principal method for procurement of services" designed to give "due weight" in the evaluation process to the qualification and expertise of the service providers. In exceptional circumstances, where tendering and the principal method for procurement of services become inappropriate, the Model law offers alternative methods of procurement. Nonetheless, these alternative methods are subject to the acceptance of member states, and where inconsistent requirements exist to the directives of regional economic integration groupings, the regional economic directives prevail (UNCITRAL 1994).

7.2.1. Tendering (Bid)

According to general rules in the UNCITRAL Model law as shown Appendix IV and the Year Book of the UNCITRAL (1994), tendering involves the following features:

- Unrestricted solicitation of participation by suppliers or contactors
- Comprehensive description and specifications in solicitation documents, thus providing a common basis on which contractors and suppliers are to prepare their tenders
- Full disclosures to suppliers or contractors of the criteria to be used in evaluating and comparing tenders and in selecting the successful tender
- Strict prohibition against negotiations between the procuring entity¹ and suppliers or contractors as to the substance of their tenders
- Public openings of tenders at the stipulated deadline for submission of tenders
- Disclosure of any formalities required for entry into force of the procurement contract

7.2.2. Principal method of procurement of services

The main features of the principal method of procurement of services in accordance with the UNCITRAL Model Law include the following:

- Unrestricted solicitation of suppliers and contractors
- Pre-disclosure in the request for proposals of the criteria for evaluation of proposals
- Pre-disclosure of the selection procedure among the three options available in the selection process

The three selection procedures in the principal method of procurement of services are:

- Selection procedure without negotiation
- Selection procedure with simultaneous negotiations
- Selection procedure with consecutive negotiation

In the first selection procedure as spelt out in article 42 of the Model law (see Appendix IV), proposals that exceed in technical rating the threshold set by the procuring entity are subjected

¹ Any governmental department, agency, organ or other unit, or any subdivisions in member state that engages in procurement

to a 'straightforward price competition'. In the second selection procedure with simultaneous negotiation as shown in article 43 of the Model Law (see Appendix IV), the procuring entity negotiates with contractors and suppliers, after which they submit their best and final offers. In this process, the price is considered separately and only after completion of the technical evaluation. This process is similar to the request for proposals procedure in article 48 of the Model Law (see Appendix IV). Under the third selection procedure with consecutive negotiation (article 44 of the Model law), negotiation solely on price is held with the contractor or supplier with the highest technical rating. The procuring entity is allowed under this procedure to negotiate in a sequential fashion with other suppliers or contractors one by one on the basis of their rating. This can only be done after terminating negotiations with the previous higher ranked supplier or contractor and negotiations terminated cannot be reopened.

However, under exceptional circumstances, the Model law offers the following modes of procurement for goods, works and services: two-stage tendering, request for proposals, competitive negotiation, restricted tendering, request for quotations and single source procurement.

7.2.3. Two-stage tendering, request for proposals and competitive negotiation

Two-stage tendering is subdivided into two consecutive stages. In stage one, the procuring entity solicits various proposals in order to obtain an idea of the specifications required for the project on the basis of technical and qualitative specifications characteristics of the procurement as well as contractual terms and conditions. In the second stage, a regular tendering proceeding follows.

Request for proposals is a procedure in which the procuring entity solicits proposals from a limited number of suppliers and contractors. The procuring entity also negotiates with them as to possible changes in the substance of their proposals, request best and final offers from them, and evaluates them on the basis of a predisclosed criteria (Yearbook of the UNCITRAL 1994).

Unlike the two-stage tendering, at no stage in this procedure are tendering proceedings conducted. Competitive negotiation is an unstructured method of procurement, which differentiates it from two-stage tendering and requests for proposals; it may be applied during cases of urgency.

The conditions for use of two-stage tendering, requests for proposals and competitive negotiation can be found in article 19 of the UNCITRAL Model law in Appendix IV.

7.2.4. Restricted tendering

Restricted tendering is a procurement procedure where by the procuring entity is restricted in the number of invitations to tender it sends out to suppliers and contractors. Thus, a limited number of suppliers and contractors are invited to tender in most cases for specialised and technically complex goods, works or services that only a limited number of suppliers are capable of providing. This procedure is also employed in cases where it is economically and efficiently viable to restrict tenders. The conditions for use of restricted tendering are found in article 20 of the UNCITRAL Model law in Appendix IV.

7.2.5. Request-for-quotation, single-source procurement

Under the request-for-quotation procedure, the procuring entity solicits quotations from a small number of suppliers and selects the lowest priced responsive offer. In practice, this method is sometimes referred to as "shopping". According to the African Development Bank (1994), there are two types of shopping: international shopping and national shopping. These are briefly explained in the following paragraphs.

International Shopping is a procurement method based on comparing relative price quotations from several suppliers (generally soliciting at least three tenders) with the aim of achieving competitive prices (African Development Bank, 1997a). International involvement is used in the event that the goods to be procured are so diversified that it would be of no commercial interest

for any single supplier to bid for them, or if the good is a standard specification commodity and cannot be purchased locally (African Development Bank, 1997a). National Shopping is similar to International Shopping except that the goods required can be acquired within the member country. The procuring entity may invite quotations, on the grounds that there is a sufficient number of national suppliers and agents of qualified foreign suppliers to guarantee competitive pricing (African Development Bank, 1997a).

Exceptional circumstances such as urgency due to catastrophic events and the availability of goods, works and services only from a single supplier or contractor require the single-source-procurement procedure to be applied. See articles 21 and 22 in the UNCITRAL Model law for comprehensive details of the conditions for use of request-for-quotations and single-sourced-procurement.

7.3. Prequalification Process

This is the next stage after a specific mode of procurement has been adopted. Prequalification is a procedure specifically meant for the selection of competent bidders; it precedes the invitation to tender or bid (African Development Bank, 1997b; World Bank, 2002). Article 6 of the UNCITRAL Model law in Appendix IV emphasises the need for prequalification irrespective of the method of procurement utilised; suppliers and contractors must be qualified before entering the procurement contract. Another standard similar to the Model law by UNCITRAL (1994) is the standard prequalification document for procurement of works and user's guide by the World Bank based on the master procurement document "Prequalification Document for Procurement of Works and User's Guide" prepared by the Multilateral Development Banks and International Financial Institutions (World Bank, 2002). It reflects the majority views of these institutions and, by the World Bank's directive, is to be used when a prequalification process takes place prior to the bidding process for procurement of works through International Competitive Bidding (ICB) (World Bank, 2002). However, the standard procurement prequalification documents for procurement of works in sub Saharan Africa expected to serve

as models are that of the World Bank Group, African Development Bank (ADB), African Development Fund (ADF), and Nigerian Trust Fund (NTF) and the UNCITRAL Model Law. Some notable benefits of the prequalification process are given below.

Usually, prequalification enables the bidders who may not be qualified on their own to avoid the expense of bidding but be encouraged on joint ventures, which increases the chance for a successful bid (African Development Bank, 1997b). The guarantee that inadequately qualified competitors will be excluded from bidding has the inevitable effect of raising the quality of bids. (World Bank Group, 2003; African Development Bank, 1997b).

The process facilitates both the assessment of the interest generated by the project among the qualified firms, and the making of any necessary adjustment in the procurement process (African Development Bank, 1997b). This change could benefit their resources and experience, as well as significantly reduce problems associated with low prices submitted by bidders of doubtful competence (World Bank Group, 2003; African Development Bank, 1997b).

7.3.1. Invitation for prequalification (IFPQ)

The IFPQ provides essential information that would enable a decision on whether to participate by potential bidders. It also indicates an important prequalification criteria or minimum requirements apart from the very important items listed in the standard prequalification documents (SPQ) (African Development Bank, 1997b). In accordance with the African Development Bank (1997b), UNCITRAL (1994) and World Bank Group (2003) the IFPQ should be issued as follows:

- An advertisement in at least one general newspaper in the procuring entity's country and in the official gazette, if any
- An advertisement (Invitation to Bid) is required in the form of a specific procurement notice in Development Business published by the United Nations

- An advertisement in well-known technical magazines, newspapers and trade publications of wide international circulation is mandatory for complex and highly specialised projects
- A letter is to be issued to interested bidders that have indicated their willingness to partake in the prequalification process following the publication of the General Procurement Notice (GPN) for which the Invitation was issued
- A notice to consular or diplomatic representatives of eligible member countries of the Bank group within the Borrowing country

7.3.2. Evaluations of submissions to prequalify

Article 6 of the UNCITRAL Model law in Appendix IV specifies the criteria and procedures to be used in the assessment of suppliers and contractors. It involves the pre-disclosure of the criteria for evaluation of suppliers and contractors in the prequalification process. These criteria must be fairly applied to all suppliers and contractors participating in the prequalification process. In article 6 of the Model Law, sufficient flexibility is given to the procuring entity as to the number of times it is appropriate to carry out the prequalification of contractors and suppliers in the procurement proceedings. Thus, in the early stages of the procurement proceedings, prequalification of suppliers and contractors is carried out, and those contractors and suppliers that have been prequalified are later revalidated.

In addition, the assessment of applicants must be based on the evidence submitted by the applicant, and not a black list, which may be based on out of date information or irrelevant data. So current poor performance may be a criterion for disqualifying an applicant if suitable steps are not being taken to correct it (World Bank Group, 2003; African Development Bank, 1997b). The procuring entity's ability to verify the claim made by the applicant and request information from their past employers and financial institutions is crucial to the procurement process. The extent of confirmation should be limited to the major issue, with the applicant being afforded the benefit of reasonable doubt. Transparency should be noted as the chief basic consideration in

the procurement process (World Bank Group, 2003; African Development Bank, 1997b). While transparency is crucial throughout the project, its importance at the bidding process of the procurement system is overriding.

7.4. International competitive bidding (ICB)

ICB procedures are detailed in the guidelines Procurement under International Bank for Reconstruction and Development (IBRD) Loans and International Development Association (IDA) Credits (World Bank Group, 2003); they could also be found in UNCITRAL (1994). The procedures have certain special features and requirements:

Public Notification: For each project involving ICB, a general procurement notice for goods and works will appear in the United Nations publication "Development Business"; the notice gives general information on the nature of the procurement to be carried out (African Development Bank, 1997a; World Bank Group, 2003). Invitations to bid for specific contracts will also be advertised in at least one major local newspaper (UNCITRAL 1994; African Development Bank, 1997a; World Bank Group, 2003). For large specialized contracts, invitations will be advertised in Development Business and/or in well-known technical magazines, newspapers and trade publications with wide international circulation (UNCITRAL 1994; African Development Bank, 1997a; World Bank Group, 2003).

Currency of bid: Bidders are entitled to express their bid price in any currency of a member country; If the bidder wishes to break the bid price into more than one foreign currency it may do so, provided that the price is made up of not more than three foreign currencies (African Development Bank, 1997a; World Bank Group, 2003). However, the procuring entity may require bidders to state the portion of the bid price representing local costs in the currency of the procuring entity's country (World Bank Group, 2003). Alternatively, for works, bidding documents may require bidders to state the bid price entirely in the local currency, along with the requirements for payment in up to three foreign currencies for anticipated inputs from

outside the procuring entity' country (African Development Bank, 1997a; World Bank Group, 2003). For the purpose of comparing prices, bid prices will be converted to a single currency as stated in the bidding documents (African Development Bank, 1997a; World Bank Group, 2003).

Payments: Successful bidders are entitled to receive payments in the currencies of their bid, thereby minimizing the bidder's exposure to exchange rate fluctuations (African Development Bank, 1997a; World Bank Group, 2003). The bank also requires that contracts include price and payment adjustment where appropriate and in accordance with commercial practices (World Bank Group, 2003).

Language and clarity of bidding documents: Documents will be in English, French or Spanish, and be worded so as to permit and encourage international competition (World Bank Group, 2003). Bidders have the right to request clarification before bid opening, and all prospective bidders will be provided with the same information (Year book of the UNCITRAL 1994; African Development Bank 1997a; World Bank Group 2003).

Public bid opening: Bids will be opened and read aloud in the presence of the bidders or any representatives who wish to attend (African Development Bank 1997a; World Bank Group 2003). Other than clarifying the purchaser's questions, there must be no discussions or negotiations and all bids are final after the public opening (UNCITRAL 1994; African Development Bank 1997a; World Bank Group 2003).

Preferences: Qualified suppliers and contractors from each of the member countries should have equal access to information, equal opportunity to bid for contracts, and a fair and impartial consideration of award, independent of national origin (UNCITRAL 1994; African Development Bank 1997a; World Bank Group 2003). Contracts are awarded to the lowest bidder, regardless of nationality (African Development Bank, 1997a; World Bank Group, 2003). However, to promote the development of local industries, the procuring entity may give a margin of preference to locally manufactured goods, plant, and civil works contractors when they are

competing against foreign suppliers or contractors (UNCITRAL 1994; African Development Bank, 1997a; World Bank Group, 2003).

7.4.1. The evaluation of bid and contract award

The purpose of bid evaluation is to determine the value of each bid in comparison to other responsive and responsible bids and to determine the lowest evaluated cost bid (World Bank, 2000; African Development Bank, 1997a). The bid evaluation shall be consistent with the terms and conditions set in the bidding document (World Bank, 2000). Generally, only quantifiable factors will be taken into consideration, and in the case of exceptions; methods and terms of quantification would be specified (World Bank, 2000; African Development Bank, 1997a, UNCITRAL 1994).

In addition to the bid price being adjusted in order to correct arithmetical errors, factors such as the time of completion and execution or the efficiency and compatibility of the equipment, cost of inland transport to the specified site, payment schedule, delivery time, operating costs, the availability of service and spare parts and related training, safety and environmental benefits will be taken into consideration (World Bank, 2000; African Development Bank, 1997a). To the greatest possible extent, these factors are to be quantified in monetary terms or issued relative weights as relevant according to the evaluation criteria in the bidding documents. As critical as the evaluation of bids is to the procurement process, its overriding objective is the award of the contract to the most suitable bidder.

Award of contracts is the final stage of the procurement process and must be made within the period of bid validity to the bidder whose bid has been determined to be the lowest evaluated cost bid. The lowest evaluated cost bid do not necessary imply the lowest offered price but that which have met the appropriate standards of required and financial resources (African Development Bank, 1997a). The successful bidder is then informed and invited to sign the contract within the period of the validity of bid (African Development Bank, 1997a).

For the successful execution of contracts for large buildings, civil engineering supply, installation projects and high-tech equipments, contracts are to be awarded to experienced contractors, after thorough competitive bidding (Mansfield et al. 1994; African Development Bank, 1997a; World Bank Group 2003). Having looked at the international best practice for procurement through the UNCITRAL model law (1994), African Development Bank (1997) and the World Bank (2002) and (2003) documents on procurements, it is necessary at this stage to examine the Nigerian procurement systems.

7.5. Procurement systems in Nigeria

The modes of procurement commonly used in Nigeria are competitive tendering and selective tendering (Esenwa 2004; Ogunje 2002; Mansfield et al. 1994). The World Bank country procurement assessment report for Nigeria as cited in Ekpenkhio (2003) identified the following gaps in the country's procurement system:

- The lack of a legal framework regarding a public procurement system
- The lack of a supervisory body to provide guidance and monitor procuring entities
- Faulty implementation of existing regulations on procurement, which has created the opportunity for bribery and corruption
- Gaps and deficiencies in existing laws and regulations
- Proliferation, ineffective mandates, limited power and authorisation thresholds of the tender's board has encouraged abuses such as the splitting of contracts, delays and non-transparency
- Cumbersome customs systems and procedure resulting in delays and corruption
- The lack of relevant training and skills on procurement procedures by those carrying out procurement duties

This investigation was carried out, on the request of the federal government of Nigeria to the World Bank in collaboration with some Nigerian private sector specialists, to study its financial systems and general procurement-related activities. This was aimed at reforming the Nigerian

public procurement system. The objective of the study was to reduce the scope of malpractice in public procurement and improve on the management of the country's public expenditure. The method of investigation applied was the participatory approach involving all the key stakeholders: the federal government, state government and local government, together with representatives of the private sector. Finally, the country's procurement assessment report (CPAR) was produced.

As a way of tackling the problems identified from the study, the following recommendations were made in the CPAR:

- The need for a procurement law based on the United Nations Commission for International Trade and Law (UNCITRAL)
- The need to establish the Public Procurement Commission (PPC) to serve as the regulatory and oversight body on public sector procurement
- Some key areas of the financial regulations need revising in order to make them more transparent
- The streamlining of Tender Boards and the strengthening of their functional authority and powers to award contracts
- A critical need to rebuild procurement and financial management capacity in the public sector
- A comprehensive review of the businesses related to export, import and transit regulations, procedures and practices, including the automated system for customs data (ASYCUDA)

In response to the recommendations in the CPAR, the Nigerian government issued new policy guidelines on public procurement and contract award procedures in 2002. The new guidelines (tagged: Circular No. F. 15775) as cited in Ekpenkhio (2003) and Etomi and Partners (2006) are as follows:

- The establishment of a public procurement commission that would be the top policy making body on all procurements and award of contract matters in the public service.

- The abolition of both federal and departmental tenders boards, thereby compelling the permanent secretary and the newly created ministerial tenders board to assume their responsibilities.
- The permanent secretary under the new arrangement has the power to approve contracts not exceeding US\$8,000 (N1,000,000) without a competitive open tendering procedure. However, he must obtain at least three written proposals from suitably qualified contractors or suppliers. Incurred expenditures from the process are to be forwarded to the minister on a quarterly basis.
- A ministerial tenders board established in each ministry or extra ministerial department can approve contracts between US\$8,000 (N1,000,000) and US\$400,000 (N50,000,000). However, all decisions made by the board are subject to the approval of the minister. This board consists of the chairman (the permanent secretary / chief executive of the ministry or extra-ministerial department) and directors / heads of department in the ministry or establishment.
- All contract valued at US\$400,000 (N50,000,000) and above are to be approved by the federal executive council.
- Deliberate contract splitting to circumvent the procedures of the guidelines is a serious offence and subject to disciplinary action.
- The ministerial tenders board must adopt open competitive tendering procedures, and where such tendering procedures are inappropriate, the board is to apply selective or limited tendering procedures.
- Contracts above US\$80,000 are to be advertised in at least two national dailies and or governmental gazette. Notice of all other tenders must be posted on the notice board of the procuring entity. A minimum period of six weeks is to be given before the bid submission deadline.
- The opening of bid envelope is to be carried out publicly at designated date and time immediately after the close of the bidding period to avoid undue influence or bids being tampered with.

- The criteria for evaluation of tenders must be clearly spelt out in the bidding document and all contracts are to be awarded on the basis of those criteria.
- A committee made up of professionals are to evaluate bids, and officials involved in the tendering process are to declare any conflict of interest and exempt themselves from the bid evaluation and approval process.
- All contracts award with a value of US\$165,000 (N20,000,000) and above are to be published in two national dailies with details of the contract, the name of the contractor and the contract price clearly stated.
- All contract variations are to be subject to the recommendations of the ministerial tenders board and method of determining price variation during contract execution must be incorporated into the contract.
- All contracts valued at US\$80,000 and above attract a bid security of not less than 2 percent of the bid price.
- A performance bank guarantee of 10 percent is necessary for all contract prices of US\$80,000 and above.
- Interest shall be paid on any delayed payments by government ministries or extra ministerial departments to contractors or suppliers. This takes effect from the sixtieth day of the submission of invoice or certificate of job completion
- Where a mobilisation fee is necessary, it must not exceed 25 percent of the contract sum.
- All eligible contractors or suppliers are to be registered with the federal ministry of works and housing or its representatives at the various ministries or extra-ministerial departments.
- Funds are to be released on the basis of a realistic, approved and updated procurement plan. A procurement plan is to be drawn up to determine the requirements for funds for various government offices at different quarters during the fiscal year.
- Certified true copies of all contract agreements and minutes of the tender board's meetings are to be sent to the office of the auditor general of the federation. The auditor general must co-sign the certificate of final payment.

- International procurement agents are to be enlisted to assist in medium and large scale contracting where necessary.

The CPAR as cited by Ekpenkhio (2003) was accepted by the government, with due exceptions for the registration of contractors and the involvement of political office holders like ministers / commissioners in the awards of contracts.

7.6: Comments and recommendations

The recommendations of the World Bank CPAR for Nigeria and the efforts by the present federal government to reform the Nigerian procurement system based on the CPAR report are commended. These recommendations are aimed at building sustainable and supportive institutions to strengthen the existing procurement framework in Nigeria, thereby ushering in efficiency, accountability, transparency and integrity in the Nigerian procurement system. As well-intentioned as these objectives are, the findings gathered from this study (most especially the survey) revealed that these efforts are likely to fail.

The experience of the data collection team points to the fact that the average Nigerian may have a divided loyalty to his country; the order of allegiance is from the small to the large scale – i.e. firstly to his immediate family, then his ethnicity and then his religion. Allegiance to his country is in the last of his priorities. Hence, the spate of corruption, religious conflicts and other malpractices such as favouring a particular ethnic group or community over others. Sometimes, census figures are manipulated to justify the increase in revenue allocation, dominance in the military, political positions and even contract awards (Mbeke-Ekanem, 2000 and 2006). This presents an obvious contrast to some parts of the world. In the west, for example, patriotism is commonly seen as overriding other interests.

This unique difference in the levels of commitment to one's country or place of birth, from one region or country to another reveals distinctiveness in perceptions, trust in society, beliefs and value systems. These ought to reflect policies, guidelines or strategies underpinning

infrastructure and service delivery. On the appropriateness of procurement systems Kumaraswamy (1994) as cited in Mcdermont (1999) and in Rowlinson and Mcdermont (1999) argues that sustainable and synergistic procurement strategies must evolve from those for which the project was intended. He discussed further the inappropriate nature of superimposing developed countries' procurement strategies or mechanisms on developing economies. Procurement systems must be appropriate to circumstances. Thus, it is the view of this study that when the users of infrastructures or services are not involved in its conceptualisation and delivery, the likely chance of success is very slim if not entirely absent. Who are the users? The people – and what makes a people? Culture, common religion, language or inherited conditions of life (American Heritage dictionary, 2000; Liu and Fellows, 1999; McDermott, 1999). Ng (1994), as cited in Martins and Taylor (1996) and in Mcdermott (1999) on the role of culture in institutions argues, that the people's participation in the procurement process is essential for community development.

On the review of public procurement regulations of the European Communities (EC), the World Trade organization (WTO), the World Bank and the United Nations (UN), Craig (1996) as cited in Mcdermott (1999) was of the view that they were designed to promote competitive tendering and to prevent the use of technical standards. He argues that it was only the WTO and the General Agreement on Tariffs and Trade (GATT) that discriminated positively for developing countries. Even contractual arrangements and forms of contracts currently being practiced in many developing countries like Nigeria are out of date in the various environments they were designed for. Fellows (1989) observed that this has been the cause of the major problems of the construction industry worldwide. For example, the standard forms co-jointly developed by the Joint Contract Tribunal (JCT) and the Institution of Civil Engineers (ICE) has been used extensively (whether appropriate, amended or not) in areas they were not designed for (Mcdermott, 1999).

The Latham Report (1994) emphasised the need for a thorough re-examination of the JCT forms in the UK. Consequently, the engineering and construction contract is been encouraged

as an alternative. Even the ICE Conditions of Contract are constantly being amended to meet the prevailing conditions within the UK construction industry (Hill 1991 as cited in McDermott 1999). It is the view of the author that as long as there is uniqueness in cultures and people, international best practice and appropriate international implementation procedures for procurement, contractual arrangements and forms of contract that could be perfectly adapted for universal use is a futile attempt. Every instance of the delivery of infrastructure and service must bear in mind the uniqueness of its intended users. Rowlinson and Root (1997) and Crook (1996) have emphasised cultural uniqueness in the analysis of procurement systems.

7.6.1: Recommendations

This identification of the importance of culture to a sustainable infrastructure and service delivery implies a demand to effectively involve the users of infrastructure, who would after all be the best custodians of their respective cultures, beliefs and value systems. They would be expected to be key players in the conceptualisation of the project; they would identify the type of infrastructure needed and on offer, its quantity, its quality, the finance strategy, design, construction, ownership, operation and maintenance. They thus partake in managing its risks and opportunities and eventually become major stakeholder in the project. However, it is unlikely that users alone could bear this burden, especially the financial responsibilities involved. It is necessary therefore, to have a cross-section not only of the likely users but also the public and private sectors involved.

In the Polycentric Cultural Framework (PCF) model for infrastructure and service delivery to be presented as an alternative proposal in this thesis, the cross-section of users comprises the traditional institutions charged, among other things with, the responsibility of identifying cultural norms, beliefs, values and the coordination of elders within the various communities and villages that would benefit from the intended infrastructure, as well as the women, youths, non governmental organisations, trade unions and the various religious organisations. Before introducing the Polycentric Cultural Framework (PCF) in detail, it is expedient to firstly give an overview of the nature, influence and relevance of the traditional institution in the formal structures of the modern state power in Nigeria and sub-Saharan Africa in general.

7.7. The nature of traditional institution in sub-Saharan Africa

In context, the traditional institution could be seen as an umbrella network of indigenous governing systems which include the council of elders, titled men or women, people of the same age grade and other similar associations (Agbese 2004). At the institution's apex is the traditional ruler, whose role is often misunderstood as being synonymous with that of the institution itself. Actually, however, the scope of the traditional institution is much broader and sometimes far beyond that of its ruler. The National Conference of Traditional Rulers in Nigeria (NCTR) as cited in Agbese (2004) defines a traditional ruler as anyone who by virtue of his ancestry occupies the throne or stool of an area, who has been appointed to it in accordance with the customs and traditions of the area, and whose throne has been in existence before the advent of British colonial power in Africa. Traditional institutions in sub-Saharan Africa before and after the colonial administration were either decentralized or centralized, as the following sections explain.

7.7.1 Decentralized system

In a decentralized traditional institution as observed by Osei-Tutu (2004), there is no hierarchy headed by a sovereign, but rather a system of clanship. The principal characteristic of this system is the presence of well established codes of conduct, usually enforced by heads of segments (clans), and in more serious cases by spontaneous community action. Some examples of a decentralized traditional state within sub-Saharan Africa are the Tallensi of Northern Ghana, the Sukuma of Tanzania, the Nuer of Southern Sudan, the Kikuyu of Kenya and the Igbos of South eastern Nigeria. Osei-Tutu (2004) highlights two major features of this system:

- The existence of well defined norms despite the absence of a hierarchical system headed by a sovereign
- Pronounced popular participation in decision making by clan members, various segments and age groups, ensuring a transparently democratic process through consensus building

7.7.2 Centralized system

This is a more structured and sophisticated political system than the decentralized one. Some examples of centralized states in sub-Saharan Africa are the Edo (predominantly Binis) and Delta peoples of Midwestern Nigeria, the Yoruba people of western Nigeria, Zulus of South Africa, Barotse of Zambia, Baganda of Uganda and the Asante and Mole-Dabgani of Ghana.

Notable features of the system as explained by Osei-Tutu (2004) are:

- The existence of a political sovereign backed by well organized law enforcement agencies
- Well articulated legal norms
- Council of elders and advisors who articulate functions in accordance with traditional laws
- Governance carried out with the assistance of lower ranked rulers as well as large numbers and levels of advisers who occupy their positions by virtue of their family or clan origins and status
- The cardinal feature of governance being the rule of law
- There is accountability and when liable rulers could be deposed or ostracised upon the violations of traditional norms
- The entire political structure being complemented by a hierarchy of courts presided over by the king, head chief or village chief
- Provision for participation in decision making by groups of the citizenry, either indirectly by clan heads or families or directly by consultation and discussion among various types of organisations or affected parties in order to arrive at a consensus

7.7.3 Consensus building in the African traditional system

On consensus building, the traditional indigenous political institution guarantees and provides more meaningful political participation (through emphasis placed on extensive discussions and deliberations of public issues) than the orthodox (Anglo-Saxon) type of democracy (Agbese 2004; Osei-Tutu 2004; Erediauwa 2002; Oladipo 2000). Extensive debates and discussions usually become vital prerequisites for a sustainable resolution, a process that continues until a

consensus is reached. To arrive at a consensus, deliberations begin within the various major families in each clan and decisions reached within each family are conveyed by the various family heads to the clan council of elders, made up of all the family heads and the various age groups' representatives. The head of each clan is usually selected from the heads of major families that make up that clan. Please see Figure 7.7.3.3 for the clan structure of a typical African society

For example, in Ogbaru Local Government Area of Anambra State (an Igbo speaking state that comprises 21 local government areas) in south eastern Nigeria, there is an average of 10 major families within each clan and a minimum average of six clans within each village (Ochijie 2006). Each village is in turn headed by a council of chiefs / elders (clan heads), although youths and women are also represented in this council. The activities of this council are coordinated by an Igwe who is selected from the heads of clans within the village. Please see Figure 7.7.3.4 showing a typical village structure in Africa. Ogbaru Local Government area is made up of 16 villages: Ogwu-Ikpele, Odekpe, Atani, Ossomala, Akili-Ozizor, Akili-Ogidi, Ochuche-Umuodu, Ochuche-Ogbakuba, Agwu-Aniacha, Ohita, Umunankwo, Ubeagwe (I), Ubeagwe (II), Umuzu, Amiyi and Mputu. However, if the issue in question goes beyond a single village, it is tabled in the council of Igwes. Issues to be discussed or deliberated on are usually communicated through the various town criers to the various families. Decisions taken are also conveyed through this means to the people or affected parties. This forms a consensus ring like structures like the one shown in Figure 7.7.3.1 and 7.7.3.2. By implication, there is widespread participation by the people in the formation of decisions which affect them at various levels, as well as consultations with relevant bodies with a concern in the outcome, in order to reach a consensus. Nonetheless, the increased obsession with "modernity" and the belief that the traditional institutions in sub-Saharan Africa are undemocratic and therefore should be left as historic relics best for antiquity, as cited in Badejo and Ogunyemi (1989), is at best erroneous and misleading.

Figure 7.7.3.1 Consensus ring structure within a village In sub-Saharan Africa.

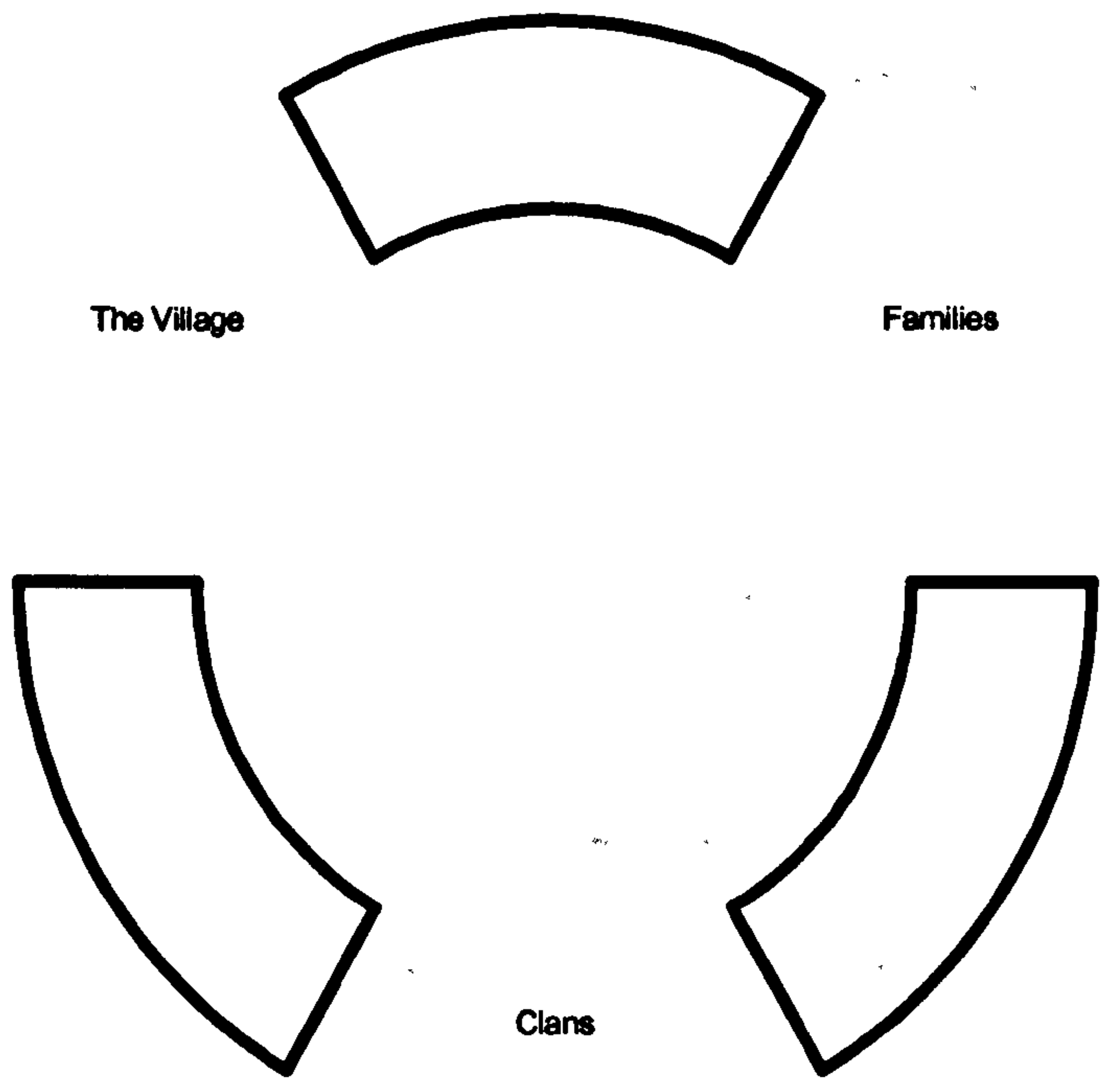


Figure 7.7.3.2 Consensus ring structure of several villages in sub-Saharan Africa.

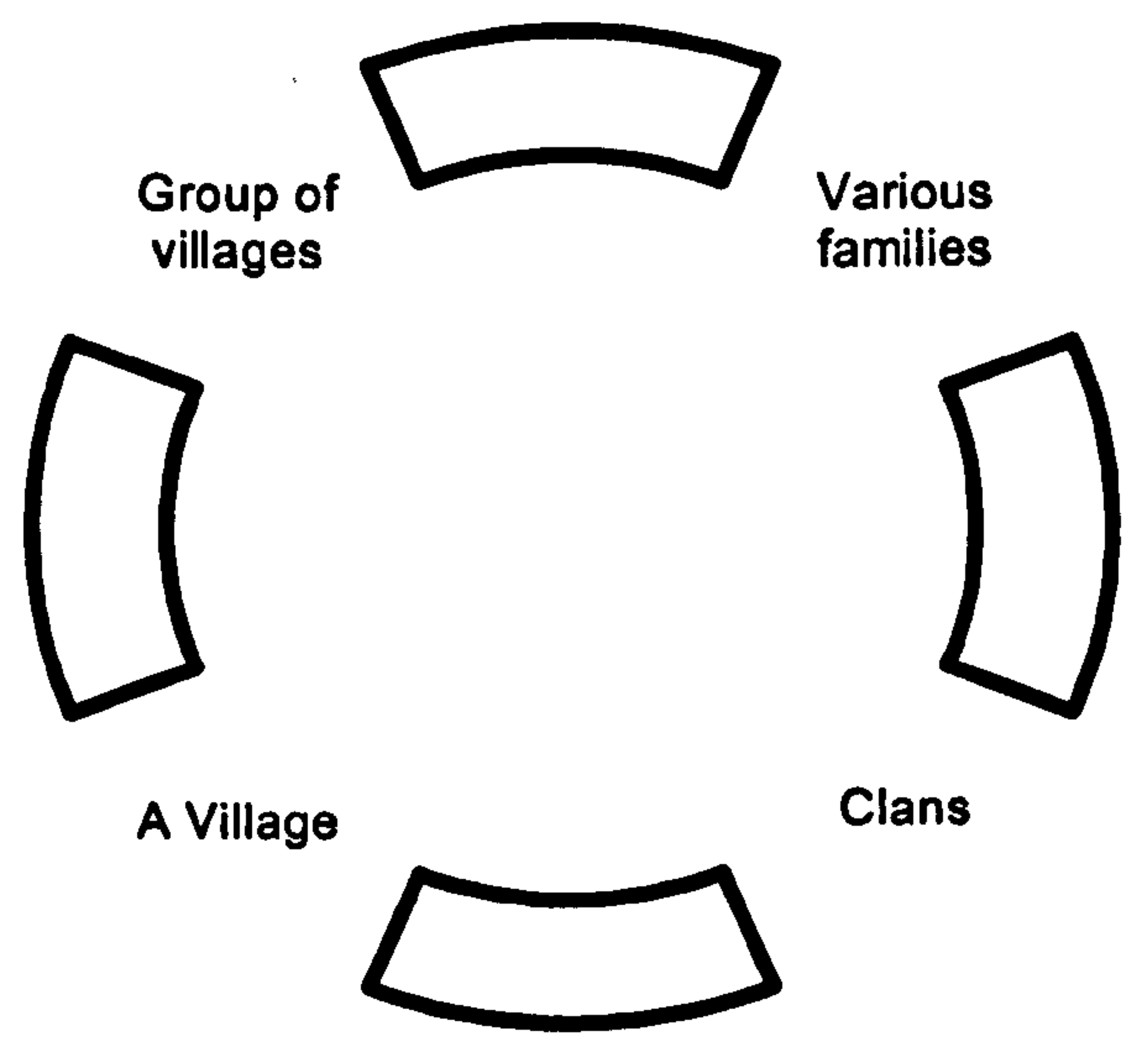


Figure 7.7.3.3 The Clan structure within an African traditional society

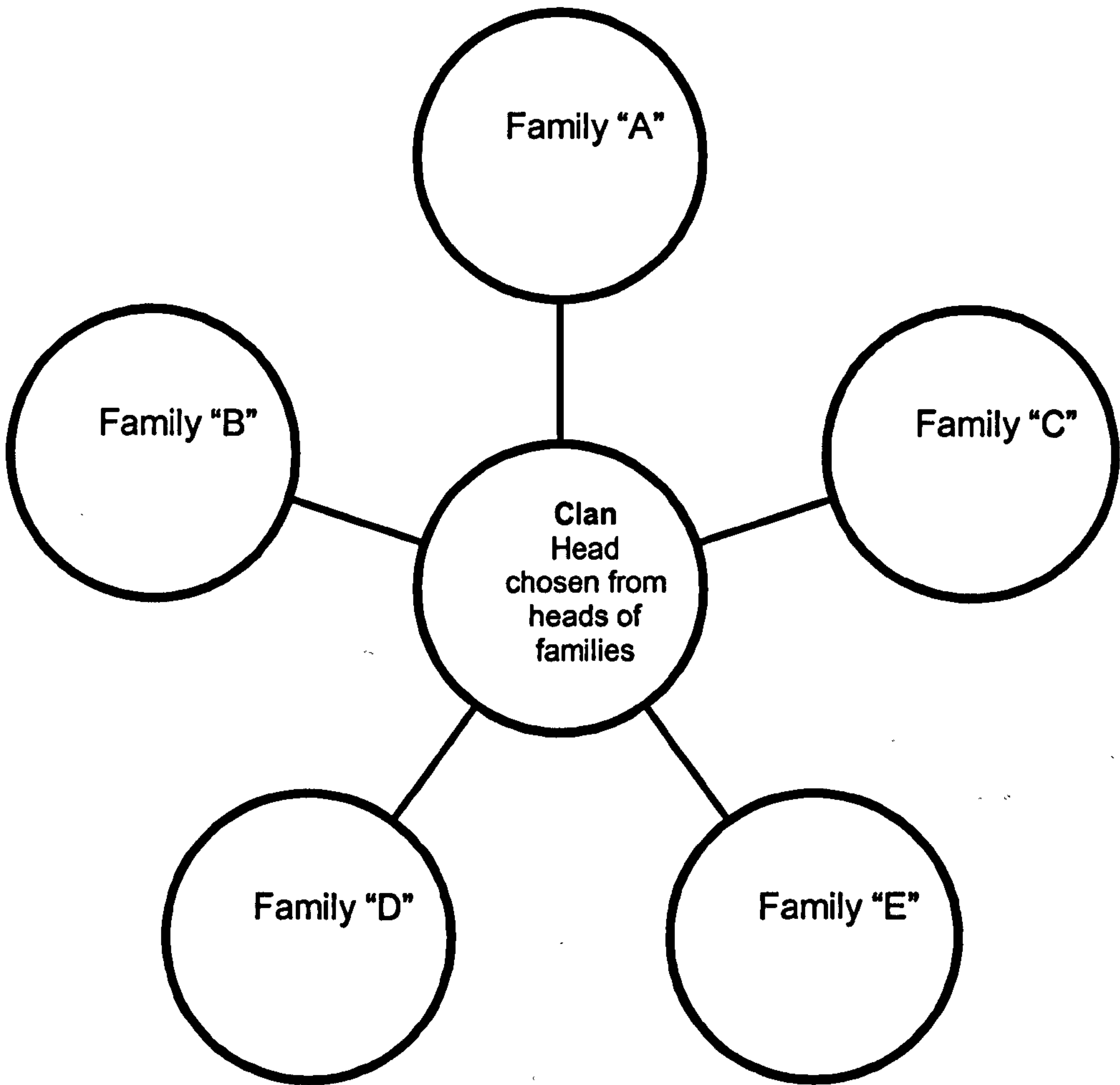
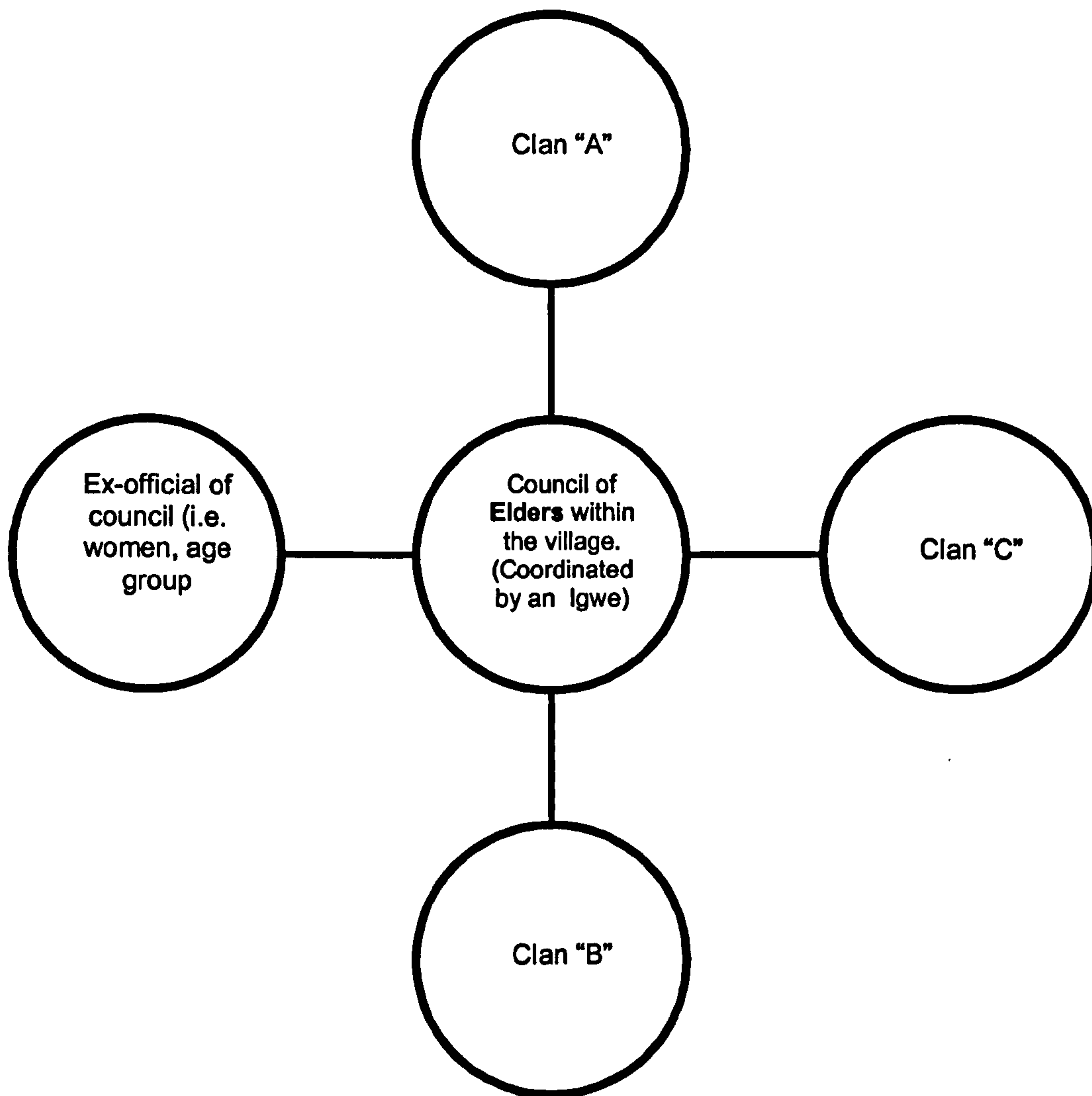


Figure 7.7.3.4 The village structure within an African traditional society



Erediauwa (2002) in his opening address during an international conference on politics, and on prescriptions for contemporary nation building in Nigeria, was of the view that although African traditional institutions do not organize political parties and periodic elections, traditional societies and institutions did not therefore lack the core features of a democratic structure. Besides, kingship in some societies or places is elective, thus capturing the true essence of democracy as “the government of the people, by the people and for the people”. Even the rule of law and respect for human dignity and rights are recognisable practices that are reflected in numerous African traditional proverbs and sayings.

Therefore, any consensus in the indigenous democratic order via the traditional institution incorporates the wishes of the majority and the minority, thus invariably reflecting the general will of the people of the community or society. This contrasts with the perception that the current situation in sub-Saharan Africa is no more than a majoritarian democratic understanding, which consistently sidelines the minority (Oladipo 2000). This situation can easily engender dissatisfaction and disaffection within society leading to a quest for power becoming fierce and confrontational. Oladipo (2000) argues that it is this scenario that the African consensual democratic model sought to prevent. However, what has become all too clear is that the so-called modernised institutions have not helped the country much (Erediauwa 2002).

Indeed, one could further argue that in the traditional society there exists a catalogue of norms for checks and balances that is meant to ensure justice and equity for all concerned. Hence, if the king or council of elders were to become authoritarian in their rule, they would face the risk of being removed from office by the people, and if this were impracticable they could lose their popularity and respect in the eyes of the people; in some cases they could even be ostracised. A punitive sacred sanction like ostracisation in African society helps to curb deviance, which indirectly advances the cause of harmonious communal life (Ejizu 2000). These rules and procedures for deposition are laid down and transmitted from generation to generation (Osei-Tutu 2004). The intended objectives of these sanctions are not different from those currently practiced by multilateral organisations or global institutions like the United Nations. In addition,

when a conflict between (for instance) member states of the international community becomes intense, sustainable resolutions are only possible by a consensus among the affected parties. Fortunately, consensus as a “win for all” model is not new to sub-Saharan Africa, as it has been present there for centuries. Nonetheless, it is important to stress that sacred sanctions as exemplified in sub-Saharan Africa were only used in very rare cases of oppression, arbitrariness in governance, corruption, negligence of state affairs and other serious traditional violations.

7.8 The influence of traditional systems (institution) in contemporary African societies.

Mbiti (1990) as cited in Ejizu (2000) observed that the concept of individualism is alien to the traditional African system. Thus, the individual does not and cannot subsist in isolation to corporate realities within his environment. “Whatever happens to the individual is believed to happen to the whole group and whatever happens to the whole group happens to the individual....the individual can only say: I am because we are and since we are therefore I am. This is the cardinal point in the understanding of the African view of man” (Mbiti 1990). In the traditional African context, a ‘family’ by definition includes one’s parents, grand- and great grandparents, brothers, sisters, uncles, aunts, cousins, nieces and nephews. A child could refer to his uncles or aunts as his father or mother, his cousins as his brothers or sister, his nephews and nieces as his brothers or sister or even children (if much older) as the case may be. Mbiti (1990) was of the view that the extended family system was the model for understanding the African perspective of a ‘family’. In sub-Saharan Africa, the molecular (nuclear) family structure is alien and inimical to the traditional value of community life. These values, which accord unique recognition not only to status and hierarchy but also to age, still influence contemporary societies within the region. Thus, the aged are cared for by their children in mutual love and respect.

In addition, as the custodian of culture and traditions, the institution of traditional ruler still plays a critical influence in the politics of some countries within sub-Saharan Africa. As stated during

the inauguration of the national constitutional conference by the then Head of States and Commander in Chief of the armed forces of the federal republic of Nigeria, General Sani Abacha (1994) was of the view that the traditional institutions are closely linked with the grassroots of society, and so enable an intimate understanding of the problems of ordinary people. The institution serves as an instrument of peace, order and stability in the Nigerian society. On the issue of chiefs, constitutions and policies in Nigeria, Agbese (2004) was of the view that the traditional institution is more assessable to ordinary people and more relevant to the daily lives of most Nigerians, particularly those in rural areas. Thus they are often used for mobilizing the citizens and to disseminate government policies and views. Lawal (1989) as cited in Agbese (2004) observed that whenever policy makers fear failure by their inability to carry the people along with them in their programs, the help of the traditional rulers is usually sought. For example, the total break down of law and order triggered by the annulment of the June 12, 1993 presidential election and the brutal execution of Ken Saro-Wiwa and eight others was judiciously prevented by the influence of the various traditional institutions in the country.

Miles (1993) and Ayeni (1985) as cited in Agbese (2004) maintained that the traditional institutions in Nigeria could foster communal solidarity and provide administrative services in situations where central government is ineffective or even disintegrating. They saw traditional rulers as ombudsmen between communities and the state bureaucracy.

Notwithstanding efforts aimed to weaken the political significance of traditional rulers in the 1979, 1989, and 1995 constitutions in Nigeria by refusing them explicit executive, legislative or judicial roles, they still exercise enormous power and influence over the lives and wellbeing of millions of Nigerians (Agbese 2004; Ochoche 2006). Most traditional institutions according to Agbese (2004) are the only means of governance in rural areas where no structures of the national Nigerian state exist. It is noteworthy that local infrastructure, trade, social services, conflict resolution and law and order are maintained in rural areas through indigenous political structures and mechanisms. It is not uncommon to find similar situations in many sub-Saharan

African states such as Ghana, Uganda, Lesotho, Swaziland, South Africa and Botswana (Osei-Tutu 2004).

As a further mark of their influence, disputes over succession to the traditional stool in Nigeria is capable of causing severe social political strife in many parts of the country. The high level of tension sparked among communal elites such as academics, civil servants, business leaders and teachers by such disputes is sometimes surprising. "Many Nigerians have lost their lives in the process". For example, the political tussle over the sultanate in Sokoto in November 1988 led to the death of 13 people within the city; a similar riot ensued over the traditional stool of Oluo of Okeoyi, Kwara state where several lives and properties were lost in September, 1993 (Agbese 2004). Several deaths were also recorded in Agilla village in Benue state and parts of Yoruba land.

Unlike most institutions in Nigeria, which are riddled with corruption, high-handedness and other vices, the traditional institution commands greater confidence and legitimacy in the minds of many Nigerians. For instance, Agbese (2004) argues that the new political dispensation in Nigeria is dominated by retired military officers and their civilian associates who maintain political power by restricting access to political participation and by bribery, repression and the introduction of autocratic policies.

The influence of the traditional institution is reinforced by federal and state government appointments of traditional leaders to key positions such as the chancellorships of state and federal universities, and even as emissaries to several governments in helping to explain governmental policies to the people. In addition, open homage is usually paid to the leading traditional ruler in every state by successive military administrators or governors as a way of popularly legitimising their administration (Agbese 2004).

Furthermore, traditional institution in Nigeria have survived several national administrations, a clear indication of its relevance to both federal and state governments. Usually, this takes place

through the form of demotion, deposition, or even banishment of some traditional rulers. Emir Sanusi of Kano, Olateru Olagbegi (the Oluwo of Owo), Ibrahim Dasuki (Sultan of Sokoto) are among notable traditional rulers that were not only deposed by their state military governments but also banished from their kingdoms. In each of these occasions there were massive revolts and riots which claimed several lives – another clear indication of the relevance and influence of the traditional institution in the lives of the people. There have been similar attempts on the throne of Benin in Midwestern during the last military administration in Nigeria. This was strongly resisted by the Edo people, indicating to the then military governor (Onyeregbulem) that their Oba (traditional ruler) has no 'replacement' due to his cultural significance in their lives. The administration's scheme was thus foiled. As a further demonstration of the significance and influence of the traditional institution in the lives of Nigerians, the Zango-Kataf mayhem in 1992 that resulted in the deaths of over 1,700 people was due primarily to resentment felt by indigenous Katafs over being traditionally ruled by Fulanis that were hand-picked by the far-off Emir of Zaria and the then Kaduna state military administrator.

There is no doubt the influence and relevance of the traditional institution in contemporary Nigeria and sub-Saharan Africa is overwhelming. It would be a great disservice to the whole region, not just to Nigeria, if such influence is not properly harmonised for the benefit of the people. Apparently, in the rural areas as indicated above, traditional institutions are the only governing structures known to the people. They are thus predominantly in charge of the management of both social and physical infrastructures and service delivery within their domain. Bearing in mind this, and the influence the institution holds even in the urban environment, there is the need for an adequate framework that would employ the services of these institutions to address the dearth of infrastructure and service delivery in Nigeria. Similar schemes exist at the very micro levels in countries such as Malawi, Botswana, South Africa, Swaziland, Ghana, Senegal, Uganda and Lesotho (Osei-Tutu 2004). Successful and practical examples of projects pioneered and financed by indigenous participations include:

- The bottom-up indigenous participatory stakeholders' partnership approach for the sustainable Ibadan city project (SIP) aimed at improving the urban environmental infrastructure (Ogu 2000).
- The indigenous demand-driven approach for infrastructure provision with variable levels of service aimed at improving both the rural and urban physical infrastructures in South Africa. The central issue of the South African Model is the communities' right to choose and finance projects that are of relevance to them (Abbott 1996).
- Success stories of developmental infrastructure projects in Senegal that have improved the lives of millions of Senegalese in rural areas through community participation (World Bank 2005).
- Most importantly, the huge success stories in Ghana regarding the provision of both social and physical infrastructure at the local level in predominantly Asante communities due to the direct involvement of their traditional ruler (Osei-Tutu 2004; Agbese 2004; Eberlee 2001).
- The various successful World Bank projects, in partnership with traditional authorities, in developing countries, and especially in Ghana, where sanitation facilities for over 41 communities and projects for safe drinking water for 1000 communities is currently in progress, as well as the encouragement of health education projects (most especially for HIV/AIDS) and programmes aimed at the preservation of traditional values and culture.

7.9 Polycentric cultural model for infrastructure and service delivery

The traditional polycentric cultural model involves the traditional institution and users as outlined in the preceding sections and shown in Figure 7.9.3. However, in the traditional African system (either decentralize or centralize system) the main representatives of the people as shown in Figures 7.7.3.3, 7.7.3.4 are predominantly the elders (whose make up has been extensively explained) the youths and the women. In most instances, the age group and women are classed as ex-official members of the elders' council. In some centralize traditional systems like the Benin and Asante Kingdoms of Midwestern Nigeria and Ghana they are given full recognition and status. The coordination of the elder's council usually lies with the head of the traditional authority that is usually more powerful in the centralized system. A simplified structure is shown in Figure 7.9.1. Nevertheless, the addition of association / organisation like NGOs, trade unions and religious organisation in the polycentric structure of Figure 7.9.3 is to strengthen the traditional structure in order to meet contemporary realities. Please see Figure 7.9.2.

The traditional polycentric model is subdivided into three major stages: conceptualisation, identification of cultural norms and values affecting the project, and the infrastructure and service procurement referendum. However, the traditional institution with the assistance of the government is expected to coordinate all meetings of the users' representatives – i.e. the elders, youths, women, non-governmental organisations, trade unions and religious organisations.

The traditional institution is also expected to identify cultural norms and values of significance and to coordinate the conceptualisation process. During conceptualisation, representatives discuss the type of infrastructure that is of relevance to them and the means of project financing, bearing in mind the various stakeholders and the polycentric governing structure of the model. At this stage of conceptualisation, the design of the project and a suitable procurement procedure adaptable to the prevailing circumstance is discussed. Bearing in mind the polycentricism of this model, ownership or ownership structure, operation, and maintenance

of the project is also discussed. After the conceptualisation stage, selected options are further subjected to a referendum: "infrastructure and service delivery referendum" as shown in Figure 7.9.3.

This referendum on the choice of infrastructure is an opportunity for every adult in the community, city or state in which the infrastructure would be located to have a say as to the type of infrastructure that would be provided them. Thus, **transparency and accountability** is strengthened right from the conceptualisation stage of the project, since the various representatives or leaders are directly accountable to the people. It is also the users that make the final choice on the type of infrastructure and service to be delivered to them. This model has the potential to reduce considerable cases of **misallocated investments**, which have been identified as one of the major causes of infrastructure failures in Nigeria, as shown in Figure 7.9.3. The traditional polycentric model gives room for an independent monitoring and verification team. Members of this unit are selected from the representatives, the local, state and federal levels of government and from the private sector. This team is given the responsibility of identifying and verifying areas of malpractice and of recommending ways of dealing with them. They monitor the procurement and construction process, operation of the infrastructure and the maintenance strategy. This type of supportive institutional arrangement of verification and monitoring of the infrastructure and service delivery process, where the users / people are directly involved could considerably reduce fraudulent acts and mass **corruption** currently being perpetuated, and which the survey identifies as one of the major causes of infrastructure failure.

In the traditional polycentric strategy, responsibilities for maintenance are shared in a polycentric fashion among users, the three tiers of government and the private sector. This polycentric maintenance strategy for infrastructure is derived from the main polycentric cultural model in Figure 7.9.3. Thus, everyone is charged with the responsibility of maintaining a project, since they have all been part of its financing, thereby addressing the problem of **inadequate maintenance** already identified as one of the major causes of infrastructure failures. For

sustainability, it is expected that one of the responsibilities of those awarded the project would be to play a key role in the training of local users in the provision of **technical and managerial skills**.

Figure 7.9.1 Simplified traditional structure

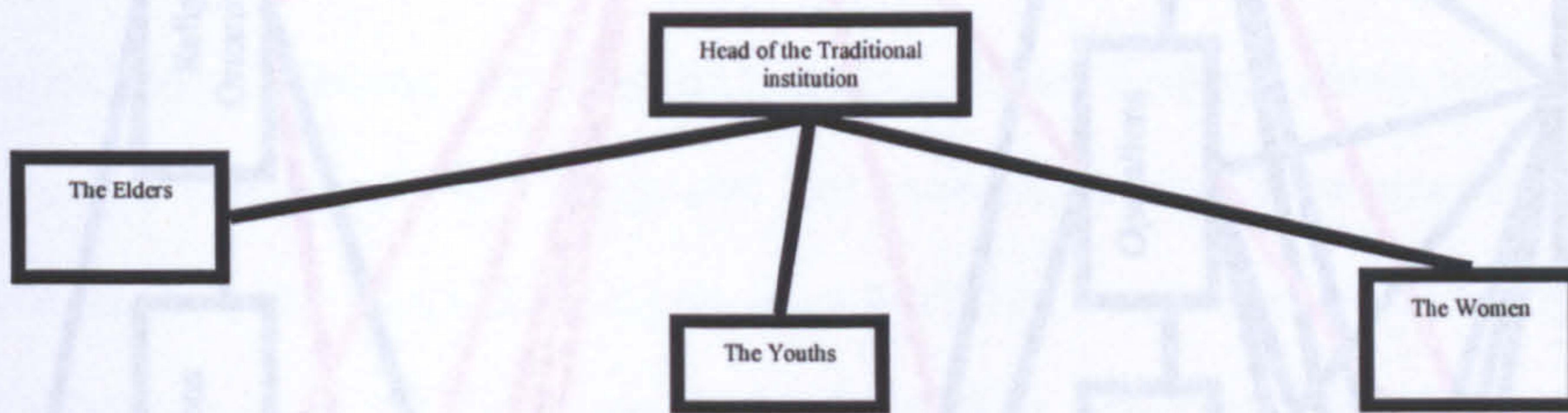


Figure 7.9.2 Cultural model for contemporary realities in the polycentric structure

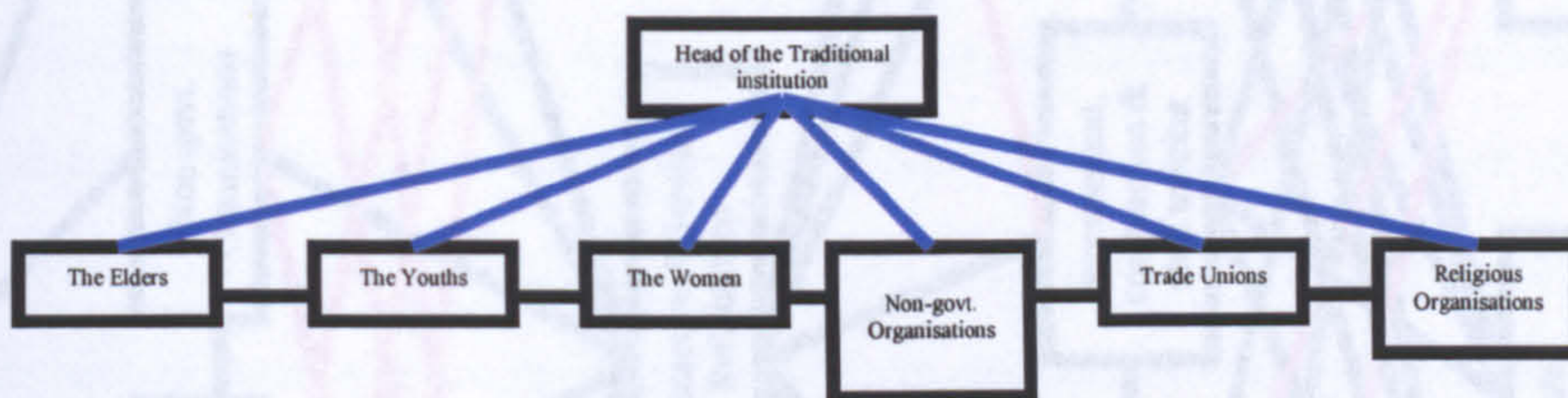
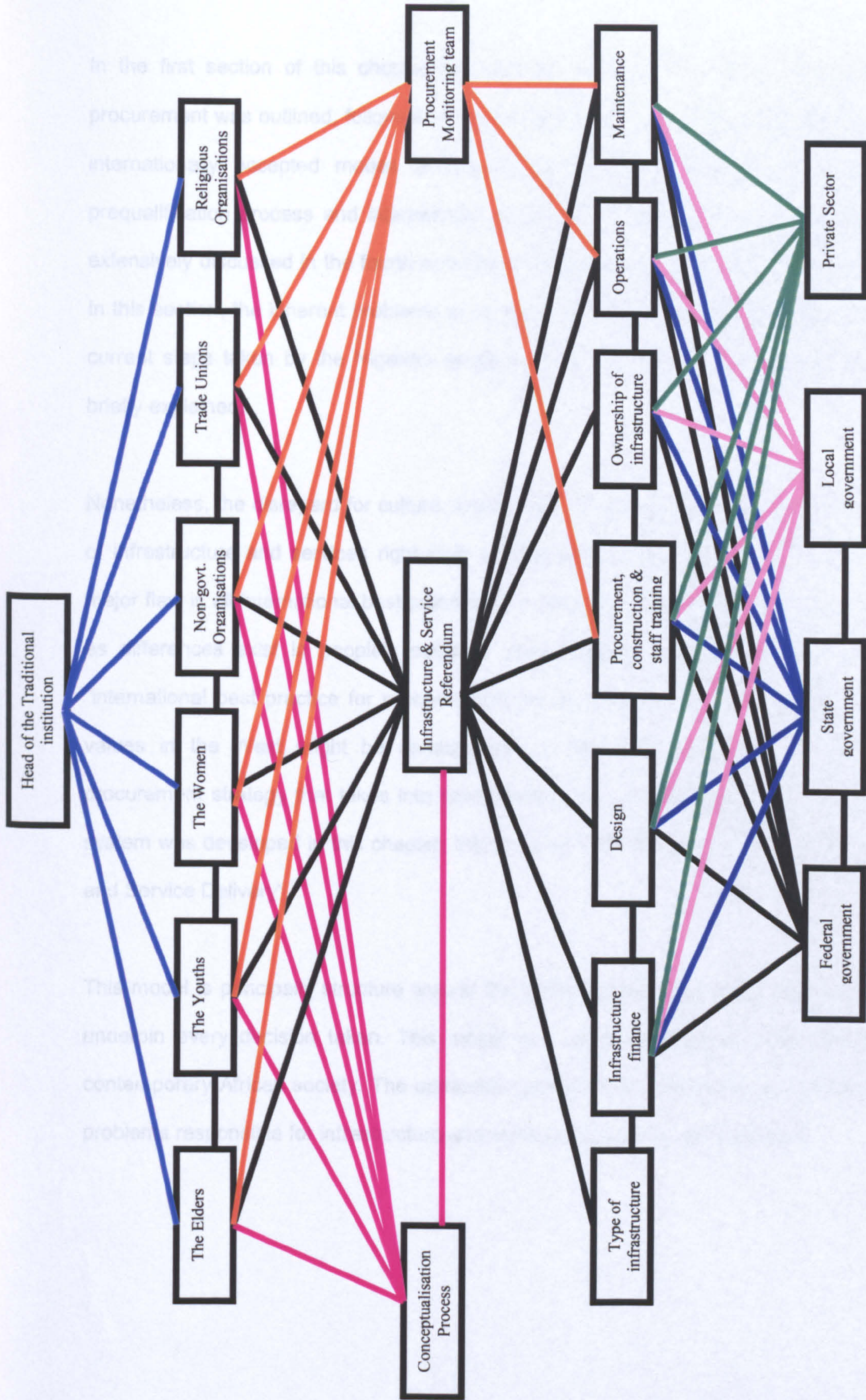


Figure 7.9.3 Polycentric Cultural Model for infrastructure and service delivery



7.10. Summary

In the first section of this chapter the concept, definition and current international best practice for procurement was outlined, followed by the apparent objectives of infrastructure procurement. The various internationally accepted modes of procurement were then introduced and briefly explained. The prequalification process and international competitive bidding, along with their various rudiments, were extensively discussed in the fourth and fifth sections, leading to an examination of Nigerian procurement. In this section, the inherent problems were identified, suggested recommendations were outlined and the current steps taken by the Nigerian government to rectify the Nigerian procurement system were also briefly explained.

Nonetheless, the disregard for culture, beliefs and value system and the sheer disregard for the users of infrastructure and services right from its conceptualisation to actual delivery was identified as a major flaw in all international best practice for procurement. In this chapter, it was argued that as long as differences exist in people's cultures, value systems and beliefs, there is no such thing as "international best practice for procurement", for the simple reason that some acceptable norms or values in the West might be unacceptable in the other parts of the world. Consequently, a procurement strategy that takes into consideration the uniqueness and complexities of the Nigerian system was developed in this chapter; this is called "The Polycentric Cultural Model for Infrastructure and Service Delivery".

This model is principally structure around the traditional African society were consensus mechanism underpin every decision taken. This model is a conglomeration of major stakeholders within the contemporary African society. The application of this model is intended to address most of the major problems responsible for infrastructure and service delivery failures in Nigeria.

Chapter Eight

Conclusion

The literature review begins by defining and discussing the concepts of infrastructure and service delivery, drawing special attention to the presence or absence of infrastructure and the implication for sustainable economic growth, as highlighted by several authors. A critical theoretical evaluation of the interface between infrastructure, economic growth and development was carried out. Although there was a positive interaction between infrastructure and economic growth, what remains unclear is the extent to which infrastructure impacts on economic growth and development. This uncertainty arises from the revelation that the implied return rate for infrastructure varies from one region to another, and from country to country. The implied return rate for infrastructure is as high as 63% in some instances and as low as 14% in others.

Overall, the greatest improvements in infrastructure have been in East Asia, with sub-Saharan Africa showing the least in the hierarchy. Though, It is outside the scope of this investigation to identify the causal relationship between infrastructure, economic growth and development, but the findings of this study give some indication of what this might be. For example, it reveals that an increase in the amount of infrastructure and income does not guarantee a concomitant improvement in the stability of infrastructure services. What does guarantee stability is the institutional environment within which it operates; this often varies across sectors in individual countries.

The study also critically evaluates the effects resulting from an infrastructure deficit in the developing world, and adduces glaring examples of how over 2.5 billion people in the developing world remain without access to basic infrastructure, with consequent implications for health, economic growth and development. Infrastructure investment patterns and the present state and perceived causes of infrastructure deficiency in sub-Saharan Africa are examined. It is revealed that sub-Saharan Africa consumes far more infrastructure services than its capacity to produce them, or to invest in them. The importance of institutions in infrastructure and service delivery in sub-Saharan

Africa and the various models for delivering infrastructure and services to the people are also critically studied. Lastly, an overview of some of the most important existing physical infrastructures in Nigeria is presented, including a regionally integrated approach to infrastructure delivery.

The first three sections of chapter 3 introduce the political and economic profile of Nigeria. The northern domination of the military and the Nigerian political landscape, along with the monocultural nature of Nigeria's economy, were all revealed. The political economy of the influence of political positions on infrastructure and service delivery in Nigeria is examined; this influence has shown a disproportionate growth since Nigeria became independent from Great Britain, and has resulted in an economic advantage to the northern part of the country. An empirical analysis reveals that this northern dominance of the political landscape is responsible for the disproportionate spread of infrastructure in Nigeria. The background of the present neglect of infrastructure in the political economy, as well as of revenue sharing, were next examined, followed by an investigation into the political economy of the effects of globalisation on infrastructure in Nigeria.

The formula for revenue sharing for infrastructure and economic development has always worked to the advantage of the majority (i.e. the north and the western parts of Nigeria) at the expense of the minority in the Niger delta, where over 75% of the country's income is generated. The uneven distribution of international trade and the elasticity of price of African exports, together with the direction of exports of African goods, were considered in order to ascertain the political economy of globalisation on infrastructure in Nigeria.

To demonstrate empirically the interface between infrastructure and economic growth and development, some production functions and secondary data are examined in chapter 4, and some conclusions are reached. This investigation establishes that industrialised countries' final consumption expenditures are greater than their gross capital formation to a degree significantly greater than that of sub-Saharan Africa, which shows that the latter region invests far less than it consumes relative to the west. The present study arrives at an inference relationship for measuring and comparing economic stability and shows that industrialised countries are economically more

stable than sub-Saharan Africa, with a 4.6% margin of stability. Another significant conclusion is that the region is presently in the hands of the private sector seven times over, contrary to popular belief, which holds that the region's infrastructure is controlled by the public sector. It follows that, because the private sector is demonstrably more efficient than the public in this region, more privatisation is needed.

In addition, it emerged that the economic predicament of sub-Saharan Africa is not really about the balance between the public and private sectors, but rather about the size of the region's GDP. The inclusion of labour services as an independent variable in the production function reveals that the interface between public infrastructure and economic growth and development in sub-Saharan Africa is quite negligible. The final interface model in equation (18) of Chapter 4 further reaffirms the dominant role of private investment or private infrastructure in sub-Saharan Africa. Thus a very strong interface exists between private infrastructure on the one hand and economic growth and development on the other.

Sampling and surveying techniques are examined in Chapter 5, with a view to establishing the most appropriate methods for fieldwork in this research. A sample size of 600, was decided on; this was evenly distributed across the six geopolitical regions or zones in Nigeria, each region having an estimated sample size of 100. The six geopolitical zones are the south-south (Edo state), south-west (Lagos state), south-east (Imo state), north-west (Kano state), north-central (Kaduna state) and north-east (Adamawa state). Respondents were drawn from the public and private sectors and from non-governmental organisations. Probability sampling was chosen, and the two-stage stratified random sampling technique was adopted, after brief discussion and rejection of mixed sampling design and the various non-probability sampling techniques on the grounds of unsuitability. The questionnaire was used as the system of data collection, and some unique experiences are also reported from the field work. In each of the geopolitical regions visited, the research data collection team observed that the understanding of the people, their culture, values, religion and even language assisted the data collection exercise considerably. In addition, practical experience and other anecdotal evidence obtained in the field revealed how failed infrastructure is affecting the

thinking and behavior of the poor. A total of 443 (73.83%) respondents returned their questionnaires and 40 (9.03%) of these were randomly selected for validation. This left a total of 403 (67.17%) questionnaires for analysis.

Chapter 6 examined the construction, distribution and results of the survey according an exhaustive array of parameters. Surveys were distributed by geopolitical region, and the results from these were cross-tabulated and compared both with national results and results from other geopolitical regions. Responses were categorised in several ways to check the effect on them of the respondents' backgrounds. It was observed that the rank or class of respondents, their range of monthly income and their age range distribution did not affect their responses. Respondents were asked to rate infrastructure services in Nigerian by region according to various criteria. These responses were then analysed by using correlations and subsequent mathematical models from regression analysis between several variables such as the stability of infrastructure services and infrastructure supply, quality, maintenance and the conduct of the staff of these services in Nigeria.

Notwithstanding the findings from these empirical models, frequency analysis earlier revealed that respondents were grossly dissatisfied in all these areas. Results from the frequency analysis were compared and contrasted across regions and with the national picture. The analysis of the collected data in this survey gave rise to a new mathematical model, called Severity Index in Matrix Order (SIMO), developed by the researcher using existing mathematical and statistical tools; this model aids the analysis and identification of core variable factors. SIMO is not specific to this research, but is rather a generic model that can be used in future investigations of this kind. This chapter concludes with clear identification of the major perceived causes of infrastructure and service delivery failures in descending order of severity in Nigeria, provides a clear line of demarcation between those perceived causes which are of major importance and those which are relatively less so, and gives a coefficient of spread of each perceived cause across all the geopolitical regions. These perceived major causes are corruption, misallocation of investments, inadequate maintenance, lack of transparency and accountability, insufficient funding for infrastructure, lack of

supportive institutions, inconsistent political, economic and social policies, and lack of technical and managerial skills.

Chapter 7 critically analyses the international frameworks of procurement provided by The World Bank, UNCITRAL and The African Development Bank, before proceeding to a detailed examination of the Nigerian situation, including identification of failures and recommendations for their rectification. The primary finding is that cultural differences undermine any attempt to construct a “one size fits all” procurement model. Practice must be adapted to local conditions, and to this end a model specifically designed for Nigeria is developed, called “The Polycentric Cultural Model for Infrastructure and Service Delivery”. The application of this model is intended to address most of the major problems responsible for infrastructure and service delivery failures in Nigeria and other parts of sub-Saharan Africa. This model underpins the traditional African system which emphasises consensus building in decision making at all levels. The true nature of the African traditional institution in both decentralised and centralised systems were examined. Also considered is consensus building in traditional African society. This can be seen at all levels, from the family through the clan to the village. In a more centralised traditional system, consensus building goes far beyond the village level. Lastly, the influences of the traditional institution in contemporary African societies are presented with some related examples of their influence on infrastructure and service delivery.

Finally, as a recommendation for future investigation, there is the need to carry out a similar kind of research in two other sub-Saharan African countries in order to examine further those perceived causes of infrastructure and service failures already identified in this study. Preferably, these should be countries from both the southern and eastern part of sub-Saharan Africa. Examples might be South Africa from the southern part and Kenya from the eastern part. Other areas for future research include the effects of infrastructure failures in these countries and the extent to which variables such as supply, quality, maintenance of infrastructure and staffs of infrastructure service providers affect the stability of infrastructure services. Procurement frameworks in these countries

should also be critically examined. After such analyses have been performed, the findings from Nigeria and other countries chosen for study should be harmonised.

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APPENDIX A

Table 1 Summary output: Investment program impact analysis for sub-Saharan Africa

Indicator	1990-2000	2000-2010
ACFT	20000	20000
ASIA	20000	20000
Quality	20000	20000
Factor	20000	20000
Factor	20000	20000

Figure 1 Infrastructure expansion in recent decades

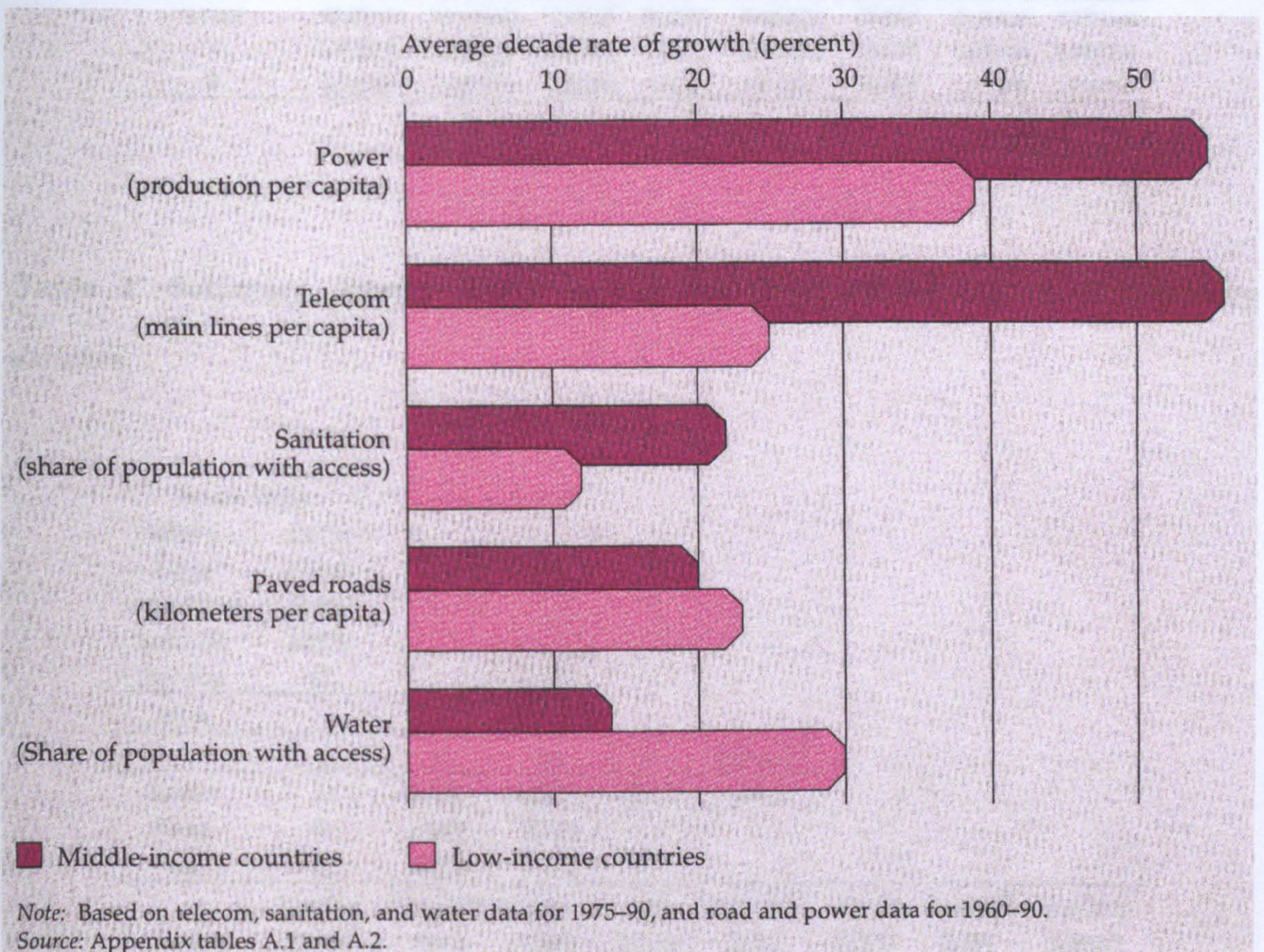


Table 1 Summary output: investment regression analysis for sub-Saharan Africa

Regression Statistics	
Multiple R	0.960989599
R Square	0.92350101
Adjusted R Square	0.920245734
Standard Error	316.8281267
Observations	50

ANOVA					
	df	SS	MS	F	Significance F
Regression	2	8056662.6	4028431.1	283.6936	5.83323E-27
Residual	47	6673973.541	14199.44		
Total	49	8724263.14			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	169.8501121	64.11316254	2.649199	0.0109538	40.86998084	298.83024	40.86998084	298.8302446
X	3.365327316	0.996655907	3.3766204	0.001481	1.360316945	5.3703377	1.360316945	5.370337686
W	3.218424906	0.35554761	9.0520223	7.2E-12	2.50319505	3.9336938	2.50319505	3.933693763

Table 2. Summary output: Linear regression with variable W as explanatory variable

Regression Statistics	
Multiple R	0.961285
R Square	0.904843
Adjusted R Square	0.902963
Standard Error	415.8568
Observations	50

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	78940647	78940647	466.9622	3.56E-26
Residual	48	8292989	172770.6		
Total	49	87242636			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	229.1154	68.0185	3.368427	0.001488	92.3551	365.8757	92.3551	365.875653
W	4.253019	0.199958	21.37668	3.56E-26	3.852992	4.653047	3.852992	4.653047039

Table 3. Summary output: Linear regression with variable X as explanatory variable

Regression Statistics	
Multiple R	0.88889471
R Square	0.7901338
Adjusted R Square	0.78576158
Standard Error	617.811002
Observations	50

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	68933355.33	68933355	180.7172	6.83202E-18
Residual	48	18309280.8	381443.4		
Total	49	87242636.14			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	175.402985	105.0758948	1.660298	0.101589	-35.66613706	386.6721	-35.66613706	386.672108
X	11.1399765	0.829675069	13.44311	6.83E-18	9.473913328	12.80614	9.473913328	12.80613958

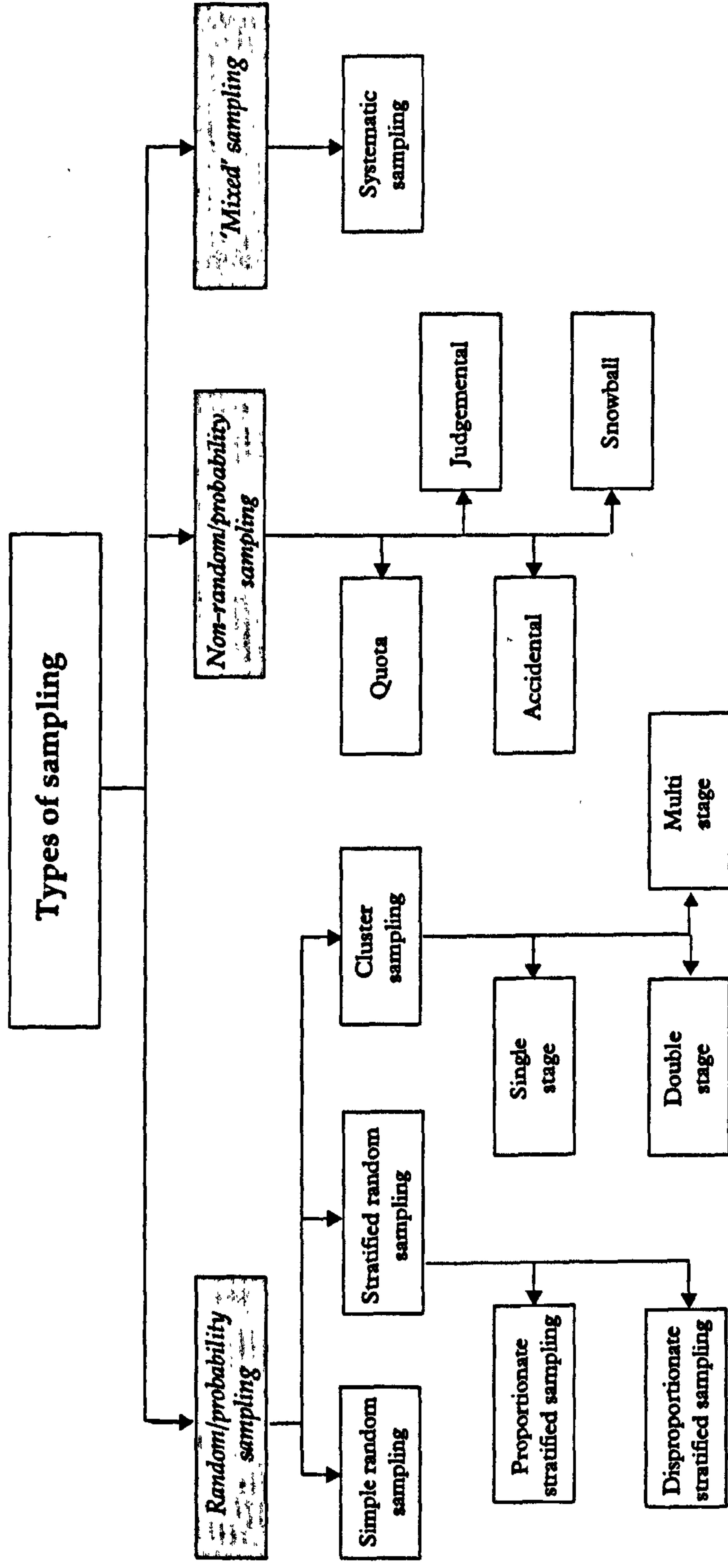
Table 4. Summary output: Linear regression for the entire explanatory variables

Regression Statistics	
Multiple R	0.992964377
R Square	0.985978254
Adjusted R Square	0.984809775
Standard Error	140.4887758
Observations	40

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	49963286.06	16654428.7	843.8135263	2.13063E-33
Residual	36	710535.4607	19737.0961		
Total	39	50673821.52			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	150.6384435	26.92044181	5.59568987	2.41248E-06	96.04132885	205.2356	96.04132885	205.235558
X	0.829452224	0.45483582	1.82362995	0.076519208	-0.09299636	1.751901	-0.09299636	1.75190081
W	2.814716223	0.310362014	9.06913893	7.90324E-11	2.185273714	3.444159	2.185273714	3.44415873
L	1.04402621	0.133966877	7.79316674	3.07872E-09	0.772329148	1.315723	0.772329148	1.31572327

Figure 2 Sampling framework



Dear Sir / Madam,

Re: Questionnaire for Infrastructure and Service delivery

This survey is being conducted to ascertain amongst others, the causes of infrastructure deterioration in sub-Saharan Africa, using Nigeria as a case study. The aim is to design an appropriate and effective blueprint for infrastructure and service delivery in the sub-Saharan Africa.

Your response to this questionnaire will not only ascertain relevant issues which pertains to my PhD but also a unique contribution to a research that serves as a direct response to the high failure rates of infrastructure and service provisions in sub-Saharan Africa, particularly Nigeria; where the dearth of infrastructure provisions continues to impose severe constraints to economic growth and development.

For clarity, infrastructure could be define as an encapsulation for social overhead capital like water supply, electricity, telecommunications, housing, sanitation, accessible roads, railways, airports, drainage schemes, irrigation, schools, hospitals and markets.

This questionnaire has been estimated to take at least ten minutes to complete and be rest assured that the information gathered would be strictly confidential and only to be used purely for academic purposes.

If you are able to let us have your response by returning the completed questionnaire in the next few days, please accept our thanks.

Yours sincerely

.....
Alohan Omoregie
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United Kingdom.
Tel: +441162577516, +447765312741(Mobile)

Questionnaire Design

Respondent number:

Where there are alternative answers, please tick the one relevant to you.

A. Personal questions:

1. Are you willing to respond to this questionnaire survey?

1	2	3	4
Yes	Partially	No	I don't know

2. In which geo-political region of the country do you work?

1	2	3	4	5	6
South-west	North-west	South-east	North-east	South-south	North-central

3. Which sector / organisation of the country do you belong?

1	2	3	4
Public	Private	Non governmental organisation	Not applicable

4. What class of rank do you belong in this organisation?

1	2	3	4
Low class	Middle class	High class	Not applicable

5. Range of monthly income?

1	2	3	4
Under-50000 Naira (£400)	50000-100000 Naira (£500)	100000 Naira and above	Not applicable

6. Age range?

1	2	3	4
Under 30years	30-60 years	60-65 years	65 years and above

B. The State of Infrastructure provision in Nigeria:

7. Is infrastructure service delivery in your area stable?

1	2	3	4
Very stable	Stable	Unstable	Very unstable

8. If you have ticked option 3 or 4 in question 7 above, please indicate the reason or reasons from the following:

- a. The lack of adequate and supportive institution
- b. Misallocation of investments
- c. Lack of an effective competition
- d. Inadequate maintenance
- e. Lack of suitable technical and managerial skill
- f. Lack of financial and managerial autonomy
- g. Inadequate cost recovery
- h. Corruption
- i. Lack of transparency and accountability
- j. Poor wages and remunerations
- k. High construction and equipment procurement cost
- l. Weather and difficult environmental terrain.
- m. Inconsistent political, social and economic policies

- n. Insufficient funding for infrastructure
- o. Hostile communal conflict
- p. Too much on existing infrastructure
- q. None of the above
- r. All of the above
- s.

9. How would you rate the supply of infrastructure in Nigeria?

Very adequate	Adequate	Inadequate	Very inadequate
1	2	3	4

10. If you have ticked option 3 or 4 in question 9 above please indicate reason or reasons from the following:

- a. The lack of adequate and supportive institution
- b. Misallocation of investments
- c. Lack of an effective competition
- d. Inadequate maintenance
- e. Inadequate cost recovery
- f. Lack of suitable technical and managerial skill
- g. Lack of managerial and financial autonomy
- h. Corruption
- i. Lack of transparency and accountability
- j. Poor wages and remunerations
- k. High construction and equipment procurement cost
- l. Weather and difficult environmental terrain.
- m. Inconsistent political, social and economic policies
- n. Insufficient funding for infrastructure
- o. Hostile communal conflict
- p. Too much on existing infrastructure
- q. None of the above
- r. All of the above

11. How would you rate the quality of infrastructure and service delivery in Nigeria?

high	Fair	low	Very low
1	2	3	4

12. If option 3 or 4 above, please tick the reason or reasons from the following:

- a. The lack of adequate and supportive institution
- b. Misallocation of investments
- c. Lack of effective competition
- d. Inadequate maintenance
- e. Inadequate cost recovery
- f. Lack of suitable technical and managerial skill
- g. Lack of financial and managerial autonomy
- h. Corruption
- i. Lack of transparency and accountability
- j. Poor wages and remunerations
- k. High construction and equipment procurement cost
- l. Weather and difficult environmental terrain.
- m. Inconsistent political, social and economic policies
- n. Insufficient funding for infrastructure
- o. Hostile communal conflict
- p. Too much pressure on existing infrastructure
- q. None of the above
- r. All of the above

13. How would you rate infrastructure maintenance in Nigeria?

high	Fair	low	Very low
1	2	3	4

14. How would you rate the response to infrastructure maintenance by relevant agencies in Nigeria?

high	Fair	low	Very low
1	2	3	4

15. If maintenance and the response rate to maintenance is rated low or very low, please tick reason or reasons from the following:

- a. The lack of supportive institution
- b. Misallocation of investments
- c. Lack of an effective competition
- d. Inadequate cost recovery
- e. Lack of suitable technical and managerial skill
- f. Lack of financial and managerial autonomy
- g. Corruption
- h. Lack of transparency and accountability
- i. Poor wages and remunerations
- j. High construction and equipment procurement cost
- k. Weather and difficult environmental terrain.
- l. Inconsistent political, social and economic policies
- m. Insufficient funding for infrastructure
- n. Hostile communal conflict
- o. Too much on existing infrastructure
- p. None of the above
- q. All of the above

16. Generally, what is your impression of the staff of your local infrastructure service providers?

Honest	Fair honest	Dishonest	I don't know
1	2	3	4

17. If you ticked option 3 in question 16 above, please indicate the reason or reasons from the following?

- a. Inconsistent billing pattern.
- b. Misallocation of investments
- c. Inadequate maintenance
- d. Inadequate cost recovery
- e. Lack of suitable technical and managerial skill
- f. Corruption
- g. Lack of transparency and accountability
- h. Poor wages and remunerations
- i. Hostile communal conflict
- j. Too much pressure on existing infrastructure
- k. None of the above
- l. All of the above

18. Are you satisfied with your average infrastructure monthly bills?

Very satisfied	Satisfied	Unsatisfied	Very unsatisfied
1	2	3	4

19. If you ticked option 3 and 4 in question 18 above, please tick why from the following:

- a. Inadequate maintenance
- b. Inconsistent billing system
- c. Inadequate cost recovery strategy
- d. Lack of suitable technical and managerial skill
- e. Corruption
- f. Lack of transparency and accountability
- g. Inconsistent political, social and economic policies
- h. Insufficient funding for infrastructure
- i. Too much pressure on existing infrastructure
- j. None of the above
- k. All of the above

Table 4 Table of Random numbers

	1	2	3	4	5	6	7	8	9	10
1	48461	14952	72619	73689	52059	37086	60050	86192	67049	64739
2	76534	38049	49692	31366	52093	15422	20498	33901	10319	43397
3	70437	25861	38504	14752	23757	29660	67844	78815	23758	86814
4	59584	03370	42806	11393	71722	93804	09095	07856	55589	50063
5	04285	58554	16085	51555	27501	73883	33427	33343	45507	50063
6	77340	10412	69189	85171	29802	44785	86368	02583	96483	76553
7	59183	62687	91778	80354	23512	97219	65921	02035	59487	91403
8	91800	04281	39979	03927	82564	28777	59049	97532	54540	79472
9	12066	24817	81099	48940	69554	55925	48379	12866	41032	21580
10	69907	91751	53512	23748	65906	91385	84983	27915	48491	91068
11	80467	04873	54053	25955	48518	13815	37707	68687	15570	08890
12	78057	67835	28302	45048	56761	97725	58438	91529	24645	18544
13	05648	39387	78191	88415	60269	94880	58812	42931	71898	61534
14	22304	39246	01350	99451	61862	78688	30339	60222	74052	25740
15	61346	50269	67005	40442	33100	16742	61640	21046	31909	72641
16	56793	37696	27965	30459	91011	51426	31006	77468	61029	57008
17	56411	48609	36698	42453	85061	43769	39948	87031	30767	13953
18	62098	12825	81744	28882	27369	88185	65846	92545	09065	22653
19	68775	06261	54265	16203	23340	84750	16317	88686	86842	00879
20	52679	19599	13687	74872	89181	01939	18447	10787	76246	80072
21	84096	87152	20719	25215	04349	54434	72344	93008	83082	31670
22	83964	55937	21417	49944	38356	98404	14850	17994	17161	98981
23	31191	75131	72386	11689	95727	05414	88727	45583	22568	77700
24	30545	68523	29850	67833	05622	89975	79042	27142	99257	32349
25	52573	91001	52315	26430	54175	30122	31796	98842	37600	26029
26	16586	81842	01076	99414	31574	94719	34656	80018	86988	79034
27	81841	88481	61191	25013	30272	23388	22463	65774	10029	58376
28	43563	66829	72838	08074	57080	15446	11034	98143	74989	26885
29	19945	84193	57581	77252	85604	45412	43556	27518	90572	00563
30	79374	23796	16919	99691	80276	32818	62953	78831	54395	30705
31	48503	26615	43980	09810	38289	66679	73799	48418	12647	40044
32	32049	65541	37937	41105	70106	89706	40829	40789	59547	00783
33	18547	71562	95493	34112	76895	46766	96395	31718	48302	45893
34	03180	96742	61486	43305	84183	99605	67803	13491	09243	29557
35	94822	24738	67749	83748	59799	25210	31093	62925	72060	69991
36	4330	60599	85828	19152	68499	27977	35611	96240	62747	89529
37	43770	81537	59527	95674	76692	86420	69930	10020	72881	12532
38	56908	77192	50623	41215	14311	42834	80651	93750	59957	31021
39	32787	07189	80539	75927	75475	73965	11796	72140	48944	74050
40	52441	78392	11733	57703	29133	71164	55355	31006	25526	55790
41	22377	54723	18227	28449	04570	18882	00023	67101	06895	08915
42	18376	73460	88841	39602	34049	20589	05701	08249	74013	25020
43	53201	28610	87957	21497	64729	64983	71551	99016	87903	63875
44	34919	78801	59710	27396	02593	05665	11964	44134	00273	76358
45	33617	92159	21971	16901	57383	34262	41744	60891	57624	06962
46	70010	40964	98780	72418	52571	18415	64362	90637	38034	04909
47	19282	68447	35665	31530	59838	49181	21914	65742	89815	39033
48	91429	73328	13266	54898	68795	40948	80808	63887	89939	47938
49	97637	78393	33021	05867	86520	45363	43066	00988	64040	09803
50	95150	07625	05255	83254	93943	52325	93230	62668	79529	66964

Source: *Statistical Tables* by Rohlf and Sokal. Copyright © 1969 by W.H. Freeman and Company. Used with permission.

The procedure for selecting a sample using a table of random numbers according as explained in Kumar (1999) is as follows:

1. Identify the total number of elements in the study population. The total number of elements may run up to four or more digits (if the total sampling population is 9 or less, it is considered one digit; if it is 99 or less, it is considered two digits).
2. Number each element starting from one.
3. If the table of random numbers is on more than one page, choose the starting page by a random procedure. Then select a column or a row that will be your starting point with a random procedure and proceed from there in a predetermined direction.
4. Corresponding to the number of digits to which the total population runs, select the same number, randomly of columns or rows of digits from the table.
5. Decide on your sample size.
6. Select the required number of elements for your sample from the table. If the same number is selected twice, discard it and go to the next. This could happen because the table for random numbers is generated by sampling with replacement.

Table 5: Variable factors under consideration

Variables	Variable factor [F(j)]
The lack of supportive institutions	F(1)
Misallocation of investments	F(2)
Lack of effective competition	F(3)
Inadequate maintenance	F(4)
Inconsistent billing strategy	F(5)
Inadequate cost recovery strategy	F(6)
Lack of suitable technical and managerial skill	F(7)
Lack of financial and managerial autonomy	F(8)
Corruption	F(9)
Lack of transparency and accountability	F(10)
Poor wages and remunerations	F(11)
High construction and equipment procurement cost	F(12)
Weather and difficult environmental terrain	F(13)
Inconsistent political, social and economic policies	F(14)
Insufficient funding for infrastructure	F(15)
Hostile communal conflicts	F(16)
Too much pressure on existing infrastructure	F(17)
All of the above	F(18)

1.0. General output for Nigeria:

Table 6: Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	210	133	63
Private	210	130	62
Non governmental	180	97	54
Total	600	360	

Table 7: Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	36	19	15	10	14	15	11	14	10	7	8	10	1	6	2	1	4	1	1.00
F(2)	101	41	33	17	13	19	14	9	10	6	3	4	4	2	4	1	0	0	0.94
F(3)	3	6	16	12	14	12	8	10	6	10	8	5	10	4	3	1	2	0	0.89
F(4)	22	55	39	41	25	11	14	9	9	1	3	4	1	1	1	1	2	1	0.83
F(5)	0	5	9	16	20	18	9	5	9	9	13	7	9	1	2	0	1	0	0.78
F(6)	0	4	9	11	14	16	12	8	9	10	10	6	2	14	3	1	0	0	0.72
F(7)	3	9	11	18	9	17	22	23	16	12	10	4	4	2	2	3	1	0	0.67
F(8)	0	17	12	7	11	9	11	19	18	12	5	10	6	4	2	5	0	0	0.61
F(9)	142	63	19	13	13	9	3	6	4	4	1	0	3	0	0	0	0	0	0.56
F(10)	5	35	35	30	33	20	19	7	9	10	1	2	1	0	0	1	0	0	0.5
F(11)	0	5	10	11	21	20	10	7	7	11	11	2	4	1	2	1	1	0	0.44
F(12)	1	1	7	8	10	19	10	7	9	8	4	13	8	4	3	1	2	0	0.38
F(13)	3	1	13	7	12	7	9	12	6	5	1	3	7	8	9	7	0	2	0.33
F(14)	4	10	12	23	15	24	28	25	11	5	2	4	2	7	3	1	0	0	0.27
F(15)	6	19	33	27	21	14	20	11	15	8	6	4	5	2	6	2	0	0	0.22
F(16)	0	1	1	3	6	6	10	6	8	7	7	6	3	6	8	6	4	2	0.17
F(17)	1	5	11	19	10	6	6	10	3	7	8	4	2	1	4	8	4	3	0.11
F(18)	59	14	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0.06

Output for North Central Nigeria

Table 8 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	14	40
Private	35	15	42
Non governmental	30	13	43
Total	100	42	

Table 9 Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	3	1	2	2	2	1	0	1	0	1	0	0	0	0	0	0	0	0	1.00
F(2)	7	8	4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0.94
F(3)	0	1	2	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0.89
F(4)	3	10	3	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.83
F(5)	0	0	4	3	2	2	0	1	0	1	1	1	2	0	0	0	0	0	0.78
F(6)	0	0	2	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0.72
F(7)	0	1	0	1	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0.67
F(8)	0	1	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0.61
F(9)	21	3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0.56
F(10)	1	4	3	3	4	2	2	1	1	1	0	0	0	0	0	0	0	0	0.5
F(11)	0	1	2	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0.44
F(12)	0	0	0	1	0	2	1	0	0	0	0	2	0	0	0	0	0	0	0.38
F(13)	0	0	3	0	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0.33
F(14)	0	0	3	4	2	2	3	0	1	0	1	0	0	0	0	0	0	0	0.27
F(15)	1	2	1	7	3	4	0	2	3	2	1	0	0	0	1	0	0	0	0.22
F(16)	0	0	1	1	1	2	2	3	0	2	1	1	0	0	0	0	0	0	0.17
F(17)	0	0	1	0	0	0	2	0	1	1	1	0	0	0	0	0	0	0	0.11
F(18)	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06

Output for North eastern Nigeria

Table 10 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	14	40
Private	35	21	60
Non governmental	30	5	17
Total	100	40	

Table 11. Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	1	2	1	1	2	4	4	0	2	0	2	3	0	0	0	0	0	0	1.00
F(2)	4	3	6	2	3	3	1	1	3	1	0	1	0	1	0	0	0	0	0.94
F(3)	0	1	0	5	2	1	3	0	0	1	1	1	2	0	0	0	0	0	0.89
F(4)	1	6	7	3	5	1	1	1	3	0	0	0	1	0	1	0	1	0	0.83
F(5)	0	1	2	1	3	3	3	3	2	1	4	0	0	0	0	0	0	0	0.78
F(6)	1	1	1	3	0	2	2	3	2	2	0	0	1	1	2	0	0	0	0.72
F(7)	0	1	3	6	2	0	3	2	2	2	2	0	1	1	0	1	0	0	0.67
F(8)	0	3	3	1	2	0	0	1	2	1	0	2	3	0	0	0	0	0	0.61
F(9)	33	0	1	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0.56
F(10)	1	15	2	2	3	4	0	0	1	2	0	1	0	0	0	0	0	0	0.5
F(11)	0	1	4	1	4	6	1	0	1	0	4	0	0	0	0	0	0	0	0.44
F(12)	0	2	2	2	0	1	2	1	1	1	1	2	0	0	0	1	0	0	0.38
F(13)	0	0	0	3	3	0	0	0	0	2	0	0	3	3	0	1	0	0	0.33
F(14)	0	0	1	3	1	4	0	4	1	2	0	2	1	1	0	1	0	0	0.27
F(15)	0	3	7	3	2	2	2	2	1	1	0	0	1	1	1	0	0	0	0.22
F(16)	0	1	0	0	1	1	0	0	0	0	0	1	0	3	1	2	1	0	0.17
F(17)	0	1	1	2	1	0	1	0	0	1	1	0	0	1	3	3	1	0	0.11
F(18)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06

Output for North western Nigeria

Table 12 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	27	77
Private	35	19	54
Non governmental	30	19	63
Total	100	65	

Table 13 Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor r $\sigma_i/18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	12	4	4	2	5	2	4	3	2	1	1	2	1	1	1	1	1	1	1.00
F(2)	3	11	3	4	1	4	1	1	0	0	0	0	0	0	0	0	0	0	0.94
F(3)	2	1	10	3	3	3	0	1	0	0	0	0	0	0	0	0	0	0	0.89
F(4)	14	9	2	11	4	3	1	1	1	1	0	0	0	1	0	0	0	0	0.83
F(5)	0	1	1	2	6	2	0	1	1	0	0	0	0	0	0	0	0	0	0.78
F(6)	0	2	5	1	1	7	1	1	1	0	0	0	0	0	0	0	0	0	0.72
F(7)	0	2	1	3	1	3	2	2	1	0	2	0	0	0	0	0	0	0	0.67
F(8)	0	11	6	2	4	2	4	2	0	1	0	0	0	0	0	0	0	0	0.61
F(9)	21	4	2	6	3	2	2	2	1	0	0	0	1	0	0	0	0	0	0.56
F(10)	0	4	3	6	2	2	2	2	0	0	0	0	0	0	1	0	0	0	0.5
F(11)	0	2	0	0	4	0	2	1	2	1	0	0	0	0	0	0	0	0	0.44
F(12)	1	0	3	0	2	4	0	4	0	1	0	1	0	0	0	0	0	0	0.38
F(13)	2	1	8	2	3	1	4	2	1	1	1	0	0	0	0	0	0	0	0.33
F(14)	0	1	1	0	1	5	2	0	0	2	0	0	0	0	0	0	0	0	0.27
F(15)	1	1	1	3	4	2	0	1	1	1	2	0	0	0	0	0	0	0	0.22
F(16)	0	0	0	0	2	0	1	1	1	0	0	0	0	0	0	0	0	0	0.17
F(17)	1	0	1	4	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.11
F(18)	11	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.06

Output for South eastern Nigeria

Table 14 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	19	54
Private	35	21	60
Non governmental	30	16	53
Total	100	56	

Table 15 Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	1	2	0	1	0	3	0	2	0	1	1	0	0	0	0	0	0	0	1.00
F(2)	5	11	8	1	3	3	1	2	2	0	0	0	0	0	0	0	0	0	0.94
F(3)	0	1	2	2	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0.89
F(4)	0	7	9	8	6	1	0	1	3	0	0	0	0	0	0	0	0	0	0.83
F(5)	0	3	2	6	0	3	1	0	0	2	0	0	2	0	0	0	0	0	0.78
F(6)	0	0	0	0	4	1	0	0	0	2	0	0	0	0	0	0	0	0	0.72
F(7)	0	0	2	2	0	1	6	3	0	0	1	0	0	0	0	0	0	0	0.67
F(8)	0	0	1	3	1	1	5	6	1	0	0	1	0	1	0	0	0	0	0.61
F(9)	28	6	1	1	4	3	0	1	2	0	0	0	0	0	0	0	0	0	0.56
F(10)	1	3	3	2	7	3	1	0	2	3	0	0	0	0	0	0	0	0	0.5
F(11)	0	0	0	0	0	2	1	1	0	2	2	0	0	0	0	0	0	0	0.44
F(12)	0	0	1	0	1	1	0	1	1	2	0	2	1	1	0	0	0	0	0.38
F(13)	1	0	1	1	0	4	3	2	2	2	0	1	1	0	0	0	0	0	0.33
F(14)	2	4	2	3	2	7	4	1	4	0	0	0	0	1	0	0	0	0	0.27
F(15)	4	3	3	4	3	0	4	4	3	0	0	0	0	0	1	0	0	0	0.22
F(16)	0	0	0	0	2	0	0	0	3	2	1	0	0	0	0	1	0	0	0.17
F(17)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.11
F(18)	20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06

Output for South-south Nigeria

Table 16 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	35	100
Private	35	32	91
Non governmental	30	30	100
Total	100	98	

Table 17 Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	18	8	3	2	2	3	3	2	2	2	4	4	0	4	1	0	1	0	1.00
F(2)	79	6	10	6	4	6	5	3	2	4	1	2	4	0	3	0	0	0	0.94
F(3)	1	2	1	2	5	5	3	4	3	3	3	3	5	2	1	1	1	0	0.89
F(4)	0	2	13	9	12	6	4	3	3	0	4	2	0	1	0	1	1	1	0.83
F(5)	0	0	1	4	2	5	3	3	4	2	6	4	5	0	2	1	1	0	0.78
F(6)	0	1	0	6	6	1	0	4	1	2	6	1	1	8	1	0	0	0	0.72
F(7)	0	5	2	3	3	10	6	4	2	4	3	1	2	2	2	2	1	0	0.67
F(8)	0	2	2	1	2	5	3	4	2	4	4	4	3	0	1	5	0	0	0.61
F(9)	2	44	11	4	3	3	0	2	0	3	2	2	2	0	0	0	0	0	0.56
F(10)	0	3	19	11	5	4	7	3	3	2	4	1	1	0	0	0	0	0	0.5
F(11)	0	1	3	8	9	5	3	3	3	4	2	2	3	1	0	1	0	0	0.44
F(12)	0	1	0	4	1	3	5	2	7	4	2	3	1	3	3	0	2	0	0.38
F(13)	0	0	1	1	1	0	0	1	1	0	0	0	1	1	8	3	0	2	0.33
F(14)	0	1	3	10	7	4	8	7	5	1	3	0	4	2	1	2	0	0	0.27
F(15)	0	7	6	3	8	4	3	3	5	3	2	3	1	1	3	2	0	0	0.22
F(16)	0	0	0	2	0	3	2	1	1	2	4	2	1	3	2	2	3	16	0.17
F(17)	0	1	4	3	3	3	1	5	1	2	2	2	1	0	1	4	3	3	0.11
F(18)	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.06

Output for South-Western Nigeria

Table 18 Questionnaire distribution and responses

Sectors/Organisation	Number distributed	Number of Respondents	% Number of responses
Public	35	24	69
Private	35	22	63
Non governmental	30	13	43
Total	100	59	

Table 19 Frequencies of Ranked variable factor positions and index factor

Variable Factors F(i)	Frequencies of ranked variable factors position (μ_{ij})																		Index Factor $\sigma_i / 18$
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	
F(1)	1	2	5	4	3	2	0	5	3	2	1	1	0	1	0	0	2	0	1.00
F(2)	3	2	2	3	2	2	3	4	3	1	2	1	0	1	1	1	0	0	0.94
F(3)	0	0	1	0	2	3	0	3	1	5	4	2	3	1	1	0	1	0	0.89
F(4)	4	21	5	3	3	0	3	0	1	0	4	1	0	0	0	0	0	0	0.83
F(5)	0	0	0	0	1	3	4	1	1	2	4	4	2	0	0	0	0	0	0.78
F(6)	0	0	0	1	2	4	2	1	2	4	2	3	1	4	0	0	0	0	0.72
F(7)	2	0	3	3	0	2	3	7	7	4	3	2	1	1	0	0	0	0	0.67
F(8)	0	0	0	0	1	1	0	4	7	5	2	2	3	1	0	0	0	0	0.61
F(9)	36	6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.56
F(10)	2	4	5	6	12	4	3	0	3	3	0	0	0	0	0	0	0	0	0.5
F(11)	0	0	1	2	2	5	1	2	1	3	3	0	1	0	2	0	1	0	0.44
F(12)	0	0	0	1	6	9	3	2	0	0	1	3	3	1	0	0	0	0	0.38
F(13)	0	0	0	0	1	0	0	0	1	0	0	2	2	0	3	0	0	0	0.33
F(14)	2	2	2	3	2	3	9	2	1	0	2	2	1	3	2	0	0	0	0.27
F(15)	0	4	12	7	1	2	4	2	2	1	1	1	0	0	0	0	0	0	0.22
F(16)	0	0	0	0	0	0	1	1	0	1	2	2	2	0	1	1	0	0	0.17
F(17)	0	2	4	9	5	2	2	1	1	1	2	2	1	0	1	1	0	0	0.11
F(18)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.06

Results using severity index in matrix order (SIMO) Model.

Table 20 Severity matrix and actual ranking positions of factors for Nigeria

f(1)	132.62		p(1)	f(9)	256.88
f(2)	236.06		p(2)	f(2)	236.06
f(3)	83.07		p(3)	f(4)	194.38
f(4)	194.38		p(4)	f(10)	162.83
f(5)	85.34		p(5)	f(15)	142.62
f(6)	78.25		p(6)	f(1)	132.62
f(7)	108.02		p(7)	f(14)	120.60
f(8)	92.92		p(8)	f(7)	108.02
f(9)	256.88		p(9)	f(8)	92.92
f(10)	162.83	⇒	p(10)	f(5)	85.34
f(11)	81.81		p(11)	f(3)	83.07
f(12)	67.66		p(12)	f(11)	81.81
f(13)	64.49		p(13)	f(6)	78.25
f(14)	120.60		p(14)	f(12)	67.66
f(15)	142.62		p(15)	f(17)	67.51
f(16)	42.97		p(16)	f(13)	64.49
f(17)	67.51		p(17)	f(18)	63.71
f(18)	63.71		p(18)	f(16)	42.97

p(1)	f(9)= corruption
p(2)	f(2)=misallocation of Investments
p(3)	f(4)=inadequate maintenance
p(4)	f(10)=lack of transparency and accountability
p(5)	f(15)= Insufficient funding for Infrastructure
p(6)	f(1)= Lack of supportive Institutions
p(7)	f(14)=inconsistent political, social and economic policies
p(8)	f(7)=lack of suitable technical and managerial skill
⇒	⇒⇒⇒⇒⇒⇒⇒⇒⇒⇒Demacation point⇒⇒⇒⇒⇒⇒⇒⇒⇒⇒
p(9)	f(8)=lack of financial and managerial autonomy
p(10)	f(5)= inconsistent billing strategy
p(11)	f(3)=lack of effective competition
p(12)	f(11)=poor wages and remunerations
p(13)	f(6)= Inadequate cost recovery
p(14)	f(12)=high construction and equipment procurement cost
p(15)	f(17)=too much pressure on existing Infrastructure
p(16)	f(13)=weather and difficult environmental terrain
p(17)	f(18)= all of the above
p(18)	f(16)=hostile communal conflicts

Thus: $D_1 = 5$; and $D_3 = 14$; $h_1 = 142.62$ and $h_2 = 67.66$

∴ Threshold value =105.14

N.B. In applying equation (10) Variable factors in the matrix having magnitudes greater than or equal to the Threshold value are to be considered critical in policy formulation.

Table 21 severity matrix and actual ranking positions of factors for North-central Nigeria

f(1)	10.77		p(1)	f(9)	26.21
f(2)	20.03		p(2)	f(18)	22.94
f(3)	5.22		p(3)	f(4)	22.27
f(4)	22.27		p(4)	f(2)	20.03
f(5)	11.59		p(5)	f(15)	18.92
f(6)	5.33		p(6)	f(10)	18.82
f(7)	9.17		p(7)	f(16)	12.01
f(8)	4.88		p(8)	f(5)	11.59
f(9)	26.21		p(9)	f(14)	11.44
f(10)	18.82	\Rightarrow	p(10)	f(1)	10.77
f(11)	7.00		p(11)	f(13)	10.29
f(12)	3.59		p(12)	f(7)	9.17
f(13)	10.29		p(13)	f(11)	7.00
f(14)	11.44		p(14)	f(6)	5.33
f(15)	18.92		p(15)	f(3)	5.22
f(16)	12.01		p(16)	f(8)	4.88
f(17)	3.05		p(17)	f(12)	3.59
f(18)	22.94		p(18)	f(17)	3.05

p(1)	f(9)= corruption
p(2)	f(18)= All of the above
p(3)	f(4)=inadequate maintenance
p(4)	f(2)= Misallocation of investments
p(5)	f(15)= Insufficient funding for Infrastructure
p(6)	f(10)= Lack of transparency and accountability
\Rightarrow	$\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow$ Demarcation point $\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow$
p(7)	f(16)= Hostile communal conflicts
p(8)	f(5)= Inconsistent billing strategy
p(9)	f(14)= Inconsistent social, political and economic policies
p(10)	f(1)= Lack of supportive Institutions
p(11)	f(13)= Weather and difficult environmental terrain
p(12)	f(7)= Lack of suitable technical and managerial skill
p(13)	f(11)= Poor wages and remunerations
p(14)	f(6)= Inadequate cost recovery strategy
p(15)	f(3)= Lack of effective competition
p(16)	f(8)= Lack of financial and managerial authonomy
p(17)	f(12)= High construction and equipment procurement cost
p(18)	f(17)= too much pressure on existing Infrastructure

Thus: $D_1 = 5$; and $D_3 = 14$; $h_1 = 18.92$ and $h_2 = 5.33$

\therefore Threshold value ≈ 12.125

N.B. In applying equation (10) Variable factors in the matrix having magnitudes greater than or equal to the Threshold value are to be considered critical in policy formulation.

Table 24 Results severity matrix and actual ranking positions of factors for South-eastern Nigeria

$f(1)$	8.03	$p(1)$	$f(9)$	41.87
$f(2)$	30.86	$p(2)$	$f(2)$	30.86
$f(3)$	5.66	$p(3)$	$f(4)$	29.87
$f(4)$	29.87	$p(4)$	$f(14)$	24.41
$f(5)$	15.70	$p(5)$	$f(15)$	24.07
$f(6)$	5.51	$p(6)$	$f(10)$	21.18
$f(7)$	12.62	$p(7)$	$f(18)$	20.94
$f(8)$	12.61	$p(8)$	$f(5)$	15.70
$f(9)$	41.87	$p(9)$	$f(7)$	12.62
$f(10)$	21.18	$p(10)$	$f(8)$	12.61
$f(11)$	4.43	$p(11)$	$f(13)$	12.27
$f(12)$	5.71	$p(12)$	$f(1)$	8.03
$f(13)$	12.27	$p(13)$	$f(12)$	5.71
$f(14)$	24.41	$p(14)$	$f(3)$	5.66
$f(15)$	24.07	$p(15)$	$f(6)$	5.51
$f(16)$	4.85	$p(16)$	$f(16)$	4.85
$f(17)$	2.00	$p(17)$	$f(11)$	4.43
$f(18)$	20.94	$p(18)$	$f(17)$	2.00

$p(1)$	$f(9)$ = corruption
$p(2)$	$f(2)$ = Misallocation of Investments
$p(3)$	$f(4)$ = inadequate maintenance
$p(4)$	$f(14)$ = Inconsistent social, political and economic policies
$p(5)$	$f(15)$ = Insufficient funding for infrastructure
$p(6)$	$f(10)$ = Lack of transparency and accountability
$p(7)$	$f(18)$ = All of the above
$p(8)$	$f(5)$ = Inconsistent billing strategy
\Rightarrow	$\Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow$ Demarcation point $\Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow$
$p(9)$	$f(7)$ = Lack of suitable technical and managerial skill
$p(10)$	$f(8)$ = Lack of financial and managerial autonomy
$p(11)$	$f(13)$ = Weather and difficult environmental terrain
$p(12)$	$f(1)$ = Lack of supportive Institutions
$p(13)$	$f(12)$ = High construction and equipment procurement cost
$p(14)$	$f(3)$ = Lack of effective competition
$p(15)$	$f(6)$ = Inadequate cost recovery
$p(16)$	$f(16)$ = Hostile communal conflicts
$p(17)$	$f(11)$ = Poor wages and remunerations
$p(18)$	$f(17)$ = Too much pressure on existing infrastructure

Thus: $D_1 = 5$; and $D_3 = 14$; $h_1 = 24.07$ and $h_2 = 5.66$

\therefore Threshold value = 14.87

N.B. In applying equation (10) Variable factors in the matrix having magnitudes greater than or equal to the Threshold value are to be considered critical in policy formulation.

Table 25 Severity matrix and actual ranking positions of factors for South-south

f(1)	44.22		p(1)	f(2)	117.44
f(2)	117.44		p(2)	f(9)	69.04
f(3)	24.62		p(3)	f(4)	45.69
f(4)	45.69		p(4)	f(1)	44.22
f(5)	21.28		p(5)	f(10)	42.70
f(6)	23.46		p(6)	f(15)	36.05
f(7)	32.20		p(7)	f(11)	32.80
f(8)	20.80		p(8)	f(7)	32.20
f(9)	69.04		p(9)	f(14)	31.87
f(10)	42.70	⇒	p(10)	f(3)	24.67
f(11)	32.80		p(11)	f(6)	23.46
f(12)	18.27		p(12)	f(5)	21.28
f(13)	13.39		p(13)	f(8)	20.80
f(14)	31.87		p(14)	f(17)	18.60
f(15)	36.05		p(15)	f(12)	18.27
f(16)	13.00		p(16)	f(13)	13.39
f(17)	18.60		p(17)	f(16)	13.00
f(18)	11.39		p(18)	f(18)	11.39

p(1)	f(2) = Misallocation of Investments
p(2)	f(9) = Corruption
p(3)	f(4) = Inadequate maintenance
p(4)	f(1) = Lack of supportive Institutions
p(5)	f(10) = Lack of transparency and accountability
p(6)	f(15) = Insufficient funding for Infrastructure
p(7)	f(11) = Poor wages and remunerations
p(8)	f(7) = Lack of suitable technical and managerial skill
p(9)	f(14) = Inconsistent social, political and economic policies
⇒	⇒⇒⇒⇒⇒⇒⇒⇒⇒⇒ Demarcation point ⇒⇒⇒⇒⇒⇒⇒⇒⇒⇒
p(10)	f(3) = Lack of effective competition
p(11)	f(6) = Inadequate cost recovery
p(12)	f(5) = Inconsistent billing strategy
p(13)	f(8) = Lack of financial and managerial autonomy
p(14)	f(17) = Too much pressure on existing Infrastructure
p(15)	f(12) = High construction and equipment procurement cost
p(16)	f(13) = Weather and difficult environmental terrain
p(17)	f(16) = Hostile communal conflicts
p(18)	f(18) = All of the above

Thus: $D_1 = 5$; and $D_3 = 14$; $h_1 = 42.70$ and $h_2 = 18.60$

∴ Threshold value = 30.65

N.B. In applying equation (10) Variable factors in the matrix having magnitudes greater than or equal to the Threshold value are to be considered critical in policy formulation.

Table 9.0. Severity magnitude and coefficient of variation (CV)

Variable factor	Severity of factors result values across regions							Mean (m)	Standard deviation (s)	Standard-error	Coefficient of variation [(m /s)100]%
	South-western	North-central	North-eastern	North-western	South-eastern	South-south					
F(1)	21.47	10.77	15.42	34.81	8.03	44.22	22.45	14.29	5.84	63.66	
F(2)	20.70	20.03	22.54	50.81	30.86	117.44	43.73	37.92	15.48	86.72	
F(3)	13.61	5.22	13.97	19.44	5.66	24.62	13.75	7.60	3.10	55.26	
F(4)	35.97	22.27	24.16	40.99	29.87	45.69	33.16	9.34	3.81	28.18	
F(5)	11.73	11.59	13.93	10.44	15.70	21.28	14.11	3.99	1.63	28.25	
F(6)	14.71	5.33	12.72	14.15	5.51	23.46	12.65	6.75	2.76	53.39	
F(7)	22.98	9.17	17.15	16.77	12.62	32.20	18.48	8.18	3.34	44.24	
F(8)	13.26	4.88	10.74	27.12	12.61	20.80	14.90	7.87	3.21	52.82	
F(9)	46.47	26.21	38.23	38.75	41.87	69.04	43.43	14.23	5.81	32.78	
F(10)	32.67	18.82	25.14	17.81	21.18	42.70	26.39	9.64	3.94	36.55	
F(11)	13.86	7.00	17.10	8.89	4.43	32.80	14.01	10.29	4.20	73.45	
F(12)	18.06	3.59	10.42	8.89	5.71	18.27	10.82	6.17	2.52	56.98	
F(13)	4.03	10.29	7.80	22.07	12.27	13.39	11.64	6.11	2.49	52.49	
F(14)	22.46	11.44	12.57	9.77	24.41	31.87	18.75	8.83	3.61	47.11	
F(15)	28.81	18.92	18.98	13.83	24.07	36.05	23.44	8.01	3.27	34.17	
F(16)	4.02	12.01	4.30	4.74	4.85	13.00	7.15	4.17	1.70	58.27	
F(17)	23.40	3.05	8.04	9.05	2.00	18.60	10.69	8.58	3.50	80.22	
F(18)	2.06	22.94	4.00	11.61	20.94	11.39	12.16	8.52	3.48	70.07	

APPENDIX B:
PUBLICATIONS

**MODELLING IN RANKING PROCEDURES; A CASE STUDY:
INFRASTRUCTURE FAILURES IN NIGERIA**

A. Omoregie¹, O. J. Ebohon² and D. Radford³

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