



Evaluation of Civil Engineering Works for Sustainable Environment and Safety of Rural Infrastructure

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ABSTRACT: Infrastructure development is the basis of measuring the performance of democratic leaders and it is the foundation of good democratic governance. Infrastructure is the medium, the tools and techniques of a project or programme or strategy. This paper gives overview of various matter concerning civil engineering works for sustainable environment and safety of rural infrastructures. The research adopts the desk study research and takes a critical evaluation of policy documents, theoretical models and plans of government at all levels (federal, state and local governments) and their implication for rural development. The findings of the study show that though a number of policies, programme have been initiated and executed, and theories promulgated, they have tended to serve the interest of the political elite and their cronies to the mortification of those whom the policies were planned for. Demand for infrastructural development is higher and resources used in provision of infrastructure are limited. Infrastructure development in democratic governance involves identifying the right project, carrying out feasibility and viability studies and carrying out physical development of the project. The challenges are numerous and include finance, technology for development, maintenance and design. The challenges also include international requirements of project to be sustainably developed. Essential measures must be put in place for accelerated rural infrastructural and sustainable engineering works.

KEY WORDS: Civil Engineering, Infrastructure, Environment, Rural, Development

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I. INTRODUCTION

Infrastructure is the basic physical and organizational structures needed for the operation of a society like industries, buildings, roads, bridges, health services, governance and so on. It is the enterprise or the products, services and facilities necessary for an economy to function (Sullivan and Sheffrin, 2003). Infrastructure can be described generally as the set of interconnected structural elements that provide framework supporting an entire structure of development. It is the means of achieving an objective or set of objectives and also includes the objectives.

It is an important term for judging a country, region or state's and individual's developments/status. The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, electrical national grids, telecommunications, and so forth, and can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions" (Fulmer, 2009).

Viewed functionally, infrastructure facilitates the production of goods and services, and also the distribution of finished products to end-users (markets), as well as basic social services such as schools and hospitals; for example, roads enable the transport of raw materials to a factory

The word infrastructure has been used in English since at least 1927 according to Online Etymology Dictionary (2012), originally meaning "The installations that form the basis for any operation or system ". Infrastructure in developing countries connotes roads and transport infrastructures. The advent of telecommunication infrastructure in Nigeria brought infrastructure to the front seat as the products and services necessary for the performance of an entity.

There are two types of infrastructure, "Hard and Soft" infrastructure. Hard refers to the large physical networks necessary for the functioning of a modern industrial nation, whereas "soft" infrastructure refers to all the institutions which are required to maintain the economic, health, and cultural and social standards of a country, such as the financial system, the education system, the health system, the governance system, and judiciary system, as well as security (Kumar, 2005).

Government is the system that organizes and sensitizes the people of an area in other for all to have an acceptable community. Government have the power to put in place all measures that it deems fit will make an environment conducive for living for everybody. The military era in Nigeria was for the most part of the economic boom and only succeeded in widening the gap in infrastructure demand and provision. Most infrastructures are now decayed and need repair or replacement.

1.1 Overview and Nature of Infrastructure in Nigeria

Infrastructure development is one of the bases of assessing the achievements of democratic leaders and it is the foundation of good democratic governance. Agitation for infrastructural development is higher in democratic government than in military dictatorship or compared to developed countries. This is because the resources for provision of infrastructure are always scarce. Ethnic-interest agitation and lobbying are common things in democratic governance in developing countries. This is why the Office of Government Commerce (OGC) in United Kingdom, advised that infrastructure project initiation should be done by an office specifically established to do this job. (P3O, 2008).

The Infrastructural report of Nigeria just like any third world country is nothing to write home about. The housing situation is in a sorry state both quantitatively and qualitatively (Agbola, 1998; Ajanlekoko, 2001; Nubi, 2000; Onibokun, 1996 Oyedele, 2006). Most infrastructures are now decayed and need repair, rehabilitation or replacement. Government is the system that plans, organizes, controls and supervises the people who are resident in an area in other for all to have conducive-environment for living and a sense of belonging.

Sustainable infrastructure refers to the designing, building, and operating of these structural elements in ways that do not diminish the social, economic and ecological processes required to maintain human equity, diversity, and the functionality of natural systems. Governments have the power to put in place all measures that it deems fit will make an environment beneficial for living for everybody. Infrastructure development in democratic governance is more challenging because of the accessibility of people to government and involves identifying the right project, carrying out feasibility and viability studies and embarking out physical development of the project. The challenges are numerous and include finance, technology for development, maintenance and design.

The challenges also include quality requirements of projects to meet international standard and to be sustainably developed. Projects must meet the carbon emission standard set by international organizations like International Standard Organization.

1.2 The Nature of Infrastructural Development in Nigeria

The state of infrastructure of any state is directly related with the quality of life. "According to recent statistics, the quality of life for most people in Africa appears to have either not improved or only done so marginally. This situation arose from the misrule of early leaders most of whom spearheaded the struggle for independence" (Eregha, 2007).

The horrible state of affairs in Africa led to untold devastation of economies in the continent; people had to live below the poverty line with food insecurity, no shelter to accommodate them and no medical or educational facilities to give them some hope for the future. In each case, the oppressive conditions in which they lived with no basic infrastructure led these people to evolve gradually into a class of disgruntled citizens desperate for change. In almost all cases, the military provided the answer by way of coup d'etat that toppled these political classes.

The meaning of rural development has also evolved over time in line with current realities. According to the World Bank (2000), rural development is understood as strategies and policies designed at improving the economic and social life of a specific group of people –rural poor. Wikipedia (2014) describes rural development as the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated area.

Integrated rural development is different from general development because, as a matter of policy, it places greater emphasis on the mobilization and development of human resources potential and on achieving a more equitable access to resources and fairer distribution of income. With regards to planning, integrated rural development goes beyond the agricultural sector. It embraces at the national level an overall policy conducive to achieving social improvements of the rural masses and takes up the complexity of regional area development when it comes to implementation, including aspects of administrative decentralization and people organization. As a national philosophy, the concept of integrated rural development Programmes, relying heavily on the concept of regional self-reliance as well as on its own efforts.

Usually, such military governments professed to have come in as corrective regimes that would stay for only brief periods within which they would right wrong things before handing over to democratic governments. These military governments often ended up entrenching themselves in power. In fact, most of them exhibited all the traits of the much-vilified early leaders and even more (Ikpi, 1997: 18). The civil wars have led to the neglect of provision of infrastructure such as education facilities and health buildings, and in some cases, agricultural services and transport facilities were destroyed.

School buildings have been converted to military use. Civil wars in Africa undermine the continent's productive capacity, destroy or severely weaken social structures, distort economic policy, pollute the value-systems of the people and perpetuate prolong poverty (Elu, 2000: 60). It is evident that Africa is the poorest continent in the world and the present situation shows backward movement in terms of infrastructural provision especially, the technology based. "It has now become clear, even to obstinate and recalcitrant policy makers, that unless drastic measures are taken, living conditions for most people in this continent will continue to fall" (Elu, 2000: 60).

There are many theories of development: they are classified into modernization and dependency. The modernization theorists based their argument on Economic, Psychology and Diffusion. The economic approach of Rostow (1962: 6) identified five stages in the process of a nation's economic development. Rostow's postulation is that underdevelopment was an original position from which traditional societies could move through (stages) to development without a recourse to social revolution.

Hagen (1962: 16) argued that traditional developing nations produced authoritarian personalities who lacked self-confidence, exhibited a high level of anxiety when faced with new situations and who were content to preserve the status quo. Developed societies have more innovative personalities who display self-confidence, derived satisfaction in solving problems and who are achievers. He argued further that for development to occur, individual personalities had to change.

II. THE BENEFIT OF INFRASTRUCTURE IN NATIONAL DEVELOPMENT

The African Development Bank (ADB) has made infrastructure development a cornerstone in its development agenda with regional member countries (TMSA, 2012). The Bank recognizes that lack of adequate social and economic infrastructure is one of the key constraints to short- and medium-term poverty reduction in Africa, and has thus been a major force in private and public sector infrastructure development through the provision of financial and technical resources. At the same time, the Bank recognizes the increasing importance of governance for infrastructure development and has made good governance an imperative in its lending and non-lending operations. There have been considerable changes in the delivery of national infrastructure services across Africa. While Nigeria has improved its telecommunication infrastructural situation, it has not improved in other areas like health, education, airport infrastructures, electricity, housing and transportation.

However, performance in terms of infrastructure service delivery and quality continue to vary across countries. Infrastructure is the medium of production of goods and services and forms the national asset of any nation. According to Kathmandu Final Workshop Report (2009), infrastructure can help solve four problems: social; health and environment; development; and, economics. A region's infrastructure network, broadly speaking, is the very socio-economic climate created by the institutions that serve as conduits of trade and investment. Some of these institutions are public, others private.

In either case, their roles in the context of integration are transformative, helping to change resources into outputs or to enhance trade by removing barriers. Therefore, an improvement in regional infrastructure is one of the key factors affecting the long-term economic growth of a region. The linkages between infrastructure and economic growth are multiple and complex. Not only does infrastructure affect production and consumption directly, it also creates many direct and indirect externalities. It also involves large flows of expenditure, thereby creating additional employment. Studies have shown that infrastructure can have a significant impact on output, income, employment, international trade, and quality of life.

Infrastructure development can reduce stress and promote good health. It will also reduce crime level. Infrastructure has always played a key role in integrating economies within a region. Well-developed and efficient infrastructure is essential for a region's economic development and growth. In a dynamic concept, infrastructure is seen as a regional public good that moves factors of production within and across countries, thus helping the region attain higher productivity and growth.

Examples of Civil Engineering works such as road construction and in-situ geotechnical investigation works are indicated in plate 1 and plate 2.



Plate 1: Typical Road Construction Works for Rural Infrastructural Development



Plate 2: On-Going Geotechnical Works for Rural Infrastructural Development

2.1 The Challenges of Infrastructural Development in Nigeria

The challenges of infrastructure development in Nigeria are:

- **Dearth of Visionary Leaders:** Visionary leaders are the builders of a new dawn, working with imagination, insight, and boldness. They present a challenge that calls forth the best in people and brings them together around a shared sense of purpose. Visionary leaders are change agents. Nigeria contains few change agents and therefore lacks the needed infrastructure to develop the nation.
- **Demand and supply:** Due to poor performances of most past leaders in the area of infrastructure provision, the agitation for infrastructure development overwhelms the provision. With a land mass of 9,110,000 square kilometers of land and over 150,000 million people, Nigeria has a total road network

of 193,200km. This comprise of 34,123km federal roads, 30,500km state roads and 129,577 km local government roads. Unfortunately, over 70% of the federal roads are in bad state of repair. In the area of housing, Nigeria requires about 17 million housing units and 60 trillion naira in order to meet its housing needs.

- **PESTLES Analysis:** The challenges of infrastructural development in Nigeria can be discussed under PESTLES Analysis. Challenges infrastructural development can be: political, economic, social, technology, legal, environmental and safety. Political environment has to do with the political stability, policy formulation and politics of the project environment both within and without.

Economic environment deals with issues like interest rate, inflation, currency exchange rate, price fluctuation etc. Social environment has to do with workforce diversity including cultural difference, age difference etc. Technology environment deals with the machineries which are used for the execution of projects. Physical environmental issues like site topography, geology and climatology is also essential. Safety issues have to do with health and safety and security of resources on site, that is, human, material and financial. While some countries have been able to implement individual projects to alleviate those difficulties, Nigeria does not have common strategic targets for infrastructure development. Good governance is crucial for ensuring the effective and efficient provision of infrastructure. This is largely because, firstly, good governance means that resource allocations will reflect national developmental priorities and thus respond to societal demands.

- **PARETO Analysis:** Pareto analysis is a statistical method in decision making that is used for the identification of a specific number of tasks that produce major impact. It uses the Pareto Principle (which is also called the 80/20 rule). It originated the idea that by doing specific 20% of the work, you can generate 80% of the benefits of doing the whole job. In terms of quality improvement, a large majority of defects (80%) are produced by a few key causes (20%). This is also known as the vital few and the trivial many. In project management, 80% of project delays are caused by 20% of tasks etc. It can also mean that 80% of the tasks are done by 20% of the workforce.

- **Development Matrix:** The four requirements of any physical infrastructure projects are: design, finance, technology and management. The appropriate designs that will ensure value for money are not adopted. The finance is not adequate, is procured at high interest rates and financial management is lacked by most Nigerian contractors. The technology of construction is scarce and the management of infrastructure is lacking. The maintenance culture of Nigerians is poor thereby allowing most projects to decay.

- **Capital Flight, Capital Sink and Capital Stagnancy:** Infrastructure development projects in Nigeria suffer from capital flight, capital sink and capital stagnancy. A lot of materials and managerial services are procured outside the country. The contracts are full of loop-holes that allow leakages of funds. In some cases, there are over-design for the designers to earn more professional fees which are percentage of the contract sum. Capital stagnancy due to abandoned projects are also rampant.

- **Project Management:** Project management approach in project delivery evolved in the late fifties in the United States of America (USA) when it was first used by the American Army for military projects execution.

- **Procurement Method:** The procurement methods being adopted are prone to criticisms. The Public Finance Initiatives, especially the Concession Method and Public/Private Partnership (PPP) are questionable and seems to mortgage others who are not part of the arrangement to the scheme's future.

- **Corruption:** Corruption does not only raise the price of infrastructure, it can also reduce the quality of, and economic returns from, infrastructure investment. The corruption in Nigeria is very high and unbearable for effective infrastructural development. The Bureau of Public Procurement (BPP), the Independent Corrupt Practices Commission (ICPC) and Economic and Financial Crimes Commission (EFCC) have not been able to eradicate corruption in the country. The BPP has saved the country a whopping sum of N216.6 billion during the 2010 Appropriation year from its review of contract processes before the issuance of Certificate of No Objection.

III. CONCLUSION AND RECOMMENDATION

The challenges of infrastructure development in third world countries are many. The demand surpasses the supply and finance that will stimulate rapid provision is not there. Due to wide gap between provision and needs, the leadership classes are in arrears in all sectors. The political situation is not encouraging to foreign investors. Governments do not set the priority right in infrastructure development. Projects are supposed to meet objectives, but in most cases, projects embarked upon are white elephant projects. The development of rural Nigeria as a matter of deliberate policy for the entire societal development remains a central problem to policy makers. A review of past policies and approaches to rural development in Nigeria show that there were bedeviled with a number of problems. Good governance will be the only antidote that can bridge the wide gap. Secondly, good governance promotes accountability, reduces corruption and therefore minimizes resource wastage through inefficiency. And finally, good governance ensures stability (economic and political) and reduces the level of risk associated with large and lumpy infrastructure investments. This in turn facilitates the mobilization of both public and private sector financing resources that are critical for infrastructure development. The country has a big land mass that makes it possible to spread out. Connecting the people of Nigeria with roads, National Grid and potable water will be tasking. High cost of materials for infrastructure development is also a challenge. The local content of production of goods and services must be increased to reduce production cost.

Corruption level in Nigeria is too high and allows incompetent hands to handle contracts. Professionals are not allowed to handle projects due to corruption. The cost of governance and recurrent expenditure are so high leaving little for capital expenditure. The high level of unemployment is a dis-incentive to market and to capital development.

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