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CHAPTER 17

DUTIES OF ENGINEERS IN MAINTENANCE OF PUBLIC PHYSICAL INFRASTRUCTURES IN NIGERIA

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Introduction

Public physical infrastructures are the basic essential facilities and services that should be put in place for development in any nation, this is because it facilitates and accelerates economic development, such that where there are no infrastructures, economic development and growth would be difficult to achieve. Economic development or growth is virtually impossible without a thriving infrastructure sector (Fidelis *et al.,* 2014), particularly as it relates to the construction, management, and regulation of infrastructure projects. These physical infrastructures range from; public buildings, ports, water supply, sewage and sanitation system, power, water resources, schools, bus terminals, residential housing estates, industrial and commercial mega-structures, and office complexes, airports, telecommunication services, hospitals, roads, railway, air transportation system, communication facilities, and so on. It is important to note that without infrastructure, enterprise and movement cannot happen. Infrastructure is central to Nigeria's economic growth; it is at the core of good governance and public welfare, and any improvement in infrastructure can positively impacts the nation's Gross Domestic Product (GDP). Several benefits can be derived from public physical infrastructures;

- Infrastructures generally serve as catalyst for public development in the entire government agenda, such as healthcare delivery, transportation, education and food security.
- Infrastructure level affects the development rating of any nation and contributes significantly to human development, attainment of Sustainable Development Goals

(SDGs) and ensures inclusive growth. By inclusive growth, it means that majority of the citizenry share benefits of the growth. Adequate infrastructure and their efficient workings are necessary for the integration of any nation's economy. Infrastructure, in the form of public buildings, roads, water and sewerage systems, electricity and other services, supports quality of life such as healthcare, education, human capital development, and it is the foundation of a healthy economy (Kevin, 2009).

- The World Trade Centre and Lekki Free Trade Zone will create more business opportunities for foreign and local investors and increase tourism and entertainment. It will also boost commercial and residential real estate development.
- Through efficient transportation facilities, the growth of trade and commerce can be enhanced. The railways will create employment opportunities for more Nigerians across the country, ease congestion on the roads, generate more income for the government, and reduce production costs.
- Increased power generation and supply as well as better telecommunication services are also key contributors that can enhance the productivity of businesses and industries. It also facilitates financial transactions, trade and investments and provides access to adequate functional infrastructure in order to ensure good health of the population, and consequently increasing work efficiency and productivity in the economy.

However, in Nigeria, the current maintenance level is insufficient to preserve the quality of the existing infrastructures resulting in annual deterioration. Ample resources have been allocated for rehabilitation, but not enough of these resources are reserved for maintenance. A historical trend of prioritizing new infrastructure over maintaining existing ones further exacerbate deterioration of existing infrastructure. The deplorable state of public infrastructure in Nigeria calls for proper and routine maintenance to be carried out in order to save our infrastructure from total collapse, and to ensure the continuous functioning and use. Engineering is a well-respected, world-class reputable profession, engineers cannot continue to fold their arms and watch Nigeria's public physical infrastructures which worth billions of naira to be wasted, hence, a swift action must be taken. Therefore, this paper, reviewed existing literatures, highlights the status of our public infrastructures and duties of engineers towards the maintenance of public infrastructures in Nigeria.

Maintenance of Public infrastructures

In Nigeria today, government custodianship of public utilities has resulted in operational inefficiency and unsatisfactory services. One of the feasible solutions to this problem is the implementation of public private partnership (PPP). It offers one of the greatest potentials of resolving infrastructural inadequacies and meeting internationally accepted development goals. It is crucial to emphasize that the provision and maintenance of our engineering infrastructure is one of the essential pathways to the actualization of development and progress in our nation. Maintenance is a very important aspect of infrastructural management that requires planning. This is because lack of maintenance leads to serious economic loss. Tijani *et al*. (2016) noted that maintenance culture means the habit of regularly and consistently keeping a building, machine, facilities, equipment, infrastructures etc., in good and working condition, and if a nation must develop, it is imperative that installation as well as maintenance of its existing facilities be given priority. Many developed nations invest on infrastructure and depend on it as a source of revenue for their economy, hence, they take maintenance of these infrastructures seriously. Countries like Dubai use infrastructure to attract tourists to their nation and this in turn yield revenue for the country (Cobbinah, 2010). The United Kingdom, Canada, United States of America, Australia, New Zealand, South Africa, Germany, France, Japan, China, Hong Kong have many developed educational institutions with adequate infrastructure which is one of the reasons why many Nigerians troop into these countries, spend a lot of money to acquire education (Cobbinah, 2010). This in turn generates huge revenue for these countries. Infrastructural development with well planned maintenance is one of the major characteristics of a developed nation. That is why in many developed nations, there is a huge presence of several well maintained infrastructures like sky scrapers, tall buildings etc. Tijani *et al.* (2016) stated that maintenance of physical infrastructures will increase the life span, allows for their availability, retains their proper functioning, keep assets from deteriorating in appearance and aesthetics, allows them to optimally achieve their full potential service life and minimizes downtime and/or disruption to services. It was also added that poorly maintained facility may conversely lead to more frequent failure of the such facility, low utilization rate and delaying of production schedule.

The Nigerian Physical Public Infrastructures - Maintenance Plight

Infrastructural development and maintenance play a great role in the socio-economic growth of any nation, but for decades, many factors have bedeviled infrastructural facilities in Nigeria, which has seriously affected its economic growth. The state of the country's public infrastructure is still a far cry from what is expected when compared to other economies of the world. Over the years, Nigeria has had a number of laudable projects that make one proud of being a Nigerian. Physical infrastructures like some roads, railways, and structures constructed over time have been abandoned and poorly maintained, they were allowed to undergo rapid deteriorations with passage of time. Most of these laudable projects in Nigeria are in their most deplorable state which constitutes threat to social, economic and infrastructural advancement of Nigeria. It is common knowledge that the deplorable state of public facilities in Nigeria poses great concern to stakeholders. The state of facilities at the airports, hospitals, schools, roads etc., gives an indication that the society lacks an agent that would help her manage, ensure effective and efficient functioning of the facilities as well as fostering national development (Tijani *et al.,* 2016).

Railway tracks are being subjected to wanton destruction, bridge railings are being removed, manhole covers are being pilfered, street lights and other power infrastructure, oil pipelines, telecoms facilities and critical aviation infrastructure are being damaged or stolen, removal of rail tracks can cause train derailment, with deadly consequences. But having been built and made to serve the immediate purpose they were meant to serve, they ended up in most cases forgotten, abandoned and at its best given very little attention, leading to its poor maintenance and management.

The declining maintenance culture in Nigeria and its effects on public infrastructure have become a big problem to the government at all levels. Emmanuel (2021) noted that Nigeria has long suffered massive infrastructure deficit due to decades of neglect, and the absence of maintenance culture. Nahimah (2008) observed that flaws in the Nigerian aviation sector was attributed to lack of maintenance culture and the training of professional engineers. The author further argued that, acquiring aircrafts is not as relevant to the industry as good maintenance of the existing ones, adding that a well maintained aging aircraft is as good, if not better than a poorly maintained new aircrafts. Routine infrastructural maintenance has

been an Achilles' heel in many Nigerian public institutions due to poor funding, misuse of facility by occupants, bribery and corruption etc. (Adenuga *et al.,* 2006). Adekalu (2020) added that consolidation of past development efforts by successive governments, efficient utilization, effective management and maintenance of facilities, access to credit facilities and inflation are other factors affecting development. In Nigeria today, many infrastructural facilities in public institutions are inadequately maintained. The few that are maintained are allowed to dilapidate completely owing to lack of a sustainable maintenance plan. Consequently, many infrastructures in public are fast losing their economic value and at the same time putting the life of the users in danger (Ugwu *et al,* 2018). Typical example is, when Cross Rivers state's government constructed Tinapa, it was a world-class recreational facility and a project of envy by other states. However, in recent times, Tinapa has lost its glory and grandeur. The poor infrastructural situation of Nigeria has really succeeded in having a very severe effect on the lives of Nigerians.

Previous studies by Omotehinshe, Dabara & Guyimu, (2015) had suggested the deteriorating nature of public facilities in terms of street lights that were erected some years back by the past and present governments that would have served as means of beautification and illumination in our society, but due to lack of maintenance culture in terms of bulbs replacement or fixing minor faults has turned our roads to death traps and hubs of illicit games, such as arm robbery stations. It is saddening that Nigerian Government focuses on new infrastructures, especially as government changes from one tenure to another, whereas old infrastructures are left to depreciate.

Duties of Engineers toward the maintenance of Physical Public Infrastructures

1. The first duty of engineers is to realize and acknowledge that Nigerian public infrastructures belong to all. Hence, maintaining these public utilities should be a collective responsibility. This knowledge should be inculcated into the incoming future engineers, so as to have a right attitude towards public infrastructures. When they have maintenance culture, they would have the attitude to maintain, preserve and protect them.
2. It is observed that in Nigeria, most public infrastructures are constructed and commissioned without any blueprint on how they should be maintained. It is the duty of engineers to ensure such blueprints are provided.

3. Infrastructure without engineers is like an education system without teachers or a health care system without doctors. This is impossible!. Since the engineers are in charge of the designing and construction of these infrastructures, they should be responsible for their maintenance.
4. It is the duty of engineers to ensure that at the design stage, ease of maintenance should be factored in mind. This is because a skillful design can reduce the amount of maintenance work and also make it easier to perform, since maintenance begins on the drawing board. It is at the design stage that the maintenance can be influenced for better or worse. Where the engineer fails to make adequate consideration for minimizing maintenance problems, it always turns out to be a big problem when the structure is eventually occupied for use.
5. It is the duty of engineers as professionals to advise the government on developing norms and standards for maintenance of different types of public infrastructure, provision of guidelines and policies for their maintenance. That is, advise on formulation of national infrastructure maintenance strategy based on comprehensive information on the state of infrastructure and the state of its management. It is the duty of engineers to make intelligent suggestions, contributions and recommendations towards the adoption of effective maintenance framework that would address the infrastructural maintenance problems in Nigeria.
6. Engineers must give proper or adequate information, awareness or guide to the public, through training and sensitization on how to rightly use these public infrastructures. They are to ensure that strict infrastructural maintenance standards are not compromised.
7. Periodic visual inspection, periodic non-destructive strength assessment, periodic assessment of usage to avoid overloading beyond the carrying capacity are the duties of engineers. Carrying out routine check and assessment on the state of the infrastructures from time to time, to know the level or extent of dilapidation and the necessary repairs or services required. Brainstorm on factors that could damage these infrastructures and how to avoid them.
8. It is the duty of engineers to understand the full lifecycle of infrastructures, and adopt sound asset management practices. This helps to measure the condition and remaining service life of existing infrastructure. A lifecycle perspective that consistently assesses

the condition and performance of infrastructure can save money and improve safety over time. For the lifecycle perspective to work, an engineer needs accurate information on the current state of infrastructure, and a consistent set of indicators and processes to assist with long-term maintenance planning.

9. Monitoring and evaluation processes must be strengthened and implemented with mechanisms for the feedback to result in the necessary improvements.

Conclusion

Public infrastructures are built to fulfill administrative, social as well as economic responsibilities to the general public, and they are to be managed properly with maintenance work to ensure functioning assets, minimum cost of repairing and providing a safe environment for the user. Unfortunately, in Nigeria, they are bedeviled by poor maintenance culture, which has adversely affected the quality of these public properties. Most public infrastructures in Nigeria are in deplorable state, ranging from roads, schools, hospitals, libraries amongst others. Hence, this calls for engineers to swiftly offer their professional expertise to the government in order to rescue these infrastructures else, Nigeria will continue to suffer a huge disastrous infrastructural damage.

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