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Research Article

Problematic Infrastructure Factors Affecting Development in the 21st Century for Zimbabwe

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Good infrastructure is linked to economic growth and development, without deny. The study explores five problematic infrastructure factors affecting development in Zimbabwe. The Zimbabwean nation has been struggling to recover from economic crisis, which has bedeviled the economy for quite a long time. The study identified and discussed five problematic infrastructure factors that hinders development. Addressing of the factors will place the country on a better position for recovery using a better recovery pace. The study utilized the Network Theory to support its argument. The identified factors are power cuts and shortages, poor road infrastructure, inefficient rail network within the country, water shortages and poor transport infrastructure for access to ports. The study employed the Relative Importance Index to enable the ranking of identified factors. Policies that target improvement of the identified problems will aid both short term and long-term development of the economy.

Keywords: Development, Economic Growth, Infrastructure, Network Theory, Zimbabwe

JEL Codes: E22, F62, N77, O11, O14, O18, Q43, R42.

INTRODUCTION

It is estimated that trillions of dollars will need to be invested in transportation, energy, water, information and communications technology and other kinds of infrastructure to achieve the Sustainable Development Goals (United Nations, 2018). Growth and development can only be achieved with the availability of economic and social infrastructure. There has been a recent surge in infrastructural studies in the social sciences (De Coss-Corzo, 2016). The link between economic infrastructure and growth is widely recognized (NEPAD, 2014; Tyson, 2018). USAID (2013) indicated that, soundly planned, well-executed, and inclusive infrastructure projects offer many potential rewards, among them increased opportunities for domestic trade, better access to regional and international markets, and, in the long run, greater food security and reduced poverty. Infrastructure is the term for the basic physical systems of a business or nation. Infrastructure refers to assets held in transportation services, electricity, water and sanitation, and telecommunications sectors (AfDB, 2019). Typical examples of infrastructure include transportation, communication, sewage, water, and electric systems among others. Bottini, Coelho and Kao (2013) indicated that, energy, water, transport, digital

communications, waste disposal networks and facilities, are essential ingredients for the success of a competitive modern economy. Infrastructures mediate between societies and their environments (Crow-Miller, Webber and Molle, 2017). Important attribute of infrastructure systems is that they tend to be high-cost investments and are vital to a country's economic development and prosperity. Infrastructure is considered a key component of the investment climate by reducing the costs of doing business and enabling people to access markets (AfDB, 2019). Infrastructure plays a critical part of a country's development (Kasper, 2015).

Tinbergen (1962) introduces the distinction between infrastructure (for example, roads and education) and superstructure (comprising manufacturing, agricultural and mining activities). Nijkamp (2000) speaks about infrastructure as material public capital (roads, railways,

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(air) ports, pipelines etc.) and superstructure meaning immaterial public capital (knowledge networks, communication, education, culture etc.). Both authors (Tinbergen and Nijkamp), tried to separate the two terms, however without specifying the proposed terms in sufficient detail. Star (1999), indicated that infrastructure is both relational and ecological – it means different things to different groups and it is part of the balance of action, tools and the built environment, inseparable from them. Infrastructure in its various forms plays a critical role in growth and development in Africa and elsewhere (NEPAD, 2014). Africa's infrastructure services are twice as expensive as elsewhere, reflecting both diseconomies of scale in production and high profit margins caused by lack of competition (Foster, 2010).

The Infrastructure Development Bank of Zimbabwe (IDBZ) was established in 2005, as a successor organization to the Zimbabwe Development Bank (ZDB), with an extended mandate to focus on infrastructure development to stimulate social and economic development. Expectations were to improve the living standards of citizen through the development of infrastructure including, but not limited to, roads, dams, water reticulation, housing, sewerage, technology, energy, amenities and utilities. The realization of the need to improve and develop infrastructure for economic and social development was of paramount importance, and hence a trace of impediments in the attainment of such goals remains critical.

Significance of the study

The amount and quality of a nation's infrastructure has an important bearing on economic growth in both the medium and longer-term. It is often viewed as the wheels of economic activity since it provides the environment for productive activities to take place and facilitates the generation of growth. Despite the clear link between growth, development and infrastructure and the consequently high payoffs to investment in infrastructure, a variety of studies have identified a significant infrastructural deficit in Africa (NEPAD, 2014) – with Zimbabwe encompassed. Economic and social infrastructure deficit has major implications for economic growth. Studies estimate that infrastructure deficits depressed enterprise productivity by around 40% in SSA (Escribano et al, 2008), and that this negative impact was greater the lower the per capita income of the economy (NEPAD, 2014). The study will help identify and discuss problematic infrastructure factors that require greater attention, with the intention of supporting and guiding effective policy formulation for the betterment of the economy's development path.

Research Problem

The Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development embodies a set of globally agreed priorities of vital importance to all

countries, including sustainable, accessible, affordable and resilient quality infrastructure (United Nations, 2018). Africa's infrastructure networks increasingly lag behind those of other developing countries and are characterized by missing regional links and stagnant household access (Foster and Briceño-Garmendia, 2010). In developing countries, there are significant infrastructure deficits in many of those sectors vital to development, including energy, transport and urban infrastructure (Tyson, 2018). The past two decades have been marred with economic challenges which led to difficulty in ensuring the continuous rehabilitation and maintenance of transport infrastructure. Zimbabwe has failed to maintain and rehabilitate the existing infrastructure since the country became engrossed in economic and political turmoil in the late 1990s (Pushak and Briceño-Garmendia, 2011). The existing infrastructure in Zimbabwe has deteriorated and the development of new infrastructure remains a challenge given the need to match regional and global standards. As noted by Artwood (2016), mentioning Harare (capital city), the level of deterioration of infrastructure and the increasing failures at service delivery in Zimbabwe, will never allow Harare to attain the status of "World Class City" by 2025. Zimbabwe in recent times is a burdened nation both politically and economically, posing a threat to development aspirations. The infrastructure challenges vary greatly by country type with the fragile states facing an impossible burden (Foster and Briceño-Garmendia, 2010). Investors who own and operate infrastructure benefit from monopolistic structures as they can exploit them and gain excess profits and this is common in economies with infrastructure deficit hence reducing social welfare (Kasper, 2015). Table 1 below shows the quality of infrastructure using scores and ranking among other countries.

Table 1: Quality of infrastructure in Zimbabwe

Indicator	Score	Rank/148
Quality of overall infrastructure	2.97	107
Quality of roads	3.28	92
Quality of railroad infrastructure	2.27	76
Quality of port infrastructure	4.09	69
Quality of air transport infrastructure	3.32	112

Source: World Economic Forum, Global Enabling Trade Report 2014

The neglecting of all sectors in Zimbabwe due to the current economic crisis has resulted in a generalized lack of new investment (in the power and water sectors in particular), and the accumulation of a huge rehabilitation agenda and this remains the case to current date (Pushak and Briceño-Garmendia, 2011). The continuous deteriorating quality of infrastructure is currently jeopardizing the functionality of the regional and national links for the economy of Zimbabwe. Given such issues the study seeks to identify and discuss the problematic infrastructure factors that affects the pace and direction of development in Zimbabwe.

TAXONOMY OF THE DEFINITION OF INFRASTRUCTURE

The definition of infrastructure is broad. Infrastructure is divided into four main sectors; tele-communication,

transport, energy and water. The sectors are further divided into subsectors which are also explained by the network parts involved. The summary of infrastructure definition is presented in the Table 2 below;

Table 2: Taxonomy of the Definition of Infrastructure

Sector	Sub-sector	Network parts	Services
Tele-communication	landline	Landline network, joints, receivers	Transmission of data
	mobile	Mobile towers, mobile phones	Transmission of data
	broadcast	Satellite, broadcaster, TV receivers, TVs	Transmission of data
Transport	Rail	Stations, tracks, control system	Transport of goods and passengers
	Road	Streets, parking areas	Transport of goods and passengers
	Air	Airports, control system	Transport of goods and passengers
	water	Ports, water streets	Transport of goods and passengers
Energy	electricity	Power plants, joints, transmission line, plug socket	Generation and transport of electricity
	Oil	Oil rig, pipeline, storage	Exploitation, generation and processing and transport of oil
	Gas	Gas rig, pipeline, storage	Exploitation, generation and processing and transport of gas
Water	Fresh water	Fresh waterside (well), pipeline	Fresh water exploitation, transport of water
	Waste water	Waste water recycling, pipeline	Transport of waste water, treatment of waste water

Source: Kasper (2015).

Table 2 above shows the four main infrastructure sectors and the sub-sectors of each group. The network parts for each sub-sectors are also shown in the table and the services they provide to the nation and its citizens. The condition of the network parts defines the quality of infrastructure and the benefits they are likely to provide. Poor network parts are likely to contribute less than the required level for significant economic growth. The network parts require replacement over time and/or upgrade over time to meet the demand for their use. It is the condition and quantities of these network parts that are also a concern for this study. For the Zimbabwean economy the network parts are far below the desired level, the condition is seen as poor, and not upgraded to meet their purposes in the modern day, and in some instances refurbishment is not being done on time and to the expected levels.

NETWORK THEORY

According to the network theory, infrastructure systems can be described as complex networks, where nodes represent infrastructure components, and links mimic the physical and relational connections among different infrastructure components (Johansson and Hassel, 2010). The nodes include any device that both receives and communicates information. Nodes may receive and store information. Infrastructures can be objects, networks, institutions or, more commonly, a material intertwinement of all these; they can have agency or be mere transmitters of social power (De Coss-Corzo, 2016). Infrastructure

systems of transportation, water supply, telecommunications, power supply, etc. are not isolated but highly interconnected and mutually coupled (Kong and Simonovic, 2018). Graphs are mathematical structures consisting of nodes and connections that are used to describe the building blocks of many physical networks and other interactions (Van Steen, 2010).

Graphical illustration of networks is shown below;

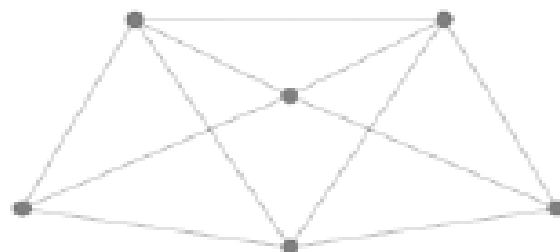


Figure 1: Graph illustration of a Simple Infrastructure Network (SIN)

Source: Phillips, 2015

Figure 1 above shows the infrastructure network model based on the network theory, where two basic components, nodes and edges, are used to build the model of a system. Network edges can be directed implying they point from one node to the next node showing connections or links. Well-built links smoothen business transactions, reduce cost of doing business and necessitate trade. The links should always be maintained and upgraded to ensure efficiency. If the links are not well

maintained, then there will not be meaningful benefits derived from them. Significant economic growth requires well maintained infrastructural links from one point to another. Efficiency also requires the shortest possible link to be designed, and this should be done from the planning stage.

Traditional network theory can be extended to analyze infrastructures that are large, spatially distributed systems, or that carry flows of resources or are interconnected with other infrastructure systems (Dunn et. al, 2013). In modern day, there exist complex links connecting a lot of nodes in place to ensure smooth business is enhanced. There is increased demand for such complex systems in the current world, and more may be demanded in future.

Complex systems, just like basic systems require proper maintenance as well, and also have to be upgraded continuously to meet the demand in business and global transactions.

A more complex model based on network theory is presented graphically in Figure 2 below;

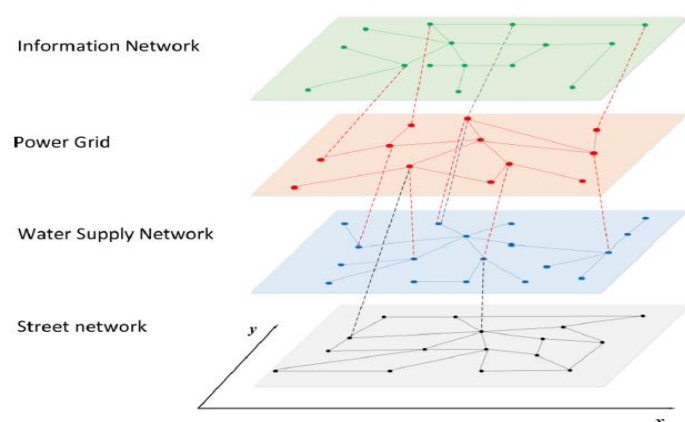


Figure 2: Graph illustration of a Complex Infrastructure Network (CIN)

Source: Kong & Simonovic (2018)

An infrastructure system model is a network of networks integrating all of the layers, as illustrated above. Since these networks provide bidirectional exchange of information, the edges are undirected.

To summarize the network theory, for development to take place the networks should be present with visible or well-developed links and those links should be well maintained for them to continue serving their purpose. Current debates on networks have been mentioning natural disasters to be disturbing the networks, and this calls for durable networks construction to strengthen the systems and avoid greater losses of reconstruction.

PROBLEMATIC INFRASTRUCTURE FACTORS IN ZIMBABWE

The economic crisis in Zimbabwe appears to be boundless as it continues to soar, despite many policies being put in place. This study brings a dimension critical to be included

to ensure recovery and growth. This section discusses the identified problematic infrastructure factors in Zimbabwe. Five factors have been identified namely; power cuts and shortages, poor road infrastructure, inefficient rail network within the country, water shortages and poor transport infrastructure for access to ports. The identified factors, are not the only existing infrastructure factors, there exist some significant ones, yet this current study emphasize the attention to be made to the identified factors more than others for a quick recovery of the economy.

(a) Power cuts and shortages

Availability of power to every citizen is a basic requirement. Rural electrification has been a mantra for both politicians and social and economic development seekers in many developing nations. Low priced power can contribute significantly to the efficient and effective functioning of the Zimbabwe economy (AfDB, 2019). There has been a growing outcry of power cuts and shortages for the past years, and this has affected the smooth flow of business. The power system has become unjustifiably costly, inefficient, and unreliable (Pushak and Briceño-Garmendia, 2011), and this remains the case to date. Zimbabwe's power infrastructure is starved of new investments. Alternatives to electric power in form of generators gained momentum, but due to shortages and high costs of fuel the option flopped. Energy crisis has been worsening over the years in the country, and to solve such there has been load shedding taking place to ration the little energy in the country (Bonga and Chirowa, 2014). To operate efficiently businesses and factories need electricity supplies that are free of interruptions and shortages (AfDB, 2019).

Zimbabwe obtains electricity energy from its five internal sources and imports as well. Kariba power station produces the highest level followed by Hwange power station with less than half while some small amounts comes from Bulawayo, Harare and Munyati stations. The power stations comprise of aging equipment, hence imported electricity has a significant fraction to cover up for the energy deficit in the country (Bonga and Chirowa, 2014).

Power cuts and shortages have affected business operations and planning. Heavy industries have scaled down heavily are far operating below capacity. The price of power has also soared due to rationing leading to high cost of doing business. The alternatives to power are equally unattainable.

(b) Poor road infrastructure

The past two decades have been marred with economic challenges which led to difficulty in ensuring the continuous rehabilitation and maintenance of transport infrastructure (AfDB, 2019). The quality of Zimbabwe road infrastructure is ranked by the World Economic Forum at

116 out of 137 in 2018, and this is down from 101. For many years, there has been increased overreliance on road transportation hence accelerated depreciation of the roads, requiring extensive rehabilitation. The condition of roads has deteriorated to the point that Zimbabwe became a bottleneck on the North–South transport corridor, and rural connectivity hardly exists (Pushak and Briceño-Garmendia, 2011). Many user fees have been introduced in Zimbabwe, however with little being seen as coming from the collected funds; administrative fees outweighing maintenance funding. The Department of Roads has limited institutional capacity to undertake its mandate (AfDB, 2019). Problems of under-investment or no investment in infrastructure, and of misconceived, inappropriate or poor-quality infrastructure, are often influenced by geopolitics, national and local politics, and economic and financial interests (United Nations, 2018).

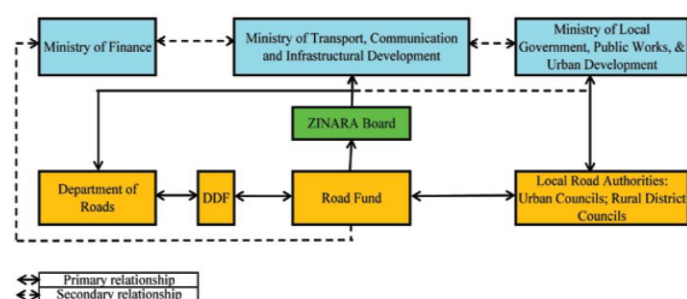


Figure 3: Institutional Relationships

Source: Zimbabwe Report, 2011.

Roads in Zimbabwe have been characterized by potholes indicating maintenance gap. The roads are not wide enough with the widening agenda being in for a long time. There is congestion in cities and towns, delaying business, road networks are labeled as poor. New links between towns are yet to be developed. Parking space is in short supply in major towns and cities. Transit cargo is facing delays due to the state of the roads.

(c) Inefficient rail network within the country

Delivery by rail is theoretically cheaper as compared to other means of transportation of business consumables, and this has been tasted a long time back when the rail system was in a better functioning state in Zimbabwe. The quality of Zimbabwe railroad infrastructure is ranked by the World Economic Forum at 86 out of 137 in 2018 and this is down from 83. The railways sector has experienced a number of challenges related to deteriorating tracks, obsolete signaling systems and rolling stock, theft of operating equipment, low locomotive and wagon availability (AfDB, 2019). This has culminated in loss of network capacity leading to reduced traffic, reduced revenues, and reduced availability of funds for infrastructure maintenance and renewal. Zimbabwe's challenges with rail transport are not unique within the sub region. The dilapidated state of the infrastructure has resulted in some major accidents and derailments. Rail

container transport is at present underutilized. Over the past decade, the NRZ's technical, operational, and financial performance have been adversely affected by instabilities in the Zimbabwean economy (Pushak and Briceño-Garmendia, 2011).

(d) Water shortages

Zimbabwe has a relatively limited endowment of water resources compared to countries occupying similar climatic zones, and the major river systems are the Save, Runde, Mzingwane, Gwayi, Sanyati/Munyati, Manyame, and Mazowe (Pushak and Briceño-Garmendia, 2011). Zimbabwe is primarily dependent on surface storage for its water needs, and all of its major rivers are shared with other members of the SADC (AfDB, 2019). Water is critical for agricultural sector, industrial sector as well as household consumption. The water sector has multiple forward and backward economic linkages to key sectors including agriculture, energy and mining sector (AfDB, 2019). Water distribution systems are thus networks that link water in rivers, lakes and storage sites to plumbing in people's homes, to irrigation pipes in farmers' fields, or to outlets in factories, enabling that water to perform economic but also social functions (Crow-Miller, Webber and Molle, 2017). The water sector has been aided by the Zimbabwe Reconstruction Fund (ZIMREF), which was approved by World Bank in 2014, as a country-specific multi-donor trust fund. ZIMREF supported the National Water Project for Zimbabwe and funds were disbursed for that purpose. One of the goals of ZIMREF is to create an enabling environment to strengthen public sector core management systems. Despite some positive efforts, lack of proper maintenance, the water and sanitation network remains in a dismal condition, thereby constituting a threat to public health (e.g. Cholera outbreaks).

(e) Poor transport infrastructure for access to ports

Zimbabwe is a landlocked country as well as a net-importing country, hence most of its goods and services are received using various ports of entry and exit. A portion of the Pan-Africa Highway passes through Zimbabwe and this part of the road network plays a major role in the movement of the country's imports and exports as well as transit freight (Zimbabwe Report, 2011). Accessing the ports has since been a challenge due to poor infrastructure linking to those ports. Better infrastructure can reduce both transport costs and spillage of products, and allow for greater producer access to extension services and other productivity-enhancing opportunities (USAID, 2013). Bottini *et al.* (2013), indicated that it is necessary to realign the nation's infrastructure to the changing world economy.

The need to correct the status of the identified factors is a necessary recipe to ensure growth and development of Zimbabwe nation. Together with some measures to ensure business flows within and outside Zimbabwe.

IDENTIFIED CAUSES OF POOR INFRASTRUCTURE IN ZIMBABWE

As noted earlier, infrastructure typically reduces the cost of doing business and facilitates access to markets and is therefore a key enabler of economic activity, growth and development. Well, with all the noted benefits of good infrastructure, there still exist infrastructure gap in the economy, and the gap is widening with time. The study examined the likely causes of the continuous deterioration of infrastructure over the past years. The notable challenges include;

- Inadequate levels of public expenditures for routine and periodic maintenance of the infrastructure networks, especially in power, water and sanitation, and transport.
- Low service prices raised the economic costs of the deterioration, resulting in unsustainable operating losses. This was common in sectors dominated by parastatals such as power, rail transport, and fixed line communications.
- Politics. With the increased importance of infrastructure comes the risk of political interference. Politics will continue to influence policy.
- Institutions. Failure to build institutional capacities for management and regulation of the basic network services.
- Weak Institutions. For example, ZINARA lacks control over the revenue collection, transfer, and allocation mechanisms.
- Role assignment and inability to collaborate. Disjointed approach to regulation and oversight among the various ministries involved.
- Funds. The large current account imbalances and low international reserves keep Zimbabwe in debt distress.

- Brain drain. Loss of technical skills in the sector.
- Private Sector Participation. The institutional and regulatory inadequacies undermined investment by the private sector in basic infrastructure.
- Declining domestic resource mobilization. Company closures and the informalisation of the economy resulted in low revenue collection.
- Unbudgeted expenditures. Unbudgeted expenditures associated with drought, e.g. grain importation took away US\$253.5 million in 2016.
- Citizen engagement. Citizen engagement with government is at its lowest level in over a decade.
- Corruption. Cosmetic anticorruption process exist in Zimbabwe, hence grand corruption is not strongly addressed.
- Debt servicing.
- Bureaucratic bottlenecks, political instability, and poor planning.

The above factors have been observed having significant impact on the level of infrastructure deterioration in the nation, and each should be dealt with so as to enable acceptable levels of infrastructural development and hence economic development and growth.

FACT SUPPORT: DATA GATHERING AND DATA COLLECTION

In an effort to confirm the contained facts of this study, a mini survey was done in form of questionnaires to technocrats including university lecturers, business populace, government workers among others to check on a few aspects related to infrastructure status in Zimbabwe.

Questions asked are presented in Table 3 below;

Table 3: Questionnaire Discussion

Question	Implication
[1]. Do you think infrastructure is linked to development in any economy? Responses: <i>Strongly Agree, Agree, Not Sure, Disagree, Strongly Disagree</i>	General link.
[2]. How do you rate the status of infrastructure in Zimbabwe? Use a scale of 1-10, 1 being poor and 10 being excellent. <i>[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]</i>	Establishing current status.
[3]. Is adequate effort being made in the maintenance of infrastructure in Zimbabwe? Responses: <i>Yes, No, Not Sure</i>	Commitment by authorities.
[4] How do you rate the following as being one of the problematic infrastructure affecting development in Zimbabwe? <i>Use a scale of 0 – 5; 0 being no effect, 1 being weak effect, and 5 having strong significant impact.</i> <i>power cuts and shortages, [0, 1, 2, 3, 4, 5]</i> <i>poor road infrastructure, [0, 1, 2, 3, 4, 5]</i> <i>inefficient rail network within the country, [0, 1, 2, 3, 4, 5]</i> <i>water shortages, [0, 1, 2, 3, 4, 5]</i> <i>poor transport infrastructure for access to ports. [0, 1, 2, 3, 4, 5]</i>	Establishing intensity and ranking factors.
[5]. Demographics Age Group <i>[18-25, 25-35, 35-45, 45-55, above 55]</i> Sex <i>[Male, Female]</i> Education <i>[O&A level, Diploma/Degree, Post-graduate/Masters/PhD]</i> Work experience <i>[0, Self-employed, 0-5, 5-10, 10 years+]</i> Marital Status <i>[Married, Divorced/Widowed, Single]</i>	Quality of responses and distribution of participants.

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Through issuing questionnaire through emails and physical delivery to various individuals across the country, the study managed to get significant responses for analysis. 746 correctly completed questionnaires were received.

Q5: Demographics. Checking on the demographics of the respondents, 518 (71.5%) were males, while 224 (28.5%) were females. 112 participants were of age group 18-25, 339 of age group 25-35 years, 248 participants of age

group 35-45 years, 28 of age group 45-55 years, and 15 participants were above 55 years. 492 participants indicated that they are married, 203 indicated single and 51 were either divorced or widowed. 223 participants have attained O&A level as their highest qualification, 467 have earned a degree or a diploma, and 52 participants had a post-graduate degree or Masters or PhD as their highest qualification. Checking on work experience, 44 have no work experience, 171 were self-employed, 111 have less than 5 years experience, 306 have 5-10 years experience, and 110 participants have more than 10years work experience.

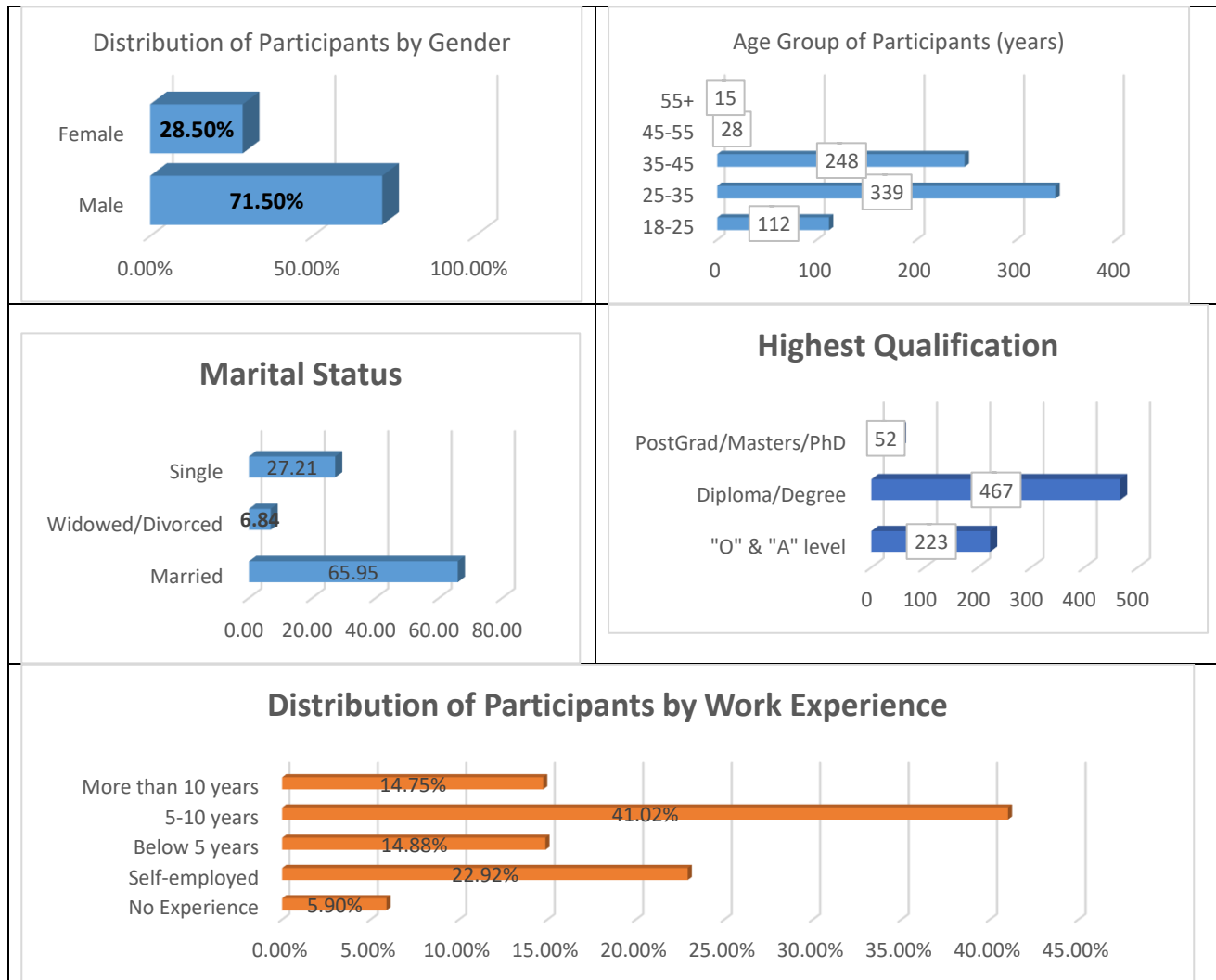


Figure 4: Demographics Graphic Illustrations

From the demographics, it is clearly seen that both sexes are represented, however with males being the significant majority. All ages are represented as well, starting at the legal adult age of 18 years up to those over 55 years, hence responses have been obtained from all age groups. Respondents were also mixed according to marital status; single participants, married, divorced or widowed all form part of the research participants. On the education radars, participants were obtained from those with Os and As,

diploma or degrees, and postgraduate or masters or doctorates, implying that responses were obtained from both the learned and the more learned. As of work experience, participants were mixed with various work experience including those self-employed and some who are yet to get experience. The study basing on the observed demographics guarantees representation of the country populace, and reliable responses for policy. The study has gathered facts from a population worth the task.

Q1: Do you think infrastructure is linked to development in any economy? 323 (43.3%) respondents indicated Strongly Agree and 423 (56.7%) indicated Agree. No participants indicated, Not sure, Disagree or Strongly Disagree of that question. The implication is that it is clearly known and understood that good infrastructure is linked to development of nations. The responses obtained from this question has confirmed the study assumptions strongly. Infrastructure development entails significant economic development, and this is enabled through smooth flow of business within expected time and minimum costs.

Q2: How do you rate the status of infrastructure in Zimbabwe? Use a scale of 1-10, 1 being poor and 10 being excellent. 81 participants indicated a scale of 1, 134 indicated a 2, 349 indicated a 3, 140 indicated a scale of 4, 20 pointed 5 on scale, 10 pointed 6, and 8 pointed a 7 on the scale. Scale of 8, 9 and 10 were not pointed by any respondent, indicating that the state of infrastructure in Zimbabwe is not in an excellent state. An overwhelming majority pointed a scale of 3 (349 – 48.2%) which signify a poor state of infrastructure in the country. The results from this question clearly points that, respective authorities should quickly find ways to address and correct the status of infrastructure in the country to at least tolerable levels that can significantly link to economic development.

Q3: Is adequate effort being made in the maintenance of infrastructure in Zimbabwe? 52 participants indicated that there is adequate effort being put to maintain infrastructure in Zimbabwe, 594 participants disagreed by indicating that effort being put is never adequate for infrastructure maintenance, and 78 participants were not sure of what effort is being put on the subject. Commitment by authorities has been verified by the inclusion of the question, and it has been found to be not matching. Greater effort is required to effect significant concern to rehabilitate the present infrastructure for notable development in the country.

Q4: How do you rate the following as being one of the problematic infrastructure affecting development in Zimbabwe? Use a scale of 0– 5; 0 being no effect, 1 being weak effect, and 5 having strong significant impact. Participants indicated various magnitudes on the scale for each infrastructure factor. The summary of responses is given below;

Table 4: Rating of Problematic Infrastructural Factors

Factor/Scale	0	1	2	3	4	5
Power cuts and shortages	-	-	17	245	334	146
Poor road infrastructure	-	-	54	220	274	194
Inefficient rail network within the country	-	18	38	291	240	137
Water shortages	-	21	164	191	265	101
Poor transport infrastructure for access to ports	-	35	248	227	184	30

To add more meaning to the above statistics, the study will rely on the Relative Importance Index (RII) to check on the intensity of the above infrastructure and also rank their cruciality. RII aids in finding the contribution a particular variable makes to the prediction of a criterion variable both by itself and in combination with other predictor variables (Johnson and Le Breton, 2004). The RII is calculated using the formula;

$$RII = \frac{\sum W}{A * N} \text{-----(1)}$$

Where $0 \leq RII \leq 1$, W - is the weight given to each factor by respondents, and ranges from 1 to 5, A - is the highest weight, which is 5, and N - is the total number of respondents.

Using the RII formula, the results obtained from the responses are presented in Table 5;

Table 5: Relative Importance Index of Problematic Infrastructural Factors

Factor/Scale	RII	Rank
Power cuts and shortages	0.7642	1
Poor road infrastructure	0.7062	2
Inefficient rail network within the country	0.7040	3
Water shortages	0.6704	4
Poor transport infrastructure for access to ports	0.5655	5
Average RII	0.6821	
Variability (Standard Deviation)	0.0656	

From the above RII statistics, it can be derived that, the minimum score is 0.5655, which is more than 50% mark, and average RII is 0.6821, both implying that all the raised infrastructure factors should be attended to for efficient development to take place. The most problematic factors as indicated by Rank 1 is power cuts and shortages, implying that more damage to development is being brought by power supply characteristics in the economy. Poor road infrastructure is ranked number 2, hence posing significant challenges to economic development. The same is also with inefficient rail networks in the country, and water shortages. Despite the “ranking approach” discussed, all the five infrastructure factors should be equally addressed for significant development in the country, as this has been indicated by a very small variability of 0.0656.

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

The study identified and explored five problematic infrastructure factors affecting development in the Zimbabwean economy. Zimbabwe, just like any other country requires its infrastructure to contribute significantly to economic development, however, through some challenges, it has been observed that deterioration of the

infrastructure is causing more damage to the development path of the economy. Zimbabwe also as a landlocked country, require its networks to be well connected to the neighboring countries, who also use the country as a transit nation for their economic benefit. While the political and economic environment has impacted on policy formulation, policy implementation and policy engagement among other issues, the current study pointed out what is required to awaken development in Zimbabwe for both the short term and the longer term. The sustainability gap in infrastructure should be acknowledged and addressed explicitly and systematically in global economic and financial decision-making. To meet its most pressing infrastructure needs and catch up with developing countries in other parts of the world, Zimbabwe needs to expand its infrastructure assets in key areas. The study employed a questionnaire approach to confirm on some of the facts and to derive policy. With the help of the Relative Importance Index, the study managed to rank the problematic infrastructure factors with the level of impact. The ranking enables priority to be given, considering resource shortages in Zimbabwe.

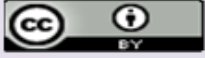
In its conclusion, the study recommends proper planning, increased engagement with the private sector, increased engagement with the rest of the world, planned maintenance of infrastructure, political will for development, empowering infrastructure institutions and institutions autonomy.

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