AN INFRASTRUCTURE FUNDING MODEL(IFM) FOR PROJECT DELIVERY IN NON-URBAN / RURAL AREAS OF SOUTH AFRICA

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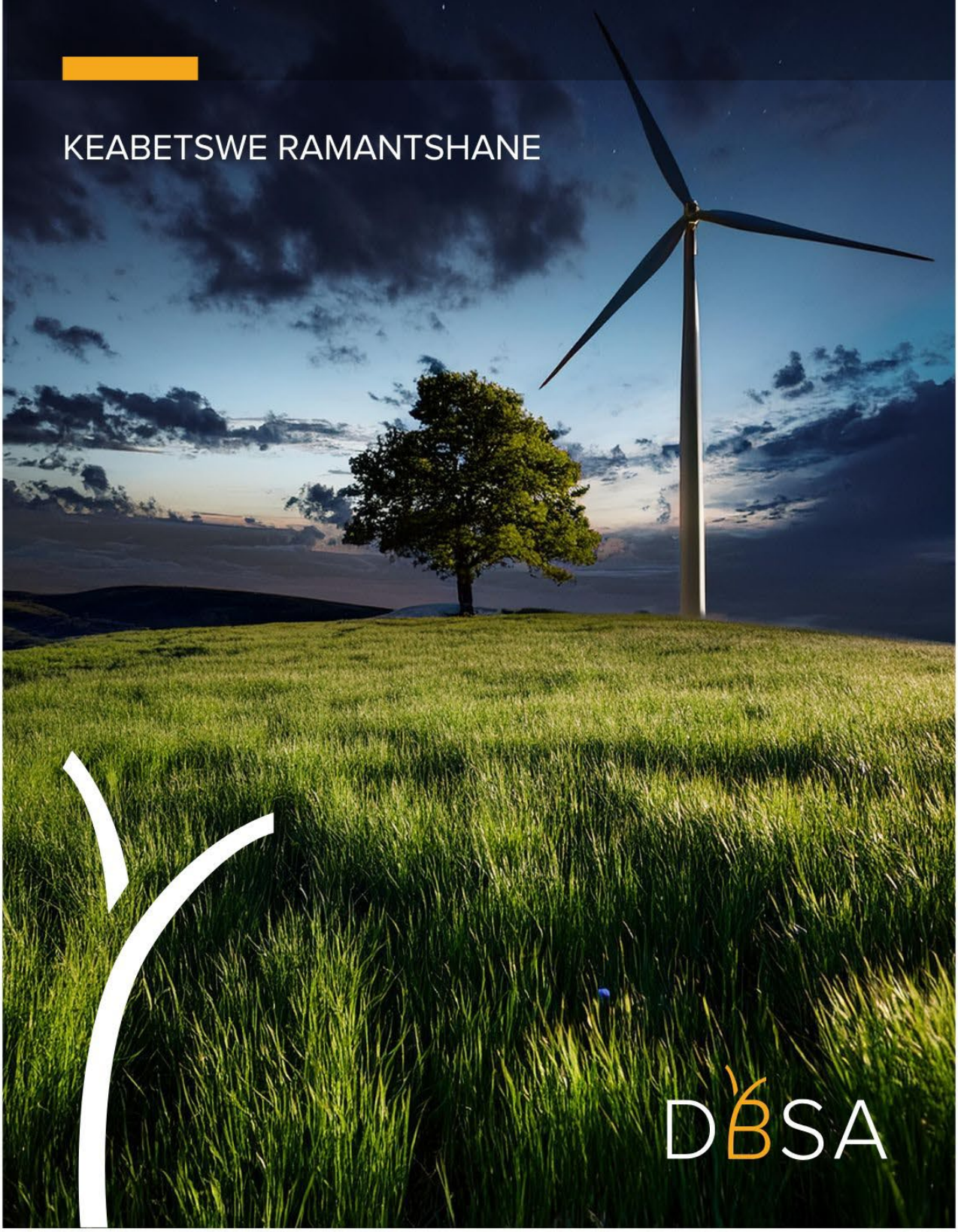

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ABSTRACT

Rapid urbanisation has been identified as a key factor contributing to rising urban congestion and poverty levels. The global goals of eliminating poverty and hunger are unlikely to be achieved if the trend of rural-urban migration continues unabated. One of the primary causes of this migration is the lack of adequate infrastructure in rural areas. Literature consistently highlights the essential role of infrastructure in fostering economic growth and improving citizens' welfare. Therefore, it is critical for governments to prioritize rural infrastructure development to curb rapid urbanisation. Developed countries have successfully implemented strategies to address this issue. For example, the UK's co-lending model focuses on rural development lending, while China uses redistributive tools like tax systems and lump sum transfers to enhance rural infrastructure. However, many developing countries, including South Africa, continue to prioritize infrastructure spending in urban areas, neglecting rural communities and worsening the disparity. This study adopts a mixed methods approach, targeting three provinces for comprehensive data collection. It incorporates the resource allocation theory and situational awareness theory to analyse infrastructure funding mechanisms. The qualitative component includes 10 interviews per province, while the quantitative segment involves distributing 60 surveys at local, provincial, and district levels. Regression analysis will be applied to assess the extent to which Infrastructure Funding Models (IFM) are utilized and to develop a more effective model for equitable infrastructure funding. The aim is to create a resourceful funding framework that addresses rural development needs and ultimately mitigates the adverse effects of rapid urbanisation

Keywords: Infrastructure Development, Rural Development, Economic Growth, Funding Model, Project Delivery

INTRODUCTION

The absence of infrastructure in South Africa's rural areas is not only glaring but has worsened the living conditions in these areas leading to unprecedented migration to the urban centres. This is despite the policy hue of the present national government to invest significantly in the rural areas. Rural poverty is linked to the exposure of households to economic vulnerability and welfare which is impacted by unfavorable resource allocation (Mokoena, Rachidi and Ngwakwe, 2020). Scarcity of studies seeking to appraise the extant infrastructure funding model for infrastructure delivery financing for rural areas has been observed, especially within the South African context. Previous studies have explored structures for funding. The studies have not considered a comprehensive model to implement and support financing techniques for the delivery of infrastructure in the Non-Urban Rural and Borderline (NRBs). This is the gap which this study seeks to bridge. As such, this study will seek to develop and validate an appropriate infrastructure funding model for engendering improved infrastructure spending in rural South Africa.

BACKGROUND

Flyvberg, Garbuio and Lovallo (2009), observed that infrastructure spending constitutes the largest share of the world's Gross Domestic Product (GDP) with 22 trillion dollars in projected investment by 2019 in emerging economies alone. Infrastructure development is a major contributor of economic growth for many countries (Wong, Wang, Luo, Zhang, and Rozelle, 2017). The provision of infrastructure is focused on large cities and towns in most parts of the world. South Africa is replete with developed cities and non-urban areas which are either underdeveloped or undeveloped. This poses a challenge to the country and constitutes a strain on cities due to population migration. Scholarly research reveals a lack of sustained rural infrastructure investments in developing countries as such that this has set challenges for economic development and growth in rural economy for the residents and investors at large (Flyvberg et.al., 2009).

This research contributes to the school of thought that emphasises infrastructure development as an enabler of socio-economic development and economic growth for non-urban and rural areas (Development Bank of Southern Africa, 2012). Where development partly exists, which hardly occurs in rural areas, there tends to be inadequate infrastructure thus implying a lack of infrastructure funding. The infrastructure funding model (IFM) has a set standard of methods to finance development projects which are successfully implemented by the public and private sectors. Unfortunately, not all projects have a successful outcome, others are incomplete or have dismally failed due to challenges that arise (Flyvberg et. al., 2009). Similarly in non-urban or rural areas there are problems of the same nature. Most of these challenges are related to financial repercussions such as the allocation of minimal budget (Flyvberg et. al., 2009). The majority of infrastructure failures and challenges encountered in rural areas, non-urban areas and the borderline environment relate to lack of financial commitment or investment.

KNOWLEDGE GAP OF CONFERENCE PAPER

The focus of this study is on the infrastructure funding models in use for infrastructure development in Non-urban/Rural and Borderline (NRB) areas and their effectiveness during implementation. The solution seeks to address the problem being studied, namely the absence of an effective infrastructure funding model (IFM) for facilitating infrastructure development in NRB areas. The South African government has a challenging exercise of creating sustainable economic growth throughout the country through infrastructure development but more specifically in the NRB environment. The Medium-Term Expenditure Framework (MTEF) has illustrated budgetary requirements for urban cities over the years however the NRB areas have not benefitted much from this framework. Hence, this study aims to develop a beneficial infrastructure funding model for both cities and NRB areas which will seek to resolve challenges pertaining to lack of infrastructure development and economic growth.

AIM OF CONFERENCE PAPER

The goal of this research is to develop an effective and efficient infrastructure funding model (IFM) for the delivery of infrastructure in South African NRB areas with the following as the secondary objectives:

1. To appraise the extant of infrastructure funding models available for infrastructure delivery in South Africa-both urban, rural, and non-urban areas;
2. To determine the effectiveness of the funding models for infrastructure delivery financing in rural, NRB areas;
3. To identify the factors influencing the effectiveness or otherwise of these models as they pertain to infrastructure delivery in rural non-urban and borderline areas of South Africa;
4. To model the influence of these factors on the effectiveness of the extant funding models in the delivery of infrastructure in NRB areas;
5. To develop and validate a suitable funding model for infrastructure delivery in rural non-urban borderline areas of South Africa.

The next below section addresses existing literature on rural infrastructure, municipal infrastructure, financial resource allocation, economic growth, and the revenue index model.

LITERATURE REVIEW

The Relationship between Rural Infrastructure and Economic Growth

There is a philosophy that illustrates infrastructure as the key element of economic growth which in turn attracts investors (Van de Walle, 2002). O'Brien and Pike (2015) state that the critical importance of infrastructure to productivity and output growth has been accentuated in the context of globalization, technological advances and shifting social demands. Agenor (2010) recognises the relationship between allocation of public expenditure and economic growth which is embodied by the economic theory (Mokoena, Rachidi and Ngwakwe, 2020).

Furthermore, (Agenor, 2010) asserts that where there is an increase in infrastructure development, there are patterns of potential economic growth.

NRB areas face a challenge to retain human resources for purposes of stimulating economic growth, this being attributable to a lack of infrastructure related resources. According to Zulu and Mubangizi (2014), high economic growth rates can be achieved through infrastructure development. In addition, this will enhance local economic development to create robust and inclusive local economies that exploit local opportunities, address local needs, and contribute to national developmental objectives.

Municipal Infrastructure Development

Rural infrastructure development is dependent on the successful implementation of an appropriate infrastructure funding model. Upon municipalities' failure to have an action plan for infrastructure development, NRB areas will deteriorate further resulting in no infrastructural growth. There is an estimated number of 257 municipalities in all provinces of South Africa with each municipality having its own challenges. According to Van der Waldt (2014), "various agencies", such as the South African Local Government Association (SALGA), National Treasury (NT), the Department of Co-operative Governance and Traditional Affairs (CoGTA), as well as individual municipalities, "perform audits of their own infrastructure to determine the status of its existence". The viability of a municipality can be measured by its ability to raise revenue to pay for basic public services, one way of assessing the ability of municipalities is to compare the gap between expenditure needs and revenue-raising capacity (Bandyopadhyay, 2013; Mokoena et.al., 2020). According to CoGTA (2016) funding is received from national and provincial governments and then only distributed to the local municipalities. The funds supplement municipal revenue for the provision of free basic services to poor households, and for the funding of institutional capacity and support to weaker municipalities. The department distributes the funds from the grants based on their determination of the level of assistance the municipality needs CoGTA (2016).

The challenges identified from the need-capacity or fiscal gap causes a contraction in the growth of infrastructure and lack of viability for municipalities. Expenditure needs is the amount of money needed to provide minimum acceptable levels of public goods (water, electricity, refuse removal, roads, etc.), while revenue-raising capacity refers to revenues that the municipality can raise from its own sources (own revenues) when exerting a standard amount of effort. According to Ncube and Monnakgotla, (2018), a municipality's revenue-raising capacity depends on its fiscal capacity, which can be measured using many variables. These variables range from municipality tax and revenue base to its socio-economic framework and all other political and legal constraints that may prevent its full revenue potential being realised. The most vital component of a municipality is its fiscal capacity and economic base (Ncube and Monnakgotla, 2018). Municipalities are expected to raise their own revenue through a collection of taxes from services rendered, however this is currently not realistic with the NRB areas, due to lack of revenue from tax bases.

Also, Ostrom, Shroeder and Wynne, (2013) maintain that the concept of donor funding is seldom applied especially where they can have an influence on availability of capital investments in the rural areas. This lack of application is exercised more in the delivery of rural infrastructure in less developed countries (Ostrom et. al., 2013). In developing countries, rural

infrastructure is characterised by donor interventions, which considers how they can influence the incentive structures affecting the sustainability of capital investments (Ostrom et. al., 2013). According to Skerratt, (2010), funding can be derived from charitable trusts, subsidised subscriptions as well as pay-for-use projects for the purpose of rural infrastructure development. On the contrary, infrastructure development in cities is dependent on collectable taxes for continuous infrastructure development which is generated through the revenue index model illustrated in the section below.

Infrastructure Delivery Management System (IDMS) Framework

"The Infrastructure Delivery Management System (IDMS) is a government management system for planning, budgeting, procurement, delivery, maintenance, operation, monitoring and evaluation of infrastructure" (Treasury, 2012). Within the IDMS there are a number of inter-related systems with the objective of ensuring that the requirements illustrated by the Medium-Term Expenditure Framework (MTEF) are met in compliance with the relevant legislation (Treasury, 2012). The IDMS is linked to a number of systems with the sole purpose of ensuring that the infrastructure needs illustrated in the MTEF are met based on the budget per capita. The IDMS comprises of the following systems where each system manages its own risks, namely: an infrastructure planning system (IPS), an infrastructure gateway systems (IGS), a construction procurement system (CPS), a programme and project management system (PPMS), and an operations and maintenance system (OMS).

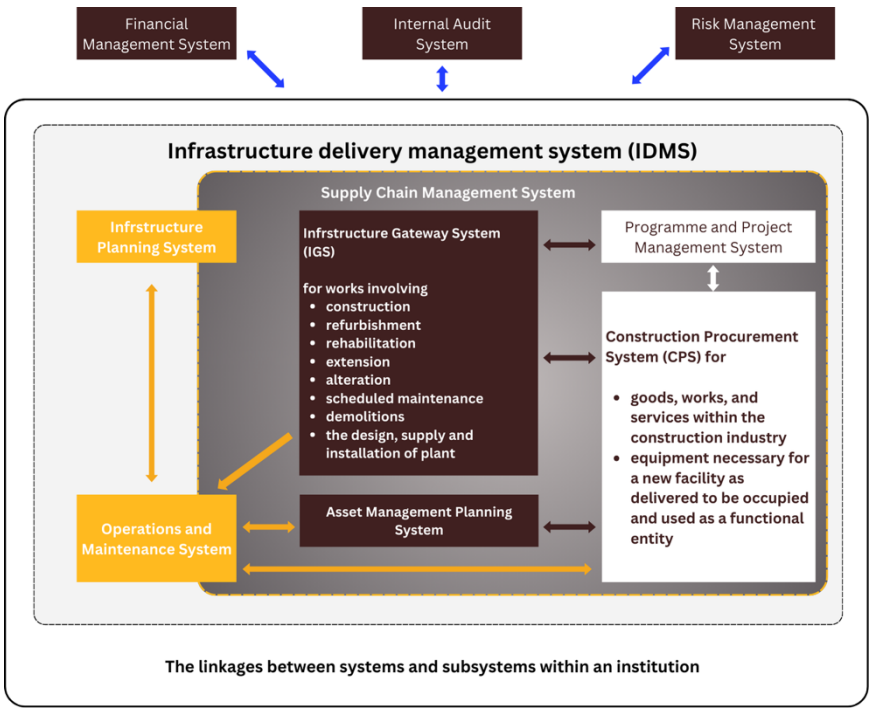

Figure 7: Infrastructure Delivery Management System (IDMS) – Treasury (2012)

Financial Resource Allocation for developed countries

Some researchers focus on the importance of infrastructure, particularly in road infrastructure to support the objective of agricultural output, economic growth, and poverty reduction (Van de Walle, 2002). Furthermore, to generate economic efficiency for the transport sector in the

United States the cost-benefit analysis and guide project selection and design by maximizing on the best models is used (Soleymani, Ravanshadnia and Montazer, 2021). Additionally, Siegel, (2005) denotes that changes may have led to improvements in the quantum of rural poverty rates however the region is still characterised by inequalities in assets and incomes. Wong et.al. (2013) and Mellor (2020) allude that the rapid growth of a small commercial farmers dominates agriculture, accelerates economic reform whilst encouraging the decline in rural poverty. In the United States a selection of investment projects in the rural roads sector, has the objective of poverty reduction and develops an operational approach in line with the public economics framework. As such, it is argued that the transport sector should be geared to maximise efficiency on a first-best model of the economy, where one aims for efficiency in production, and redistributive instruments such as the tax system and the lump-sum transfers are used to achieve the redistribution objective. Moreover, Siegel (2005) promotes the asset-based approach where household assets are considered as drivers of economic growth. Drivers of sustainable rural growth and poverty reduction is part of an ongoing effort by the Central American Environmentally and Socially Sustainable Development. Furthermore, Siegel (2005) states that government and donors lack understanding on the drivers of rural growth and poverty reduction hence there is minimal investments and prioritisation strategies.

Skerratt (2010) outlined the widespread acceptance in academic research and in policy statements and interventions of rural Scotland that the absence or presence of infrastructure and services in rural areas can lead to cycles of decline or resilience in these localities. It is also accepted that in remote areas, population sparsity leads to a higher unit cost for delivery of services and infrastructure. O'Brien and Pike (2015), follow solid persistence on government reform in England at the city/city-region or local level in return for further decentralised funding and powers, brokered by deal-making, from the Manchester (Devo-Manc) Model. Tomaney and McCarthy (2015) raise three fundamental issues; First, Greater Manchester is a distinct city-region based primarily on an urban geography, it has provided the basis for several joint economic development, transport, and public service arrangements on behalf of constituent local authorities across a functional economic area. On the contrary rural Scotland is not privileged to have such economies of scale, nor will all cities, city-region or other rural areas be in a similar position. Furthermore, cities and city regions facing relative decline with weaker economic potential have narrower tax bases and deeper social needs and face the prospect of being disadvantaged in such a system (Pike, Rodriguez-Pose, Tomaney, Torrisi and Tselios, 2012). There is a genuine risk that pursuing a Greater Manchester (Devo-Manc) model will not produce the desired outcomes in other areas that are envisaged by government (O'Brien and Pike, 2015).

Moreover, evidence on the economic effects of decentralized governance is mixed and inconclusive, and the interconnection between governance arrangements and economic and social outcomes is difficult to isolate (Tomaney, Pike, Torrisi, Tselios, Rodriguez-Pose,2011) and (Pike, Rodriguez-Pose, Tomaney, Torrisi, and Tselios,2012). Therefore, in determining a feasible infrastructure funding model for the rural areas it is critical to bear these factors for consideration. An alternative model by Acharya, and Sundaresan (2014) holds the view that the PPP programs were established to fund infrastructure projects (Zang, Hou, and Qian, 2020). This co-lending model was developed by Australia and is used by over 56 countries where it lends on commercial terms to both private and public sectors to bridge the financial gap for both sectors to fund privately financed initiatives (PFI) which indicates a potential opportunity for the development of rural areas.

Own Revenue Index Model

Ncube and Monnakgotla (2018), developed a model named the own-revenue index. It is generated from a ratio of own revenues to total revenues and according to the index, own revenue is the main source of income for over 70% of newly demarcated municipalities. Due to lack of generation of taxes and services in NRB areas, municipalities struggle to generate their own revenues. Dang (2013); Ncube and Monnakgotla (2018) illustrate that a system of taxation and public expenditure raises revenue and control over expenditure on various levels within government. While taxes and fees are known as traditional revenue generation instruments, other cash generation methods such as grants, bond-based finance, tax incentives or infrastructure levies are classified as the recent innovative financing vehicles (Squires, Javed, Trinh, 2021). With consideration of the per capita gross value added (GVA) index, this indicator measures the value of goods and services produced by a municipality over a given period (Ncube and Monnakgotla, 2018). Municipalities with a higher capita GVA have a larger revenue base and an inherent ability to pay taxes.

RESEARCH METHODOLOGY AND METHOD

This study adopts a pragmatist philosophical stance. Accordingly, a mixed methods research design is deployed for data collection and analysis. Paper-based and electronic surveys were distributed to the relevant personnel at different municipalities and the Non-urban, Rural and Borderline (NRB) communities across three (3) provinces to investigate the level of understanding on infrastructure funding models and its benefits to rural development. In addition, interviews were conducted considering the need to establish an enhanced view of people directly and indirectly affected by infrastructure challenges. A random selection of the current 257 municipalities across all nine provinces was conducted as part of the data collection and sampling process, where interviews are targeted to key informant officials. Once the data is collected from the municipalities through surveys, interviews were held with officials from the different municipal categories (Local, Provincial and District) to outline the problem and address the study. However, it is important to note that this study's scope is limited to three provinces (Gauteng, Limpopo, and Mpumalanga) and limited municipalities. As a result, the findings may not be fully generalisable to other provinces. Hence, future research could extend the scope to include other provinces and more municipalities, to enable broader comparative insights and greater generalisability of the results.

				SURVEY Matrix		
Interviews				Official Data		
10 Interviews conducted with local municipalities				Total Local Municipal data	Total Provincial Municipal data	Total District Municipal data
				SURVEYS		
GP	10			20	10	10
LIM	10			3	3	3
MP	10			**60**	**30**	**30**

Table 1: Survey & interview plan

Source: Author's Work

RESEARCH RESULTS

This section illustrates the highest and lowest resource allocation for each province with the focus on data collection from Gauteng, Limpopo, and Mpumalanga. This explored the thought process of the underlying factors that state that higher resource allocations are consistently distributed to urban municipalities while local/rural municipalities are exposed to a relentless infrastructure crisis due to lack of resources. Table 1 maps out the infrastructure need status based on the data demonstration discussed in the section below.

Province	Water/ Sanitation	Electricity	Roads/ Transportation	Healthcare Services	Telecommunication
GP	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Low**
MP	**High Priority**	**Moderate**	**High Priority**	**High Priority**	**Low**
LIM	**High Priority**	**Moderate**	**High Priority**	**High Priority**	**Low**

Table 8: Rural Infrastructure Status per Province
Source: Author's Work

The City of Johannesburg has the allocation of R9464674 for year 2017 and R9771313 for 2018 and the lowest grant allocation was to Midvaal with R138398 for the year 2017 and R166113 for the year 2018 respectively (Statistics SA, 2019). The City of Johannesburg Metropolitan municipality was recorded to have a population of 4434827 in year 2011 and increased to 4949347 in the year 2016 (Municipalities, 2019), on an area of 1644.98 km² radius (Census, 2011). The population growth rate was recorded to be 2.49% per annum from the year 2011 to the year 2016.

Furthermore, the year 2016 confirmed that basic infrastructure development in the asset class of sanitation with full connection to the sewerage system is at 88.6%, where weekly refuse removal is at 85.4% water supply specifically piped water for the benefit of households is at 60.3% and access to electricity of 90.9% in this area (Municipalities, 2019). The Midvaal local municipality was recorded to have a population of 95301 in the year 2011 and increased to 111612 in the year 2016 (Municipalities, 2019) on an area of 1722.47 km² radius (Census, 2011). The population growth rate was recorded to be 3.59% per annum from the year 2011 to the year 2016. Furthermore, the year 2016 confirmed that basic infrastructure development in the asset class of sanitation with full connection to the sewerage system is at 62.6%, where weekly refuse removals is at 82.9% water supply specifically piped water for the benefit of households is at 62% and access to electricity of 81.9% in this area (Municipalities, 2019).

Min			Median			Max		
Municipality	2017	2018	Municipality	2017	2018	Municipality	2017	2018
Midvaal LM	138 398	166 113	Merafong City LM	381 998	372 536	City of Tshwane MM	612 3596	646 7568
Lesedi LM	146 878	185267	Mogale City LM	441 376	625 292	Ekurhuleni MM	686 7925	727 4925
West Rand DM	242 918	252 906	Rand West LM	468 632	479 629	City of Johannesburg MM	946 4674	977 1313

Table 9: Gauteng – Municipal Grant allocation (Statistics SA, 2019

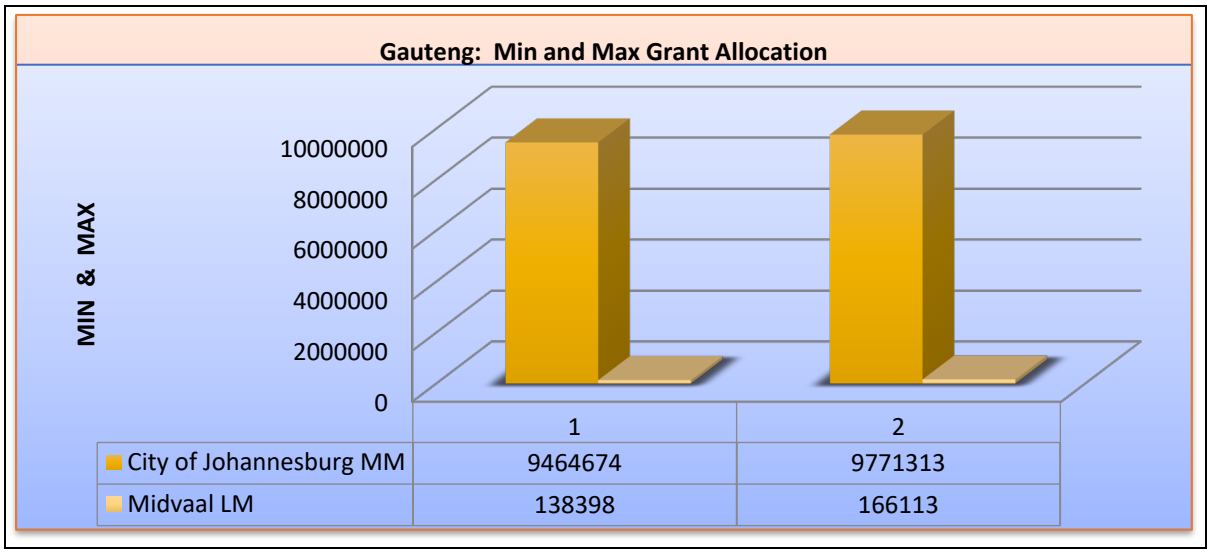

Figure 8: Gauteng Min and Max Grant Allocation (Statistics SA, 2019)

The Thabazimbi local municipality was recorded to have a population of 85234 in year 2011 and increased to 96232 in the year 2016 (Municipalities, 2019), on the area of 11190.14 km² radius (Census, 2011). The population growth rate was recorded to be 2.76% per annum from the year 2011 to the year 2016. Furthermore, the year 2016 confirmed that basic infrastructure development in the asset class of sanitation with full connection to the sewerage system is at 57.9%, where weekly refuse removal is at 41.7% water supply specifically piped water for the benefit of households is at 38% and access to electricity of 74.9% in this area (Municipalities, 2019).

Min			Median			Max		
Municipality	2017	2018	Municipality	2017	2018	Municipality	2017	2018
Thabazimbi LM	93240	73592	Blouberg LM	261623	256302	Sekhukhune DM	1072910	1251854
Waterberg DM	125360	121975	Greater Letaba LM	270846	316409	Vhembe DM	1304349	1360763
Ba-Phalaborwa LM	143068	176813	Elias Motsoaledi LM	282035	324064	Polokwane LM	1342039	1578024

Table 4: Limpopo – Municipal Grant allocation (Statistics SA, 2019)

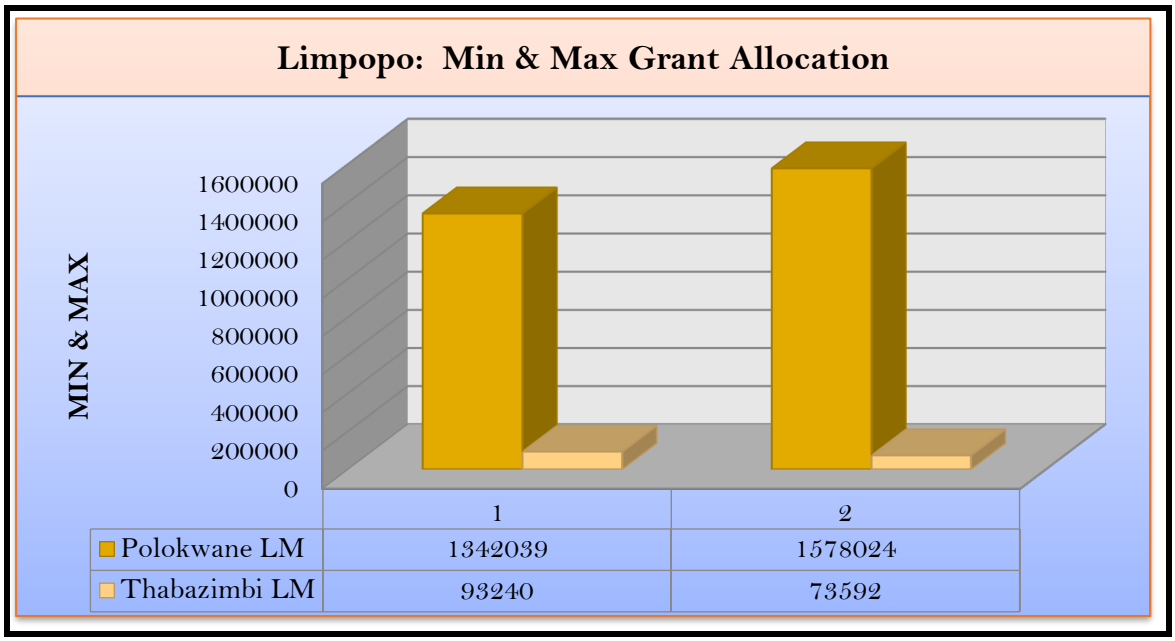

Figure 9: Limpopo Min and Max Grant Allocation (Statistics SA, 2019)

Bushbuckridge was allocated R1321757 for the year 2017 and R1207194 for the year 2018, with the lowest allocation of R88535 for the year 2017 and R112214 for the year 2018 for the Emakhazeni Municipality in Mpumalanga (Statistics SA, 2019). The Bushbuckridge local municipality was recorded to have a population of 538593 in year 2011 that increased to 546215 in the year 2016 (Municipalities, 2019), in the area of 10249.93 km² radius (Census, 2011). The population growth rate was recorded to be 0.32% per annum from the year 2011 to the year 2016. Furthermore, the year 2016 confirmed that basic infrastructure development in the asset class of sanitation with full connection to the sewerage system is at 6.2%, where weekly refuse removal is at 4.2% water supply specifically piped water for the benefit of households is at 7.4% and access to electricity of 96.5% in this area (Municipalities, 2019).

The Emakhazeni local municipality was recorded to have a population of 47216 in the year 2011 and increased to 48149 in the year 2016 (Municipalities, 2019) on the area of 4735.59 km² radius (Census, 2011). The population growth rate was estimated to be 0.94% per annum based on the year 2011 population data (South Africa Population, 2019) however Municipalities (2019) that recorded the population growth rate from the year 2011 to the year 2016 to have been at 0.44% per annum. Furthermore, the year 2016 confirmed that basic infrastructure development in the asset class of sanitation with full connection to the sewerage system is at 75.2%, where weekly refuse removals is at 56.3% water supply specifically piped water for the benefit of households is at 46.7% and access to electricity of 83.1% in this area (Municipalities, 2019). Additionally, these efforts of minimal infrastructure development have a direct and indirect contribution to the unemployment rate which was estimated to be 34.2% in the year 2016.

Table 10: Mpumalanga – Municipal Grant allocation (Statistics SA, 2019)

Min			Median			Max		
Municipality	2017	2018	Municipality	2017	2018	Municipality	2017	2018
Emakhazeni LM	88535	112214	Thaba Chweu LM	208628	221365	Nkomazi LM	828019	737111
Dipaleseng LM	95522	102063	Ehlanzeni DM	227283	238224	City of Mbombela LM	1131384	1219533
Victor Khanye LM	111507	114006	Mkhondo LM	250087	329104	Bushbuckridge LM	1321757	1207194

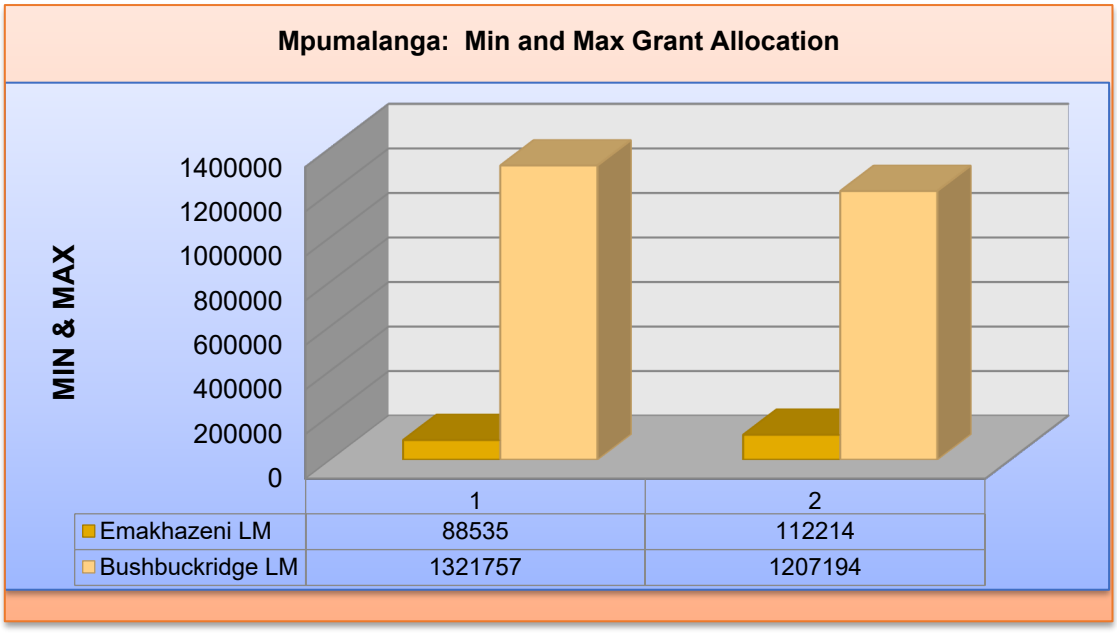

Figure 10: Mpumalanga min and max grant allocation (Statistics SA, 2019)

DISCUSSION

The above representation of Gauteng, Limpopo and Mpumalanga provides a comparison of grant allocation from lowest to highest municipalities and indicates that the municipalities that have received the highest grants are not in the NRBs. This illustration depicts the challenges raised in the research questions on resource distribution. Below are the proposed attributes which determine the asset classes to consider in developing the model algorithm.

Table 11: Equation Attributes

Province(P)	Local (L)
Non-Urban, Rural and Borderline (NRB)	Metro(M)
Population(P)	Electricity®
Water (w)	Sanitation (s)
Solid Waste (SW)	Borderline(B)
Urban(U)	Non-Urban (Nu)
District(D)	Rural®
t = time	r = rate

Source: Author's Work

Model A: Urban Allocation = $\boldsymbol{u = d^{n+1}m^{n+1}}$
Factor: Population growth rate = $\boldsymbol{P_t = P_0\,(1+r)^t}$

The below grant allocation model structures the allocation process on the basis of the regional prioritization model and attributes illustrated in the above table: Equation 1: Average Grant Allocation

$$P1(u) = D1 + D2 + D3 + M1$$
$$P1 = (1 + 3d) + m1$$
$$u = d^{n+1}m^{n+1}$$
$$P1(L) = NuRB1 + NuRB2 + NuRB3 \dots\dots\dots$$
$$Average\ Allocation = \frac{P1(L)=(1+\ NuRB1)}{dm}$$

Equation 2: Equation per Asset Class

Water	Sanitation
$\frac{\boldsymbol{u = d^{n+1}m^{n+1}}}{\boldsymbol{P_t = P_0\,(1+r)^t}}\boldsymbol{\pi/w + 1}$ **Electricity**	$\frac{u = d^{n+1}m^{n+1}}{P_t = P_0\,(1+r)^t}\pi/s + 1$ **Solid Waste**
$\frac{\boldsymbol{u = d^{n+1}m^{n+1}}}{\boldsymbol{P_t = P_0\,(1+r)^t}}\boldsymbol{\pi/e + 1}$	$\frac{u = d^{n+1}m^{n+1}}{P_t = P_0\,(1+r)^t}\pi/sw + 1$

Figure 11: Equation per Asset Class

The above figures outline the development in asset classes per province for urban and rural areas and compare the growth rate of resource distribution. These algorithms emphasise the resource allocation per province for both local and district municipalities. Additionally, asset classes such as water supply, electricity and solid waste are projected for effective resource allocation per rural and urban areas. The above stipulated resource allocation per asset class is dependent on the application of the two theories which is the baseline in development of the conceptual model. In this study resource allocation theory is aligned based on the following for the formation of the model: i) budgetary allocation, ii) public expenditure, iii) economic activity, and iv) political influences. The second theory of interpretation for the development of this model is the situational awareness theory which focuses on three main artifacts: i) perception of current situation (pcs), ii) comprehension of current situation (ccs), iii) projection of future status (pfs). The below formula addresses the initial stage in determining resource allocation based on situational awareness developed through observation and data collection based on the perception and resource allocation theory through the snowballing sampling strategy. The second stage is to comprehend the current situation as per the data collected during the perception phase and finally project the future resource allocation output for the NRBs.

$$(ra)^n = bp(1+x)^n - pe^n if \sum_{pi=0}^{ea} = \frac{-sa \pm \sqrt{pcs^o - pcs^p}}{P_0\,(1+r)^t}$$

CONCLUSION

Rural areas are lagging behind in development as the main focus of infrastructure development seems to be more effective in urban areas. Rural infrastructure is a challenge in African countries, stipulated are the fundamental conceptions of challenges faced by rural communities due to lack of infrastructure development. It further denotes the importance of exercising an effective infrastructure funding model in the NRB environment. Existing infrastructure and funding related frameworks and models are explored to determine their use as successes in their respective field of implementation. The study further demonstrates the importance for the existence of effective infrastructure funding models. On this note, the South African Local Government Association (SALGA) made efforts to encourage the implementation of an infrastructure funding model for rural development, however little progress is recorded. This therefore left the position of the NRB areas unchanged, with challenges of no service delivery or services that are non-existent.

In this light, rural municipalities are dependent on government transfers as part of revenue generation base, it is eminent that rural municipalities will continue to be dependent on provincial municipalities unless they can achieve self-sufficiency. It is acknowledged that the NRB areas are dependent on donors and government transfers for execution of service delivery. However, this mammoth challenge can be overcome through the implementation of an effective infrastructure funding model. The development of an effective Infrastructure Funding Model is not only critical, but also is a dependency for the successful implementation of rural infrastructure. The developed model intends to address the needs that arise for each asset class in different local municipalities. Now it is clear that government does not have a reliable and consistent infrastructure funding model, this therefore resulting in the slow

economic growth in rural areas. Therefore, it is imperative for this study to develop an effective infrastructure funding model for the improvement and enhancement of asset classes as per the different local municipalities located in the rural non-urban and borderline areas.

RECOMMENDATIONS

Established literature shows that for successful infrastructure development rural development cannot be donor or transfer dependent alone, hence the need for private sector involvement. It is projected that rural infrastructure development can be a reality upon correct implementation of an infrastructure funding model, as other countries have executed with efforts from government and private sector combined.

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