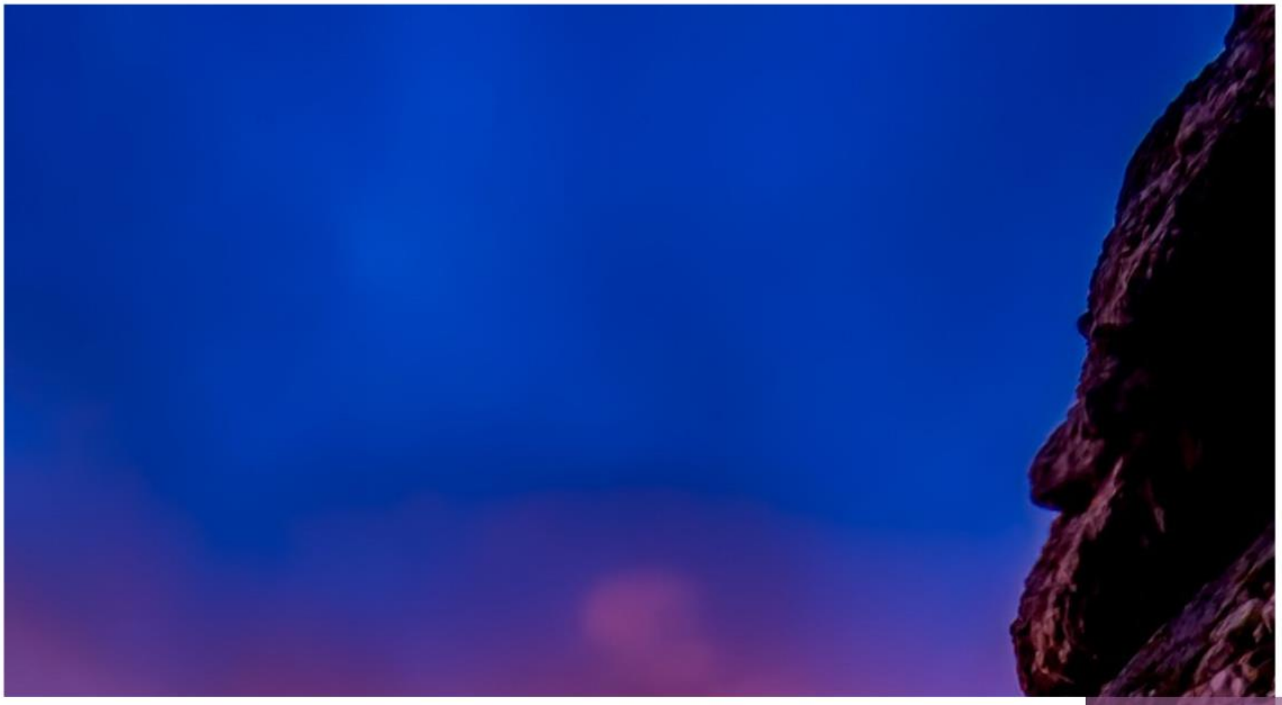

DEVELOPING A MODEL TO PRIORITISE INFRASTRUCTURE DEVELOPMENT PROJECTS AT THE MUNICIPAL LEVEL IN SOUTH AFRICA

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DEVELOPING A MODEL TO PRIORITISE INFRASTRUCTURE DEVELOPMENT PROJECTS AT THE MUNICIPAL LEVEL IN SOUTH AFRICA

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ABSTRACT

The ability to respond to ever-changing demands for urban management and human settlement services depends on the governments' sustainable infrastructure development, especially at the municipal level. Spatial planning frameworks in local government play a crucial role in guiding the provision of infrastructure development projects. However, in South Africa, most municipalities need help to invest in finance capital infrastructure development projects, and manage, maintain, and capitalise infrastructure assets under construction. Thus, this study aims? to develop a model to prioritise and coordinate infrastructure development projects and asset management at the municipal level in South Africa. The study adopted a qualitative approach to collect data and used content analysis to achieve saturation with ten participants. The sample comprised five City of Tshwane Metropolitan Municipality departments. Findings reveal that infrastructure provision at the municipal level is germane to improving and achieving many SDGs and promoting economic growth that empowers communities to reach their goals. As part of the implications, a model was developed to enhance prioritising and coordinating infrastructure development projects and asset management at the municipal level in South Africa.

Keywords: Coordination, Decision making, Infrastructure, Spatial planning, Sustainable.

INTRODUCTION

The only requirements for countries and governments globally to meet the objectives of Sustainable Developments Goals (SDGs) are to provide health, education, economic, water and sanitation, transport, and power generation infrastructure and services that enable society to function. Infrastructure development is pertinent to achieving SDGs (United Nations Office for Project Services, 2019). They affirmed that infrastructure provision is part of a system with a portfolio of assets to deliver the three pillars of the SDGs, namely social, environmental, and economic sustainability. The provision of infrastructure influences spatial planning. Also, it enhances the integration between sectors and improves national and local urban and rural development systems, considering environmental considerations. Klein et al. (2012) asserted that infrastructure plays a key role in shaping the city's spatial form and influences

sustainability, efficiency, and inclusiveness. The UN-Habitat (2009) identified transport, energy, water and drainage, waste, information technology, greening including rivers, open spaces, coastlines, community, and social infrastructure as components of the physical infrastructure. Spatial planning at the municipal level is key in providing a long-term framework for developing and coordinating infrastructure development projects. It provides a vision and common direction for policies.

A few studies (Harrison, 2006; Ruiters, 2013; Dithebe et al., 2019; Fouche and Brent, 2019; Khambule, 2021; Maswime, 2022) have been conducted concerning developing a framework for infrastructure in South Africa. Apart from the study by Khambule (2021), there is none regarding infrastructure provision at the municipal level. This is the study's motivation because municipalities are key to enhancing economic and social development. Ruiters (2013) developed a financing framework for water infrastructure provision in South Africa with the emphasis on public-private partnership. Dithebe et al. (2019) identified the hindrances facing the delivery of water infrastructure assets in South Africa. These include unreliable planning and procurement processes, high credit risk for private financing, cost recovery issues, high fiscal deficits by government, weak project arrangement, hostility, and corruption. Similarly, Fouche and Brent (2019) identified legislative issues, scarcity of finances, and aging infrastructure as the issues hindering implementation of renewable energy, a part of infrastructure development. Khambule (2021) proposed a district development model to provide economic and social development outputs. Harrison (2006) and Maswime (2022) emphasised the need for government to prioritise infrastructure plans. Achieving this requires legislation and the political will with the support of an enabling environment.

This study aims to provide practical guidelines for the rational allocation of resources to achieve sustainable infrastructure development. An integrated framework model for decision-making to prioritise and coordinate infrastructure development projects at the municipal level is required, and this paper aims to present an efficient and effective model. Lastly, asset management at the municipal level is a key contributor to infrastructure development, and the paper will emphasise the importance of maintaining infrastructure assets to ensure continuous service delivery. There is an increasing demand for municipal services and accelerated infrastructure development (National Treasury: Final Assets Management Guidelines, 2009). Managing local government assets is essential to efficient government operations and community safety. Local government has many assets to maintain. Local government asset management assists in addressing poorly planned budgets, higher deferred maintenance costs, and slow emergency response times, which, in practical terms, affect the delivery of services. These include health, education, economics, water and sanitation, transport and power generation infrastructure – all services in high demand.

2. LITERATURE REVIEW

2.1 Spatial planning and infrastructure development

Many South African townships and suburbs were planned for the emerging population densities (Marais et al., 2020). Consequently, the infrastructure and services become

overloaded, resulting in blockages and breakdowns. The scale of the problem in any area depends on the spare capacity within the local infrastructure networks. The researchers opined that the South African cities have some of the world's lowest city densities. The cost to municipalities of clearing blocked drains, replacing damaged electrical equipment, tackling illegal dumping, and dealing with shack fires and other disasters can be substantial. The other challenging phenomenon is the increase in backyard rental opportunities, which poses a serious risk to existing infrastructure. The public infrastructure in well-located settlements should be expanded and upgraded to accommodate the enlarged population. Infrastructure for new human settlement developments should be planned and linked to spatial planning to cater for informal densification in the future (Schindler and Kanai, 2021). Proactive designs for backyarding could include bigger stand sizes and improved site layouts. The government plays a regulatory and development function through local, provincial, and national spatial planning to achieve sustainable infrastructure development.

Planners should pay more attention to understanding informal densification processes, particularly why certain places are highly sought after by the population (Enns and Bersaglio, 2020). Strategic decisions over bulk infrastructure investments should follow these realities on the ground where possible and be planned by the spatial planning objectives (International Transport Forum, 2021). The government has drafted the National Infrastructure Plan 2050 (NIP, 2050), which describes the status quo regarding public infrastructure in various functional areas. A host of government rules and regulations relating to infrastructure development, networks, public facilities, and the built environment are often disregarded and not linked to spatial planning, thereby creating hazards, posing serious risks of harm to residents, and lacking alignment and integration with other urban development initiatives. The quality, access, and social arrangements concerning basic infrastructure and services (e.g., water/sanitation, electricity, refuse removal) are urban management functions and contribute to service delivery in a municipality (Lemanski, 2020).

2.2 THEORETICAL FRAMEWORK

This study adopted three theoretical approaches. Various approaches linking spatial planning and infrastructure development employ different viewpoints and consider different dimensions (Salet and Faludi, 2000). The researchers adopted an interactive approach to spatial planning and infrastructure development for this study. The approach aims to respond to the general challenges of spatial planning concerning the totality of social forces in which the actual spatial development occurs in infrastructure development projects. Breetzke (2009) asserted that in most municipalities in South Africa, infrastructure departments incurred massive capital expenses to serve housing projects. This happens normally when spatial planning is not linked to infrastructure development, and political pressures influence this development. The interactive approach integrates interdisciplinary factors, scenic values, and built environment infrastructure (Pakzad and Osmond, 2015). The interactive approach addresses hindrances in integrating planning across infrastructure sectors (International Transport Forum, 2021).

The increasing interactions within and between different sectors and competing land use relating to the location of electrification, economic, transport, social, and

recreational programmes are embedded across all infrastructure networks. This creates additional complexity if not linked to spatial planning (International Transport Forum, 2021). Current research indicates that the lack of interaction between spatial planning and infrastructure development contributes to infrastructure development projects lacking feedback, adaptability, and expression from the public (Yang et al., 2022:03). The other crucial element of the interactive approach is stakeholder engagement strategy and action plan (International Transport Forum, 2021). Manomano et al. (2016) affirmed that, in practical terms, implementing infrastructure projects must involve promoting participation and encouraging community ownership of infrastructure development projects. It entails a set of relationships among the actors involved in the infrastructure development processes. Marsden et al. (1990) opined that the beneficiaries of infrastructure development projects feel empowered and engaged in a developmental initiative and should feel a greater sense of purpose. The main objective of the social developmental approach is to empower communities to plan, partly finance, implement, monitor, and maintain sustainable projects (Olusa, 2021). Enfu and Zhongbao (2018) stated that infrastructure development projects are influenced by social development, whereby the production of public goods and services is oriented toward people's livelihoods and for the people's subjectivity.

As for spatial planning, the study adopted the bottom-up theoretical approach. Healey (1997) defines spatial planning as a set of governance practices for developing and implementing strategies, plans, policies and projects, and for regulating the location, timing, and form of development. Spatial planning is influenced by a bottom-up approach wherein a community has needs, problems, and expectations that are different from other communities, and the same community is willing to participate in planning procedures that influence the implementation of infrastructure projects (Pissourios, 2014). The bottom-up approach proposes what Cilliers and Victor (2018) called a 'planning with' approach to spatial planning for people with low incomes in South Africa, whereby communities contribute and provide a more integrative and sustainable approach to spatial planning. Semeraro et al. (2020) affirmed that the bottom-up approach is not a tool to obtain maximum consensus but mainly a moment of confrontation to address social issues more effectively in urban planning and design. The bottom-up approach uses new planning tools (Manomano et al., 2016). For this reason, municipalities are encouraged to conduct periodic socio-economic research and assessments for future infrastructure programmes and project developments to influence spatial planning and design implementation. Spatial planning at a metropolitan level provides some form of comprehensive land-use and transportation planning. It articulates future settlement patterns backed by zoning ordinances, subdivision regulations, and capital improvement programmes, including infrastructure development projects (Seto et al., 2014). South African cities are experiencing urbanisation at an increasing rate, putting pressure on the existing infrastructure. It is expected that cities should develop mitigation options that are effective and supported by bundled policy instruments (such as robust evidence and high levels of agreement).

3. RESEARCH APPROACH AND METHODOLOGY

The research followed the phenomenological approach. The study adopted a content analysis method and consulted published articles and documents on infrastructure

development and spatial planning to support the retrieved interview data. The researchers' knowledge of the facilitation of human settlement infrastructure provision and human settlement planning was employed to support the retrieved data. The study employed a semi-structured interview approach for the oral interview sections. It allows for open and closed-ended questions. This aligns with the view of Aigbavboa et al. (2023a, 2023b). The authors adopted the same approach to allow flexibility during the interview session. The interviewees were asked to describe the present state regarding how spatial planning can influence infrastructure development at the municipal level. Questions were also posed about the rational allocation of resources to achieve sustainable infrastructure development, coordination of decision-making to prioritise infrastructure development projects at the municipal level, incorporation of infrastructure projects in spatial planning development, the role of spatial planning and infrastructure development, the benefits of linking spatial planning and infrastructure development in municipalities, the contribution of asset management at the municipal level to infrastructure development, and the importance of maintaining infrastructure assets to ensure continuous service delivery.

The study's participants were experts in the subject matter with over ten years of work experience. The study employed a purposive sampling method. Neuman (1997) and Ebekozien et al. (2023a) opined that purposive sampling enhances the researcher's ability to select the most appropriate sample. The sample comprised five City of Tshwane Metropolitan Municipality departments: Energy and Electricity, Water and Sanitation, Roads and Transport, Human Settlements and Spatial Planning. Two participants were interviewed from each of the respective departments, constituting ten participants, and saturation was achieved. The interviewees were informed of the study's objectives and agreed to participate voluntarily. This is in line with the guidelines by Ebekozien et al. (2023b). The permission of the participants' principals was sought. Face-to-face interviews with the selected participants were then conducted (Azungah, 2018). A thematic approach was adopted to analyse the data and code it in line with the first principle of open coding to generate the main themes, as presented in the next section.

4. FINDINGS AND DISCUSSION

This section presents findings about the usefulness of linking spatial planning and infrastructure development within cities. Also, the study discussed findings regarding how resources are allocated to achieve sustainable infrastructure development and challenges in the implementation of infrastructure development projects. Lastly, the study proposed an integrated framework model for decision-making to prioritise and coordinate projects in line with the generated themes. Five main themes emerged from the analysed data. These include:

- Implementation of planning systems and regimes;
- Spatial planning challenges and risks;
- Infrastructure development encumbrances and risks;
- Government alignment and integration of spatial planning and infrastructure development-related functions; and
- Benefits of linking spatial planning and infrastructure development.

Table 1 shows the summarised main and sub-themes:

Table 1: Summarised main and sub-themes

Themes	Sub-themes
Theme 1: Implementation of planning systems and regimes	• Different planning framework sources. • Different implementation plans, interpretations, aims, objectives, targets, and priorities. • Spatial planning frameworks formulated on unattainable goals and milestones. • Goals and milestones are not realistic and unattainable.
	• Spatial Development Framework, National Spatial Development Framework, Provincial Spatial Development Framework, Regional Spatial Development Framework, Integrated Development Plan, District Development Model.
Theme 2: Spatial planning encumbrances and risks	• Spatial planning is highly regulated, which makes it difficult to implement. • Complications and complexity dealing with informal settlements and businesses in townships. • Spatial planning based on old models cannot adapt to the developing world landscape. • Spatial planning frameworks derived from western concepts only partially apply to dynamic South African cities. • Spatial planning models emphasise 'planning for' instead of 'planning with'. • Poor and lack of communication between spatial planning and infrastructure development teams. • Town planners lack the capacity, skills, and experience. • Lack of workable spatial planning implementation plan. • Silo approach in which cooperative structures struggle to work horizontally across various departments within a municipality. • Delays in finalising planning and regulatory instruments. • Lack of cross-departmental coordination and integration.
Theme 3 Infrastructure development challenges and risks	• Infrastructure development financial risks. • Inadequate funding for infrastructure development projects. • Stoppage by construction Mafia and business forums.

Themes	Sub-themes
	• Lack of community participation and buy-in.
	• Political interference. • Infrastructure development projects used as catalysts for political support.
	• Inadequate institutional capacity to implement infrastructure development projects. • Migration of people coming into the Gauteng Province leads to the mushrooming of informal settlements, which in turn impacts the provision of infrastructure development.
	• Infrastructure development project inspection and monitoring systems are lacking. • Lack of coordination between the three spheres of government in the implementation of infrastructure projects. • Delays in transferring infrastructure assets to municipalities. • Low-capacity levels to maintain infrastructure assets. • Shortage of engineering expertise for maintenance and operation. • Lack of funds to maintain infrastructure assets. • No reliable data about the state and performance of municipal infrastructure and its maintenance. • New infrastructure is being constructed without addressing the condition of existing infrastructure. • Rapid urbanisation which puts pressure on municipalities to provide infrastructure and services. • Low capacity of professionals to deal with backlogs. • Lack of understanding and appreciation of community dynamics.
Theme 4: Government's alignment and integration of spatial planning and infrastructure development-related functions.	• Three spheres of government alignment, prioritisation, and target setting for spatial planning and infrastructure development projects. • Functionality of spatial planning and infrastructure development task teams, committees, and fora.
	• The role of Integrated Development Plans in synchronising, aligning, and integrating spatial planning and infrastructure development projects.
	• Rational allocation of resources by the three spheres of government for infrastructure development projects.

Themes	Sub-themes
	• Spatial planning and infrastructure development administrative networks.
	• Defining infrastructure development demand by the three spheres of government.
	• Qualitative and quantitative analysis of the role of local government in the delivery of infrastructure projects.
	• Effective and operational intergovernmental relations system to implement infrastructure projects.
	• Coordination and reporting between the three spheres of government on spatial planning and infrastructure development.
Theme 5: Benefits of linking spatial planning and infrastructure development	• Infrastructure projects will be aligned with spatial planning. • Infrastructure project budgets are spent within the timeframe. • Better strategic decisions are made. • Projects are prioritised. • High rate of successful implementation and completion of infrastructure development projects. • High level of coordination of spatial planning and infrastructure development activities. • Infrastructure projects are incorporated within the IDP. • Integrated planning and cost-effectiveness in implementing infrastructure projects. • Spatially arranged sustainable development. • Able to accommodate the community's needs concerning the services they require through spatial planning. • Ability to determine the level of service in line with the infrastructure project to be delivered. • Opportunity for municipalities to design a level of service concerning the capacity of bulk infrastructure to address issues of overload and quality of services. • Feasibility studies conducted during the planning phase determine the capacity of infrastructure development projects. • Potential to realize the objective of building resilient, vibrant, and sustainable communities. • It provides a broad indication of where different types of development should occur within the municipal area. In other words, it provides spatial guidance for development.

4.1 The benefits of linking spatial planning and infrastructure development within municipalities

Infrastructure development plays a key role in shaping the spatial form of the city at a macro and more local scale (UN-Habitat, 2009). Findings reveal that better spatial planning leads to adequate space for infrastructure and services and efficient access for fire engines and other emergency services. The lack of adequate access to housing areas by fire trucks endangers life. It creates a favourable atmosphere for the destruction of numerous houses and other property in case of fires. Findings identify the following benefits of linking spatial planning to infrastructure development:

- Decreases costs of infrastructure, services, and transport;
- Land-uses for infrastructure development reduce much unnecessary movement, which decreases urban air pollution.
- Concentration of people, activities, and economic integration instead of physical isolation for the low-income households.
- Contributes to better utilisation of infrastructure and effective land use.
- Low-income communities will benefit from social infrastructure development and, as such not segregated.
- Infrastructure deficiencies will be understood in relation to housing development in cities.
- The urban market for investment in properties is encouraged which contributes to effective land sector reform.
- Urban economic, social, and cultural activities will be intensified.
- Spatial planning and infrastructure development is used in sustainable city development and integration of urban management functions.
- Contributes to city planning and facilitation of multiple benefits for urban inhabitants.
- Physical infrastructure associated with information communication technology follows the lines of other infrastructure such as roads, electricity, sewerage, and water pipelines.

The link between spatial planning and infrastructure development contributes to the liveability and inclusiveness of cities as it promotes access to many facilities and amenities.

4.2 The rational allocation of resources to achieve sustainable infrastructure development

Allocation of resources for infrastructure provision is controlled by the state and decoupled from supply and demand factors. Findings show that the public sector needs to intensify its involvement regarding regulations, operation, control, and contractual arrangement. These findings agree with those of Zayyanu (2015). Infrastructure provision in the urban and rural areas was poor due to a lack of rational allocation of resources and the scattered nature of the settlement, which is difficult to service. The question remains whether there is any political will by the government to provide efficient services and programmes through infrastructure improvement initiatives (Assumpta, 2008).

Infrastructure development costs can be covered through a diversified built environment, socio-economic integration of assorted social strata, and better land

utilisation. The inflow of middle and high-income households into the neighbourhood means that people experiencing poverty are not segregated and are the best approach towards cross-subsidisation in the provision of infrastructure (Assumpta, 2008). In South Africa, a rational allocation of resources to achieve sustainable infrastructure development is based on credible integrated development planning. A rational allocation of resources for infrastructure development is based on the following approaches as identified:

- Formula-based performance in terms of implementation of infrastructure projects;
- Sound infrastructure expenditure framework;
- Immediate technical priorities;
- Multi-year allocations;
- Financial management measures; and
- Under-expenditure of their capital budget of less than 35%.

4.3 A coordinated approach towards implementation of infrastructure projects within a municipality and between government departments

The NIP 2050 focuses on coordinating infrastructure planning to ensure vertical integration across spheres and tiers of government and horizontally across provinces and municipalities (Department of Public Works and Infrastructure, 2022). These findings agree with those of Khumalo (2019), who identified inadequate coordination from government ministries/agencies/departments that should work together. These MDAs ought to share information, making institutional arrangements with municipal departments and among government departments where policy implementation protocols are to be observed as well as adherence to laws and regulations. Aigbavboa (2014) affirmed that scarce budget allocation, unsuitable policy, lax planning, and inadequate coordination were the most critical factors affecting the delivery of infrastructure projects in South African municipalities.

Ramokgopa (2023) stressed the importance of solid coordination vertically and horizontally across government departments and agencies and efficient and effective mechanisms to monitor performance throughout an asset's lifecycle. The coordination of infrastructure investment across the different spheres of government is vital towards enhanced efficiency and effectiveness in infrastructure delivery. Horizontal and vertical cooperation can also bring about the mutualisation of funding, enhancing access to finance for infrastructure development (Ramokgopa, 2023:10). In South Africa, the roles and responsibilities of various entities and departments lack certainty and are hampered by insufficient coordination mechanisms.

4.4 Main challenges in the provision of sustainable infrastructure development and spatial planning

Infrastructure provision remains one of the challenges to meet the objectives of Sustainable Development Goals. The high rate of urbanisation and population growth puts pressure on existing infrastructure. Identified challenges militating against the provision of sustainable infrastructure development include the following:

- Inadequate funding: The first major challenge is the issue of finance, which cuts across individuals, private as well as the government itself. Given the

country's economic conditions, funding major capital infrastructure projects remains a major challenge for the government (Yirenkyi, 2014).

- It is critical for the government to develop financial frameworks for investment in infrastructure. This should include public or parastatal agencies or private contractors such as privatised or private sector enterprises. This is meant to ensure the orderly planning and maintenance of existing infrastructure (United Cities and Local Government, 2019).
- Multi-stakeholder management: Owing to broad interest groups involved in infrastructure development project delivery, project leaders are responsible for aligning and managing diverse interests towards the project objective.
- The infrastructure delivery process has several partners within the project life cycle who are implicated by the project's outputs. Thus, findings reveal that it is important to have a multi-stakeholder management plan to ensure that all project challenges and bottlenecks with community leaders and professionals are addressed.
- Weak management: There is a common belief that the government is weak in managing capital infrastructure development projects. This is evident in the long construction times and cost overruns.
- There are some inefficiencies in municipal and state-owned utilities and infrastructure providers in sub-Saharan Africa, and they cost around billions of rands a year. A comparison between public-private partnerships (PPPs) and those that are publicly procured shows that PPPs can achieve better results.
- Poor governance systems are largely responsible for poor state infrastructure in all sectors. Ramokgopa (2013) affirmed that poor governance has been demonstrated to be at the heart of the poor productivity of infrastructure projects. In most developing countries, there is inefficient allocation and poor management of human and natural resources (Olaseni & Alade, 2012).
- Insufficient capacity and policy frameworks hinder the government's ability to develop a robust, credible, and bankable project pipeline. Government currently lacks the technical expertise and institutional landscape to attract private sector finance.

4.5 The effective integrated framework model for decision-making to prioritize infrastructure projects within municipalities

In South Africa, institutional overlap regarding competencies and growing political, economic, and administrative dependencies among the three spheres of government in implementing infrastructure development projects remains a challenge. The local government sphere is at the heart of infrastructure development. It must deal with operational activities, integration, coordination, planning, defining and articulating norms and standards, and ensure an institutionalised decision-making process to prioritise infrastructure projects, as illustrated in Figure 1:

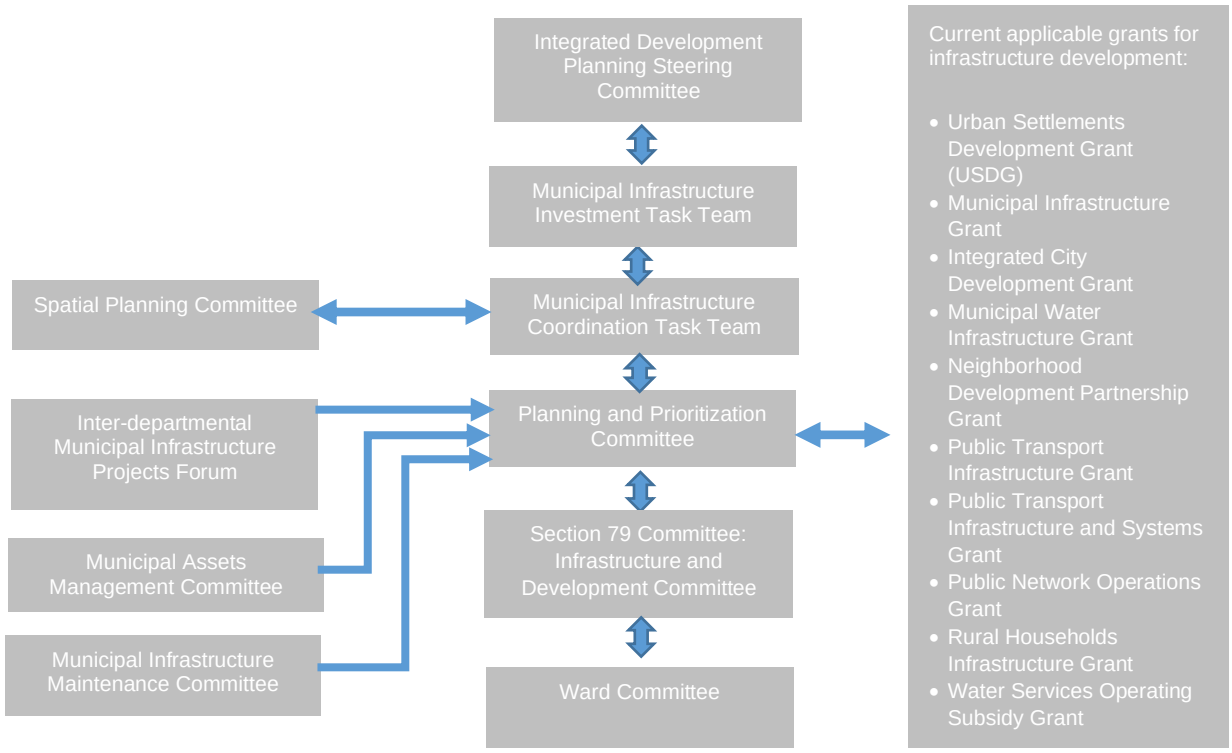

Figure 1: Model for decision-making to prioritise infrastructure development projects at the municipal level

Social development theory recognises and incorporates societal actors such as wards, integrated development planning steering committees, section 79 committee on municipal infrastructure, spatial planning committees that rely heavily on cooperation and partnerships with other spatial planning and infrastructure development actors such as the national, provincial, and state agencies and task teams. Infrastructure provision involves collaboration and joint efforts among the various departments in a municipality. The Integrated Development Planning (IDP) Steering Committee should promote participation, involvement, and the encouragement of community ownership of infrastructure development projects. It entails a set of relationships among actors involved in the infrastructure development processes and the actual implementation thereof. It must be noted that the IDP steering committee was established at the municipal level as a point of entry for large-scale infrastructure projects and, by implication, the custodian of the projects pipeline that is linked to the spatial framework at the municipal level, as presented in Figure 1 (Ramokgopa, 2023).

Under the IDP steering committee, there is the Municipal Infrastructure Investment Task Team, which reviews infrastructure investment initiatives across all departments in a municipality to ensure investment planning and alignment between departments. The model proposes the Municipal Infrastructure Coordination Task Team, which coordinates infrastructure investment planning, financial planning, and grant funding applications. The task team coordinates sector-specific infrastructure development projects and grants funding in line with spatial planning objectives. The task team is

directly linked to the Spatial Planning Committee. The other committee is the Planning and Prioritization Committee, which ensures things are happening.

At the municipal level, the model proposes a political oversight committee, the Section 79 Committee: Infrastructure and Development Committee, which provides political oversight, monitors project performance, and ensures that spatial planning objectives are met. The committee ensures that the environment is favourable for the municipality to invest in infrastructure projects by encouraging the participation of departments dealing with spatial planning, property development, maintenance, assets management, human settlement planning, legal, and bulk infrastructure services. The model also highlights ward committees' role in identifying service delivery needs at the ward level, such as water and sanitation, housing, waste removal, and health services.

The model proposes the Inter-Departmental Municipal Infrastructure Projects Forum, as presented in Figure 1. This is a forum to share infrastructure goals that are financially feasible and sustainable, exchange information, and collaborate among different departments within a municipality. It is essential for effective communication and the successful completion of tasks related to infrastructure development. The model proposed the Assets Management Committee, which will focus on all assets management functions at the municipal level. The National Treasury (2008) described asset management as a broad function with a structured administration process. This committee's main role is to ensure satisfactory asset registers with supporting documentation to substantiate asset values. The model is incorporated into the Integrated Development Plan to ensure financial and institutional resources are integrated and aligned to ensure a coordinated approach in delivering infrastructure development projects at the municipal level.

5. CONCLUSION AND RECOMMENDATIONS

The provision of infrastructure centralised at the local government level facilitates integrated planning and provides the municipalities with sufficient autonomy. For policymakers, the study presents how infrastructure development projects can intervene in empowering communities to reach their goals. In developing countries such as South Africa, infrastructure development projects contribute towards addressing socio-political factors. Thus, the study proffers recommendations that can be explored to ensure infrastructure development plays a key role in shaping the spatial form of South African cities. These include the following:

- There are multiple grants to address the infrastructure backlog. These need to be managed to prevent overlap, and sector-specific grants should be consolidated towards achieving national targets and priorities. Lastly, transfers should flow directly to municipalities.
- Where national or province builds infrastructure on behalf of municipalities through indirect grants, service-level agreements should be in place to define the roles, responsibilities, targets, and priorities clearly. Also, the responsibilities of all actors involved need to be unambiguously defined.
- Municipalities should develop infrastructure investment plans via investment and financial planning practices to coordinate the demand and supply of infrastructure projects. This is pertinent to address infrastructure backlogs

and monitor the delivery of infrastructure development projects. Also, the local government sphere should be capacitated to deal with issues of regulation of infrastructure provision, norms and standards, planning, designing, implementation, and monitoring.

- Government to address the widening funding gap in infrastructure investment. Municipalities need to embark on efficient land use whereby infrastructure projects to deliver water, electricity, housing, waste management, roads, sewer systems, and other recreational services are linked to spatial targeting and capital investment programming. Also, municipalities should consult with spatial plans to identify and prioritise infrastructure projects.
- An enabling environment for the private sector to contribute to bulk infrastructure funding by creating economic opportunities. Municipalities must facilitate and coordinate linkages between spatial planning and infrastructure development by engaging and involving key stakeholders and actors in the infrastructure development sector. Also, the planning framework needs to be simplified to ensure the synchronisation of conditional grants and sector-specific grants to align spatial planning targeting and prioritisation across all spheres of government.

6. REFERENCES

Aigbavboa, C., Ebekozien, A. and Mkhize, N. (2023a). An assessment of South African airlines' growth in the era of fourth industrial revolution technologies: The unexplored dimension. Journal of Facilities Management. https://doi.org/10.1108/JFM-07-2022-0076 (date of access)

Aigbavboa, C., Addo, L., Ebekozien, A., Thwala, W. and Arthur-Aidoo, B. (2023). Developing a framework for effective institutional management of Ghana's urban water supply. International Journal of Building Pathology and Adaptation, https://doi.org/10.1108/IJBPA-05-2023-0058 (date of access)

Alade, K. and Windapo, A. (2020). Leadership framework for sustainable housing production in South Africa, 1. 109-119. https://www.researchgate.net/publication/346428299_Leadership_Framework_for_Sustainable_Housing_Production_in_South_Africa/citation/download (date of access)

Azungah, T. (2018). Qualitative research: Deductive and inductive approaches to data analysis. Qualitative Research Journal, 18(4), 383-400.

Breetzke, K. (2009). From conceptual frameworks to quantitative models: spatial planning in the Durban metropolitan area, South Africa—the link to housing and infrastructure planning. Unpublished case study prepared for the Global Report on Human Settlements.

Bubolz, M. M. (1991). Theory, research, and practice in home economics. Journal of Theory in Home Economics, 1(1), 1-14.

Cilliers, J. and Victor, H. (2018). Considering spatial planning for the South African poor: An argument for 'planning with'. Town and Regional Planning, 720, 29-42. https://doi.org/10.18820/2415-0495/trp72i1.3

Dithebe, K., Aigbavboa, C. O., Thwala, W. D. and Oke, A. E. (2019). Analysis of the perceived occurrence of challenges delaying the delivery of water infrastructure assets in South Africa. Journal of Engineering, Design and Technology, 17(3), 554-571.

Ebekozien, A., Aigbavboa, C., Ikuabe, M. and Thwala, W. (2023a). The built environment craftmanship in higher education institutions: Issues and prospects from stakeholders' perception. Education + Training, 65(3), 492-509. https://doi.org/10.1108/ET-03-2022-0086 (date of access)

Ebekozien, A., Aigbavboa, C., Samsurijan, M. S., Isa, R. and Malek, N. M. (2023b). Developing a framework for higher education institution building maintenance via soft system methodology. International Journal of Building Pathology and Adaptation, 41(6), 184-200.

Enfu, C. and Zhongbao, W. (2018). Enriching and developing Marxism in the twenty-first century in various aspects: Six definitions of Marxism. International Critical Thought, 8(2), 177-192.

Enns, C. and Bersaglio, B. (2020). On the coloniality of "new" mega-infrastructure projects in East Africa. Antipode, 52(1), 101-123.

Fouche, E. and Brent, A. (2019). Journey towards renewable energy for sustainable development at the local government level: The case of Hessequa municipality in South Africa. Sustainability, 11(3), 755.

Fowler, L. (2018). Intergovernmental relations and energy policy: What we know and what we still need to learn. State and Local Government Review, 50(3), 203-212.

Harrison, P. (2006). Integrated development plans and third way politics. In U. Pillay and J. du Toit (Eds.). Democracy and Delivery: Urban policy in South Africa. Cape Town: HSRC Press, 186-207.

Healey, P. (Ed.). (1997). The revival of strategic spatial planning in Europe. In Making strategic spatial plans. London: UCL Press, pp. 3–19.

Hegedus, J., Lux, M. and Teller, N. (2014). Social housing in transition countries. New York: Routledge.

International Tennis Federation (ITF). (2021). Developing strategic approaches to infrastructure planning.ITF research reports. Paris: OECD Publishing.

Khalid, S. (2012). Rural development administration in Nigeria. In I. S. Ogundiya and J. Amzat (Eds.). The basics of social sciences, 535–550. Lagos: Malthouse Press
Khambule, I. (2021). The district development model: Towards a capable local developmental state in South Africa. Journal of Public Administration, 56(3), 507-523.
Khumalo, P. (2019). Is access to adequate human settlements still a 'wicked' problem for Africa? Revisiting South Africa's policy and strategy landscape. Proceedings of the 4th International conference on Public Administration and Development Alternatives. 3-5 July 2019. Johannesburg: IPADA Publishers.
Klein, G., Klug, N. and Todes, A. (2012). Spatial planning, infrastructure and implementation: Implications for planning school curricula. Town and Regional Planning, 60, 19-30.
Koo, J. and Kim, J. B. (2018). Two faces of decentralization in South Korea Asian Education and Development Studies, 7(3), 291-302.
Lemanski, C. (2020). Infrastructural citizenship: The everyday citizenships of adapting and/or destroying public infrastructure in Cape Town, South Africa. Transactions of the Institute of British Geographers, 45(3), 589-605.
Manomano, T., Tanga, P. T. and Tanyi, P. (2016). Housing problems and programs in South Africa: A literature review. Journal of Sociology and Social Anthropology, 7(2), 111-117.
Marais, L., Denoon-Stevens, S. and Cloete, J. (2020). Mining towns and urban sprawl in South Africa. Land Use Policy, 93, 103953.
Marsden, D., Oakley, P. and Pratt, B. (1990). Evaluating social development projects. Oxford: Oxfam Publishers.
Maswime, G. (2022). Streamlining municipal infrastructure planning under the district development model using the rationalised implementation framework. Journal of Public Administration, 57(3), 726-741.
Muhammad, Z. (2015). A review of housing provision and the challenges of sustainable housing delivery in the Federal Capital Territory Abuja, Nigeria. Journal Teknologi, 77, 23-31.
Naiker, U. (1992). Sustainable development and human settlements. Australian Planner, 30(4), 207-210.
Neuman, W. L. (1997). Social research methods: Qualitative & quantitative approaches. 3rd edition. Needham Heights, MA: Allyn & Bacon.
Nnaggenda-Musana, A. (2008). Housing clusters for densification within an upgrading strategy. The case of Kampala, Uganda. https://doi.org/10.13140/RG.2.1.1429.4241(date of access)
National Treasury (NT). (2008). Local government capital AM guidelines. Pretoria: Government Printers.
Noyoo, N. (2014). Introduction to the concepts of social development. In L. Calvelo, R. Lutz and
A. Strauss (Eds.). Development and social work: Social work of the south. Germany: Paulo Frere Verlag,pp. 27-41.
Olaseni, M. and Alade, W. (2012). Vision 20:2020 and the challenges of infrastructural development in Nigeria. Journal of Sustainable Development, 5, 63-76.
Olusa, A. O. (2021). Impact of community social development projects on community improvement:Case of Ibule-Soro Community, Ondo State, Nigeria. Journal of Infrastructure Development, 13(1), 7–20.
Pakzad, P. and Osmond, P. (2015, December). A conceptual framework for assessing green infrastructure sustainability performance in Australia. Proceedings of the 7th State of Australian Cities Conference, 9-11 December 2015, Gold Coast, Australia.
Patience, J. J. (2015). Infrastructure management challenges in Ekurhuleni Metropolitan Municipality. Unpublished Master's dissertation, University of Johannesburg, Johannesburg.
Pissourios, I. A. (2014). Top-down and bottom-up urban and regional planning: Towards a framework for the use of planning standards. European Spatial Research and Policy, 21. https:doi.org/2478/esrp-2014-0007 (date of access)
Ramokgopa, K. S. (2023). South African infrastructure emergency: An urgent and collaborative intervention.

Republic of South Africa: Annual Inspection Report 2019/2020. Pretoria: Office of Health Standards Compliance (OHSC).
Republic of South Africa: Department of Human Settlements. (2004). Breaking new ground: A comprehensive plan for the development of sustainable human settlements. Pretoria: Government Printers
Republic of South Africa: Department of Public Works and Infrastructure (2022). Draft national infrastructure plan 2050 Phase 2. Pretoria: Government Printers
Ruiters, C. (2013). Funding models for financing water infrastructure in South Africa: Framework and critical analysis of alternatives. Water SA, 39(2), 313-326.
Salet, W. and Faludi, A. (2000). Three approaches to strategic spatial planning. The revival of strategic spatial planning, 155, 172. https://api.semanticscholar.org/CorpusID:167544041(date of access)
Schindler, S. and Kanai, J. M. (2021). Getting the territory right: Infrastructure-led development and the re-emergence of spatial planning strategies. Regional Studies, 55(1), 40-51.
Semeraro, T., Nicola, Z., Lara, A., Cucinelli, F. S. and Aretano, R. (2020). A Bbottom-up and top-down participatory approach to planning and designing local urban development: Evidence from urban university center. Land, 9(4), 98. (page numbers or is 98 the only page number)
Seto, K. C., Dhakal, S., Bigio, A., Blanco, H., Delgado, C. G., Dewar, D., Huang, L., Inaba, A., Kansal, A., S. Lwasa, J. E., McMahon, D. B., Müller, J., Murakami, H., Nagendra, H. and Ramaswami, A. (2014). Human settlements, infrastructure and spatial planning. In: Climate change 2014: Mitigation of climate change. Contribution of working group iii to the fifth assessment report of the intergovernmental panel on climate change. Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (Eds.) Cambridge, UK: Cambridge University Press.
Soiferman, L. K. (2010). Compare and contrast inductive and deductive approaches. University of Manitoba. South African Cities Network (2014). From housing to human settlement: Evolving perspectives. Proceedings of the united cities and local government conference. Rethinking housing policies: Harnessing local innovative to address the global housing crisis. Durban, 15-19 November 2019.
UN-Habitat. (2009). Planning sustainable cities: Global report on human settlements 2009. United Nations Human Settlements Programme (UN-Habitat).
United Nations. (2008). Spatial planning: Key instrument for development and effective governance with special reference to countries in transition. UN: New York and Geneva.
United Nations Office for Project Services. (2019). The critical role of infrastructure for sustainable development goals. https://content.unops.org/publications/The-critical-role-of-infrastructure-for-the-SDGs_EN. (date of access)
International Monetary Fund and World Bank. (2016). World Bank's Africa infrastructure diagnostic study. (https://ppp.worldbank.org/public-private-partnership/library/world-bank-s-africa-infrastructure-diagnostic-study). (date of access)
Yang, Y., Liu, C., Li, B. and Zhao, J. (2022). Modelling and forecast of future growth for shandong's small industrial towns: A scenario-based interactive approach. Sustainability, 14, 16823. https://doi.org/ 10.3390/su142416823 (date of access)
Yirenkyi. J. N. (2014). Urban housing supply challenges and implications for affordable housing in Accra:. Unpublished Master's dissertation. University of Ghana. http://ugspace.ug.edu.gh. (date of access)