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## AIMS AND SCOPE

The Development Bank of Southern Africa's (DBSA) African Journal of Infrastructure Development aims to serve as a preeminent platform for scholarly discourse, presenting cutting-edge research and analytical insights into the complexities of infrastructure development in the African context. It aspires to bridge the gap between theory and practice, fostering a multidisciplinary dialogue that spans economics, urban planning, engineering, environmental science, finance, and public policy.

This scholarly publication is dedicated to examining the multifaceted nature of infrastructure projects, from conceptualization to implementation, including the evaluation of economic impacts, the exploration of innovative financing mechanisms, and the assessment of sustainability and governance practices. It seeks to discuss and expand the challenges and opportunities inherent in developing resilient infrastructure that can withstand socio-economic and environmental pressures while propelling inclusive growth and regional integration.

The journal's scope encompasses both macro and micro perspectives, inviting contributions that analyze national frameworks, regional cooperation models, and case studies of specific infrastructure projects. By providing a forum for the exchange of ideas among academics, practitioners, policymakers, and international development agencies, the journal endeavours to influence the discourse on infrastructure development policies and contribute to the achievement of sustainable development goals in the African continent. With a commitment to rigour and relevance, the DBSA's African Journal of Infrastructure Development strives to impact not only the academic community but also practical applications in the field. It encourages submissions that employ diverse methodologies, from quantitative studies and policy analyses to qualitative research and comparative reviews, all aimed at enriching understanding and guiding effective action in Africa's infrastructure sector.



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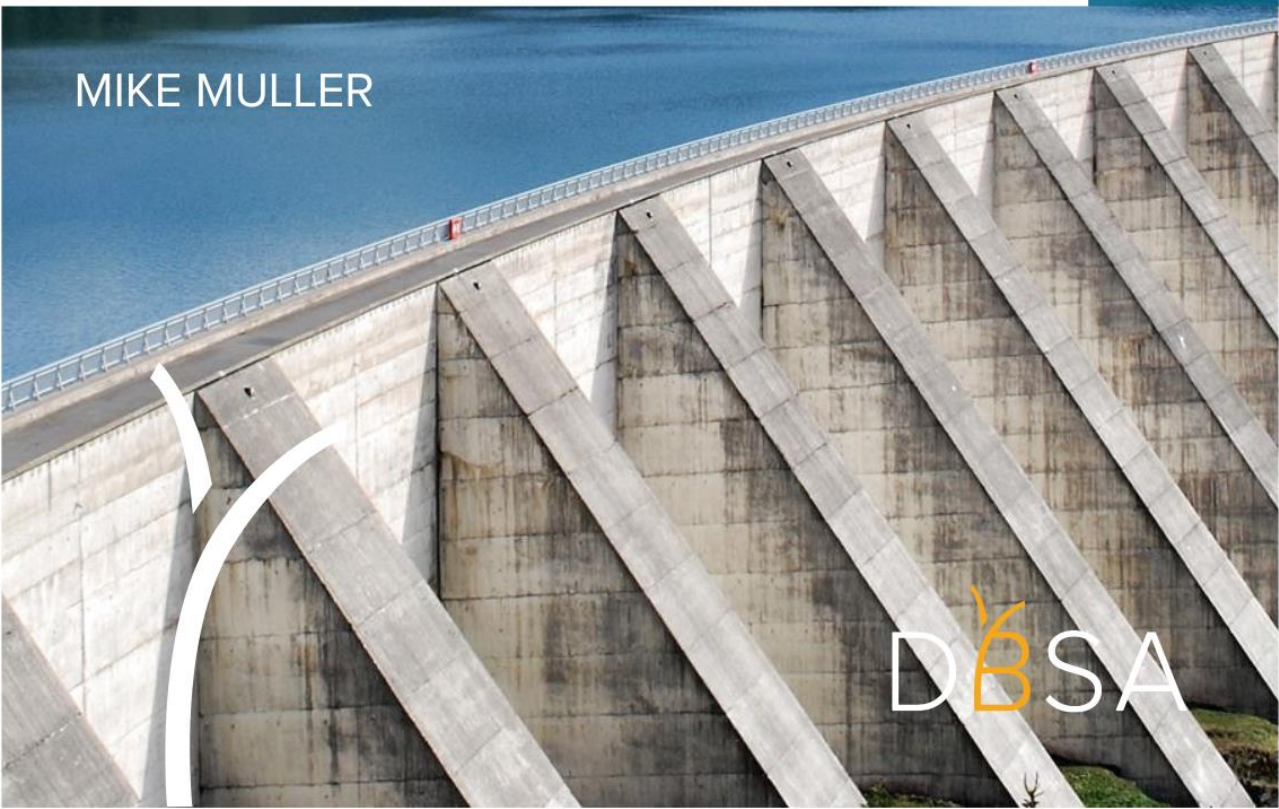






**EFFECTIVE STRATEGIES FOR  
SUSTAINABLE WATER SERVICES:**  
CURRENT OBSTRUCTIONS AND  
POTENTIAL PATHWAYS AROUND THEM

MIKE MULLER



# EFFECTIVE STRATEGIES FOR SUSTAINABLE WATER SERVICES: CURRENT OBSTRUCTIONS AND POTENTIAL PATHWAYS AROUND THEM

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## ABSTRACT

South African efforts to channel increased financial flows to support the provision of sustainable water supply and sanitation services have enjoyed limited success and the quality of service provision is declining. This paper identifies critical obstacles to performance improvement and suggests potential pathways to overcome them. Current obstacles include a failure to balance infrastructure investment with O&M (operations and maintenance) resources or to ring-fence water-related financial flows at municipal level; institutional deficiencies which weaken oversight and limit intervention where systems fail; and inappropriate norms and standards for service provision coupled with unrealistic user expectations, which are often encouraged by weak political leadership. Potential reform interventions that are feasible within current Constitutional arrangements are described and the constraints on their implementation are outlined, together with strategic suggestions on how these may be overcome. In most cases, substantial policy innovation will be required, backed by institutional reform.

**Keywords:** Current obstructions, Effective strategies, Potential pathways, Sustainable water services

## INTRODUCTION

By 2010, South Africa, together with many other countries, had achieved the year 2000 Millennium Development Goal (MDG) of halving the proportion of people without sustainable access to safe drinking water. A target for access to improved basic sanitation was only introduced as an afterthought at the 2002 World Summit on Sustainable Development and proved to be more challenging. Nevertheless, South Africa which had lobbied strongly for the inclusion of a sanitation goal, declared that it had been achieved in 2012 (Stats SA, 2015).

Following the relative success of the MDGs, the United Nations adopted a more aspirational programme for its next development round. The sustainable development goals (SDGs) were presented as “a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity” (UNDP, 2015). Accordingly, the SDG targets are considerably more ambitious than the MDGs. SDG6

includes targets for universal access to safe and affordable drinking water as well as to adequate and equitable sanitation and hygiene.

In the more detailed elaboration of the targets and indicators, emphasis is placed not just on the provision of infrastructure services but also on 'affordable access' to them as well as their safe and sustainable management. The achievement of these more onerous, albeit obvious, criteria for performance assessment is indeed proving to be challenging. Moreover, independent projections suggest that, on present performance, South Africa will not achieve them by 2030 (WHO/UNICEF JMP, 2022).

This paper reports on the current status of service delivery and, after setting out the current institutional context for service delivery, considers the challenges that are calling the achievement of service delivery goals into question. It identifies areas in which the water supply sector's performance is deteriorating and some of the factors that contribute directly to this poor performance, many of which are well known. However, while the direct drivers of poor performance can be identified, it is necessary to identify and address the barriers to action if the sector's performance is to be improved.

It is suggested that these barriers lie primarily in the institutional and political sphere, and compounded by financial constraints. Based on this analysis, with the challenges better defined, some potential interventions to improve performance are outlined and an indicative programme, structured to sequence and prioritise the actions required, is set out. The paper focuses specifically on water supply rather than on the water supply and sanitation services in their entirety. This is both because water supply is the more immediate public priority but also because it is less complex than sanitation where the challenge is to balance contesting environmental regulation, social preferences, and financial constraints.

## **BACKGROUND: TRENDS IN THE PROVISION OF WATER SUPPLY SERVICES**

The following four metrics are often used to monitor the performance of water supply services:

- availability of supply infrastructure (population served by infrastructure);
- reliability of the quantity and quality of the supply provided;
- sources of water actually used by households; and
- user satisfaction with the service received.

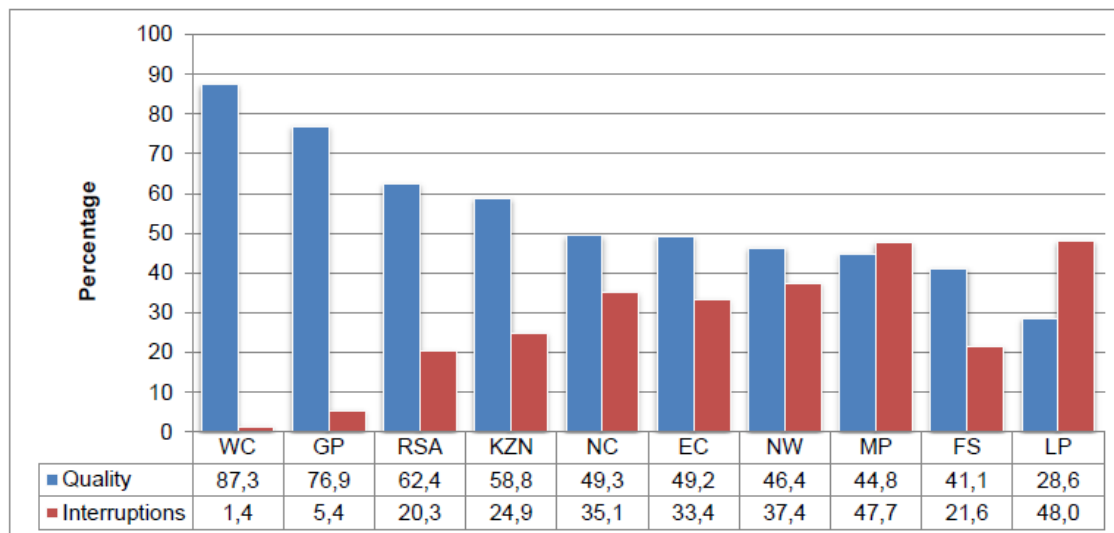
Availability of infrastructure is an indicator of the technical ability to provide a water supply while reliability indicates whether the system is effectively managed from a technical perspective. Information about the source of water actually used (often determined through household surveys) offers insights into the quality of access (convenience) of the supply but critically also whether it is affordable. Finally, 'user satisfaction' provides both a gauge of the users' expectations as well as providing a check on the validity of the technical indicators reported.

South Africa performed well against the MDGs because they focused on the availability of water supply infrastructure. The number of households with access to



piped water has expanded significantly since 1994: between 2002 and 2021 it grew from 9.45 million (84.4% of the population) to 12 900 (91%) in 2012. However, although the number of households served continued to rise, service provision did not subsequently keep pace with population growth and the proportion of households served declined to 88.7% in 2021 even as the number served rose to 17.95 million (Stats SA, 2021). Physical access in the metropolitan municipalities ('Metros') had reached 98.6% with the unserved population now in smaller cities, towns and rural areas. However, the reliability and quality of the supplies provided have faltered. The measure of reliability adopted for the national norms and standards (Dept of Water Affairs and Forestry, 2001) is the number of supply interruptions reported by households which lasted more than two days at a time, or more than 15 days in total over the year. Using this metric, the performance picture is mixed with substantial divergences between the national averages and the situation in individual provinces and municipalities. At a national level, 25.8% of households reported that their supplies were unreliable. Rates of interruption ranged from 55% in provinces with large, dense rural populations to just 9.5% and 4.6%, respectively in predominantly urban Gauteng and Western Cape.

These interruptions correlated with households' reported perceptions of the quality of their supplies. Provinces with low rates of interruptions were rated as having a high quality of services while those with higher rates of interruption reported a lower quality. Poor reliability and its impact were also confirmed by the alternative sources such as water vendors and tankers, which households reported using when their formal supplies failed.



**Figure 1.** 2018 Percentage of households rating the quality of water services provided by the municipality as good and those reporting service interruptions by province (Stats SA, 2019)



## **ANALYSIS: CONTRIBUTORS TO POOR PERFORMANCE**

The poor and deteriorating performance of water supply systems is attributed to a number of factors, most of which are well known and documented.

### **Infrastructure inadequate to meet existing and future needs**

Despite substantial investment since 1994, there are still many communities where there is no infrastructure to provide a formal safe and reliable water supply. According to the DWS's estimates (<https://www.dws.gov.za/niwis2/AccessToWaterID>) over 7 million people, 12% of the population, did not have access to 'water infrastructure' in May 2021. The largest deficits were in the rural provinces of Eastern Cape (30%), Limpopo (25%), KwaZulu-Natal (19%), NorthWest (16%) and Mpumalanga (13%).

Even where there is infrastructure, it is often reported that poor service delivery is due to inadequate or old infrastructure. This is then given as the motivation for new infrastructure investments. However, there are also many examples of infrastructure elements (treatment plants, bulk pipelines, reservoirs) that are not fully functional, often because they are not connected to or cannot be supported by other elements of the system. In addition to current needs, South Africa's population has been growing more rapidly than expected. The 2012 National Development Plan estimated that, by 2030, the population would grow from 50.6 million to between 58 and 61.5 million, including immigrants (using projections provided by the Actuarial Society of South Africa). It has already exceeded the higher estimate and is now expected to reach around 65 million by 2030 (United Nations, 2022), 5 million more people than the NDP planned for. The implications of this underestimate were already highlighted in a 2013 report which noted that "... policymakers will be compelled to meet the service needs of a larger population in areas like healthcare, education, employment or basic infrastructure need", warning that key decisions on social and economic development need good forecasts (Go et al., 2013)

### **Poor operation and maintenance of existing infrastructure**

Even where infrastructure is present, it is often not providing a reliable supply to households. This is a longstanding problem. In 2003 it was alleged by civil society activists that water supply interruptions were due to cut-offs for non-payment (Bond and Dugard, 2008). However, formal surveys found that most were due to technical failures. The reasons for interruptions given by affected households were mainly operational: pipe bursts, pump breakdowns and lack of maintenance accounting for 57%, vandalism (17%) and water source problems (e.g. drought) 17%, while only 10% were due to cutoffs for non-payment. This pattern continued for the next decade with around 80% of the households that complained of unreliable supplies attributing this either to poor maintenance or to the fact that water was only delivered occasionally (presumably by tanker trucks), often where piped supplies had already failed (Galvin, 2016).

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A recent systematic review by the South African Institution of Civil Engineers found that, outside the large urban areas, much of the country's water supply infrastructure is at risk of failure. It is "poorly maintained and not coping with demands. Public may suffer severe inconvenience and even danger if prompt action is not taken." The urban infrastructure was found to be "satisfactory for now" but it was noted that "condition is acceptable although stressed at peak periods. Will need investment in Medium Term Expenditure Framework period to avoid serious deficiencies" (South African Institution of Civil Engineers, 2022).

### **Failure to manage water use and collect revenue**

Water supply infrastructure is designed to provide a specific level of service, which determines the expected consumption by present and future users. Actual household water use depends on the household facilities (indoor baths and flush toilets, for instance) as well as the cost of the water (Nel et al., 2017). This assumes that meters are installed and read, and that consumption is billed and paid for, which is often not the case. In 2019, over 55% of households with piped water connections reported that they did not pay for water although only 16% formally qualified for free basic water (Stats SA, 2020). As a result, not only was less funding available for operation and maintenance but there was also no incentive for households to limit their water use. The resulting excessive consumption by some users increases production and distribution costs and deprives other users of reliable supplies.

### **Insufficient funding or inadequate welfare provision?**

Failure to collect revenue may aggravate local government funding challenges. However, careful analysis is needed since it is unclear whether non-payment is due to the unwillingness or inability of users to pay for their water use. The proportion of South Africans living below the formal upper-bound poverty line before COVID was already around 55% and may have risen since then (Gumede, 2021). If policy is that all South Africans living below the (upper) poverty line should have access to free basic water, there is a substantial funding gap that will have to be met by public finance transfers. This affects, in particular, operation and maintenance expenditure. If the transfer through the equitable share of revenue is insufficient, the more systemic challenge may be that public finance and water sector policy are not coordinated and, as a result, budgetary transfers are not adequate to meet the policy goals that have been established for service delivery (Khambule, 2022).

The adequacy of funding for capital expenditure is more difficult to determine. Capital expenditure is required both to meet the needs of growing populations as well as refurbishing and replacing existing infrastructure. In the urban areas where the population is growing most rapidly, allocations of public funds through municipal infrastructure grants should cover the proportion required to meet the needs of 'poor' households while funding for smaller, rural municipalities, where populations are growing more slowly, will have to reflect the larger proportion of 'poor' households. However, the rate at which infrastructure must be refurbished or replaced is determined to a large extent by the quality of infrastructure operations and maintenance. Failure to spend and perform adequately on maintenance thus increases the requirement for capital funding but raises the question of whether this



should be supported by national government if it is the consequence of weak local management.

### **Municipal capacity and unqualified staff**

Many municipalities perform poorly because they do not have adequately qualified personnel to manage their water supply systems (Lawless, 2017). While there were shortages of entry-level technical personnel in the first decade of democracy, there is now a substantial pool of relatively recent graduates actively seeking opportunities. It is often reported that technically qualified staff are unwilling to relocate, in particular to rural municipalities (Lehmann et al., 2008). However, in many of those municipalities the staffing structure is 'top heavy' and senior technical staff may be placed at the 3<sup>rd</sup> or 4<sup>th</sup> tier, which is not adequately remunerated, although this is slowly being remedied.

A further concern is that a technical academic qualification alone does not prepare its holder to work in a technical field such as engineering. Further structured professional development is mandatory for new graduates in most branches to achieve the 'professional engineer' status which is a statutory requirement to perform consulting engineering work or to take responsibility for the performance of engineering work. The registration process also requires support and supervision arrangements that often prove difficult to provide in smaller municipalities.

### **Availability of water resources**

The provision of potable water services must always be underpinned by access to a reliable water resource. While resource shortages are sometimes mentioned as a contributor to water supply failures, there are few places in South Africa where water resource availability is an absolute constraint, even in rural areas (Bond and Dugard, 2008). Supply shortages during dry periods are more often the result of poor planning and operation rather than any acute drought event. The constraints are usually failure to address in a timely manner the planning, implementation and funding required to develop and operate a system to abstract and transport the water to the users (Galvin, 2016).

## **DISCUSSION: CRITICAL OBSTACLES TO PERFORMANCE IMPROVEMENT**

The immediate contributors to poor performance, outlined in the analysis above, are well known. They are relatively easy to identify and, potentially, to begin to rectify. The critical question therefore is to identify the obstacles that have blocked effective remedial action. It is suggested that these fall into three distinct but interlinked domains:

- Bias against operation and maintenance in municipal financial systems;
- Institutional constraints in a complex context; and
- Politics and policy ambiguity.

## **Bias against operation and maintenance in municipal financial systems**

At an operational level, infrastructure investment is often not coordinated with funding for the O&M of the systems of which new infrastructure is a part. As a consequence, inadequate O&M funding reduces infrastructure lifespan. Legislation requires those municipalities that are water services authorities (not all are) to produce a water services development plan (WSA s13(h)v). This should set out capital and operational expenditure and the sources of revenue to support it. However, even where these plans are prepared, there is limited evidence to suggest that they are used to guide the application of resources and infrastructure is often built without budgetary provision for its operation and maintenance.

A bias toward infrastructure investment is inherent in the structure of national government's financial support to municipalities. Infrastructure investment is funded through conditional grants whose conditions correctly seek to prevent funds intended for service provision 'leaking' to be used for other purposes. However, funding for O&M in poorer municipalities is not similarly protected. The Constitution (s.227) states that the purpose of the equitable share is to enable local government to "provide basic services and perform the functions allocated to it". The equitable share is the primary source of funds for O&M in the smaller, poorer, municipalities that do not have high levels of user payment. It has been suggested that it is already inadequate to meet these needs (Ledger, 2019).

However, although its constitutional purpose is clearly stated, the equitable share is formally 'unconditional' and is often used for other, more or less licit, activities. The reluctance of the National Treasury to require greater reporting of and discipline over its use has been unhelpful and contributed to the diversion of funds to other purposes and the consequent underfunding of water supply O&M. The misapplication of the equitable share is aggravated by the failure of municipalities to ring-fence and account separately for water services activities although the Water Services Act requires that "when performing the functions of a water services provider, a water services authority must manage and account separately for those functions". A particular challenge is that municipalities account to multiple agencies of government, National Treasury, CoGTA as well as sector regulators. This leads to a lack of coherence of approach and confuses efforts to ensure compliance and accountability. While the Auditor General, CoGTA and National Treasury have begun to question municipal O&M spending deficits, more direct accounting would support such efforts.

One consequence of this confluence of poor planning and weak O&M is the accelerated aging of assets due to poor maintenance. There is a vicious cycle in which the lack of O&M leads to service failure and is compensated for by investment in replacement infrastructure, particularly in installations involving mechanical and electrical equipment. Other systemic problems include a failure to manage water use and collect revenue which is addressed below. This often reflects policy ambivalence and political reluctance to ask for, let alone enforce, reductions in water use.

### **Institutional constraints in a complex context**

*Extreme autonomy:* Municipal water supply in South Africa is undertaken by over 150 municipalities which provide water supply services to communities in very different



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physical and economic contexts. The institutional architecture of the sector and the regulatory framework that has been built around it have some flaws that are now contributing to its weak performance. The history is that, ahead of the establishment of a democratic government in 1994, a range of possible institutional arrangements for domestic water supply was considered. Aside from the option of establishing a single, national, water supply utility, the alternatives considered included greater concentration through the establishment of ten or fifteen regional water supply organisations as well as extensive decentralisation that would allow local communities to take responsibility for their own operations. In the event, the structure was determined by the need to establish institutions that could bridge the historic racial and economic divides, a primary objective for the local government structures that were formalised in the 1996 Constitution. The Constitution and subsequent municipal legislation also provided for a two-tier system in which district municipalities could support smaller local municipalities that would otherwise not have the capacity to undertake their functions.

The Constitution thus allocated a variety of powers and functions to municipalities, including “Water and sanitation services limited to potable water supply systems and domestic wastewater and sewage disposal systems”. National and provincial governments’ concurrent role was limited, in the first instance, to oversight and regulation and was constrained by complex procedures for intervention if necessary to “maintain essential national standards or meet established minimum standards for the rendering of a service”. As argued in Muller (2021), this “extreme autonomy” afforded to local government was effectively a ‘sunset clause’ to protect minority interests during the transition.

*Both too few and too many institutions:* While the initial institutional arrangements provided a basis for the progress made to date, the system has begun to reveal significant weaknesses. In larger rural municipalities with more dispersed populations, there are arguably too few water supply management institutions to manage a large number of small systems. This places an administrative and financial burden on the district municipalities that have to respond to relatively minor operational problems which might more effectively be addressed locally. In these circumstances, it would be better to provide district level technical support to small local operators. However, the current situation is that small and peripheral communities that are not adequately served by their formal water supply authority cannot access resources or support to manage their supplies themselves.

Equally, the capacity of many smaller municipalities would be limited even if human and financial resources were appropriately deployed. Such small institutions find it difficult to comply with the administrative processes as well as retaining the technical staff needed. Although they may be able to run day-to-day operations, they also require access to specialised resources that would be available in a larger institution. They would benefit from being members of a larger family of supply systems with some central support. In this context, the role of the family of water boards established by the DWS to provide bulk water services across municipal boundaries may become relevant. The Water Services Act allows them to undertake additional other functions, such as retail water services, although they cannot be imposed on municipalities. One suggestion currently being investigated is water boards could be requested to become regional water service providers, acting where current municipal providers are failing.



*The incentives of the status quo:* Any attempt to transfer the water supply function to new institutions is likely to be resisted by the incumbents. A consequence of the autonomy enjoyed by municipalities – and lack of consequence management for their failures – is that their political administrations have been able to divert financial resources from areas such as water supply or manage them to their own advantage. A general finding, reported as part of an investigating into the staffing of the water supply functions, is that “support departments, although meant to support line departments, have usurped the authority and undermine the processes that are the domain of technical departments”. This obstructed the progress of young candidates who sought to work towards professional registration. However, it also enabled other forms of corruption. Failure to maintain, and even sabotage, supply infrastructure has been identified as one mechanism by which officials and their private sector collaborators have gained access to lucrative opportunities such as contracts to provide tanker-based water supplies to communities where piped services have ‘failed’ (Muller and Schreiner, 2020).

### **Politics and policy ambiguity**

The extreme autonomy granted by the Constitution to local government is one of the root causes of the declining performance of water supply institutions. This autonomy insulates poorly performing municipalities from external intervention and makes it difficult for the affected communities to remedy municipal failure. As outlined below, if the issue were to be carefully and strategically addressed, greater intervention might be found to be consistent with the provisions of the Constitution. Indeed, the mere existence of a credible threat that national or provincial agencies could step in and take over the water supply function might encourage better municipal performance. Such efforts would, however, be politically challenging since those who benefit from their current autonomy would likely oppose it. The situation is complicated because the Constitution allocates primary responsibility for municipal oversight to provincial government. There is inevitably a tight nexus between local and provincial politics which makes it difficult for provincial agencies to enforce unpopular interventions on their local government colleagues or to support moves that would limit their autonomy.

Similar political sensitivities also inhibit discussions about measures to discipline the use of equitable share and ensure that it is devoted primarily to meeting the Constitutional intent which is to “provide basic services”. It is a challenge to promote objective discussion about the levels of service that can be afforded by different communities. Because of South Africa’s high levels of inequality, the politicians, technicians and even civil society representatives who lead such discussions invariably have ‘better’ standards of service than the basic levels available for poorer communities. This makes it uncomfortable for them to advocate the restraint that is inevitably necessary.

The debate about free basic services further illustrates how political discomfort translates into damaging policy ambiguity. The official national policy on free basic water is that its provision is only funded for households that are formally registered as ‘indigent’. In 2019, only 16% of all households with piped water connections were eligible and equitable share funding was calculated on that basis. However, according to the 2019 household survey (Stats SA 2019), over 55% of those households



reported that they did not pay for water. This divergence presumably reflected a combination of municipal tolerance in not enforcing payment and a failure to perform their basic function of metering and billing 'non-indigent' water users. The consequence, however, was that municipalities received less funding than needed to sustain safe and reliable supplies while in many of the communities concerned, supplies were unreliable or failed completely. This situation was aggravated because households whose consumption is not metered or billed have no incentive to constrain their water use.

## **RECOMMENDATIONS: PATHWAYS TO BETTER PERFORMANCE**

Urgent intervention is required to address the poor performance of many municipal water supply systems. The aim should be to reverse the deteriorating trends, meet community needs and government's policy goals and, while doing that, to achieve the relevant UN Sustainable Development Goal, which is rapidly moving out of reach.

### **A strategic programme of interventions**

Given the water supply sector's limited human and financial resources and other constraints, it is important to identify, prioritise and sequence a set of interventions that might improve performance.

Too often, the response to the challenge of poor water supply system performance is to call for additional investment in infrastructure or simply for more financial resources for the service. However, the analysis suggests that additional capital funding for new or refurbished infrastructure will not, in itself, improve outcomes. Practical experience in many systems is that, for a variety of reasons, funding nominally directed to build municipal water supply infrastructure often fails to result in better supply performance. Funds may be diverted to other purposes, formally or informally. Even when the funds are applied for investment in new infrastructure, there is no assurance that performance will improve if investment has not been guided by a systematic planning and prioritisation process and construction undertaken by qualified contractors to ensure value for money.

In addition, too little funding goes to the O&M of the infrastructure once it has been commissioned. This reflects limited allocations from the equitable share of revenue, low municipal revenue collections from water supply tariffs but, more generally, the diversion of funding intended for water supply to other purposes. The consequence is that poor operations and maintenance lead to early failure of mechanical and electrical equipment as well as civil infrastructure.

In order to improve service provision, it will be necessary to:

- enable the recruitment and deployment of competent operational and planning staff into a functional organisational structure;
- ring-fence funds allocated for water supply and their appropriate, balanced application to operations, maintenance and investment; and
- control water use, through the application of an appropriate combination of metering, billing, collection and enforcement measures backed by community



consultation and mobilisation that provide an agreed framework for free basic water provision.

However, these building blocks can only be put in place once a new foundation has been laid which remedies the institutional and political failings that currently undermine effective water supply service provision. These inter-linked interventions would include:

- establishment of norms and standards for basic and 'above basic' levels of supply, in consultation with community of users;
- consultation with public finance authorities about the quantum of public funding to provide basic water supplies and the conditions for its allocation and application;
- political support for the implementation of the agreed norms and standards in practice; and
- establishment of mechanisms to transfer any funds intended for municipal water supply to the institution that provides the service, including the equitable share, conditional grants as well as revenue collected from users.

For this to be possible, further interventions must end the culture of municipal impunity enabled by the extreme autonomy nominally afforded to local government by the Constitution, complicated by the intermediate oversight role afforded to provincial governments. This would need to:

- enable external intercession (by national government) on behalf of affected communities where municipal administrations fail to provide effective services and provincial interventions have failed; and
- establish institutional capacities to provide effective water supply service, particularly in poor, poorly planned and spatially heterogenous communities as well as more formal municipal contexts.

Performance improvement is thus dependent not on giving the right people sufficient funds to do their jobs but implementing the interlinked set of social, political and institutional interventions that might make it possible for them to do so. Each of the interventions needs to be addressed in detail which is beyond the scope of this paper. However, none of them are *prima facie* impossible. To illustrate this, three specific issues are considered.

### **The Constitutional autonomy of local (and provincial) government**

For over a decade, successive ministers have complained that the Constitution and municipal and water sector legislation make it too difficult to intervene to remedy water service problems at local level. However, s.152 of the Constitution states that the objects of local government are to, inter alia, "ensure the provision of services to communities in a sustainable manner" and "promote a safe and healthy environment". Further, s.153 requires a municipality to "structure and manage its administration and budgeting and planning processes to give priority to the basic needs of the community". Finally, s.155 requires national government to "see to the effective performance by municipalities of their functions ... by regulating the exercise by municipalities of their executive authority".

While there are, correctly, caveats and constraints about how national government should go about this task, constitutional law also recognises that a balance must often be struck between different provisions. Further, these should give priority to substantive rather than procedural issues as explained by Seedorf and Sibanda:

*“Constitutional restrictions on public power may be both procedural and substantive. The focus of substantive restrictions is an entrenched and justiciable bill of rights and a commitment to certain foundational values, such as the rule of law. The separation of powers falls on the procedural side, although its purpose is related to substantive interests: it is a means to ensure the protection of individual rights by way of the distribution of political power between different institutional actors and includes mechanisms to ensure that such power is not unduly exercised” (Seedorf and Sibanda, 2008).*

Given the demonstrable deterioration in the performance of water provision, particularly in poorer communities, it is surely time to argue that the rights of citizens to basic services provided for in the Bill of Rights must trump the procedural protection of local government autonomy. The legal challenge is complicated because the Constitution gives the primary responsibility to provincial government to oversee and intervene in the local sphere. But Schedule 4 of the constitution classifies “water and sanitation services” as “functional areas of concurrent national and provincial legislative competence”. National government is thus expected to regulate performance by municipalities and inherent in the duty of regulation is the obligation to ensure performance of the matters regulated. Since s.154 requires that national and provincial governments “by legislative and other measures, must support and strengthen the capacity of municipalities to manage their own affairs, to exercise their powers and to perform their functions”, there is scope for determined action and procedural innovation to address the local service delivery failure.

### **Alternative institutional arrangements for water services**

Peering through the constitutional fog, where there is persistent failure by municipalities to perform their water supply responsibilities, national government has a clear duty to intervene. However, the duty to intervene must be accompanied by a demonstration of the capability to intervene effectively. In this area, more remains to be done.

A mechanism for intervention is needed that requires municipalities that persistently fail to perform their water supply functions effectively to hand over the function to an institution that will do so on their behalf. However, municipalities will still have a degree of political accountability for service provision even if they do not directly perform the function themselves. This is not particularly novel. Many municipal services from waste collection to financial accounting are currently conducted by external contractors who account to the municipality for their performance.

In this regard, s.19 of the Water Services Act (1997) already distinguishes between the role of the water services authority (WSA), which has overall accountability for service provision, and the role of water services provider (WSP) which actually performs the function under contract to the WSA. This can still allow municipalities to exercise oversight of a WSP’s performance but not to take control of its operations.

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This arrangement, which makes the municipality responsible for the performance but does not allow it to divert resources from it or interfere in its operations, may be more effective than the present situation where the municipality is both the provider and oversight authority.

A set of institutional options to provide this service function is available. Already, a handful of municipalities have a private company acting as a WSP (In many more, specialised functions such as the operation of water treatment works, or metering and billing are already contracted out).

In addition, there is provision in the Water Services Act for institutions such as water boards to undertake the WSP function on an agency basis. This is already being done in municipalities such as Emfuleni (albeit with wastewater management) as well as in the Amatole District Municipality in the Eastern Cape.

Whether through water boards or private companies, such water services provider arrangements can allow specialised capacities to be deployed, particularly to smaller municipalities that are not able to recruit and retain the necessary technical skills. The challenge of expanding these arrangements further will be to ensure that there are clear and transparent procedures as well as technical support to guide their application and mechanisms to transfer finances to them.

### **Revised norms and standards**

The 1997 Water Services Act provides for norms and standards to guide water service provision. These are established by the Minister through regulations. This mechanism offers a ready-made framework for new approaches to be developed and implemented. The norms and standards are often seen as the formal commitment to the levels of service that government will provide and the conditions under which these will be available. Just as important, however, they imply a commitment by citizens to accept the conditions and, if required by the norms and standards, to pay for services beyond the basic services that are provided free of charge.

For this reason, any revision of the norms and standards should ensure that the conditions of service to be established are generally understood and supported by the wider community of water users. Only then can municipalities effectively enforce conditions such as payment for services by users who take more than the basic free allowance. At the same time, the establishment of norms and standards provides an opportunity for both national and local government to understand and agree on the extent of the financial commitments that are required for service providers to perform their functions effectively.

### **CONCLUSIONS**

The need for action and innovation to address failing water supply is evident and widely recognised. What has been missing is a clear set of options to address the gap. Overarching responsibility for this lies with the Department of Water and Sanitation which has available to it the mechanisms of the Water Services Act. These may need to be simplified since they were introduced at a time when there was great pressure for private sector involvement which had, in turn, engendered considerable





opposition. However, domestic water supply is complex and politically sensitive and is a mandate shared with other national departments (CoGTA and National Treasury) as well as provincial governments. Action and innovation must therefore be guided by a coherent overarching strategy that identifies and addresses the different political, financial and technical challenges and their inter-linkages. The proposals in this paper are intended to illustrate the type of action that is required rather than provide a definitive prescription. Critically, such a programme of action will depend on broad public support for its success. Once the need for action is recognised, the next step should be to initiate the wider public debate that will be required to ensure sufficient consensus to be built to enable the adoption of new approaches.

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IMPACT OF TARGETED  
INFRASTRUCTURE INVESTMENT ON  
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DBSA



# IMPACT OF TARGETED INFRASTRUCTURE INVESTMENT ON ECONOMIC GROWTH AND EMPLOYMENT IN SOUTH AFRICA

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## ABSTRACT

Infrastructure investment is key to stimulating economic growth, increasing employment, and reducing inequality. Increasing both private and public sector investment has been a strategy taken by several countries to stimulate economic recovery in the post-lockdown era. To realise the National Development Plan (NDP) investment goals, South Africa is advancing infrastructure investment as an avenue through which long-term economic and social goals can be obtained. This paper empirically assesses the impact of infrastructure investment on economic growth and employment. Specifically, this paper investigates the potential impact of the remaining infrastructure investment allocation in the R100 billion Infrastructure Fund. Scenarios are created in which the share of investment made towards several sectors is adjusted to determine which distribution of investment could yield the greatest impact. From the results, it can be concluded that infrastructure investment can stimulate both economic growth and employment creation, with the largest gains expected in the secondary sector. The greatest impact on gross domestic product (GDP) and employment is achieved when the bulk of the investment is allocated towards utilities, including electricity and water infrastructure. The paper provides empirical evidence to motivate for targeted infrastructure investment directed at sectors which yield the greatest impact on economic growth and employment.

**Keywords:** Infrastructure impact, Infrastructure investment, Economic growth, Employment, Infrastructure Fund

## INTRODUCTION

It is widely agreed among academics and policymakers that public infrastructure is critical to the functioning of economies. Infrastructure investment is seen as a key lever to stimulating economic growth, increasing employment, and reducing inequality. Evidence suggests that it can boost short-term demand and raise long-term productivity. In line with post-apartheid objectives of stimulating inclusive economic growth, South Africa developed several policy documents which all propose infrastructure investment as a lever to achieving growth objectives. These policies include the Reconstruction and Development Programme (RDP), the Growth, Employment and Redistribution (GEAR) Macroeconomic Strategy, the Accelerated

and Shared Growth Initiative for South Africa (ASGISA), and the more recent National Development Plan (NDP), Economic Reconstruction and Recovery Plan (ERRP), and National Infrastructure Plan (NIP) 2050.

Despite the repeated acknowledgement of infrastructure's role in growing the economy, infrastructure investment in the country has been slow and inefficient owing to issues in the construction sector itself, as well as challenges in the preparation and implementation of infrastructure projects. Some of the contributing factors to slow infrastructure investment include poor project preparation, a lack of capacity of procuring and implementing agents, and delays in the implementation of construction projects. In the construction sector itself, many large and small-scale construction firms have been forced to exit the industry owing to a lackluster demand for construction activities and a deterioration in profitability. These outcomes, along with other operational and policy-related challenges, have limited the gains from the implementation of the above-mentioned policy documents. Recent decisions to create Infrastructure South Africa (ISA) as a centralised government investment agency, publish the National Infrastructure Plan (NIP) 2050 and operationalise the Infrastructure Fund – designed to facilitate blended finance solutions and co-financing mechanisms to increase investment – are expected to support post-pandemic recovery.

The study therefore aims to examine empirically the potential impact of the R100 billion Infrastructure Fund's remaining investment value into economic and social infrastructure on gross domestic product (GDP) and employment. The impact is assessed across several sectors to motivate for infrastructure investment into projects within sectors where the greatest impact will be realised. This will be explored through an investment scenario-based analysis using the Energy-Environment-Economy Macro-Econometric Model (E3ME) developed by the European Commission's research framework and by Cambridge Econometrics.

The remainder of the paper is structured as follows: the literature review provides the background into South Africa's relevant policy landscape, infrastructure initiatives and related progress. The research methodology section outlines the mechanisms of the E3ME model and the research scenarios, followed by a section on results, while policy implications and study limitations are covered as conclusions.

## LITERATURE REVIEW

Infrastructure investment is seen as key to stimulating economic growth, increasing employment, and reducing inequality. There are various channels through which infrastructure can impact economic growth. Kumo (2012) notes that infrastructure is a direct input into production processes, therefore serving as a factor of production. Furthermore, infrastructure is a complement to other inputs into the production process, lowering the cost of production but also stimulating factor accumulation by facilitating human capital development. It also boosts aggregate demand by increasing expenditure during the construction and maintenance of operations. Finally, it can serve as a tool to guide industrial policy which focuses on investing in specific infrastructure projects with the intention of guiding private-sector investment decisions (Fedderke and Garlick, 2008; Kumo, 2012).



## Impact of GDP and Employment: Other Countries

Despite the fundamental role of public infrastructure in the functioning and expansion of economies, theoretical and empirical research to support this was not undertaken until the late 1980s (Munnell, 1992; Bougheas et al., 1999; Calderon and Serve, 2010). According to Munnell (1992), this work was triggered by David Aschauer who assessed the impact of public capital investment on output by estimating regressions that incorporate public capital as an additional variable to the production function. Aschauer's initial work concludes that "*much of the decline in U.S. productivity that occurred in the 1970s was precipitated by declining rates of public capital investment*" (Munnell, 1990). Early studies applying this approach to econometric equations found that the impact of aggregate public capital investment on private sector output and productivity is significant (Munnell, 1990). Specifically, Aschauer finds evidence in his initial study that a one per cent increase in public capital investment will lead to an increase in private sector output by 0.39 per cent (Munnell, 1990). Several criticisms were levelled against these earlier estimates, reflecting concerns among academics about the large estimated coefficients, the spurious correlation and potential endogeneity associated with the variables (Munnell, 1990; Aakar et al., 2017). Subsequent studies have refined econometric techniques and sought to resolve the challenges raised.

Over the period 1960-1996, Ferreira and Araujo (2006) used Brazil's infrastructure investments in paved roads, telephone lines and electricity generation capacity to investigate the impact of the investment flows on capital variation (or the stock of capital) and growth. Using elasticities, the authors found a positive impact of each case of physical infrastructure investment on the expansion of each type of infrastructure. Other studies confirm the long-term relationships between infrastructure investment and growth. Using ordinary least squares (OLS) and instrumental variable estimation (IV) models, Bougheas et al. (2000) introduced physical infrastructure as a technology that enables the reduction in the fixed cost of producing intermediate inputs. This is in contrast to the older body of research that assumed capital as an exogenous variable in the production function. The study finds that (i) for the United States economy, the degree of specialisation in manufacturing is positively correlated with core infrastructure, and (ii) cross-country growth regressions show a positive impact between infrastructure and long-run growth.

Using correlation matrices, cointegration analysis and vector autoregression (VAR) models, Ferrira and Araujo (2006) assessed the long-run association between output and infrastructure over the period 1960-1996. Correlations between investment in physical infrastructure (roads, telephone lines and electricity generation) and output were found to be close to 1. The results of the regressions show that a 10 per cent increase in the stock of public infrastructure would raise long-run output per capita by between 2.2 and 3.3 per cent. Heintz et al. (2009) estimated a production function using the autoregressive-distributed lag (ARDL) model for the United States of America (USA) over the period 1951 – 2006. The results show that there is a long-run relationship between public capital and private productivity, with infrastructure having a crowding-in effect on private investment.

Changes in economic output tend to occur in parallel with changes to employment given that an increase in the production of goods and services requires an increase



in the demand for labour. Several authors have also assessed the direct employment effect of infrastructure investment. Moszoro (2021) used firm-level panel data from 41 countries over 19 years to assess the direct employment impact of a USD 1 million infrastructure investment and maintenance in electricity, roads, schools and hospitals, and water and sanitation in advanced, emerging, and low-income developing economies. The author used marginal pass-through from spending on public investment to employment by regressing employment on revenues by sector and country income group at the individual firm level. The results show that three to seven jobs are created in advanced economies, ten to seventeen jobs in emerging market economies, and sixteen to thirty jobs in low-income developing countries when USD 1 million is invested into each economy.

International Monetary Fund (IMF) researchers find that among the Organization for Economic Cooperation and Development (OECD) countries, an increase in public investment of 1 percentage point of GDP generally results in a decrease in the unemployment rate by 0.11 per cent in the short term and 0.35 per cent in the medium term (Abiad et al., 2016). Further, research by Demetriades et al. (2015) estimated the impact of increased public capital on labour demand, using an intertemporal optimisation framework. The findings reveal that in the USA a 1 per cent increase in public capital increases labour demand by 1.13 per cent in the short term, 1.07 per cent in the medium term, and by 0.08 per cent in the long term.

## **2.2. Impact of GDP and Employment: South Africa**

The impact of investment on economic growth in the South African context has also been widely explored. Kumo (2012) employed the VAR methodology and used Granger causality tests to test the relationships empirically among economic infrastructure investment, economic growth, and employment in South Africa between 1960 and 2009. He found that a strong, positive bi-directional causal relationship exists between infrastructure investment and growth. This result also holds for infrastructure investment and public sector employment owing to increased activity in construction, operations and maintenance. The author noted that although infrastructure investment has the potential to address poverty through employment creation, this potential is often not realised since projects are often equipment-intensive and rely on foreign contractors. It is therefore crucial for policymakers to ensure that economic objectives do not take precedence over social objectives and that local job creation remains at the centre of policy decisions.

While the Kumo (2012) study considers infrastructure spending in aggregate, Fedderke et al. (2006) disaggregated spending by type of economic infrastructure to determine which type of infrastructure has a material impact on growth in South Africa. The Pesaran, Shin and Smith (2001) (PSS) F-Test results suggest that railway goods stock, locomotives, unpaved and paved roads, goods and passenger vehicles, and electricity generation have a statistically significant impact on aggregate output.

To quantify the extent to which increased public economic infrastructure investment impacts social and economic indicators such as employment and economic growth, Mbanda and Chitiga-Mabuga (2016) utilised a dynamic computable general equilibrium (CGE) model and the Statistics South Africa (Stats SA) 2005 South Africa Social Accounting Matrix (SAM). Using simulated increases in aggregate

infrastructure investment financed through government deficit, taxation, and a combination of both, the authors showed that improved public infrastructure investment reduces unemployment through higher labour demand, and lowers price levels while stimulating economic growth. They further showed that investment into economic infrastructure positively spills over into other sectors. This is through increased intermediate demand for commodities produced by other sectors, especially sectors with the strongest forward linkages with the public economic sector, such as construction and equipment manufacturing. Economic infrastructure investment positively impacts growth more generally in most sectors through a reduction in marginal costs.

Du, Zhang and Han (2022) similarly argue that infrastructure investment has both a direct and indirect macro-level impact in that it is an input factor, by increasing intermediate demand and total factor productivity (TFP). Infrastructure expansion also has a micro-level impact in that it can improve a firm's technical efficiency by reducing its inventory and operating costs.

Kularatne (2006) studied both economic and social infrastructure spending in South Africa by utilizing PSS ARDL methodology. The PSS F tests established that both economic and social infrastructure investment have a positive and statistically significant impact on growth. A vector error correction model (VECM) was used to show that public economic infrastructure investment has a multiplier of 1.02 on per capita GVA. Furthermore, a one per cent increase in social infrastructure investment resulted in a 0.06 per cent increase in per capita GDP. The author argued that social infrastructure spending, such as education and health infrastructure expenditure, has a positive impact on growth by improving the productivity of the labour force and providing beneficial outcomes to society. In essence, positive externalities are generated through a healthier and more educated population.

### **2.3. Investment Drive: South Africa**

Given the impact that infrastructure investment can have on economic growth and employment, it is not surprising that it has been a strategy pursued by policymakers in South Africa. Following the abolishment of apartheid, several key policy documents have been developed to provide guidance on stimulating inclusive economic growth to meet the evolving needs of the country. These include the Reconstruction and Development Programme (RDP), adopted pre-1994 elections; the Growth, Employment and Redistribution (GEAR) Macroeconomic Strategy, introduced in 1996; the Accelerated and Shared Growth Initiative for South Africa (AsgiSA), published in 2006; the more recent National Development Plan (NDP), published in 2012; and the Economic Reconstruction and Recovery Plan (ERRP), published in 2020. Each publication proposes pursuing infrastructure investment to facilitate economic growth and address pressing socioeconomic needs.

In the initial years following the demise of apartheid, infrastructure investment was directed towards increasing access to social infrastructure, specifically housing, education, health care and basic services for historically disadvantaged individuals. The underlying rationale was that providing these necessary basic services would unlock previously suppressed economic and human potential in various areas of the country (South African Government, 1992). This would in turn modernise



infrastructure and human resource development and increase the output in all sectors of the economy, leading to economic growth. GEAR and AsgiSA took a similar approach to the RDP but encouraged an acceleration in public sector infrastructure expenditure to address the backlogs and service deficiencies and introduced the concept of harnessing private sector infrastructure investment.

In recent policy documents, the need for infrastructure investment has shifted towards economic, strategic and catalytic infrastructure which can unlock economic opportunities and further harness private-sector investment and expertise through private-public partnerships (PPPs). This is captured in the NDP, which provides a long-term strategy for eliminating poverty and reducing inequality in the country by 2030 (National Planning Commission, 2012). This policy proposal highlights the ability of infrastructure investment to provide citizens with a means to improve their own lives and boost their incomes.

#### **2.4. Infrastructure Commitments and Focus Areas**

The NDP sets out objectives and actions in Chapter 4 (Economic Infrastructure), Chapter 6 (Inclusive Rural Economy) and Chapter 8 (Transforming Human Settlements) of the document aimed at improving infrastructure in the country. Priority areas for investment include transport and port capacity, energy, water and sanitation, housing and broadband access. The NDP commits to a gross fixed capital-to-GDP target ratio of 30 per cent by 2030, with public investment reaching 10 per cent of GDP. The NDP states that the role of government in infrastructure provision should be in the provision of social infrastructure which would not generate financial returns, the regulatory and governance space, and the provision of some financial assistance by offering guarantees and selective subsidies (National Planning Commission, 2012). Furthermore, it states that in the long run, the user-pay principle should be applied to economic infrastructure, with protection offered to poor households.

The ERRP reiterates the need for infrastructure investment and delivery, stating that it is one of the leading priority interventions to achieving the reform agenda (South African Government, 2020). Specifically, it states that a large-scale infrastructure programme can boost aggregate demand, assist in reviving the construction sector and increase employment. The ERRP emphasises the need to crowd in private investment into infrastructure through PPPs and blended finance. As a concept, blended finance utilises development or public finance to unlock additional funding support through the private sector to fund projects that have a social impact, can generate financial returns and will stimulate economic growth. The public sector contribution acts as gap funding and incentivises private involvement by de-risking investment into infrastructure projects (South African National Treasury, 2022).

The ERRP builds on the NDP and emphasises the need to improve the state's technical, project preparation and financial engineering capabilities. It also acknowledges the importance of utilising existing expertise in the private sector. One of the commitments made in the 2020 ERRP was to create Infrastructure South Africa (ISA) to act as a centralised government agency responsible for coordinating and implementing the infrastructure investment programme (South African Government, 2020). ISA was established in May 2020 and is currently housed as a programme within the Ministry of Public Works and Infrastructure (Development Bank of Southern

Africa, 2018). The role of ISA is to fast-track the delivery of catalytic social and economic infrastructure projects and oversee the project preparation, appraisal, and evaluation required to package a credible and market-ready infrastructure project pipeline (Infrastructure South Africa, 2022). Additionally, ISA aims to clear policy and regulatory blockages that prevent the development and implementation of infrastructure projects in the country. It is envisaged that ISA will facilitate the roll-out of South Africa's Infrastructure Investment Plan and the National Infrastructure Plan (NIP) 2050. The NIP 2050 aims to create a foundation for achieving the NDP's vision of inclusive growth and target of 30 per cent investment to GDP ratio.

ISA's mandate stretches across three main areas: (i) investment facilitation, (ii) the creation of a pipeline of public sector infrastructure, and (iii) improving the ease and cost of doing business. ISA also plays a central role in supporting the Infrastructure Fund, which was first announced by President Cyril Ramaphosa in 2018 as a means to utilise blended finance and co-financing mechanisms to increase investment and facilitate the delivery of socio-economic infrastructure programmes and projects in the country (Infrastructure South Africa, 2022).

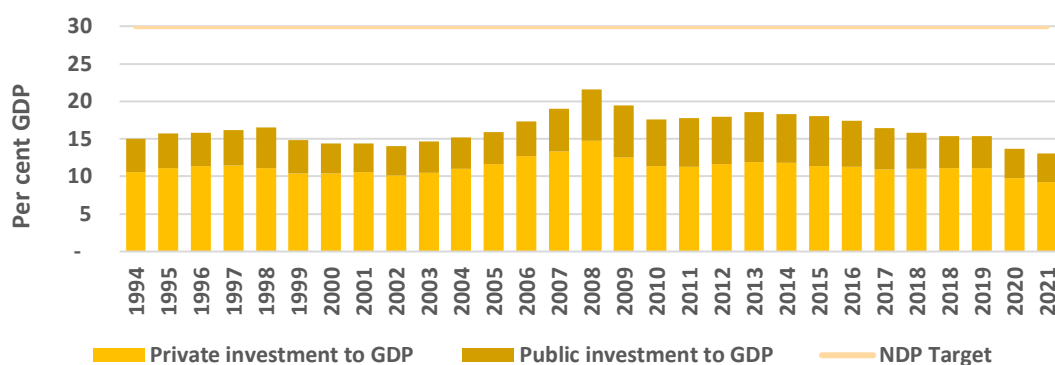
The Infrastructure Fund, which is a collaboration between the National Treasury of South Africa (National Treasury), ISA, the Development Bank of Southern Africa (DBSA) and project owners, was established in 2020. The National Treasury has provided seed funding of R100 billion over ten years into the Infrastructure Fund to unlock private sector investment and infrastructure delivery in the country. The Infrastructure Fund Implementation Unit (IFIU), a ring-fenced division housed within the DBSA, assists with structuring infrastructure projects such that they can utilise a variety of capital from the private sector institutional investors, multilateral development banks and development finance institutions. To obtain portions of the funding from the Infrastructure Fund, projects or programmes have to be submitted to the Budget Facility for Infrastructure (BFI) in the National Treasury for appraisal. Once projects or programmes have been appraised and are deemed to fulfil the assessment criteria, funding can be allocated through the Infrastructure Fund. Since the inception of the Infrastructure Fund, R3 billion has been allocated to infrastructure project/programme implementation. This includes projects which have received funding and projects or programmes approved until the fifth window of the BFI (2021). These projects include four student housing infrastructure projects delivering 9 500 beds (R900 million), one social housing programme (R304.5 million) and the Lepelle Northern Water project (R1.4 billion).

## **2.5. Continued Failure to Deliver Infrastructure**

Despite the acknowledgement of its importance, infrastructure investment has been slow and inefficient, characterised by, among other issues, project delays, under-budgeting and over-expenditure, and widespread corruption in both the tendering and expenditure components of infrastructure delivery. Investment as a share of GDP has remained well below the NDP target, measuring 13.1 per cent of GDP in 2021.







**Figure 1: Investment to GDP ratio**  
(Source: South African Reserve Bank)

Barriers to infrastructure delivery emanate from the investment and financing, project preparation and implementation, and construction sides. Infrastructure projects are often poorly delivered owing to insufficient capacity to plan, implement and monitor infrastructure projects, an inability to raise the required finance to implement the project, project overruns, and the exclusion of project lifecycle costs in the budgeting process. The tendering process is long and onerous, characterised by delays in awarding tenders, and when awards are made, the lowest cost submission often takes preference over the quality and scope of tenders. Of increasing concern is the rise in mafia-like behaviour on construction sites which is hampering the delivery of projects and affecting investor sentiment, as well as threatening the safety of construction workers.

Following the COVID-19 pandemic, infrastructure investment was again highlighted in the NIP 2050 as a means to extricate the economy from a recession and reverse the growing unemployment issue. However, owing to the above-mentioned challenges, this has been slow in materialising. Furthermore, the fiscus is constrained and the scarce financial resources have to be carefully allocated.

## RESEARCH METHODOLOGY

This study aims to examine empirically the potential impact on GDP and employment in South Africa of the remaining infrastructure investment allocation from the R100 billion Infrastructure Fund. The impact is assessed across various sectors to motivate for infrastructure investment into projects within sectors where the greatest impact will be achieved. This is explored through scenario-based analysis using the Energy-Environment-Economy Macro-Econometric Model (E3ME) developed by the European Commission’s research framework and Cambridge Econometrics.

### 3.1. Background to the E3ME model

This widely used dynamic, structural, global macroeconomic model is well suited for analysing the impacts of Energy-Environment-Economy (E3) policies by allowing two-way linkages among the energy system, environment, and economy. This allows for the analysis of interactions among these components, as well as an investigation into the short-term dynamics and longer-term impacts of policies. The E3ME model

manual provides a detailed description of the model, data sources and inputs, software, econometric specifications and modelling approaches. Table 1 provides a list of data sources used within the model.

**Table 1: E3ME model data sources and key equations**

Variable(s)	Data source	
	Historical data	Baseline forecast
Population	UN	IMF WEO (short-term) IEA WEO CPS (medium-term) IIASA SSP2 (long-term)
National accounts data	UN	
Labour force and employment	ILO	
Bilateral trade	OECD STAN	
Energy demand	IEA	IEA WEO CPS
CO2 emissions	EDGAR	

Equations sets:

Below are some of the equations of interest obtained from the Cambridge Econometrics manual (2019). For the full set of equations and additional details, please refer to the Cambridge Econometrics manual (2019). There are 61 countries or regions included in the model. The data is disaggregated to 69 economic sectors for European countries and 43 sectors for other countries, including South Africa.

Output equation

Co-integrating long-term equation:

$$\text{LN}(\text{YRN}) = \text{BYRN} + \text{BYRN} * \text{LN}(\text{YRY}) + \text{BYRN} * \text{LN}(\text{YRX}) + \text{BYRN} * \text{LN}(\text{YKNO}) + \text{BYRN} * \text{LN}(\text{YCAP}) + \text{ECM}$$

Dynamic equation:

$$\text{DLN}(\text{YRN}) = \text{BYRN} + \text{BYRN} * \text{DLN}(\text{YRY}) + \text{BYRN} * \text{DLN}(\text{YRX}) + \text{BYRN} * \text{DLN}(\text{YKNO}) + \text{BYRN} * \text{DLN}(\text{YCAP}) + \text{BYRN} * \text{DLN}(\text{YR})(-1) + \text{BYRN} * \text{ECM}(-1)$$

BYRN	matrix of parameters
YRN	matrix of normal industrial output for 69/43 sectors and 61 regions
YR	matrix of gross industry output for 69/43 industries and 61 regions
YRY	matrix of average industrial output (excluding own sector) for 69/43 sectors and 61 regions
YRX	matrix of average industrial output (excluding own region) for 69/43 sectors and 61 regions
YKNO	matrix of the knowledge stock for 69/43 industries and 61 regions
YCAP	matrix of the capital stock for 69/43 industries and 61 regions

Investment equation

Co-integrating long-term equation:

$$\text{LN}(\text{KR}) = \text{BKR} + \text{BKR} * \text{LN}(\text{YR}) + \text{BKR} * \text{LN}(\text{PKR/PYR}) + \text{BKR} * \text{LN}(\text{YRWC}) + \text{BKR} * \text{LN}(\text{PQRM}) + \text{ECM}$$

Dynamic equation:

$$\text{DLN}(\text{KR}) = \text{BKR} + \text{BKR} * \text{DLN}(\text{YR}) + \text{BKR} * \text{DLN}(\text{PKR/PYR}) + \text{BKR} * \text{DLN}(\text{YRWC}) + \text{BKR} * \text{DLN}(\text{PQRM}) + \text{BKR} * \text{LN}(\text{RRLR}) + \text{BKR} * \text{LN}(\text{YYN}) + \text{BKR} * \text{DLN}(\text{KR})(-1) + \text{BKR} * \text{ECM}(-1)$$



Identities:

$$YRWC = (YRLC/PYR) / YREE$$

$$RRLR = 1 + (RLR - DLN(PRSC)) / 100$$

BKR	matrix of parameters
KR	matrix of investment expenditure for 69/43 industries and 61 regions
YR	matrix of gross industry output for 69/43 industries and 61 regions
PYR	matrix of industry output price for 69/43 industries and 61 regions
PKR	matrix of industry investment price for 69/43 industries and 61 regions
PQRM	matrix of import prices for 69/43 industries and 61 regions
PRSC	vector of consumer price deflator for 61 regions
YRLC	matrix of wage costs (including social security contributions) for 69/43 industries and 61 regions, local currency at current prices
YREE	matrix of employees for 69/43 industries and 61 regions
RLR	is a vector of long-run nominal interest rates for 61 regions
YYN	is a matrix of the ratio of gross output to normal output, for 69/43 industries and 61 regions

Employment equation

Co-integrating long-term equation:

$$LN(YRE) = BYRE + BYRE * LN(YR) + BYRE * LN(LYLC) + BYRE * LN(YRH) + BYRE * LN(PQRM) + BYRE * LN(YKNO) + BYRE * LN(YCAP) + ECM$$

Dynamic equation:

$$DLN(YRE) = BYRE + BYRE * DLN(YR) + BYRE * DLN(LYLC) + BYRE * DLN(YRH) + BYRE * DLN(PQRM) + BYRE * DLN(YKNO) + BYRE * DLN(YCAP) + BYRE * DLN(YRE)(-1) + BYRE * ECM(-1)$$

Identity:

$$LYLC = (YRLC/PYR) / YREE$$

BYRE	is a matrix of parameters
YRE	matrix of total employment for 69/43 industries and 61 regions
YR	matrix of gross industry output for 69/43 industries and 61 regions
YRH	matrix of average hours worked per week for 69/43 industries and 61 regions
YRLC	matrix of employer labour costs (wages plus imputed social security contributions) for 69/43 industries and 61 regions
YKNO	matrix of the knowledge stock for 69/43 industries and 61 regions
YCAP	matrix of the capital stock for 69/43 industries and 61 regions
PYR	matrix of industry output prices for 69/43 industries and 61 regions
YREE	is a matrix of wage and salary earners for 61 regions
PQRM	is a matrix of import prices for 69/43 industries and 61 regions

Source: Cambridge Econometrics E3ME Manual (2019)



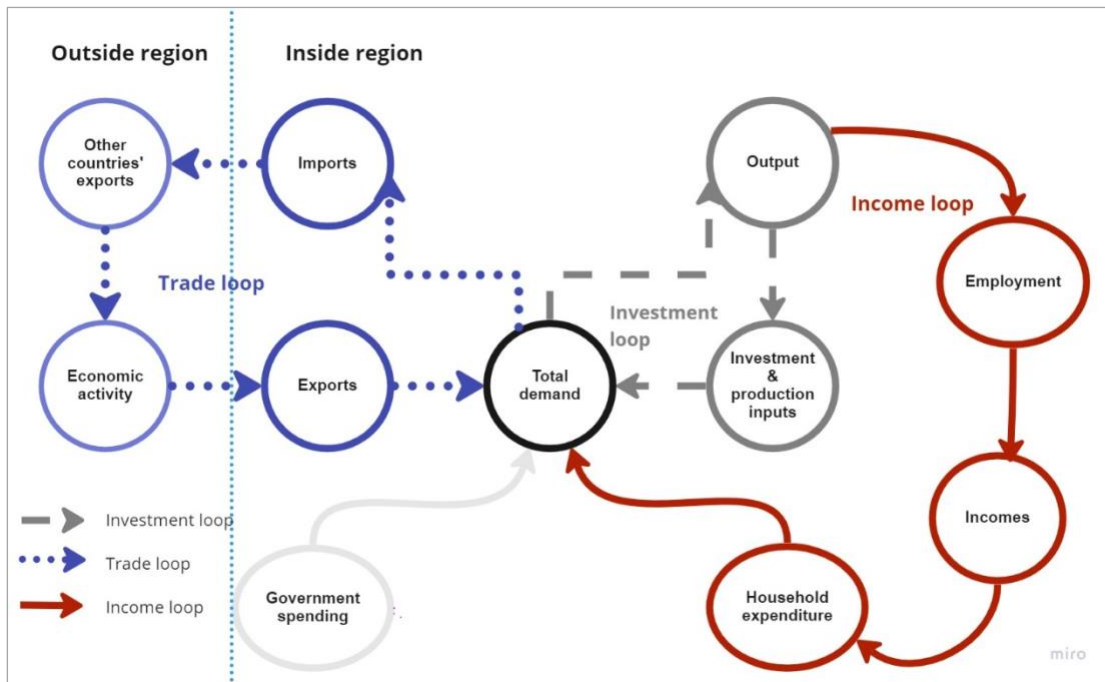
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The E3ME model includes both accounting and behavioural relationships, and is based on the national accounting framework, disaggregated to 43 industries. The model includes 29 stochastic equations encapsulating behavioural relationships which are set by employing cointegration and error-correction methodologies. Of specific importance to this paper is the E3ME's economic module, which accounts for changes in economic activity by persons, households, firms and other groups in society. Unless there are constraints to supply, output and employment are determined in the model by levels of demand. Cambridge Econometrics, in the E3M3 Technical Manual (2019), outlines the loops through which changes in the economy are transmitted through markets:

1. Sector interdependency loop: This loop captures the impact that a change in one sector will have on other sectors. An increase in output from one sector requires an increase in input which may be drawn from suppliers in another sector. This is similar to a Type I multiplier where intermediate demand is determined by the input-output relationships in the model.
2. Income loop: This loop captures the increase in labour demand as a sector increases its output and grows. As more people are employed, incomes increase and consumption expenditure with it, which in turn increases total demand and feeds back into the economy, which is similar to a Type II multiplier.
3. Investment loop: As firms and the demand for the goods or services that they supply increase, they invest in expanding their production capacity. Production investments increase the demand in sectors that produce investment goods (e.g., construction, engineering) and their supply chains.
4. Trade loop: Imported goods and services are necessary when the uptick in domestic demand cannot be met by domestic supply. The model allows for interactions among different countries and captures the impact on a country when there is an increase in demand for imported goods from another country.



For illustrative purposes, Figure 2 captures the interdependencies among these loops.



**Figure 2:** A diagram illustrating E3ME's economic structure  
 Source: Cambridge Econometrics E3ME manual (2019)

The main differences between E3ME and Computable General Equilibrium (CGE) models are the assumptions about optimisation. While CGE models generally determine behavioural factors through an optimising framework, E3ME determines behavioural factors empirically (Cambridge Econometrics, 2019).

### 3.2. Modelling Infrastructure Investment

The E3ME model generates a baseline using the behavioural and accounting relationships of the model and the country-specific databases from which it draws. Exogenous shocks can then be imposed on the model to determine the impact of the shock, measured as the deviation from the baseline. The imposition of shocks allows for scenario-testing, which enables evidence-based decision making premised on which scenario leads to better economic and social outcomes.

This paper uses the investment allocated towards the Infrastructure Fund as an exogenous shock to the model. Since the Infrastructure Fund is not captured in any departmental budgets, it is not included in the baseline of the model and is therefore an ideal example of an exogenous investment shock. Any exogenous changes in investment – recorded as gross fixed capital formation – are captured in the Exogenous Investment Expenditure variable (KRX). Gross fixed capital formation (investment) consists of machinery and other equipment, transport equipment, construction works, buildings and other assets. The investment period begins in 2023 and extends to 2028, the remaining timeframe of the Infrastructure Fund. While the Infrastructure Fund is premised on catalysing private sector investment, this paper

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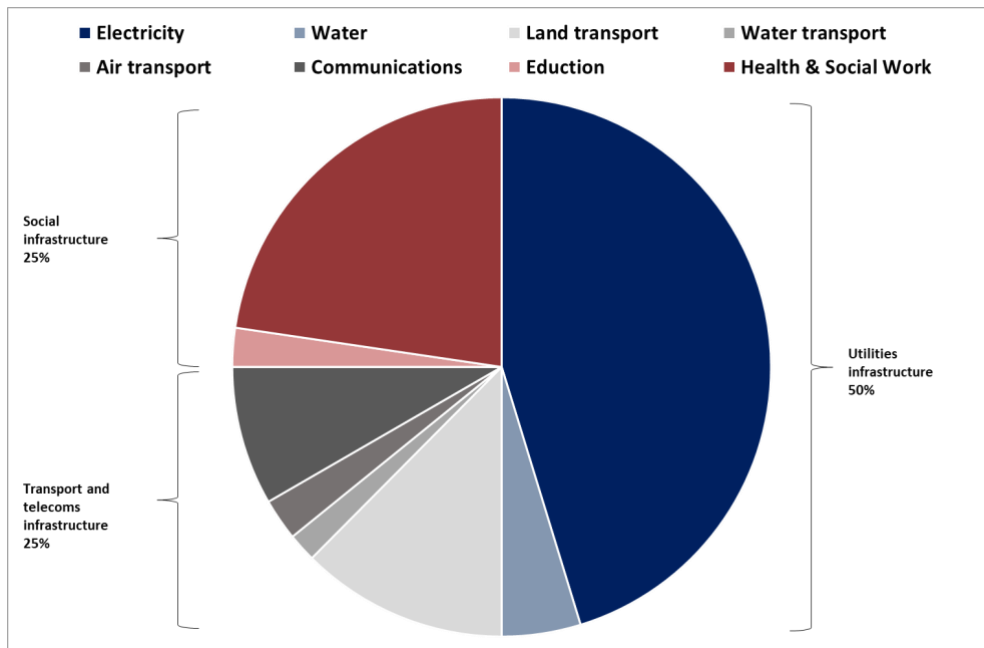
does not make assumptions on the magnitude of private sector investment that can be unlocked through the Infrastructure Fund.

Aligning with the priorities identified in the NDP and NIP 2050, the Infrastructure Fund focuses on investment into economic and social infrastructure, including amongst others electricity, water, transport, telecommunication, education, and health. Infrastructure development in these sectors is anticipated to open opportunities for growth. In keeping with the focus of the Infrastructure Fund and for the purpose of this paper, these abovementioned key sectors have been grouped into three categories. The weight of each sector in the respective categories is based on the current distribution of investment, based on the national accounts data. Category 1 includes electricity and water and is referred to as utilities infrastructure. Category 2 includes transport (land transport, air transport and water transport,) and telecommunications and is referred to as transport and telecoms infrastructure. Category 3 includes health, social work and education and is referred to as social infrastructure.

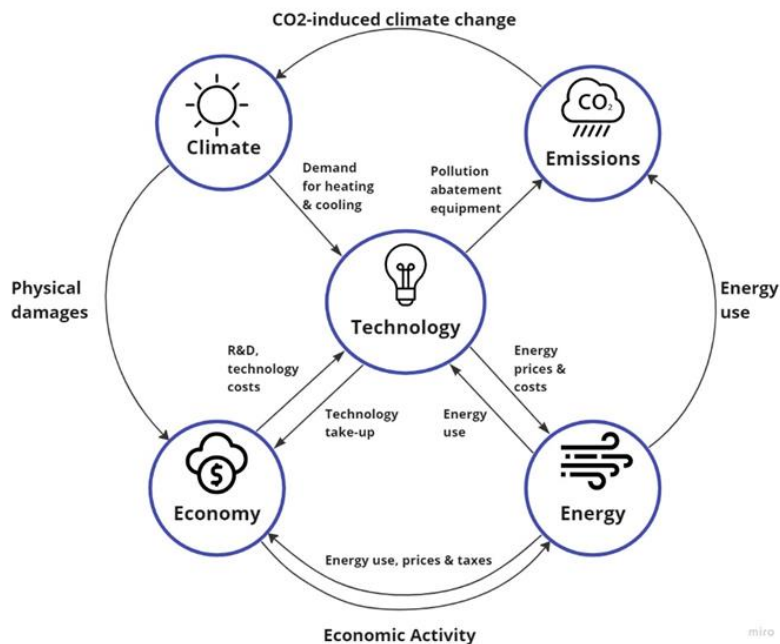
To determine the impact of the Infrastructure Fund investments on economic growth and employment, three scenarios with varying levels of investment are modelled. The three scenarios are captured as follows:

1. Scenario 1 assumes the bulk of the investment (50 per cent) is channelled towards **utilities infrastructure** (electricity and water in a 90:10 ratio) and the remainder is equally divided between transport and telecoms and social infrastructure. Figure 3 depicts the allocation of exogenous investment under Scenario 1.
2. Scenario 2 assumes the bulk of the investment (50 per cent) is channelled to **transport and telecoms infrastructure** (land transport, water transport, air transport and communications in a 50:10:10:30 ratio) and the remainder is equally divided between utilities and social infrastructure. Figure 3.1 depicts distribution of investment into economic and social infrastructure under Scenario 2.
3. Scenario 3 assumes the bulk of the investment (50 per cent) is channelled to **social infrastructure** (health and social work, and education in a 90:10 ratio) and the remainder is equally divided between utilities, and transport and telecoms infrastructure. Figure 3.2 demonstrates the distribution of investment into economic and social infrastructure under Scenario 3.

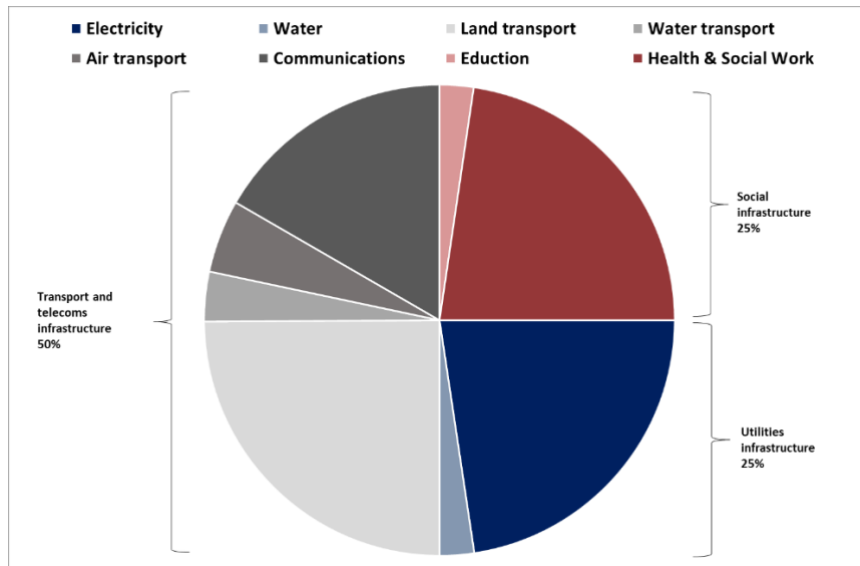




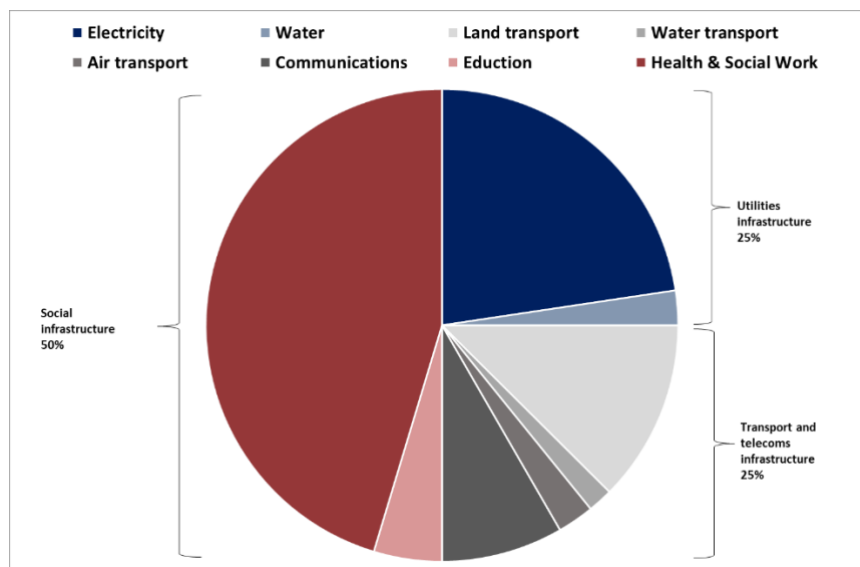
**Figure 3:** An illustrative graph of the distribution of investment into economic and social infrastructure under Scenario 1.  
Source: Authors' assumptions



**Figure 3A1:** The feedback mechanism between the Energy, Environment and Economy model components  
Source: Cambridge Econometrics E3ME Manual (2019)



**Figure 3.1:** An illustrative graph of the distribution of investment into economic and social infrastructure under Scenario 2  
Source: Authors' assumptions



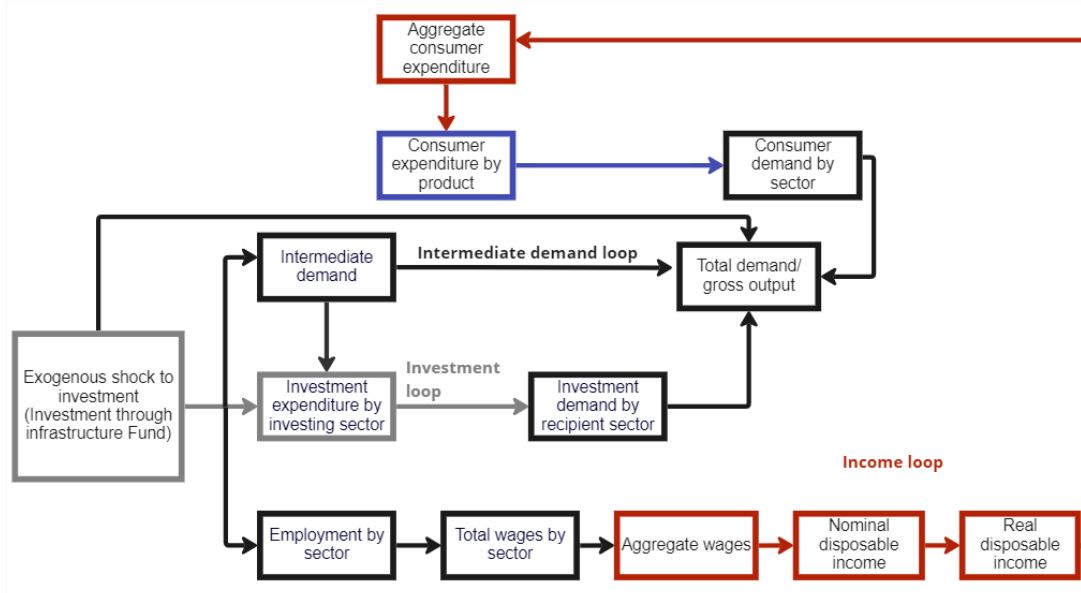
**Figure 3.2:** An illustrative graph of the distribution of investment into economic and social infrastructure under Scenario 3  
Source: Authors' assumptions

The current scenario formulation is not informed by historical BFI allocations owing to limitations in the existence of a strong pipeline to inform trends in the types of project investments, therefore limitations in informing future allocations. Secondly, the allocations are provided on the basis of project preparedness and do not speak to the dynamics of the economy at the time or what the optimal outcome from a growth



impact perspective is. Finally, the Infrastructure Fund does not have an expenditure or investment guide for different project categories, and specificity in assumptions can only be informed by such a guide. The infancy of the Infrastructure Fund implies the analysis needs to assess the full and dynamic potential of the programme.

Guided by information published in the Budget Review 2023, this paper makes the following assumptions about the distribution of the remaining R97 billion: R7.2 billion in 2023, R14.7 billion in 2024, R16 billion in 2025, R18 billion in 2026, R20 billion in 2027 and R21 billion in 2028. The allocations from the Infrastructure Fund for the first two years (2023-2024) are based on information provided in the Budget Review 2023. The assumptions made from 2025 onwards are based on the authors' own assumptions for the purpose of this paper and are in no way a commitment made by the National Treasury. The authors assume that the allocations will increase incrementally until 2028



**Figure 4:** A diagram illustrating an exogenous investment shock's feedthrough mechanisms in the E3ME model. Source: Cambridge Econometrics E3ME manual (2019)

Figure 4 illustrates how an exogenous investment shock is expected to feed through the interdependent loops within the economic model of the E3ME model. Exogenous infrastructure investment initially impacts the investment loop, before feeding into the intermediate demand and income loops.

### DATA ANALYSIS

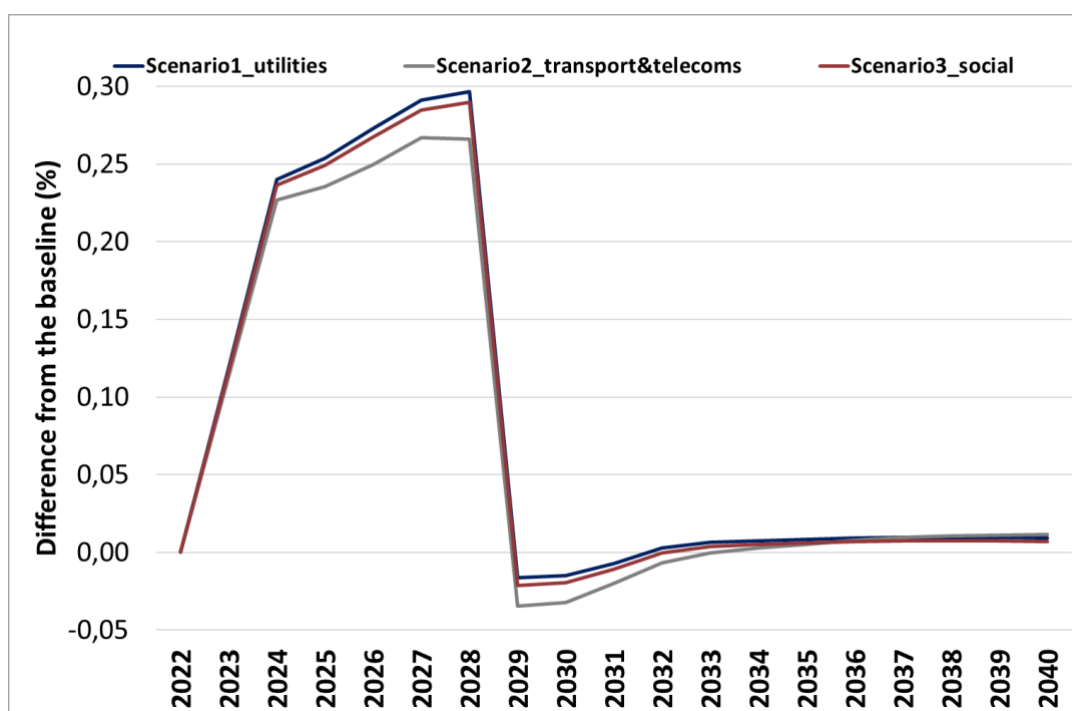
It should be noted that the projections and simulation results presented are quantified estimates of the relative impact of the investment fund on the various indicators and should not be interpreted as predictions. As such, the generally accepted method of reporting the impact of the policy change on economic, social, and environmental indicators is to report the difference from the baseline (Cambridge Econometrics,

2019). In theory, one can expect that the impacts of infrastructure investment would be felt on both the demand side (a near-term stimulus effect) and the supply side (in the long run, from an increase in economic capacity, and a potential reduction in unit costs). As a demand-driven model, E3ME is mainly suited to analyse the first of these. Therefore, these results likely underestimate the long-run benefits of this investment spending, as the model does not capture the potential supply-side impacts. The E3ME model captures not only the direct and indirect impacts of stimulus spending at a point in time, but also short-run business cycle dynamics over time. These short-run effects are a function of the lagged differences of explanatory variables, in other words, the direction of travel of the economy, and capture economic frictions and the economic agents. In this case, the removal of the investment subsidy inevitably produces a year-on-year reduction in output, which influences the expectations of consumers, who (at the margin) make more conservative spending decisions. This produces a slightly negative macroeconomic outcome relative to the baseline in 2029. However, the overall negative impact is minimal, and it is more accurate to describe the results as reverting to the baseline trend.

#### 4.1. Aggregate Results

From the results, it can be inferred that an external shock of almost R100 billion from the Infrastructure Fund to investment in utilities, social or telecoms and transport infrastructure results in a small but permanent improvement in aggregate economic activity relative to the baseline, as illustrated in Figure 5. By 2028, GDP is expected to be 0.3 per cent higher compared with the baseline as a result of the R97 billion investment. The results further show that the largest impact on economic activity is reported under Scenario 1, where the bulk of investment is in utilities. It should be noted, however, that the impact on growth from the three scenarios all yield fairly similar results in terms of the magnitude of impact, and a greater shock to investment is thus needed to determine whether the impact from the various scenarios differs significantly.

The pass-through effect of the exogenous infrastructure shock is most pronounced in the investment loop. This is seen by the large uptick in investment expenditure by the investing sector and investment demand by the recipient sector. The effect in the intermediate demand loop is less pronounced; however it does move as expected owing to the increased demand for inputs by investment-implementing sectors such as the construction sector. By 2028, investment expenditure will have increased by 2.0 per cent from the baseline, while total demand increases by 0.2 per cent from the baseline when the bulk of investment is made towards utilities. Over the long term, economic activity tends to the baseline; however, it does indicate a small, positive impact on economic growth.



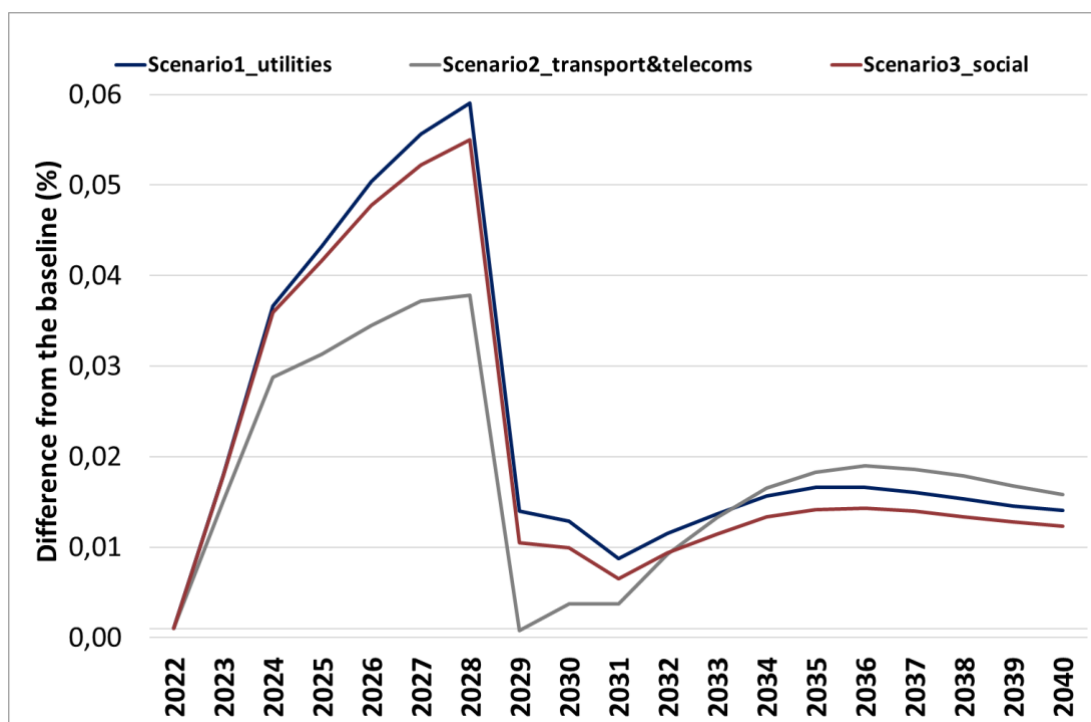
**Figure 5: Aggregate GDP**

Source: Authors' own results from the modelling exercise

Figure 6 illustrates that the increase in investment has a positive impact on employment. Employment increases and peaks at 0.06 per cent above the baseline by 2028. Specifically, the uptick in employment is most pronounced when the largest share of investment is allocated towards utilities, followed by investment into social infrastructure. The impact on employment captures the income loop, and Figure 6 highlights the lagged effect that investment has on wages and consumer expenditure. Infrastructure investment will increase employment as labour will first be required to construct this infrastructure and second, to increase output by material suppliers. The increase in labour demand for construction activities will be the first-round effect, while the expansion of production capacity may be lagged as it is a second-round effect.

Moreover, investment into production capacity is not limited to labour but also encompasses production machinery and equipment, thus making the second-round effect into production capacity less impactful. In line with the findings from Mbanda and Chitiga-Mabugu (2016), the results indicate that infrastructure investment will generate more jobs in absolute terms in highly- and semi-skilled occupations. In line with the classifications by Stats SA in the Standard Classification of Occupations, highly-skilled occupations include managers, professionals and technicians and associate professionals; semi-skilled occupations include clerical support workers, services and sales workers, skilled agricultural and fishery workers, craft and related trades, and plant and machinery operators and assemblers; while low-skilled occupations cover elementary occupations. In anticipation of this, the infrastructure investment drive should be accompanied by measures that increase the skills of the

existing labour force so that these employment opportunities can be utilised. South Africa has an overwhelming number of unskilled labourers who, with some training, would be better positioned to benefit from infrastructure investment.



**Figure 6:** Aggregate employment

Source: Authors' own results from the modelling exercise

The aggregate results indicate that the impact on both growth and employment is the most significant in the secondary sector, followed by the primary sector and lastly, the tertiary sector. The modelling results are available for all 43 industries, although for the purposes of this paper, industries have been grouped according to primary, secondary and tertiary sectors and include an explanation of which industries are driving the results. This is discussed more broadly below.

#### 4.2. Primary Sector

The results in the primary sector follow a similar pattern to the aggregate results. Figure 7 illustrates that by 2028, primary sector GVA is expected to be approximately 0.3 per cent higher compared with the baseline as a result of the R97 billion investment in economic and social infrastructure. The results are driven by the mining sector and are predominantly due to an increase in demand for intermediate inputs from the sector, or the Type I multiplier. The mining sector has strong forward linkages to the construction and other transport equipment sectors; therefore, the construction of economic and social infrastructure will increase the demand for intermediate inputs supplied by the mining sector. The infrastructure investment is also expected to have a positive, albeit marginal, impact on employment in the primary sector, driven again by the mining sector as illustrated in Figure 8. By 2028, primary sector employment



is expected to be around 0.05 per cent higher compared with the baseline as a result of the investment. Increased investment in infrastructure and additional intermediate inputs required to construct infrastructure also result in increased labour demand and higher levels of employment in the mining sector.

Scenario 1, where the bulk of the funds are allocated to utilities; and Scenario 2, where the focus of the investment is social infrastructure, yield the greatest impact. ArcelorMittal indicates that each new megawatt (MW) of solar power requires between 35 to 45 tons of steel, and each new MW of wind power requires 120 to 180 tons of steel with iron ore and scrap metal being the main inputs to steel. Renewable energy sources such as solar photovoltaic (PV), wind and batteries as well as power cables in distribution and transmission networks also use a wide range of materials such as copper, manganese, nickel, chrome, and aluminium, all sourced from the mining sector. Furthermore, economic and social infrastructure construction activities require other building materials such as cement and bricks with raw materials such as limestone also sourced from the mining sector.

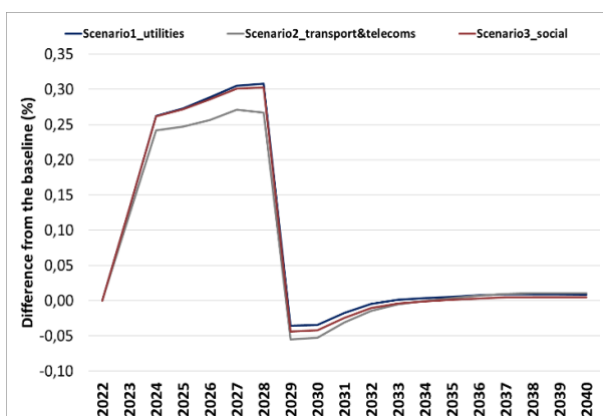


Figure 7: Primary sector GVA

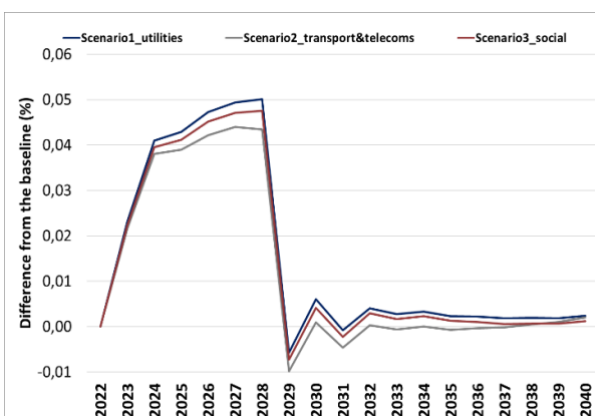


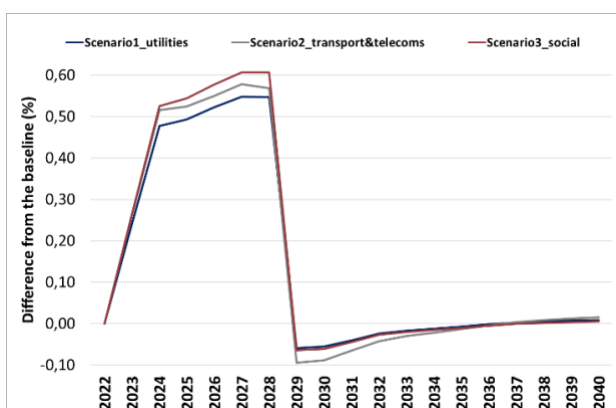
Figure 8: Primary sector employment

Source: Authors' own results from the modelling exercise

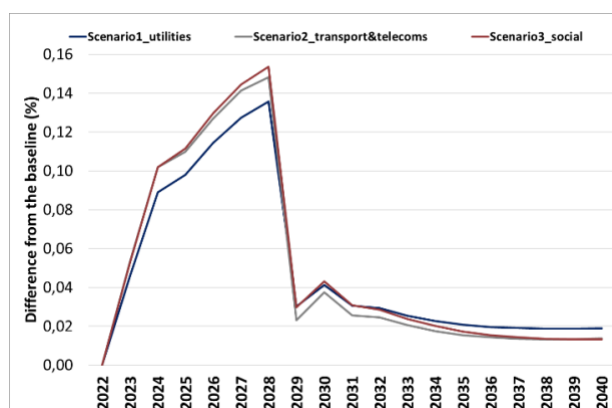
### 4.3. Secondary Sector

Relative to the primary and tertiary sectors, the investment impact is the greatest in the secondary sector. By 2028, economic growth in the secondary sector is anticipated to be 0.6 per cent higher than the baseline when there is an increase in infrastructure investment. Employment is expected to increase by approximately 0.15 per cent by 2028, with employment growth remaining positive over the long term. The drivers of the uptick stem from an increase in demand for construction services as well as an increase in the demand for manufactured intermediate goods, both of which contribute directly to enabling infrastructure delivery. While the investment into infrastructure such as electricity and water will allow for expansion in the manufacturing sector due to the availability of inputs into the production of goods, this supply side effect is not well captured in the model. Rather, the model captures the effect of an increase in demand for the goods or services produced by the secondary sector when there is an increase in investment.

The employment figures do not reflect the same movements as the growth graph owing to the differing employment patterns of the two driver sectors. The construction sector, from which the majority of the increase in employment stems, increases employment rapidly in the initial years of investment and in line with infrastructure expenditure. Once the project implementation period is complete, employment in the sector returns to the baseline. In contrast, the expansion in manufacturing employment increases steadily from 2023, and drops off once the investment period is complete, but does not return to the baseline. This steady increase reflects an expansion in manufacturing capacity, which takes time and is less labour intensive. An increase in demand for manufactured goods will first be met by an increase in production with available manufacturing capacity, then through inventories, and then through expanded capacity. Where technically and economically feasible, the expanded capacity may also decrease the demand for imported manufactured goods and shift towards locally-produced intermediate goods.



**Figure 10:** Secondary sector GVA



**Figure 9:** Secondary sector employment

Source: Authors' own results from the modelling exercise

In terms of manufacturing, manufactured intermediate goods such as steel, cement and bricks, tar, glass and the like are primary inputs into most infrastructure projects. Manufacturers of such products benefit from the uptick in demand for construction materials, thus enabling them to expand their outputs and operational capacity, and increase employment. According to the World Bank Group (2022), as of 2021, South Africa imported approximately 64 per cent of its manufactured goods. While infrastructure investment has a significant impact on the domestic manufacturing sector, this impact could in fact be even larger if the investment drive was accompanied by measures that prioritised the use of domestically manufactured goods through support for the expansion of the production of value-add manufactured goods.

Intermediate goods produced by the manufacturing sector are then utilised by the construction sector for the implementation of infrastructure projects. The construction sector, which benefits the most from the increase in infrastructure investment, is labour intensive and provides employment opportunities for individuals of various skill levels ranging from low to highly-skilled labourers. The demand for services provided by the construction sector increases with infrastructure investment, and it is thus the

sector that drives the aggregate increase in employment. This reinforces the drive by the South African government to utilise infrastructure investment as a stimulus for employment in the country.

The greatest growth in both gross value-add and employment is achieved when the bulk of the investment is made towards social infrastructure (Scenario 1), followed by the bulk of investment being channelled towards transport and telecoms infrastructure (Scenario 2). The construction of social infrastructure is more labour and material intensive than the construction of utilities and telecommunications and transport infrastructure. This is consistent with results found by Heintz and Peltier (2009), who examined investment into different infrastructures in the USA. A USD 1 billion investment into school infrastructure provided 14 029 direct employment opportunities, whereas an investment of the same magnitude into transport generated 13 829 direct employment opportunities, while water and electricity generated an average of 13 024 direct employment opportunities.

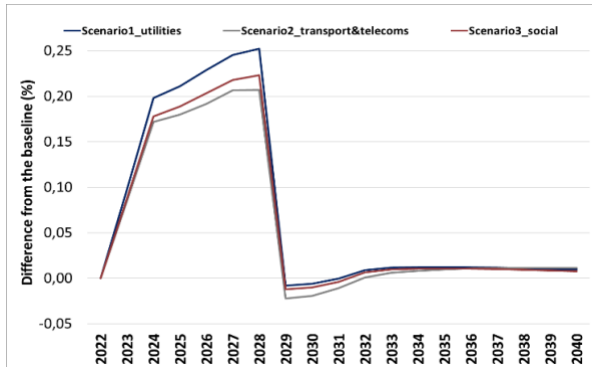
### **Tertiary Sector**

Tertiary sector output and employment results are also positive, in line with the aggregate findings. Output is expected to increase by 0.25 per cent by 2028 (Figure 11). In the long run, the impact is negligible and just above 0.0 per cent. In terms of employment, Figure 12 shows that a marginal increase of 0.04 percentage points above the baseline is expected by 2028. Further contributions are expected in the long run, with the employment contribution peaking at just above 0.02 per cent above the baseline in 2036.

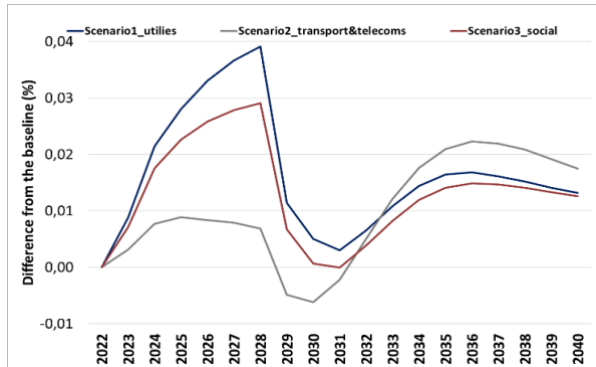
Despite the positive results, the investment impact on the tertiary sector is the smallest relative to the secondary sector, followed by the primary sector. This speaks to the nature of how, as discussed above, infrastructure spending is expected to support input-intensive sectors as well as the construction sector more directly. The positive tertiary sector results are driven by engineering services, transport and telecommunications sub-sectors. Engineering and transport are seen as support functions for economic activity in other sectors and will therefore benefit from infrastructure investments. Engineering services provide engineering design services, which include project management activities related to construction and water management projects (Statistics South Africa, 2012). These services differ from the civil engineering works under the construction sector, which captures the actual construction of civil engineering projects. These are considered to be heavy construction projects such as streets, bridges, railways, harbours and other water projects, and electricity facilities. These services are expected to support the development of the infrastructure projects under the various scenarios.

According to Bezuidenhout et al. (2008), the disproportionate distribution of raw materials, labour, factories and markets necessitates the utilisation of transport to support economic activity. This highlights the role that the transport sector will play in moving goods and labour, both for the primary and secondary sectors. With respect to telecommunication services, Beyh and Kagioglou (2004) found that communication means are necessary for mobile personnel on the construction site, which, through the advancement of technology, have evolved to offering services, including collection

and management of data. This is an additional service that is expected to grow from construction-related investments as companies seek to optimise project development.



**Figure 12:** Tertiary sector GVA



**Figure 11:** Tertiary sector employment

Source: Authors' own results from the modelling exercise

Directing the largest share of investment in infrastructure to utilities (Scenario 1) results in the greatest impact on output. The development of energy infrastructure projects for the generation, distribution and/or transmission of power and water projects such as wastewater treatment facilities is expected to trigger the support functions within the tertiary sector. This may be driven by South Africa's need to import more of its wind and solar PV characteristic products such as gearboxes, blades, towers, solar panels, and converters, expected to provide additional support for transport services (Rivett-Carnac, 2022a and 2022b). For instance, under the fourth round of the Renewable Energy Independent Power Producer Procurement programme, transport costs for wind farms were 13 per cent of total project costs (Rivett-Carnac, 2022b). This indicates the significant role of both costlier and specialised transportation of large components (such as masts and blades) and its need over longer periods during the development phase. Rivett-Carnac (2022b) indicates that for the Jeffreys Bay Wind Farm that started commercial operations in July 2014, transportation of the wind turbines from the Port of Ngqura to the project site started in July 2013 and was completed in February 2014. This covered a total distance of 110 000 kms. Similarly, the greatest employment impact is driven by the utilities infrastructure investment (Scenario 1), which is expected to follow output results. However, in the long run, the peak in employment contribution of a marginal 0.02 per cent above the baseline is driven by Scenario 2 results, where the greatest share of investments is in transport and communications.



## DISCUSSION OF FINDINGS

Based on the findings from this paper, the following can be concluded in terms of policy implications:

1. Infrastructure investment can stimulate both economic growth and employment creation. Despite the magnitude of investment modelled in this paper being small relative to total investment, the results still indicate the positive effect of infrastructure investment. This paper therefore supports the existing body of research that indicates that infrastructure investment can stimulate economic growth and increased employment, and confirms that the results hold in the South African context. The impact is expected to be the greatest in the secondary sector, driven by construction and manufacturing.
2. Infrastructure investment can be targeted at a sectoral level: A study such as this can contribute to policy discussions surrounding targeted investment expenditure which aims to prioritise employment and/or economic growth. Specifically, it can provide empirical support for a sectoral approach to infrastructure investment. This is in line with the recommendation that suggests that projects in the electricity and water sector receive the bulk of infrastructure investment, given that investment into these sectors yields the greatest impact on overall economic growth and employment creation. With reference to the Infrastructure Fund, this study motivates for investment into capacity building for submitting entities and project sponsors in specific sectors, such as water and electricity, wishing to submit projects for funding through the Infrastructure Fund. Improved capacity will increase the number of well-prepared projects with sound financial models within sectors that yield the greatest impact on economic growth and employment.
3. Measures targeting skills improvements should be taken in expectation of the infrastructure investment programme. Given that infrastructure investment will generate the greatest number of employment opportunities for semi- and highly-skilled individuals, it is suggested that measures that will improve the skills distribution of South Africans be explored. Skills development relevant to sectors such as construction and manufacturing will be most needed with increased infrastructure investment.
4. The production of value-added manufactured goods should be expanded to meet the additional demand for intermediate goods. South Africa is still dependent on imports for many manufactured goods; however, an opportunity exists to expand the production of intermediate goods utilised in the construction process. This will enable more locally manufactured goods to be used in the construction of large-scale infrastructure projects funded through the Infrastructure Fund. There are opportunities to develop local industries, including introducing additional certification and testing of products to comply with international standards; supporting the production of correct product specifications; continuity and certainty in investment opportunities to enable the development of industries; and concessional finance to support the growth of small manufacturers (Rivett-Carnac, 2022a and 2022b). Pre-emptive action can be taken to explore measures such as combining taxes and incentives to

make domestically produced manufactured goods more competitive relative to imported goods.

## CONCLUSION

The study modelled the impact of the remaining investment commitment of R100 billion under the Infrastructure Fund. The investment shock is applied to the exogenous investment variable of the E3ME model under three scenarios. Scenario 1, which assumes the bulk of the investment is allocated to utilities infrastructure; Scenario 2 which assumes the bulk of the investment is directed to transport and telecoms infrastructure; and Scenario 3 which allocates the bulk of the investment to social infrastructure. In line with the literature, the study finds that on aggregate, there is a positive impact on growth and employment when investing in economic and social infrastructure. By 2028, GDP is expected to be 0.3 per cent higher compared with the baseline while employment increases and peaks at 0.06 per cent above the baseline by 2028. These results are attained under Scenario 1, where the bulk of investment is in utilities. The results under the three scenarios do, however, yield similar outcomes in terms of the magnitude of impact, and a greater shock to investment is needed to determine the extent to which the scenarios differ significantly.

In terms of the sectoral results, primary sector output is expected to be approximately 0.3 per cent higher in 2028, compared with the baseline. By 2028, primary sector employment is expected to be around 0.05 per cent higher compared with the baseline as a result of the investment. These results are attained under Scenario 1, where a large investment in utilities is expected to support the mining sector through its close link to primary inputs required for construction and transport material. Secondary sector GDP is expected to be 0.6 per cent higher than the baseline by 2028, while employment is expected to increase by approximately 0.15 per cent by 2028. These results are expected under Scenario 3, with increased investment allocated to social infrastructure. Investments will support the construction and manufacturing sectors, both of which contribute directly to enabling infrastructure delivery. In the tertiary sector, output is expected to increase by 0.25 per cent above the baseline. Employment is expected to increase by 0.04 percentage points above the 2028 baseline. Tertiary sector results are supported by the scenario where the greatest investment is directed to utilities infrastructure, which is expected to trigger engineering services, transportation and telecommunications support functions within the tertiary sector.

The results of the study not only highlight the extent of the positive gains government can expect from the implementation of the Infrastructure Fund investments, but also highlight the sectoral impact behind the results. This can enhance policy planning, allowing governments to, a priori, establish the types of investments that will have the greatest impact.

## ACKNOWLEDGEMENT

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## DISCLAIMER

The views expressed in this paper are the personal views of the authors and do not represent those of the National Treasury. While every precaution is taken to ensure the accuracy of information, the National Treasury shall not be liable to any person for inaccurate information, omissions or opinions contained herein.

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



MAKOTA MADISHA



DÉSA

# 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 Development 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 Ebekoziem 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 Ebekoziem 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
<p><b>Theme 1:</b> Implementation of planning systems and regimes</p>	<ul style="list-style-type: none"> <li>• Different planning framework sources.</li> <li>• Different implementation plans, interpretations, aims, objectives, targets, and priorities.</li> <li>• Spatial planning frameworks formulated on unattainable goals and milestones.</li> <li>• Goals and milestones are not realistic and unattainable.</li> </ul>
	<ul style="list-style-type: none"> <li>• Spatial Development Framework, National Spatial Development Framework, Provincial Spatial Development Framework, Regional Spatial Development Framework, Integrated Development Plan, District Development Model.</li> </ul>
<p><b>Theme 2:</b> Spatial planning encumbrances and risks</p>	<ul style="list-style-type: none"> <li>• Spatial planning is highly regulated, which makes it difficult to implement.</li> <li>• Complications and complexity dealing with informal settlements and businesses in townships.</li> <li>• Spatial planning based on old models cannot adapt to the developing world landscape.</li> <li>• Spatial planning frameworks derived from western concepts only partially apply to dynamic South African cities.</li> <li>• Spatial planning models emphasise ‘planning for’ instead of ‘planning with’.</li> <li>• Poor and lack of communication between spatial planning and infrastructure development teams.</li> <li>• Town planners lack the capacity, skills, and experience.</li> <li>• Lack of workable spatial planning implementation plan.</li> <li>• Silo approach in which cooperative structures struggle to work horizontally across various departments within a municipality.</li> <li>• Delays in finalising planning and regulatory instruments.</li> <li>• Lack of cross-departmental coordination and integration.</li> </ul>
<p><b>Theme 3</b> Infrastructure development challenges and risks</p>	<ul style="list-style-type: none"> <li>• Infrastructure development financial risks.</li> <li>• Inadequate funding for infrastructure development projects.</li> <li>• Stoppage by construction Mafia and business forums.</li> </ul>



Themes	Sub-themes
	<ul style="list-style-type: none"> <li>• Lack of community participation and buy-in.</li> </ul>
	<ul style="list-style-type: none"> <li>• Political interference.</li> <li>• Infrastructure development projects used as catalysts for political support.</li> </ul>
	<ul style="list-style-type: none"> <li>• Inadequate institutional capacity to implement infrastructure development projects.</li> <li>• Migration of people coming into the Gauteng Province leads to the mushrooming of informal settlements, which in turn impacts the provision of infrastructure development.</li> </ul>
	<ul style="list-style-type: none"> <li>• Infrastructure development project inspection and monitoring systems are lacking.</li> <li>• Lack of coordination between the three spheres of government in the implementation of infrastructure projects.</li> <li>• Delays in transferring infrastructure assets to municipalities.</li> <li>• Low-capacity levels to maintain infrastructure assets.</li> <li>• Shortage of engineering expertise for maintenance and operation.</li> <li>• Lack of funds to maintain infrastructure assets.</li> <li>• No reliable data about the state and performance of municipal infrastructure and its maintenance.</li> <li>• New infrastructure is being constructed without addressing the condition of existing infrastructure.</li> <li>• Rapid urbanisation which puts pressure on municipalities to provide infrastructure and services.</li> <li>• Low capacity of professionals to deal with backlogs.</li> <li>• Lack of understanding and appreciation of community dynamics.</li> </ul>
<b>Theme 4:</b> Government's alignment and integration of spatial planning and infrastructure development-related functions.	<ul style="list-style-type: none"> <li>• Three spheres of government alignment, prioritisation, and target setting for spatial planning and infrastructure development projects.</li> <li>• Functionality of spatial planning and infrastructure development task teams, committees, and fora.</li> </ul>
	<ul style="list-style-type: none"> <li>• The role of Integrated Development Plans in synchronising, aligning, and integrating spatial planning and infrastructure development projects.</li> </ul>
	<ul style="list-style-type: none"> <li>• Rational allocation of resources by the three spheres of government for infrastructure development projects.</li> </ul>

Themes	Sub-themes
	<ul style="list-style-type: none"> <li>• Spatial planning and infrastructure development administrative networks.</li> </ul>
	<ul style="list-style-type: none"> <li>• Defining infrastructure development demand by the three spheres of government.</li> </ul>
	<ul style="list-style-type: none"> <li>• Qualitative and quantitative analysis of the role of local government in the delivery of infrastructure projects.</li> </ul>
	<ul style="list-style-type: none"> <li>• Effective and operational intergovernmental relations system to implement infrastructure projects.</li> </ul>
	<ul style="list-style-type: none"> <li>• Coordination and reporting between the three spheres of government on spatial planning and infrastructure development.</li> </ul>
<p><b>Theme 5:</b> Benefits of linking spatial planning and infrastructure development</p>	<ul style="list-style-type: none"> <li>• Infrastructure projects will be aligned with spatial planning.</li> <li>• Infrastructure project budgets are spent within the timeframe.</li> <li>• Better strategic decisions are made.</li> <li>• Projects are prioritised.</li> <li>• High rate of successful implementation and completion of infrastructure development projects.</li> <li>• High level of coordination of spatial planning and infrastructure development activities.</li> <li>• Infrastructure projects are incorporated within the IDP.</li> <li>• Integrated planning and cost-effectiveness in implementing infrastructure projects.</li> <li>• Spatially arranged sustainable development.</li> <li>• Able to accommodate the community's needs concerning the services they require through spatial planning.</li> <li>• Ability to determine the level of service in line with the infrastructure project to be delivered.</li> <li>• Opportunity for municipalities to design a level of service concerning the capacity of bulk infrastructure to address issues of overload and quality of services.</li> <li>• Feasibility studies conducted during the planning phase determine the capacity of infrastructure development projects.</li> <li>• Potential to realize the objective of building resilient, vibrant, and sustainable communities.</li> <li>• 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.</li> </ul>

#### **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



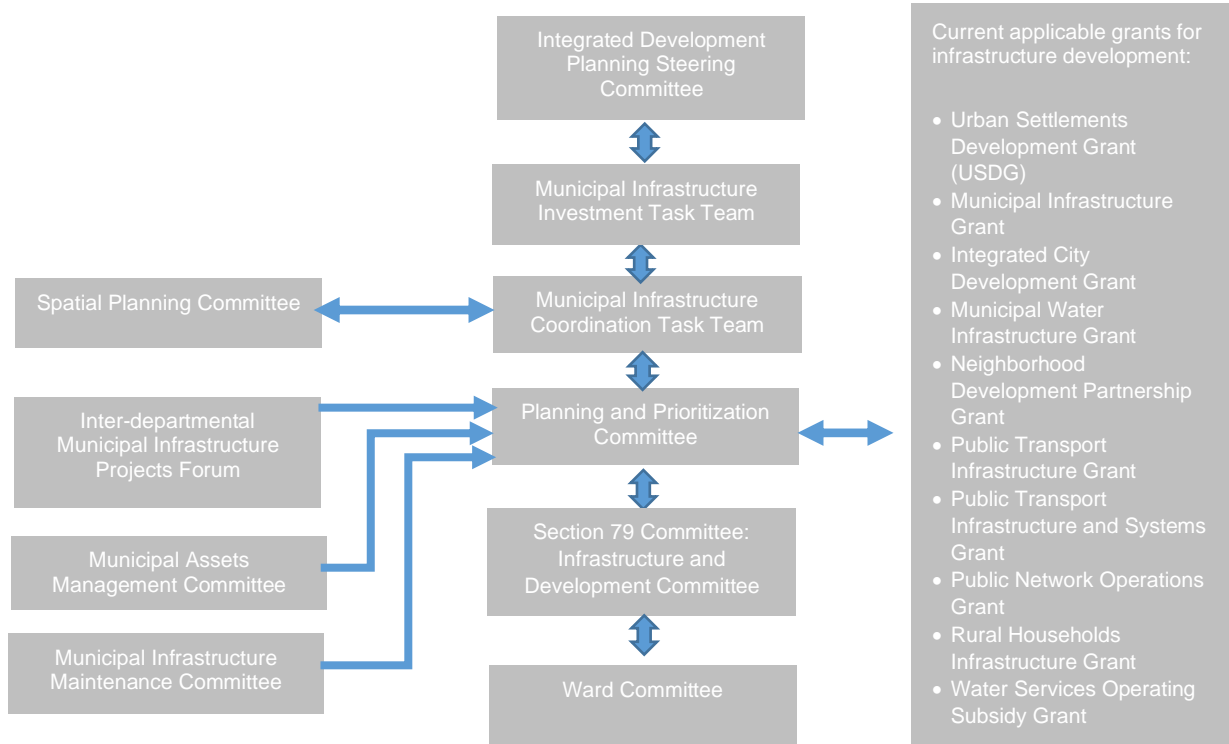
country's economic conditions, funding major capital infrastructure projects remains a major challenge for the government (Yirenkyi, 2014).

- 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

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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.



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LEVERAGING PARTNERSHIPS AND  
MACROECONOMIC POLICY FOR  
INFRASTRUCTURE DEVELOPMENT IN  
SOUTH AFRICA - A REVIEW APPROACH

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# LEVERAGING PARTNERSHIPS AND MACROECONOMIC POLICY FOR INFRASTRUCTURE DEVELOPMENT IN SOUTH AFRICA- A REVIEW APPROACH

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## ABSTRACT

The African continent faces many economic development challenges, and infrastructure plays a vital role in accelerating and breaking barriers to economic advancement. With a limited fiscal budget allocation by governments towards infrastructure development, the success and failure of public infrastructure investment are also dependent on policies and public-private partnerships, among others. Through a literature review on leveraging partnerships, this study addresses the impact of leveraging partnerships in the Development Bank of Southern Africa (DBSA) ecosystem. These lucrative partnerships can unlock pipeline development for South Africa and sub-Saharan Africa. The study's findings include the challenges to infrastructure delivery, which are governance structures, National Development Plans, mandates and capacity building, as well as fiscal budgets, which are not able to single-handedly fund capital-intensive projects/programmes in the absence of strategic partners to provide financing solutions. Therefore, the study concludes that if development financing partnerships are well established, value creation will be realised, and benefits can be yielded for all stakeholders involved. Finally, the study recommends a consolidated framework that allows for clear guidelines for partnerships with monitoring and evaluation of investments for impact.

**Keywords:** Infrastructure development, Partnerships, Policy, Review, South Africa

## INTRODUCTION

Socio-economic development, or the development of an economy, is dependent mainly on infrastructure development (PIDA, 2010; Srinivasu and Rao, 2013; Bhattacharya et al., 2015). However, there is no standard definition of infrastructure used in all economic studies (Torrise, 2009). Infrastructure is defined by Dobbs et al. (2013) as the framework or fundamental basis that sustains a community's progress and this definition highlights the infrastructure's vital role in socioeconomic development. Significant changes are made to the surrounding area by infrastructure developments, such as building roads, tunnels, subways, trains, and the like.



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According to Flyvbjerg et al. (2004), infrastructure developments are hugely expensive (commonly referred to as significant or even mega), and their deliverables are meant to benefit society for many years. Infrastructure developments get the attention of several stakeholders because of their magnitude and social effects.

The most crucial factor for successful infrastructure development is stakeholder engagement and partnership (Park et al., 2017). According to Smith et al. (2001), stakeholders are the representatives—direct and indirect—who may be interested in and are? able to contribute to the project that is being presented. Previous definitions of stakeholders, such as those contained in the publications of Turner (1999) and Moodley (1999), included those who were seen to have a genuine claim against the project's substantive components because they believed they had an interest in or benefitted from the project at hand. A more thorough definition of a stakeholder may be found in Winch's (2002) work, in which anyone who directly gains from the project or experiences loss is considered a stakeholder. Furthermore, partnership is the process by which parties join together to talk about matters of mutual interest in order to find a middle ground (Gray, 1989; Bramwell and Lane, 2000; Jamal and Stronza, 2009). A successful partnership strengthens ties across organisations, guarantees increased actor engagement, offers workable answers to issues, and makes it easier to make decisions in unison. However, the lack of partnership among stakeholders can have a detrimental influence on infrastructural developmental outcomes (Waris et al., 2022).

In addition, Ma'rifah (2022) opined that the government can, through policy, determine the direction and success of infrastructural development. Gumede (2008) posited that all openly stated goals of a government driven by widespread desire are collectively referred to as public policy. Public policies, however, can be described in various ways that meet various criteria by their very nature. The true goal of public policy is to improve the country's welfare significantly or, more specifically, to impact human lives positively. Other factors, including political or public engagement, which breathe life into the policy-making process, are responsible for public policy's mainstream existence. Consequently, it is generally acknowledged that public policy is a matrimonial executive and that choices made by the public entail public consideration or political engagement from both state and non-state entities.

Considering the above, the underlying reason for this study is to investigate the advantages of partnerships and macroeconomic policies, especially for development finance institutions (DFIs), in infrastructure development in South Africa. According to Netshiswinzhe et al. (2023), the state of the economy in South Africa is dire right now: unemployment is at an all-time high, poverty and inequality are still rampant, and the economy is not expanding. The government must make smart investments in infrastructure development to put the nation on a growth trajectory. The nation's growth depends on well-planned and managed infrastructure, and these investments should be made in a way that will eliminate the spatial legacies of the past. However, the National Development Plan (NDP, 2011) report shows that the slow progress in infrastructure development is due to the failure to implement policies and an absence of broad partnerships. Through a literature review on leveraging partnerships, this study addresses the impact of leveraging partnerships in the Development Bank of Southern Africa (DBSA) ecosystem. These lucrative partnerships can unlock pipeline development for South Africa as well as sub-Saharan Africa. This can be key to



advancing infrastructure delivery and human capacity development for the? public good and economic growth.

## DEVELOPMENTAL FRAMEWORKS

From a global perspective, the eight worldwide development objectives formed after the United Nations Millennium Summit in 2000 are outlined in the Millennium Development Goals (MDGs) published by the United Nations in 2013. At least 22 international organisations pledged to become involved in achieving the MDGs by 2015, and all 191 United Nations member states at the time approved the UN Millennium Declaration (Millennium Development Goals, 2013). These goals include ending extreme poverty and hunger, the realisation of universal primary education; the advancement of gender equality and women's empowerment; the reduction in child mortality; the enhancement of maternal health; the fight against HIV/AIDS, malaria, and other diseases; the maintenance of the environment; and the formation of international development partnerships. Partnerships were elevated in Goal 8 of the MDGs as one vehicle with the target of developing further an open, predictable, rules-based, non-discriminatory financial and trading system. Also, meeting the unique requirements of tiny island developing states, landlocked nations, and least developed countries was a further target. Lastly, an additional priority was collaborating with the private sector to share the advantages of emerging technology, particularly ICTs.

Furthermore, all governments agreed in 2015 to replace the MDGs with 17 global goals known as the Sustainable Development Goals (SDGs) of the United Nations. Value creation that is achieved sustainably to ensure development is a shared element between the Africa 2063 Agenda and the South African NDP 2030. Even though each SDG has specific objectives, the overarching aims are connected. “Transforming our World: The 2030 Agenda for Sustainable Development,” or Agenda 2030 for short, is another name for the SDGs. This study will focus on unpacking Goal number 17, which speaks to partnerships. SDG goal 17 recognises multi-stakeholder partnerships are crucial tools for mobilising and exchanging information, skills, funds, and technology to help all nations—but especially poor nations—achieve the goals of sustainable development. Building on the expertise and resource-allocation tactics of partnerships, it further aims to foster and advance successful public, public-private, and civil society collaborations. The interlinkages and integrated nature of the SDGs, as reflected in Table 1, are crucial in ensuring that the purpose of the new global agenda is realised. Partnerships for Goals: Goal 17 is unpacked below with finance, technology, capacity building, trade, systematic issues, multi-stakeholder partnerships, data monitoring and accountability as keys to its success.

**Table 1: Sustainable Development Goal 17 (Source: United Nations 2015)**

SDG GOAL 17: PARTNERSHIPS FOR THE GOALS	
<ul style="list-style-type: none"> <li>• <b>Finance</b></li> </ul>	<b>17.1:</b> Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection.



	<p><b>17.2:</b> Developed countries to implement fully their official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of ODA/GNI to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries; ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries.</p> <p><b>17.3:</b> Mobilize additional financial resources for developing countries from multiple sources.</p> <p><b>17.4:</b> Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress.</p> <p><b>17.5:</b> Adopt and implement investment promotion regimes for least developed countries.</p>
<ul style="list-style-type: none"> <li>• <b>Technology</b></li> </ul>	<p><b>17.6:</b> Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.</p> <p><b>17.7:</b> Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed.</p> <p><b>17.8:</b> Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology.</p>
<ul style="list-style-type: none"> <li>• <b>Capacity-Building</b></li> </ul>	<p><b>17.9:</b> Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation.</p>
<ul style="list-style-type: none"> <li>• <b>Trade</b></li> </ul>	<p><b>17.10:</b> Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organisation, including through the conclusion of negotiations under its Doha Development Agenda.</p>

	<p><b>17.11:</b> Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020.</p> <p><b>17.12:</b> Realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries, consistent with World Trade Organisation decisions, including ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access.</p>
<ul style="list-style-type: none"> <li>• <b>Systemic issues</b></li> </ul>	<p><b>Policy and Institutional Coherence</b></p> <p><b>17.13:</b> Enhance global macroeconomic stability, including through policy coordination and policy coherence.</p> <p><b>17.14:</b> Enhance policy coherence for sustainable development.</p> <p><b>17.15:</b> Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development.</p>
<ul style="list-style-type: none"> <li>• <b>Multi-stakeholder partnerships</b></li> </ul>	<p><b>17.16:</b> Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the SDGs in all countries, in particular developing countries.</p> <p><b>17.17:</b> Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.</p>
<ul style="list-style-type: none"> <li>• <b>Data, monitoring and accountability</b></li> </ul>	<p><b>17.18:</b> By 2020, enhance capacity-building support to developing countries, including least developed countries and small island developing states, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts.</p> <p><b>17.19:</b> By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries.</p>

Finally, there are other strategic frameworks to guide development. An example is the Southern African Development Community (SADC) Vision 2027. It creates an operational framework that will direct the establishment of a seamless, reasonably priced, transboundary infrastructure in southern Africa. Six pillars support this vision: energy, transportation, tourism, transboundary water resources, meteorology, and

information and communication technology (ICT). The SADC Regional Infrastructure Development Master Plan carries out the vision. Also relevant is Agenda 2063 of the African Union (AU). The overarching goal of the AU is to make Africa the next superpower. Agenda 2063 is a strategy framework intended to realise the socio-economic transformation of the African continent over the next fifty years. It was signed in 2015 by several leaders of state from Africa.

Agenda 2063 highlights Africa's future goals while also outlining important flagship programmes to support the region's economic development and prosperity, which will ultimately cause a swift change in the continent. Lastly, the comprehensive South African NDP 2030 is for boosting economic growth, eradicating poverty, and lowering inequality in South Africa. The NDP's primary goal of accelerated economic growth will allow the nation to undergo social and economic change. Large-scale infrastructure projects in the energy, transportation, water, and ICT sectors will eliminate social infrastructure bottlenecks and increase regional integration.

## FINANCIAL FRAMEWORKS

To enforce governance, financial management guidelines and frameworks are an important aspect of managing development funds. A financial framework is the term for the policies, procedures, regulations and standing orders. According to the Stern Business School of Business and New York University (2016: 33) on legal structures and frameworks, "Different states vary substantially in their capacity to assemble land for new network infrastructure projects. Compare, for example, two former British colonies: Singapore, which has an unusually aggressive eminent domain law, and India, where historically, it has been difficult for the government to use its legal right to eminent domain. Singapore today has perhaps the world's finest infrastructure, whereas India's infrastructure remains chronically underdeveloped relative to the country's needs". Furthermore, Ralf Muller (2009) states that "without a governance structure, organisations often run the risk of conflicts and inconsistencies between the various means to achieve organisational goals, the processes, and resources, causing costly inefficiencies that impact negatively on both smooth running and bottom-line profitability. However, the frequency of projects failing to meet these corporate objectives has focused attention firmly on the process of project governance." Some financial frameworks include the following:

### International Financial Reporting Standards (IFRS)

The International Accounting Standards Board (IASB), an independent organisation with headquarters in London, UK, issued the International Financial Reporting Standards (IFRS) accounting rules, or "standards," as a set of guidelines that, in theory, should apply uniformly to financial reporting by public companies worldwide (Ball, 2005). "The objective of this IFRS is to ensure that an entity's first IFRS financial statements and its interim financial reports for part of the period covered by those financial statements contain high-quality information. Furthermore, the fundamental economic function of accounting standards is to provide agreement about how important commercial transactions are to be implemented" (Ball, 2005).

Analysis of the G20 IFRS profiles (2018) in the analysis of the uptake of the IFRS's standards reveals the following: "The following observations relate to the information in the profiles of the members of the Group of Twenty (informally, the G20), which is the premier forum for international cooperation on the most important issues of the global economic and financial agenda. The G20 brings together finance ministers and central bank governors from the following 19 countries plus the European Union: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, and the United States of America. Commitment to a single set of global accounting standards: All the G20 jurisdictions have made a public commitment to supporting a single set of high-quality global accounting standards. Additionally, the audit reports in ten of the fifteen G20 jurisdictions that have adopted IFRS Standards for all or most publicly traded companies refer to conformity with IFRS Standards. The audit reports in the other five G20 jurisdictions using IFRS Standards refer to conformity with IFRS adopted by the European Union. The audit report in Saudi Arabia refers to conformity with IFRS endorsed in Saudi Arabia".

### **International Monetary Fund (IMF)**

Founded in 1945, the International Monetary Fund (IMF) is a group of 189 nations that work to promote international commerce, ensure financial stability, encourage high levels of employment and sustainable economic growth, and lessen poverty on a global scale. The 189 nations that make up the IMF's almost universal membership are in charge of and answerable to it. All macroeconomic and financial sector concerns that impact global stability were included in the Fund's mandate when it was revised in 2012.

For development and to ensure economic stability, Northern Colonial States decided what should be relevant for Southern States, using macroeconomics as a driver. This approach introduced the development theory and related economic policies for nations such as South Africa. These 10 main levers, often known as the Washington Consensus, determine what it means for an economy to expand and develop through ten policy drivers based on GDP performance. Spence (2021) argues that the Washington Consensus list was never intended to be interpreted as a fully elaborated plan, a growth strategy, or a development model. Considering the above, the inherited spatial plans and Bantustans from the colonial and apartheid legacy remain challenging to the South African landscape. In development, this neo-liberal approach lacks the element of environmental, social and governance (ESG) for human resilience and climate matters, an important sustainable development outcome.

### **BRICS Collaborative Bank – New Development Bank (NDB)**

A new multilateral development bank founded in 2014, the New Development Bank was established by the BRICS countries—Brazil, Russia, India, China, and South Africa—to mobilise resources for sustainable development and infrastructure in the BRICS and other neglected emerging economies in order to spur faster development through innovation and state-of-the-art technology (NDB, 2014). The NDB collaboration says that it would collaborate with the BRICS countries in the areas of knowledge and capital, establishing equitable opportunities for the development of



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each member country and accomplishing development objectives with openness and compassion. With loans to its member nations, the Bank would support ongoing global economic and development initiatives by regional and international financial organisations.

Buhl (1991) echoes that “coordination requires some planning and division of roles and opens communication channels between organisations”. A more durable and pervasive relationship marks pooled or collaborative funds where donors share a common interest and may participate in the re-granting decisions. Participants bring separate organisations into a new structure fully committed to a common mission. The BRICS collaborative partnership through the BRICS Bank answers the aspect of leveraging partnerships from a DFI perspective and appears to lean towards creating a framework for partnerships about DFIs.

### **Public Finance Management Act (PFMA)**

The Public Finance Management Act no. 1 of 1999 (PFMA) is used primarily in state-owned entities to curb fruitless and wasteful expenditure, monitor governance and take proper care of public money. The objective of the Act is “To regulate financial management in the national government and provincial governments; to ensure that all revenue, expenditure, assets and liabilities of those governments are managed efficiently and effectively; to provide for the responsibilities of persons entrusted with financial management in those governments; and to provide for matters connected therewith”.

### **POLICYMAKERS**

Gumede (2008:167) states that “Public policy can be referred to all exposed aspirations of an administration which are propelled by the wish of the people. However, public policy can be defined in more ways than one, which, by their actual nature, satisfy different aspects. The actual objective of public policy is to greatly satisfy the nation's welfare or particularly aimed to touch the lives of individuals positively”. Public policy exists in the mainstream owing to other components, such as public or political participation, which give life to the formulation process. Therefore, it can be widely accepted that public policy is a matrimonial executive and public decisions involve public consideration or political participation through state and non-state actors.

### **National Development Plan**

The National Development Plans (NDPs) are the drivers of any country's economy and serve succinctly as the agenda for governing. The economy of a country and its agenda are anchored clearly through the NDP for the global community to make determinations on relationship building. Furthermore, an NDP allows existing and potential partnerships to assess commonalities for greater collaborations and shared goals. Importantly, partnerships can offer an advantage as a means of achieving public policy goals that contribute to good citizenship.



## DEVELOPMENT BANK OF SOUTHERN AFRICA

A development bank is a specialised financial institution with functions and operations that can be defined regarding its hybrid financial and developmental character (Bruck, 2006). He further stated that “Development banking goes beyond the scope of a development bank in addition to the functions and operations of development banks. Development banks cover relationships of these institutions with national and local governments, with regional and international institutions, and with policymaking and planning agencies”. The Development Bank of Southern Africa (DBSA) acts as a catalyst for unlocking infrastructure and mobilising funding. The catalysation strategy unlocks infrastructure and human capacity development by being an enabler through funding and development projects. The DBSA was founded in 1983 to carry out a wide range of economic development tasks within the framework of the then-current national constitutional system. The DBSA's role and function were altered in 1994 owing to the new Company Act.

According to the Development Bank of Southern Africa Act, the DBSA was reorganised as a DFI in 1997 (Government Gazette, 1997). Its primary aim is to “promote economic development and growth, human resource development and institutional capacity building by mobilising financial and other resources from the national and international private and public sectors for sustainable development projects and programmes in South Africa and the wider African continent”. The objective is to enhance the impact of development in the area by broadening the availability of development funding and proficiently incorporating and executing sustainable development strategies to bolster economic expansion via investments in social-economic infrastructure.

### Development Bank of Southern Africa and Partnerships

For the successful embedding of partnerships in the DFI space, the ever-changing global economy and evolving best practices have largely influenced the need for the DBSA to transform and adapt. The role of the DBSA as a DFI is to enable innovative development and to provide a flexible suite of funding instruments for infrastructure development. This cannot be achieved separately from partnerships or collaborative approaches but through catalysing. Based on the reviewed literature relating to leveraging partnerships, the answer to unlocking value is collaborating to deliver on mandates to stakeholders, clients, and shareholders.

There is a significant influence that multi-organisational partnerships have when well executed; these collaborative endeavours provide for public and private economies of scale for greater impact. Huxlam (1996) refers to partnerships as collaboration advantage which offers a compelling substitute for the market, quasi-market, and contractualised arrangements that have shaped the global public management reform movement over the last ten years. Development finance's value proposition centres on relationship building and leveraging existing or new partnerships to access funding, develop project pipelines, drive capacity development and accelerate infrastructure development. The DBSA has varying types of relationships with



partners within the South African context, both regionally and internationally, which are core to attaining the development objectives.

### **Stakeholder and Strategic Partnerships (Office of the Chief Executive)**

Key to the DBSA's DFI competitive advantage and value proposition in strategic partnerships is capacity building. In strategic partnerships, a Memorandum of Understanding (MOU) or Memorandums of Agreements (MOAs) are formulated as a guiding principle indicating, amongst others, the capacity building to be provided as part of the skills exchange. The DBSA's systematic and strategic approach to partnerships with an executive sponsor allocated for oversight, namely the Japan International Cooperation Agency (JICA), the Council for Scientific Research and Industrial Research (CSIR), and BRICS (Brazil, Russia, India, China, and South Africa). The DBSA's development agenda largely influences these partnerships as a state-owned entity through the National Development Plan and mandate, Africa's growth plan trajectory (related partnerships for SADC, EAC & ECOWAS) but leans on and is influenced by the other overarching United Nations (UN) global MDGs which have now been replaced by the SDGs.

A case in point, the SDGs on Partnerships for Goals 17.9 seeks to increase foreign assistance for the implementation of focused and efficient capacity-building in developing nations to support national plans carrying out all of the SDGs, especially through triangular, South-South, and North-South cooperation (UN, 2015). That, as a global imperative, anchors strategic partnerships which enable DBSA developmental objectives and present modalities in which benefits can be extracted and leveraged. Monetary and non-monetary benefits can be in the form of technical expertise in the DFI ecosystem for infrastructure and human capacity development.

Regarding South Africa, the constraints imposed by the state of inequality are compounded by historical issues that require a social contract or compact that promotes sustainable growth, inclusiveness, and shared prosperity. Political decisions and institutional frameworks must be considered when evaluating the financial implications of a society's economic development because they are inextricably intertwined. Institutions such as the DBSA and its partners (private and public) should be adequately utilised as vehicles for development in the new democratic dispensation. Partnerships can be complex and bureaucratic in the absence of enabling legislative environments.

### **Infrastructure Delivery Division Business Development/Partnerships (IDD)**

To manage the complexity of contraction partnerships, legal, in the context of IDD, manages the contracts from "cradle to grave", a full life cycle of the infrastructure rehabilitation mandate such as clinics, schools, and hospitals. Adherence to the Construction Industry Development Board (CIDB) propels the DBSA Supply Chain Procurement Strategy to apply measures that consider related regulations. The IDD is recognised as an implementing agent of choice in the infrastructure delivery environment by municipalities, South African government departments and state-owned entities such as the South African Roads Agency (SANRAL) to execute the infrastructure mandate as a partner. To enable efficiencies in delivery, the IDD activates resources internal to the DBSA, such as supply chain management, a

climate financing team (sustainability and just transition) and technical experts and professionals (quantity surveyors, programme managers, planners, and developers). While the IDD team adheres to the CIDB standards to deliver on its mandate, collaboration and partnerships ensure acceleration of service delivery. The types of partnerships in the main include but are not limited to industry players, regulators, interest groups, community groups, tertiary institutions, and financial institutions.

As an example, the IDD has partnered with the University of Johannesburg (UJ) in the development of the building information modelling (BIM) system (virtual platform). This innovation allows for design costs issues of maintenance in buildings. Research students have partnered in artificial intelligence for civil engineering and construction to create a body of knowledge. During the COVID crisis, the DBSA/IDD partnered with the Council for Scientific and Industrial Research (CSIR) innovation in the development and production of respiratory devices deployed across the country. This is evidence of alternative methods to support the COVID crisis – technical and financial.

### **DBSA Coverage Investment Partnerships**

The role of DBSA's Coverage Investment portfolio is to ensure pipeline development through cultivating partnerships in and across the South African borders to advance trade and unlock development. It is important to cultivate relationships post-signing a memorandum of agreement (MOA) or memorandum of understanding (MOU). Importantly, a centralised systematic monitoring and evaluation of relationships/partnerships in collaboration with internal stakeholders pre-, during and post-implementation of projects allows for streamlining to avoid duplication or parallel contracts within the bank. The coverage approach to partnerships is focused on transactions and deal origination; essentially, investments by sector and geography influence partnerships. Also, it is important to maintain relationships with local, regional, and international DFIs, funding institutions, the private sector, commercial banks for risk pooling, regulatory bodies for investment leveraging, and for profiling of DBSA at funding and development forums in partnership with the internal DBSA Treasury Unit for resource mobilisation and strengthening of the DBSA Loan Book.

Importantly, infrastructure deals stem from conversations with partners for the deal makers' pipeline internal to the DBSA. The strategic intent is to source deals, bringing business to the bank, e.g., private sector-led infrastructure transactions to enhance existing sovereign sourced deals. The DBSA participates in working groups and boards of forums e.g., African Development Bank and African Export-Import Bank (Afri-Exim). The advantage of forming part of a network with funding partners and pipeline development was asserted for pipeline development and infrastructure delivery. The DBSA's Integrated Annual Report (2022) reported R15.1 billion as catalysed out of the R33.4 billion total infrastructure delivered partnerships are leveraged – evidence of collaborative investments and value derived.

DBSA funding instruments play a vital role in de-risking projects and mobilising funds for co-investing with other funders such as BRICS/New Development Bank (NDB), Infrastructure Investment Programme for South Africa (IIPSA) - (EU, KfW, AFD, EIB and National Treasury), SADC Project Preparation Development Facility (PPDF), KfW and the European Union (EU), PPFS-AFD, the Global Environment Facility (GEF),

the Green Climate Fund (GCF), other project prep facilities – (Electra, InfraCo, Harith, ECOWAS PPF, development banks in countries of operation), the Southern African Development Community Development Finance Resource Centre (SADC DFRC) and commercial banks. Other coverage partners for pipeline development include the Infrastructure Consortium for Africa (ICA), Project Preparation Facilities Network (PPFN), Sustainable Infrastructure Foundation (SIF), the Programme for Infrastructure Development in Africa (PIDA) – NEPAD and SADC, Common Markets for East and Southern Africa (COMESA), the United States Trade and Development Association (USTDA), international agencies and associations, DFIs - regional and international, SA Contractors (SA Inc), financial institutions (commercial), the Japan International Cooperation Agency (JICA), and service providers for conferences related to mandate business development opportunities, marketing and public relations.

### **Public-Private Partnerships**

Public-private partnerships (PPPs) are an agreement between the public and private sector to achieve a shared vision and, in the context of this study, public infrastructure delivery, services, and impact. Both parties partner in project creation and execution, as well as sharing the costs, benefits, risks, and resources. Sanusi (2012) opined that there is broad agreement that private funding is necessary for this, even if the government has other alternatives for raising money. When used effectively, private funds reduce financial limitations and increase productivity by utilising the creativity and managerial know-how of the private sector. PPPs are a type of project-specific or long-term cooperation between public institutions and private service providers, according to Gerrard (2001), who made reference to Wilhelm Georg, the President and CEO of Germany's municipal local public transport utilities. PPPs may also provide a way out of the conflict between the government's funding demands under the condition of exclusive public investment and the country's financial crisis. He continues by saying that PPPs address a number of funding issues that public sector businesses have.

According to Lakshmanan and Anderson (2002), macro-level studies encompass econometric evaluations that link the total amount invested in (or stock of) transportation infrastructure to indicators of economic performance across the economy. Generally speaking, they define cost or production functions in which private companies operating within a region or country view public infrastructure as an input to their operations. The projected production and cost functions show how infrastructure investment boosts the productivity of private companies and, in some situations, allows a rate of return on total infrastructure investment to be determined. Considering the factors mentioned above, adopting PPPs is crucial for the growth of economies and for fostering trade harmony, a crucial part of reducing poverty, unemployment, and inequality, as well as political instability.

### **CONCLUSION**

Infrastructure development plays a vital role in accelerating and breaking barriers to economic advancement. Thus, DFIs are, by their nature, government-owned and lead infrastructure development in resident countries globally, acting as a catalyst for funding infrastructure projects/programmes. Infrastructure delivery is therefore key to



ensuring delivery on social compacts. Sadly, there are challenges such as governance structures, national development plans, mandates, and capacity building, as well as fiscal budgets, which are not able to fund capital-intensive projects/programmes single-handedly in the absence of strategic partners to provide financing solutions jointly. This study focuses on the Development Bank of Southern Africa as a South African and regional and continental DFI for primary information while considering global DFIs and partnerships' role and ability to transform, resulting in concrete infrastructure projects, to review blockages/dynamics and to increase cohesion. Accordingly, development finance-related standards that contribute to the effectiveness of DFIs are identified in this study, and network links in infrastructure in the form of valuable strategic partnerships are enforced as recommendations in the form of a framework as part of this section's recommendations.

From the review, it has been established that there are fundamental governance structures to be observed globally, namely partnerships, policies and engagements that should be in place for successful infrastructure development and address how greater collaboration and partnerships help unlock value and improve efficiencies for public value. Furthermore, the answer to unlocking value is collaboration to deliver on mandates to stakeholders, clients, and shareholders. Thus, this study stressed the importance of development finance's value proposition centred around relationship building and leveraging existing and prospective partnerships to access the funding project pipeline and accelerate the development agenda. Finally, the study concludes that if development financing partnerships are well established, value creation will be realised, and benefits can be yielded for all stakeholders involved.

The result is the enrichment of lives through direct and indirect development impact, which can lead to profound global improvement, transforming it for the better. Also, there is a need to understand where the world is going, innovative market trends, legislations, best practices, and global associations influencing development financing. Furthermore, Africa needs the unlocking of trade for economic advancement. In addition, the Programme for Infrastructure Delivery in Africa (PIDA), adopted in 2012 by the African Union (AU) and its associated priority plan (PAP), has seen an accelerated rate of development by prioritising the continental programme to address the infrastructure deficit hampering Africa's competitiveness in the global economy.

## **RECOMMENDATION**

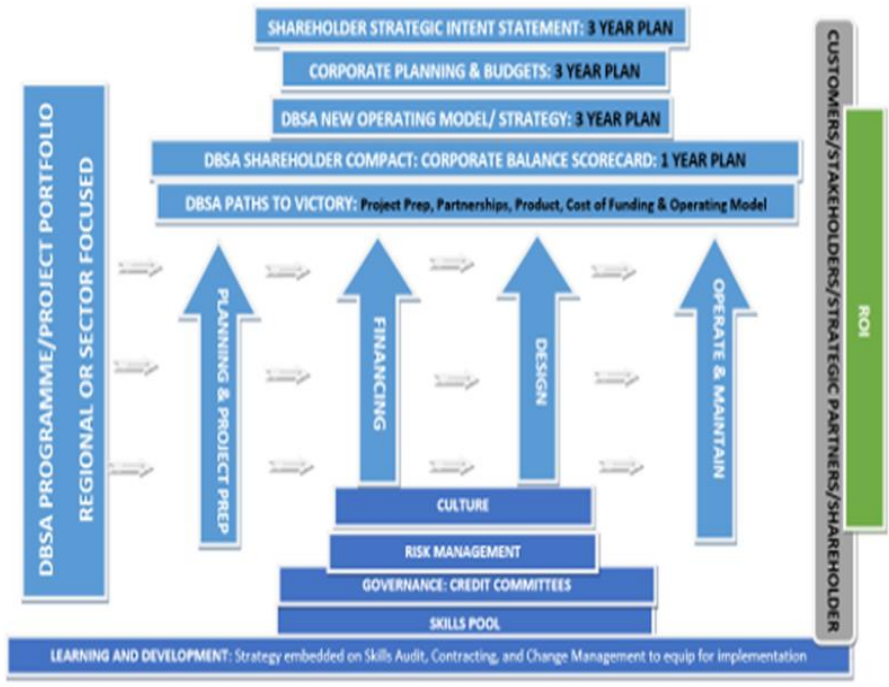
Based on the conclusion, a consolidated framework that allows for clear guidelines for partnerships with monitoring and evaluating investments for impact is recommended. Stimulus measures are encouraged as part of economic recovery and growth locally, regionally, and globally in the context of developing countries' development agendas. It is also suggested that all the recommendations and solutions should be actively linked to the National Development Plan with consideration for applicable global and regional alliance legislations. At a global level, the MDG 8 - "Develop a global partnership for development" and SDG 17 – Partnerships for the goals: "Strengthen the means of implementation and revitalise the global partnership for sustainable development" in this context are applicable.

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With the above considered, it is therefore imperative to observe that implementation of global strategies comes with its challenges in African states.

Furthermore, governments are encouraged to promote PPPs to fund and capacitate infrastructure needs. Governments are encouraged to formulate policies that support partnerships as a foundation for engagement in infrastructure development and funding thereof. A standardised PPP legal and regulatory framework to accelerate SDG 17 will ease political and legislative blockages and fast-track infrastructure development. A framework is therefore tabled as a recommendation below schematic, a structure for development financing institutions (DFIs) such as the DBSA to reference to and observe, e.g., SDGs globally, BRICS Agenda, PIDA regionally and NDPs nationally, which are relevant for the DFI role of being a strategic catalyst in unlocking value and impact through funding for infrastructure development. The proposed strategy in the form of a working framework (see Figure 1) should be considered when venturing into partnerships and collaborations.





**Figure 1:** Infrastructure development partnerships framework for DFIs  
 Source: Author (2023)



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A CRITICAL VIEW OF THE SOUTH  
AFRICAN CONSTRUCTION SECTOR  
POST- COVID-19 LOCKDOWN: AN  
OPINION PAPER ON RECOVERY



# A Critical View of the South African Construction Sector post-COVID-19 Lockdown: An Opinion Paper on Recovery

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## ABSTRACT

The COVID-19 pandemic had numerous detrimental impacts on the construction sector, including but not limited to job losses to construction employees, revenue losses to stakeholders in the industry, as well as supply chain disruptions. Several construction firms had to shut down operations owing to the impact of the financial losses incurred during the lockdown, while the few that are still in operation have had to review their modus operandi to comply with COVID-19 regulations. While the pandemic has negatively impacted the industry, the effect has also necessitated the need for innovations across the construction sector. This opinion paper presents a critical analysis of the pandemic and also analyses the several disruptive technologies that emerged as one of the strategies to retain productivity within the sector while also serving the mitigation purpose of curbing the spread of the virus. Other gains of the pandemic include increased government infrastructural investment, private sector participation, government transparency, and effective policy implementation, which have been established to be key drivers of swift and systemic economic recovery post-COVID-19 and are integral in creating jobs in the construction industry. Lessons from the pandemic can also be harnessed for more efficient project delivery and expenditure planning through cautious incorporation into ongoing and future infrastructural projects.

## INTRODUCTION

The COVID-19 pandemic and the subsequent global reactions in the form of lockdowns and movement restrictions have halted the global economy enormously. While the impact was felt worldwide, the intensity of the effect has been regionally specific and varied, with advanced and developing economies recording varying levels of contraction. The construction sector, one of the major players in the global economy, has not been immune to the pandemic's impact, and several construction projects and firms were shut down globally (Adekunle et al., 2023). Mitigative measures in response to the pandemic in the form of social distancing, movement restrictions and regional/country-wide lockdowns have resulted in significant delays and supply chain disruptions leading to devastating economic recession. This has necessitated job cuts, uncertainty in the business environment and significant unrest across several regions globally.

These impacts are felt the world over, though developing countries were observed to have been more severely impacted. To understand the impacts and create a way for the industry to bounce back from the adverse effects., it is necessary to study the developing countries critically and the construction industry's future. Consequently, this paper aims to document the impact of the COVID-19 pandemic on the construction sector organisational processes and supply chains while also investigating the response of firms to the necessitated changes. In addition, the study thoroughly appraised how the pandemic-induced lockdown has shaped the post-lockdown architecture of the industry using the South African construction industry as the case study. The next section provides a balanced and critical review of the South African construction industry. This provides the background to better understand the South African construction industry and provides a basis for this practical opinion paper.

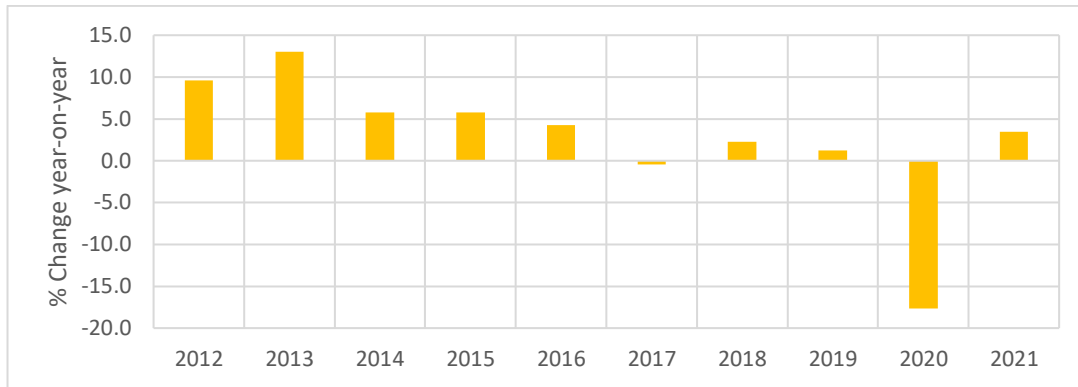
## **AN OVERVIEW OF THE SOUTH AFRICAN CONSTRUCTION INDUSTRY AND CORONAVIRUS PANDEMIC**

The construction sector in South Africa is a significant driver of socio-economic development and an employer of labour, as it is in most other parts of the world. The significance of the sector cannot be over-emphasised as it adds significant value to the end user of construction infrastructure as well as the active players in the sector, such as investors/financiers, clients, workers, regulatory agencies, and suppliers (Rossouw & Naidoo, 2016).

Frequent recessions and negative growth have been recorded within the sector before the pandemic. In 2019, R106 billion of total value added was recorded, a drop in value from the figure of R110 billion reported in 2016 (Stats SA, 2019). External factors such as corruption, legislation, scarcity of resources and rapid evolvement in technology were highlighted by Smallwood and Wentzel (2016) as impacting the construction enterprises, especially SMEs. Windapo and Catell (2013) cited insufficient capital, volatility in material prices, and fluctuating exchange rates as some of the major issues limiting construction firms within the South African construction sector. These challenges have been exacerbated by COVID-19, resulting in a stagnated national economy with low infrastructural spending, leading to massive job losses across the construction sector, which outweigh losses in any other sector within South Africa.

The construction sector suffered the greatest contraction within the South African economy (Stats SA, 2022). This was majorly due to lockdown restrictions that resulted in site shutdowns and consequent project failures. Wood (2022), however, forecasts a rebound of the construction sector between 2023 and 2025 due to the action plan of the South African government on massive infrastructural investment. Promising signs of recovery are already being recorded in the sector, as a 37 per cent increase in completed building projects was reported by Stats SA (2022) in March 2022, and a 17 per cent increase in sectorial value contribution between 2020 and 2021.





**Figure 13: Construction sector value added and GDP for South Africa Stats SA (2022)**

According to the CIDB (2020), huge job losses, bankruptcy of construction firms, and labour disruptions are some of the major issues that must be dealt with in the South African construction industry post-COVID-19. The survey by the CIDB investigated both the short- and long-term impacts of COVID-19 within the South African construction industry. The results of the findings are presented in Tables 2 and 3. If the industry is to recover swiftly and adequately from the losses impacted by the pandemic, strategic plans geared towards addressing the short and long-term impacts must be put in place and implemented adequately with the roles and responsibilities of industry players properly spelt out.

**Table 1: Short-term impacts**

	Grades 2 to 4	Grades 5 and 6	Grades 7 and 8	Grade 9	Overall
Short-Term Impacts	Ranking	Ranking	Ranking	Ranking	Ranking
Job losses for construction workers	1	1	1	2	1
Loss of income/revenue for organisations	2	2	4	5	2
Retrenchment of construction workers by firms	3	3	1	1	3
Non-payment of preliminaries and general during the lockdown	4	6	3	4	4
Significant increase in the cost of materials	4	7	6	9	5
Lack of payment for certified work	6	4	5	2	6

(CIDB, 2020))



**Table 2: Long-term impacts**

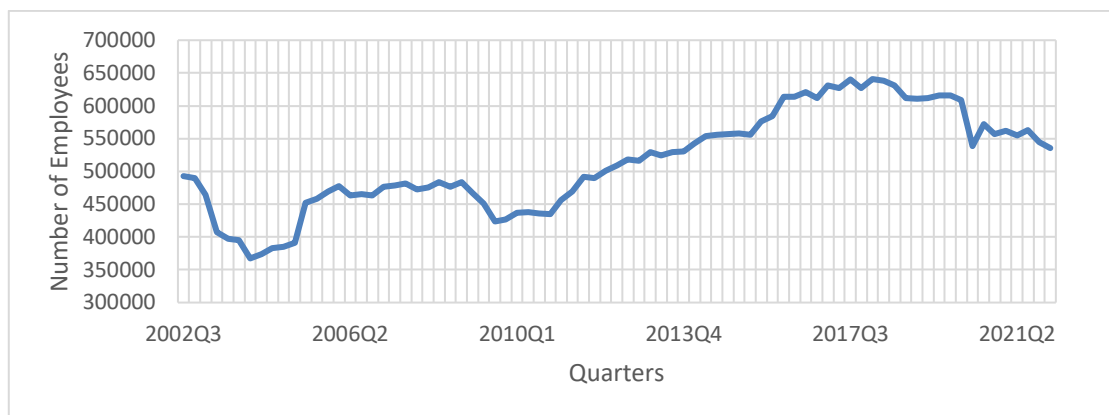
	Grades 2 to 4	Grades 5 and 6	Grades 7 and 8	Grade 9	Overall
Long-Term Impacts	Rankin g	Rankin g	Rankin g	Rankin g	Rankin g
Massive job losses for construction workers	1	1	6	2	1
Bankruptcy of construction firms	2	2	2	1	2
Business interruption	3	4	3	5	3
Labour disruptions	4	5	4	7	4
Interruptions in the delivery of critical infrastructure projects	5	3	4	10	5
Suspension of projects/potential site closure	6	6	7	2	6
Increase in the number of claims related to contractual scheduling along with scheduling along with mediations, arbitrations, and litigation over construction delays	9	6	1	8	7

(CIDB, 2020)

## **MICRO, MESO AND MACRO LEVEL IMPACTS OF THE CORONAVIRUS ON THE SOUTH AFRICAN CONSTRUCTION INDUSTRY**

### **Job Impact on the Construction Industry**

Over the years, the construction industry has been characterised by a relatively high employment share to its gross domestic product (GDP) contribution. Since the sector utilises inputs from other sectors of the economy, it indirectly has a job creation impact in sectors beyond its confines. The COVID-19 pandemic has, however, heavily impacted the construction sector in terms of job losses. In fact, the most notable impact of the pandemic has been devastating job losses to all categories of workers within the sector as well as large-scale retrenchment. Before the pandemic, job cuts were fairly prevalent in the South African construction industry, as stated by Stats SA (2022) (Figure 2).



**Figure 2: Number of employees in the construction sector in South Africa (Stats SA, 2022)**

It can be seen that since the third quarter of 2017, a downward trend in the number of employees is evident, as depicted in Figure 2, with a steep plummet in the year 2020 when the pandemic struck. According to the CCMA 2018/2019 report, the construction sector had the highest retrenchment occurrence and organisation liquidation viz-a-viz other sectors of the economy owing to the financial constraints imposed on many construction firms due to the pandemic (CCMA, 2019). Owing to these job losses, the construction sector is liable to experience a major skill shortage in the coming decade due to the volatile nature of job retention, which was further exposed by the pandemic. A chunk of the workforce in the sector are highly skilled workers. There is a high possibility of losing them to other regions of the world if they remain unemployed for too long, while the younger generation is becoming somewhat sceptical about studying construction-related courses owing to the high volatility and lack of job security in the sector. Another important consideration worthy of attention is the issue of skills transfer from the veterans and highly skilled older generation to the younger ones. For the construction sector to readily have the required skills needed in the near future without importing those skills from neighbouring countries, adequate measures must be implemented to enhance a systemic transfer of skill and knowledge within the South African construction industry (Mashego, 2021).

### **Expenditure on Construction Projects**

A steady decline in the expenditure on infrastructural projects has also been noticed since 2016, with the pandemic inducing a steep plummet in the first two quarters of 2020. Although the investment in public infrastructure has been steadily lower than the targets set by the National Development Plan (NDP), which stipulates a value of 10 per cent GDP from 2010, the advent of COVID-19 dropped investment levels to 7.1 per cent in the 4th quarter of 2020 (Industry Insight, 2021).

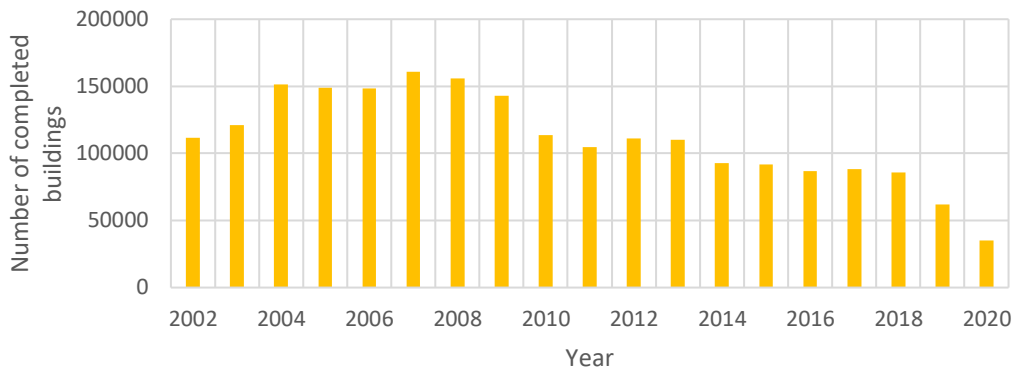
National Treasury (2021), however, posits that contractions in the construction sector are attributable to restrictions due to COVID-19, which has resulted in extensive project delays and a downgrade in credit ratings. This has caused a significant reduction in capital expenditure programmes. Significant declines in completion were recorded in all sub-segments of the building construction industry, with flats and townhouses being the most impacted, alongside luxury and low-cost housing.

Contrastingly, the wholesale market of construction building materials experienced an upward trend of activities by 14 per cent in the second quarter of 2020. This has been attributed to the boom in the renovations sector and the Do-It-Yourself (DIY) market, which has been positively impacted by the pandemic and the desire for various degrees of home renovation and refurbishments and the availability of lower interest rates to fund such improvements. The non-residential construction sector also suffered from the impact of the pandemic, as was evident in the all-time low demand for office spaces and shopping centres. The pandemic engendered the wide acceptance of remote working, and the demand for office spaces might likely be compromised for a very long time (Alsharif et al., 2021).

The civil construction industry has also been reported to be underperforming, with an 18 per cent reduction in investment recorded (Stats SA, 2021). The poor performance of the civil engineering sector since 2016 has been majorly anchored to the underperformance of the South African economy as a whole, resulting in declined infrastructural spending and poorly performing state-owned entities, which have, over the years, been responsible for the most significant investments in the sector. Generally, confidence and profitability levels in the sector are still extremely frail, which was evident in most civil contractors recording an extremely low level of patronage (SAFCEC, 2021). Although a subsequent increase in the expenditure on construction has since been recorded towards the end of the third quarter of the year 2020, it will still take a conscious effort by the government (being the major driver of infrastructural projects) as well as other industry stakeholders to come up with ways of necessitating increased investor confidence in the construction sector as well as justifying the investments in the form of commensurate value for every penny spent if the expenditure ratings are to reach the highs of the year 2017 or even beyond.

### **Delay on Commencement of Prospective Projects**

The COVID-19-imposed delays experienced by the construction industry have not just been limited to the execution of ongoing projects but also extended to the award of already-priced tenders. The CIDB (2020), for instance, reported the labour and financial impacts resulting from the pandemic and how the entire construction supply chain interruption has affected the timely delivery of projects. Owing to the costly nature of the tendering process, contractors are forced to retain resources for promised pipeline projects. These idle resources could have been invested elsewhere, and the cost of retaining these resources is quite significant to the contractors' cost of doing business. A 6 per cent increment was recorded in construction project postponement in the 2nd quarter of 2020 and was majorly attributed to improper planning and liquidity concerns due to the pandemic (Industry Insight, 2020). A glance at Figure 3 shows that the number of completed building projects was at its all-time lowest in the pandemic-induced year 2020. While the number of completed buildings has been gradually decreasing since 2007, with some slight comparative increase in 2012 and 2017, the percentage decrease in the subsequent year was highest during the pandemic-ravaged year of 2020.



**Figure 3: Buildings completed  
(Stats SA, 2021)**

### Health Infrastructure

While the pandemic brought the health sector to its knees and exposed lacunas in both the quality and capacity of the global health infrastructure, it served the purpose of awakening almost all governments globally to the need for massive investment in health infrastructure. In South Africa, for instance, the 2020/2021 health budget increased substantially owing to intended spending on issues relating to the COVID-19 pandemic through the allocation of approximately R20 billion to the health sector to aid the expansion of various medical facilities as well as the acquisition of equipment needed for swift response required for keeping the virus under control. An additional amount of R8 billion was also allocated to health departments at the provincial level (National Treasury, 2021).

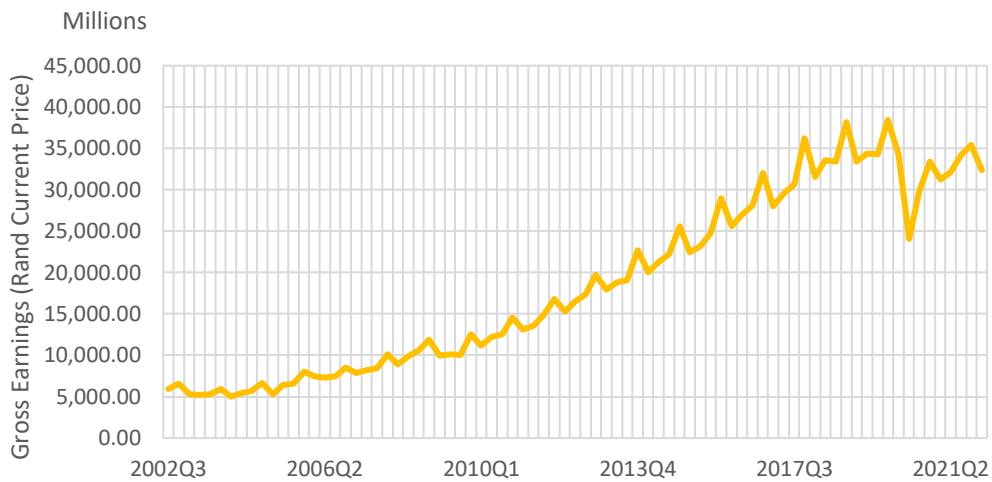
### Supply Chain Management and Financial Standing of Contractors

The construction industry is heavily reliant on the steady availability of various materials. Lockdown restrictions have hugely disrupted the construction supply chain, not just within South Africa but globally as well. The ecosystem of materials movement from within local and global sources has been seriously hampered and several projects have been delayed owing to this issue. The trend is expected to continue way beyond COVID-19 restrictions as it will take time to meet up with some of the existing backlogs of supplies. Manufacturing facilities have also been negatively impacted by the pandemic in terms of their workforce and facility management challenges (Chivilo et al., 2020). Even if production were increased in the various factories and industries supplying these materials, logistic demand would still create a bottleneck in trying to deliver the resources to the desired locations.

The pandemic has also impaired the liquidity challenges of various construction firms and has accelerated job losses in the process. Figure 6 shows how gross earnings in the sector experienced a downturn in 2020 as a result of lockdown restrictions. These losses were not limited to construction firms but extended to various material

suppliers, resulting in the temporary shutdown of some and the complete exit of others from the industry, thereby disrupting the supply chain.

One of the foremost concerns of construction firms across all categories is the issue of bankruptcy. It ranks high (among the top three) of the issues troubling construction firms and often stems from the temporary suspension of projects or site closures that result in job cuts for site workers or sometimes in pay cuts when the firm tries to retain the workforce. These project suspensions often result in the contractor laying claims, which often result in mediations and arbitrations and even occasionally stretching to litigative actions, which impose huge financial strains on construction firms.



**Figure 4: South African gross earnings in the construction sector (Stats SA, 2022)**

### Construction Site Invasion by Syndicates

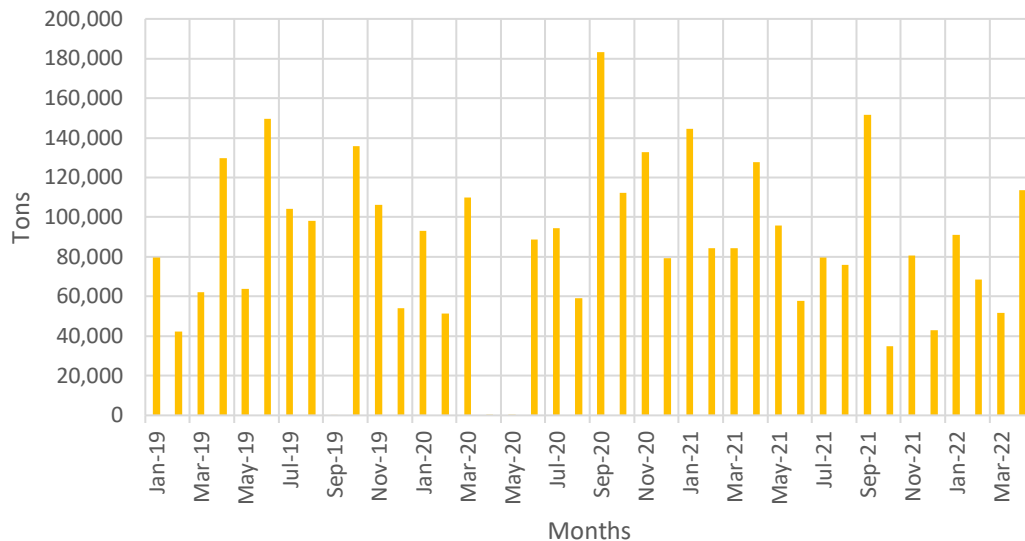
According to Master Builders South Africa (MBSA, 2021), criminal gangs have usurped the majority of building sites across the country. Site invasions by the syndicates have negatively affected the timely delivery of infrastructural projects (Irish-Qhobosheane, 2022). These criminal groups, which sometimes appear under the guise of local business forums, mostly target large-scale construction sites, requesting a certain percentage of project earnings in order to allow the smooth running of operations on site or sometimes compel project contractors to sub-contract certain aspects of project work to nominated individuals who are members of their criminal gang. These syndicates normally adopt a method of intimidation, assault, and sometimes threaten murder and commit arson in the presence of state security officials.

### Imports in the Construction Sector

Lockdown restrictions due to the pandemic significantly affected general imports into the South African space. In 2020, the South African import value dropped by US\$1.2 billion between January and March (Viljoen, 2020). A drastic reduction in cement



import is evident from Figure 5 between April and May during the lockdown. A major rebound was, however, recorded in September 2020, with a somewhat steady flow of imports into the country ever since.



**Figure 5: Cement imports statistics in the construction sector (South African Revenue Services, 2022)**

The majority of the cement imports coming into South Africa emanate from Vietnam, Pakistan, and Mozambique. In an effort to improve local production and increase the GDP, the South African government has recently banned the utilisation of imported cement in state-funded contracts (Erasmus, 2021). This embargo is believed to protect the local cement manufacturing companies from foreign ones with larger production capacity and competitive advantage. The government recently extended the anti-dumping duties imposed on Pakistani imported cement by five years. This has stirred a great deal of mixed reactions amongst construction firms, with the major concern being that the limitation of the cement import would increase the cost of cement in the market and would have inflationary effects on the rates of cement-related tasks (such as concreting and masonry) and consequently increase their cost of doing business. The effect of COVID-19 spans beyond just cement but also on other major construction materials such as stone, plaster, asbestos, glass, and ceramic products.

## **RESPONSE OF THE CONSTRUCTION SECTOR TO THE COVID-19 PANDEMIC**

### **Managing Project Risks**

With the pandemic strike came new challenges such as social distancing on sites, travel restrictions, on-site safety and security, labour shortages due to movement restrictions and the health impact of the pandemic on site workers, supply chain

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issues, unanticipated delays, and reduced productivity. Remote working was adopted globally in almost all sectors as a risk mitigative measure to the pandemic. Unfortunately for the construction sector, the majority of the activities cannot be executed remotely. Project meetings, documentation, designs, planning, and budgeting were the major activities that mostly benefited from remote working. In a bid to incorporate innovation and mitigate the risk of COVID-19, contractors have embraced an alternate duties approach to prevent overcrowding of the site by the simultaneous presence of the entire workforce. Activities are planned so that workers visit the site on different days and sometimes different periods. This practice enables site managers to control the number of personnel on site and aids the easy attainment of social distancing. Other safety measures by several construction contractors during the pandemic include establishing risk-mitigating programmes for employees needed on site, compelling sick employees to isolate themselves from site, adequate record keeping of employee movement during the pandemic, and introducing mandatory sanitation rules on the construction site.

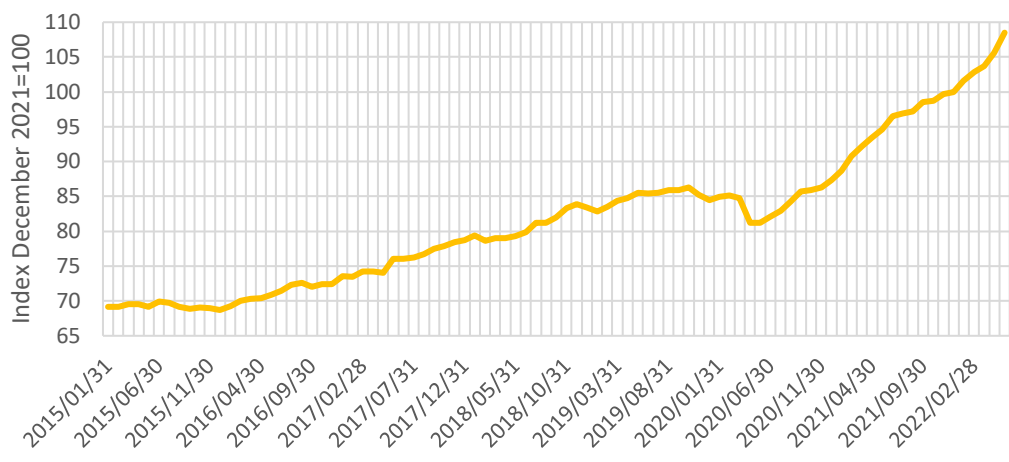
### **Safety Measures to Prevent the Spread of COVID-19**

The pandemic has brought the issue of health and safety on construction sites to the forefront. Construction firms now prioritise the health and safety of their workers more than ever as it has become an integral part of most contract conditions and carries heavy fines in cases of non-compliance. Thorough cleaning now occurs at construction sites along with isolated disinfection of construction vehicles, mobile plants, eating facilities, security access control rooms and hand-washing facilities, which are properly disinfected and deep cleaned. Regular cleaning and disinfection of contact points such as taps, door handles, communication equipment, handheld tools and other construction machinery are widespread in construction sites nationwide. To ensure construction sites are COVID-19 free, site employees are adequately screened through no-contact thermometers and have to wear full personal protective equipment (PPE) before being granted site access.

### **Post-Lockdown Architecture of the Construction Sector**

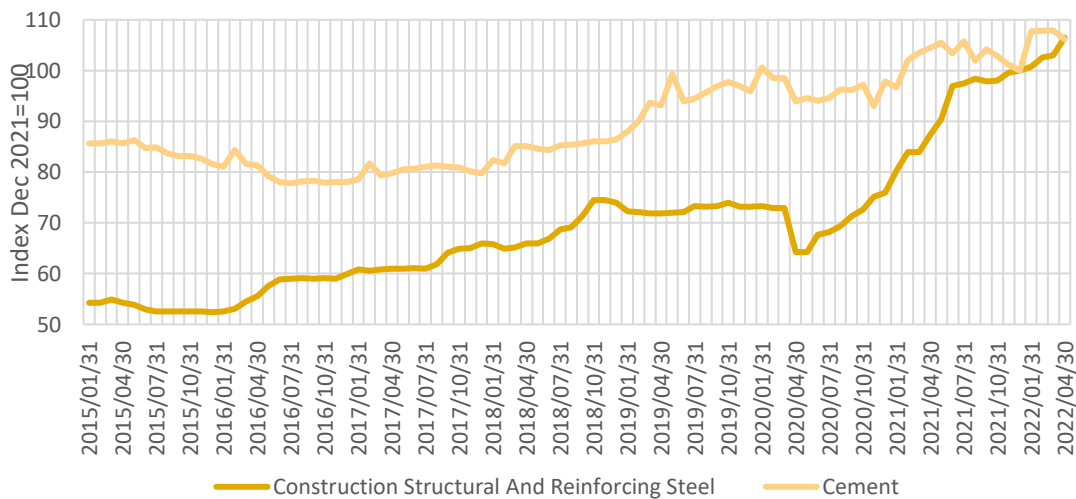
Construction project costs have increased post-lockdown owing to the impact of hindered labour productivity due to lockdown and movement restrictions, elongated project durations, additional project requirements such as deep cleaning and sanitising of certain site areas, job trailers and the need for additional PPE. The price indices of construction materials have also increased significantly since the pandemic. A 14 per cent increase in price has been recorded since the start of the pandemic (Figure 6), largely due to inflationary pressures from the economic rebound of the construction sector.





**Figure 6: Construction materials price indices (Stats SA, 2022)**

Increased crude oil prices have also affected the cost of materials manufactured from crude oil derivatives such as bitumen used for road construction. Preliminaries and site operations costs have also been impacted by increased global fuel prices (Reaper, 2022). The Russia-Ukraine conflict has also affected the global prices of steel (Figure 7) as both nations rank amongst the top producers of steel globally. In contrast, several other steel plants in other regions of the world have had to shut down owing to rising global energy costs.



**Figure 7: Construction input price index (Stats SA, 2022)**

### Development of a Resilient Local Supply Chain

The criticality of business resilience in the construction industry has been further accentuated by the COVID-19 pandemic in that planning should not be majorly

prioritised for the interim but designed around a more stable and long-term basis. A sustainable supply chain is the fulcrum on which the industry's resilience is pivoted. Local industries have been highly prioritised in the delivery of infrastructural projects according to the South African government's economic reconstruction and recovery plan. This was done with the belief that adequate engagement of the local industry would help improve their capacity and provide a robust supply chain adequately in local control over time and easily sustainable and devoid of unpredictable external influences. It is further stressed that women empowerment, youthful engagement, and the involvement of military veterans and the physically challenged will give a sense of societal inclusivity and a spirit that fosters competitiveness and resilience. This engagement will go alongside formulating a local supplier industry for infrastructural projects (The Presidency, 2020). Further actions that can be used in strengthening the construction supply chain, according to Das et al. (2021), include outsourcing business operations, geographical partnering of supply chain agents, and contingency planning. Adequate implementation of these strategies would likely engender a sufficiently resilient supply chain adequately equipped against future pandemics.

### **Utilisation of Disruptive Technologies**

The construction industry's labour-intensive nature and its heavy reliance on manual labour, coupled with the reluctance to change, has been responsible for the limited technological innovation in the construction sector over the years. The COVID-19 pandemic has, however, necessitated the embracing of technological innovations throughout the entire life cycle of construction projects. The utilisation of disruptive technologies such as drones, pre-fabricated components, radio frequency identification, smart wearables, immersive solutions, 3D printing, modular construction, big data, artificial intelligence, and the Internet of Things has been on the increase since the pandemic struck.

While COVID-19 has negatively impacted the work supply to the sector, it has also aided the integration of several technologies in the pipeline before COVID-19. One such technology is modular construction, a process by which building components are manufactured off site in a plant under controlled conditions with the same materials that would have been used had construction been in situ. Designs are based on the same standards as conventionally constructed facilities. Modular construction has been noted to aid speedy construction of facilities with an average of 50 per cent cut in construction duration (Modular Building Institute, 2021). The Chinese government adequately demonstrated the utilisation of modular construction during the peak of the pandemic through the construction of a 1000-bed space capacity medical facility within two weeks.

Owing to the majority of the modular construction work being carried out in a controlled environment, the risk of spreading COVID-19 was significantly reduced. Social distancing was more easily achieved on site owing to fewer workforce requirements in the integration of components, thereby facilitating on-site personnel management and making it safer. The construction cost is also reduced with modular construction, and the risk in schedule is minimal as site weather conditions have minimal impact during the installation of modular components (Villegas, 2021).

The construction sector has also embraced artificial intelligence and machine learning to aid efficiency improvement across the entire construction value chain. These technologies have been adopted from the material manufacture stage up to the construction facilities' management. Robots are being deployed for real-time monitoring of construction activities as well as the execution of works that are repetitive to improve productivity. Drones and rovers are also being engaged on construction sites for material transportation, photograph taking and quick and comprehensive scanning of the job site.

Furthermore, 3D printing, which is the computer-controlled sequential layering of materials to create three-dimensional shapes, has also gained prominence in the construction sector since the outbreak of COVID-19. It is extremely useful in the manufacture of construction components or in the printing of an entire building in construction. Apart from the swift and accurate execution of tasks or the manufacture of materials, AI and 3D printing utilisation can also aid the reduction in labour costs, consequently reducing the construction cost (SAICE, 2021). While software packages were widely embraced prior to the pandemic, remote working requirements due to lockdown increased the use of online software packages in project packaging and administration.

It is expected that the adoption of several new technologies in the construction sector will have some sort of impact on employment in the construction sector. According to Agenbag and Amoah (2021), utilisation of new technology equipment is expected to impact the workforce negatively as tasks that are normally expected to be executed by personnel are now being done by machines. The upside to this is the increased productivity achievable in the South African construction industry through adopting these technological devices. As shown in Table 3, if drone technology is adequately adopted for site monitoring, 100 per cent of the workforce in that section of the site could be replaced. Similarly, for the inspection of work, it is believed that one robot machine has the capacity to replace at least five workers, and one excavating plant can replace 15 workers for the same task, while paving machines and self-driven roller compactors can replace as many as five workers with a more certain amount of quality. Agenbag and Amoah (2021) conclude that the construction sector had to prepare for massive job cuts resulting from using technology to carry out traditional human functions and the resulting unemployment.

However, it appears a daunting task to harness the use of technology fully in construction operations, not just because of the reluctant nature of the industry to change, but mainly because of the sector's sensitivity to job creation for the semi-skilled and general workers in the labour market. Although lack of expertise hinders the adequate use of technological equipment on construction sites, the biggest challenge that would have to be surmounted by the government would be the identification of an alternative sector that can absorb the massive unemployment that will permeate the South African economy if technology is allowed to take the place of humans on job sites.

## **THE FUTURE OF THE SOUTH AFRICAN CONSTRUCTION INDUSTRY**

There is a strong consensus among construction professionals that the rollout of vaccine is one of the major steps to drastic recovery from the pandemic (SAICE,

2021). It is believed that a swift vaccine rollout to construction site workers is an integral step towards ensuring a safe work place devoid of the possibility of COVID-19 transmission. The CIDB (2020) further suggests that for full recovery from the pandemic to be achieved in the construction sector, substantial support will be required from the government to cushion the effects of job and revenue losses among construction workers and contractors, respectively. These support measures can come in the medium term in the form of tax benefits, swift approval of tenders and post-lockdown reimbursements of outstanding invoices from stalled projects. Also, ensuring the payment of unemployment insurance funds and increased government spending on infrastructural projects will go a long way to ensure stability and sustained recovery of the construction sector post COVID-19.

The COVID-19 pandemic and mass riots in 2021 have placed the business confidence in the South African construction industry at an all-time low. Business conditions in the construction industry are not looking good for South Africa's planned infrastructural rollout programme which is an essential part of the nation's economic recovery plan. The low business confidence is not new to the construction sector as it was reported prior to the occurrence of COVID-19 that the lack of sufficient infrastructural projects, low return on investment, slow transformation pace, and lack of innovation had been prevalent (Engineering News, 2021). COVID-19 merely acted as an exacerbating factor that dipped the confidence level of a sector that had already been struggling, as was evident in the reluctance of clients to award tenders and the frequent cancellation of already awarded tenders.

Suppose the South African investment plan is to achieve its goals. In that case, it must prioritise proffering solutions to the issues of underspending that have characterised all spheres of government down to state-owned enterprises. Although the government agrees that there is an exigent need for purposive infrastructural investment and has taken the right step to addressing this through the newly formulated infrastructural development system (SIDS) aimed at creating a framework for the attainment of the South African development agenda, adequate implementation of this framework should be ensured by the government departments saddled with its actualisation. The Department of Public Works and Infrastructure (DPWI) also produced the National Infrastructure Plan (2050) with the intent of diversifying the South African economy from a monolithic one which relies on mineral resources to a more robust one which is regionally integrated and globally inclusive to promote dynamic investments for future industries (NIP, 2021). The NIP 2050 provides a base for the NDP's vision which creates a nexus between NDP objectives to actionable steps and achievable intermediate outcomes. In order to attain the goals of the NDP, an amount in excess of R6 trillion will have to be invested in infrastructure between 2016 and 2040.

Concerns have, however, been raised regarding the NIP 2050 by the Development Bank of Southern Africa (DBSA) as to whether the NDP is a vision document similar to the NDP or an actionable plan addressing infrastructural development. It has been learnt over time that the lack of specificity hinders the implementation of such plans/documents as was the case with past national economic policies. Lucidity is also one of the issues to be addressed on the NIP 2050 as it fails to stipulate explicitly the responsibilities of the players in the plan, from the government at various levels to the private sector participants. According to the National Planning Commission, for



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instance, for the first time since record keeping, the private sector emerged as the biggest investor in civil construction projects, exceeding the values obtained by the government and public entities (NPC, 2020).

This emphasises the emerging role of the private sector in infrastructural project investment and as such, assuming a traditional role for a player taking up a more important role in a somewhat conservative industry would be inappropriate. It therefore becomes important to create an enabling environment that adequately caters to the private sector's needs to encourage more private sector participation, which would foster a more broad-based public-private partnership (PPP). The economic reconstruction and recovery plan also captures the network industry and the freight and public transport sector. Private sector skills and expertise are targeted for fast tracking the infrastructural project delivery through improving state technical ability and project administrative capacities.

Social compacting, which is the implicit agreement between the government and the citizens, is also stressed as a key success factor in the actualisation of the economic reconstruction and recovery plan. Professionals of various fields are the forces driving the private sector which emanates from the citizenry, and a high level of trust between them and the government is expected to foster a cordial relationship capable of mitigating the risk that might be imposed on the industry by a future pandemic. The government's response to the COVID-19 pandemic shows an obvious mistrust between the government and the governed as several accusations are still left unattended to regarding graft issues in several government agencies in respect of palliative resources. It is generally believed that establishing amicable relationships among parties in the spirit of social compacts will positively impact conflicts and crises. If private sector investment is to be fully encouraged, issues of transparency and nepotism in the government's decision-making and accountability in resource utilisation should be adequately addressed.

## CONCLUSION

Similar to many other industries, the construction sector was obviously not equipped for a pandemic of the COVID-19 magnitude. The effects of the pandemic are still very evident within the South African construction industry and the world at large. Risk mitigation strategies within the construction industry must be adequately anchored to the government's conscious effort alongside various recovery plans if the construction sector is to recover fully from the impact of the pandemic. Positives from the pandemic such as disruptive technologies should continue to be harnessed and improved upon to ensure a more productive and innovative industry. Unemployment issues that may result from the proper integration of the necessitated disruptive technologies should be further investigated with a view to engaging the manual labour that will be shed from the construction industry properly into other sectors within the national economy that might be more in need of it.



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A REVIEW OF HOW MUNICIPAL  
INFRASTRUCTURE DELIVERY  
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EDDIE RAKABE AND RAMOS MABUGU

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# A REVIEW OF HOW MUNICIPAL INFRASTRUCTURE DELIVERY MANAGEMENT FLAWS HAMSTRING GROWTH AND DEVELOPMENT IN SOUTH AFRICA

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## ABSTRACT

Planning, budgeting, coordinating, managing the lifetime of a project, evaluating it, being transparent and accountable, and adhering to rules on the public availability of infrastructure services are all part of infrastructure delivery management. However, there is a declining local government infrastructure budget in South Africa. Hence, this study evaluates local governments' management and infrastructure delivery chain to pinpoint the obstacles preventing the creation of an efficient, sustainable, and successful infrastructure delivery program through a review approach. The study's findings reveal the institutional and regulatory framework for infrastructure delivery, infrastructure delivery chain, municipal infrastructure delivery performance, and local government infrastructure delivery challenges, such as poorly managed consultations, weak multi-government coordination, political-administrative interface, and monitoring and evaluation. The study concludes that municipal infrastructure has no proper planning or life-cycle management. Therefore, the study recommends a stronger focus on peer learning across municipalities and the complete life-cycle management of municipal infrastructure rather than introducing new infrastructure. The secret to sustainable infrastructure delivery management is to plan for appropriate infrastructure that adapts to local conditions, maintains existing infrastructure, and renovates infrastructure that has outlived its intended use.

**Keywords:** Infrastructure delivery, Management, Review, South Africa

## INTRODUCTION

Developing the infrastructure required to supply utility services to the corporate sector and basic services to homes is a significant obligation placed on South African municipalities. Municipalities spend approximately R45 billion a year on infrastructure. Despite this, the programme to deliver infrastructure is plagued by

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frequent instances of poor governance and delivery management (AGSA, 2022). The municipal infrastructure-built programme is part of the broader national goals to drive infrastructure-led economic growth as articulated in the Economic Reconstruction and Recovery Plan (ERRP), the National Development Plan (NDP), and the National Infrastructure Plan (NIP). The conversation around infrastructure delivery often ignores the larger management or governance aspects to concentrate on the lack of funding for new projects. Research indicates that improved public infrastructure investment management may provide significant advantages for the investment and that greater economic growth outcomes are correlated with better infrastructure delivery management (OECD, 2015). Though it is generally acknowledged that capital investments are essential for economic growth and development, local government infrastructure delivery performance is falling (Kumo, 2012).

Most municipalities face significant infrastructure delivery and maintenance backlogs within an environment of limited resources and fragile economic growth. External and internal constraints mar the infrastructure delivery programme. Municipalities face challenges from the outside world, including population expansion, rising input costs, years of neglected renovations and maintenance, and a general lack of resources, which have put increasing strain on the infrastructure already in place. Internal technical capacity deficiencies, particularly in planning, contracting, and quality assurance, limit the infrastructure delivery programme (DPME, 2014). Despite these obstacles to infrastructure delivery, there has been a general improvement in the growth of enabling infrastructure between 2001 and 2021 to support the provision of fundamental municipal services. The biggest gains are seen nationally in the areas of piped water to homes and electrical connections, with over 90% (69.7%) and 88% (84.4%) access rates in 2021 (Statistics SA, 2001), respectively. During the same period, there has been a noticeable improvement in the availability of better sanitation facilities (pit and waterborne with ventilation) and weekly waste pickup services, with rates of 84.1% (61.7%) and 60.3% (56.1%), respectively, increasing (Statistics SA, 2021).

Improvements in infrastructure delivery have been made possible by several measures, such as coordinated financial allocations and capacity assistance from several national and local government agencies. Over the past 22 years, municipalities have been granted at least R 1 trillion, mostly to fund the construction of infrastructure for essential services (National Treasury, 2022). Around the same time, several capacity-building initiatives were launched to solve technical shortcomings related to allocating funds and guaranteeing efficient project management and execution of infrastructure. Municipalities continue to exhibit a worrisome incapacity to allocate capital funds, manage infrastructure projects, operate and maintain current infrastructure, and construct high-quality infrastructure, even years after waves of interventions. Delays in completion, poor workmanship, and cost overruns are characteristics of projects (AGSA, 2022). As a result, there are never-ending cycles of budgetary allotments for project completion and correction, while assets rapidly deteriorate owing to poor craftsmanship and maintenance failures, “white elephants,” and eventually extended disruptions in service delivery.

The efficiency of infrastructure delivery management and the governance and accountability frameworks for managing the municipal infrastructure investment function are called into question by the persistent issues in infrastructure delivery.



Planning, budgeting, coordinating, managing the lifetime of a project, evaluating it, being transparent and accountable, and adhering to rules on making infrastructure services publicly available are all part of infrastructure delivery management (OECD, 2015). It is about ensuring that the appropriate infrastructure is implemented in an economical, timely, budget-conscious, high-quality manner, and properly maintained and managed. Thus, a clear and regulatory institutional framework, cost-effective and affordable decision-making processes, an open and transparent prioritisation mechanism, efficient coordination amongst governmental levels, and assessment mechanisms that track performance over the asset lifecycle are all necessary for successful infrastructure governance (OECD, 2017).

In light of these circumstances and the fact that local government infrastructure budgets are decreasing, this study evaluates local governments' management and infrastructure delivery chains to pinpoint the obstacles preventing the creation of an efficient, sustainable, and successful infrastructure delivery programme. To obtain insight into the infrastructure delivery management procedures within municipalities and other government domains accountable for local government infrastructure, the study uses a review approach that includes a policy review of the local government infrastructure delivery architecture, a budget analysis of infrastructure programmes, and case studies.

## **INTERNATIONAL STANDARDS FOR MANAGING THE SUPPLY OF INFRASTRUCTURE**

An increasing number of people worldwide realise that it is unsustainable to concentrate on building new infrastructure projects without considering the long-term life cycle obligations related to the upkeep, renewal, and operation of the capital stock. Large-scale public investments have been made over a long period to promote sustainable contemporary livelihoods through local government infrastructure networks for roads, water, power, and community facilities. Enhancing economic growth, raising living standards, guaranteeing environmental sustainability, and using limited resources most efficiently are just some advantages of better infrastructure management. Therefore, municipalities must employ the best infrastructure management skills and practices to gain the full benefits of infrastructure investment (Association of Local Government Engineering, 2006).

Local government infrastructure comprises a set of stationary systems or networks intended to serve a defined community with a specified level of services. The infrastructure asset base may consist of solid waste facilities, parks and recreation centres, educational institutions, water utilities (water supply, wastewater, and stormwater), transportation networks (road, rail, and ports), and electrical reticulation systems. The interdependence and interconnectedness of the local government infrastructure are acknowledged both inside and between various types of networks and within a single asset network. It is essential to manage these interdependencies properly since the optimal operation of other network components is impacted when one component fails. For instance, the electricity supply component failure may affect both the supply of water and traffic control, compromising the overall network. Infrastructure management aims to provide the bare minimum of services efficiently and economically while managing the assets for the duration of their useful lives.



Determining service levels and tracking performance, implementing long-term economic management techniques, comprehending and addressing the effects of expansion through demand management, controlling risks related to infrastructure networks, and ongoing infrastructure stock improvement are all essential components of efficient infrastructure management. Improved risk management, increased customer satisfaction and service management, greater governance and accountability, and improved financial performance are all advantages of infrastructure delivery management (Association of Local Government Engineering, 2006).

### **Framework for Infrastructure Delivery Management**

Regardless of the delivery mode, a generalised framework must be followed while managing infrastructure delivery. However, there is no set pattern. The framework provides decision-makers with a method for analysing problems, outlining potential solutions, and assisting them in reaching conclusions. The governance framework comprises two parts: (a) a list of preconditions for governance that address the general enabling governance environment for infrastructure, and (b) a decision tree that directs institutions in making decisions about individual sectors and infrastructure. A robust ability about one prerequisite can partially offset a feeble ability regarding another. Nonetheless, research and application indicate they are complementary and should be addressed as a whole (OECD, 2015). The infrastructure delivery management best practices are outlined in the following guidelines (OECD, 2015):

- A long-term, national strategic vision should guide infrastructure development and utilisation considering the problems' complexity.
- Cost-effective and sustainable frameworks, concepts, and procedures should facilitate infrastructure creation, management, and renewal.
- A user-centric approach should be taken to manage infrastructure projects over their entire life cycle. It should be based on extensive discussions, organised participation, information availability, and primary attention to the demands of the users.
- Open communication, regularity, and performance-based coordination are essential across governmental levels and jurisdictions. Sectorial and overall government perspectives should be balanced in coordination across government levels.
- Having the right personnel and processes to provide strict project assurance, affordability, value for money, and transparency is important.
- Evaluations of projects ought to be grounded in facts and a fair value-for-money process.
- Systems should be in place to focus on the asset's performance throughout its life.
- Potential entrance points for corruption should be identified at every step of the public infrastructure project and the anti-corruption and integrity controls should be strengthened.
- Political, sectoral, and strategic considerations should all be considered when selecting the best delivery method.

## REGULATORY AND INSTITUTIONAL FRAMEWORK FOR INFRASTRUCTURE DELIVERY

Established by the Municipal Systems Act (MSA), the Integrated Development Plan (IDP) serves as the overarching strategic framework that directs and informs the implementation of infrastructure and general development within the local government sector. The IDP offers a five-year framework for organising all municipal short- and medium-term objectives into a unified strategic plan. It is also crucial to figure out how much money and manpower are needed to carry out these plans. It takes a team to compile the IDP, with contributions from corporate services, community service, infrastructure, and financial planning, among other municipal administration departments. According to legislation, the IDP must include several elements, such as backlogs in service delivery, municipal development goals, how municipal development plans correspond with national and provincial sector plans, land use development patterns, and a financial plan (DPLG, 2006).

In particular, the MSA (2000) sets down the guidelines municipalities must adhere to while implementing their infrastructure plans in sections 78 and 79. Municipalities must, above all, evaluate their internal and external capacity to deliver infrastructure projects, paying close attention to the advantages and disadvantages of each delivery method, the municipality's potential for internal project delivery in the future, various options for service delivery, and the opinions of the local community. In addition, municipalities must undertake a feasibility analysis on any infrastructure projects they choose, considering factors including affordability, value for money, the needs of the underprivileged, and larger organisational and financial ramifications.

The legislative mandates of the various sector departments in charge of managing the various municipal activities (e.g., water, electricity, roads) serve as the basis for the infrastructure sector plans needed to create an index of displacement. Every sector department must contribute to each municipality's corresponding Integrated Development Plans (IDPs) via the Consolidated Municipal Infrastructure Plan. The Capital Works Programme (CMIP) describes the capital works (new construction, renovation, and upgrading), operations and management plans, goals and risks, financing sources, budgets, and tariff implications for the current and next years. The Health and Safety Act, 83, of 1993, which addresses construction rules, is the main law in the infrastructure delivery chains. Since municipalities own infrastructure, including highways, waterworks, reservoirs, bridges, and buildings, they must keep strict safety regulations and inspection records. The lifespan costs of these infrastructure standards and legislation delivery affect municipal budgets.

Municipalities must adhere to specific technical rules and standards besides the legal mandate for the coordinated infrastructure supply. For example, the Water Services Act governs water flow, metering, and drinkable water quality, all necessitating investments in supporting infrastructure. The South Africa National Systems (SANS) Code of Good Practices must be followed throughout construction. Municipalities must use specific designs and technology to develop infrastructure in the human settlement sector. In addition, there are general recommendations provided by the Municipal Infrastructure Grant for providing infrastructure for a minimal basic level of

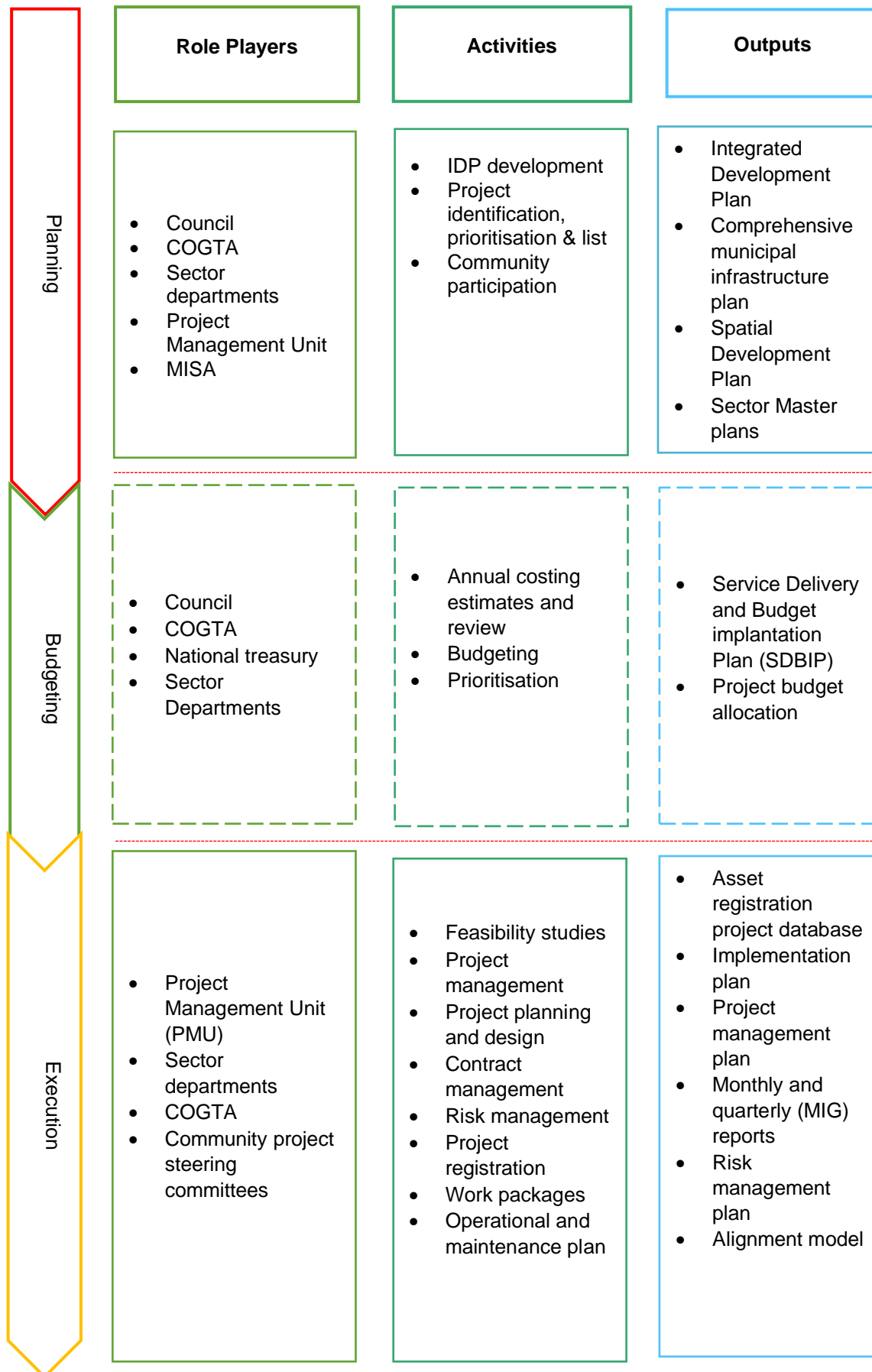
services, such as one streetlight per four dwellings. The previous conversation has made it clear that local government infrastructure delivery management must comply with several regulations, some of which may be quite onerous and expensive.

### **Infrastructure Delivery Chain**

Building capacity for integrated planning, budgeting, procurement, and infrastructure administration is the goal of the National Treasury-managed Infrastructure Delivery Improvement Programme (IDIP). The IDIP was enhanced after six years of piloting with the Standards for Infrastructure Procurement and Delivery Management (SIPDM), a guideline implementation tool that creates control frameworks for the planning, designing, and executing infrastructure projects and infrastructure procurement. As a result of these efforts, the Infrastructure Delivery Management System (IDMS), a best practice model for managing and delivering infrastructure that all branches of government can utilise, was created. These tools aim to create a uniform and transparent method for managing public investment at all levels of government and across its “life cycle” (SAICE, 2016).

The IDMS, supervised by the National Treasury, lays out the delivery chain for local government infrastructure, and the Municipal Infrastructure Support Agency (MISA) established Project Portfolio Management (PPM) methodology in its implementation. With an emphasis on life-cycle management, procurement management systems required to buy, operate, and maintain infrastructure, skills development, and legal compliance, the IDMS is a guiding tool that describes best practices in infrastructure delivery management. A general overview of the supply chain is given in Figure 1, which shows the many roles played, the tasks involved, and the work results. The process starts with planning and ends with execution.

Figure 1 illustrates how infrastructure delivery management involves a complex planning, budgeting, and project execution process. Municipal councils work with the community, sector departments, and other stakeholders to select and rank projects based on resource availability and requirements throughout the planning process. The CMIP is compiled at the end of the consultation procedures and is incorporated into the IDP. Following the completion of the planning phase, funds are distributed following council priorities, project cost estimates, and the Medium Term Expenditure Framework (MTEF) in the second part of the process. Municipalities frequently bear a heavy financial burden during the final execution phase of the infrastructure delivery process, which consists of many operations. For example, all municipalities must set up a fully-staffed project administration unit under the direction of a licensed engineer. This unit will handle MIG funding, project identification, feasibility studies, coordination, and administration. In addition, municipalities must form a community project steering committee for each infrastructure project to work with the project management unit to oversee contractors. (CIDB, 2010; DPLG, 2006).





## **SDBIP (Service Delivery and Budget Implementation and not Implantation Plan)**

### **Figure 1: Local government infrastructure delivery chain**

**Source:** Author (2023) compilation based on CIDB (2010) and MISA (2017)

The infrastructure delivery process is broken down into three crucial phases: project portfolio, project management, operations, and maintenance, according to the IDMS toolkit. The toolkit recognises that certain infrastructure projects might have a common purpose and scope. As such, they should be combined into a single portfolio to facilitate resource sharing and optimise cost-effectiveness. Groups of work can be delivered under a single contract or as a “work package,” as they are frequently called. The Construction Industry Development Board (CIDB) recommends project management practices, and municipalities are urged to implement the Gateway System as part of this. A well-informed choice is necessary throughout the entire infrastructure life cycle. Projects will probably stay within the scope of financial constraints and align with the goals for which they were designed in this fashion. It is important to note that municipalities apply various project management methods and techniques, such as management contracting, design and construct, development and contract, and employer-driven design. Municipalities must establish an operations and management plan when the project is finished, which outlines how the asset will be integrated into the portfolio of assets already in place, maintained throughout its life, and ultimately demobilised (CIDB, 2010).

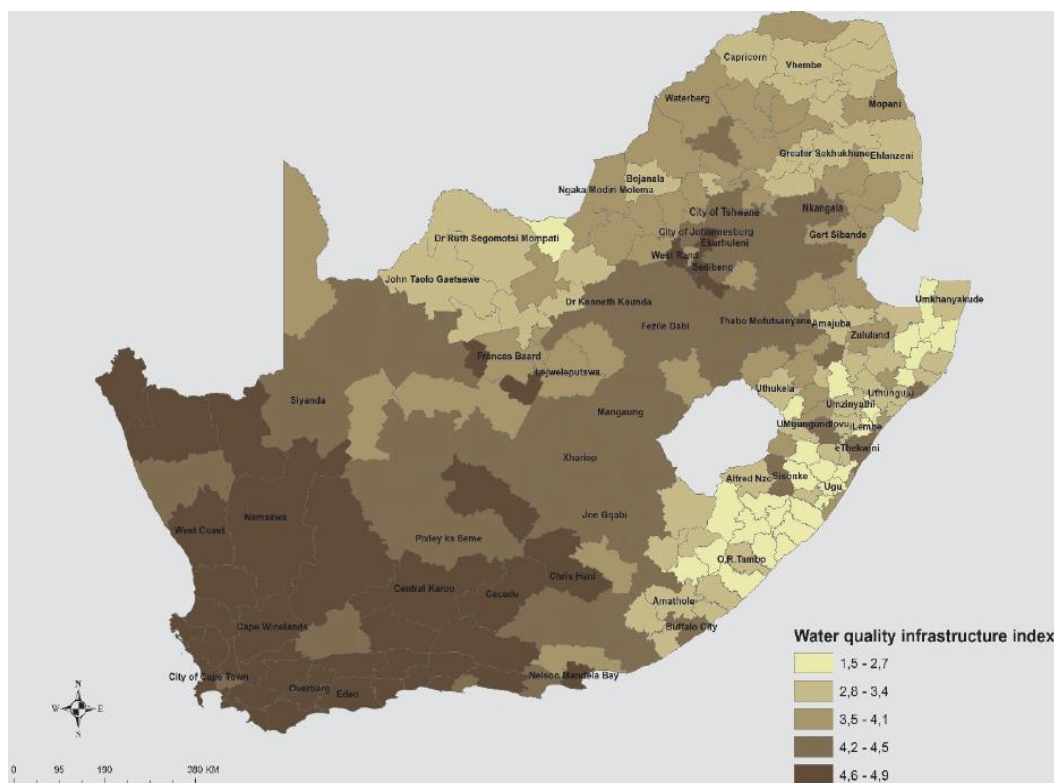
The aforementioned explanation makes it abundantly evident that a solid institutional, legislative, and administrative framework is in place for providing local government infrastructure. There are enough rules outlining what laws municipalities need to follow and what steps they need to follow to acquire infrastructure and manage it over its life. However, what is necessary in theory might not always be possible in practice. Some towns might not have the means to put the required structures in place or follow the required procedures, resulting in subpar infrastructure delivery. Furthermore, some communities may find the several levels of standards, laws, controls, and activities unduly expensive and oppressive. For example, every infrastructure project requires towns to create project steering committees and carry out feasibility assessments, which depletes a significant portion of the construction budget. Studies of viability are essential to managing infrastructure delivery, though some towns might not have the resources to carry them out.

### **The State of Local Government Infrastructure Delivery Management**

In South Africa, 89% of households have access to electricity, 84% to water, and 80% to sanitation services in 2021. However, the dependability of these services is low. The percentage of provinces with water supply disruptions is as high as 50%, especially in provinces such as Limpopo, the quality rating of which is slightly below 50% (Stats SA, 2018). Partially deficient municipal infrastructure is indicated by poor water quality and supply disruptions. A total of 56% of 1150 wastewater and 44% of 964 water treatment facilities are in a poor to critical state, according to the Department of Water and Sanitation (2017), and both need immediate restoration. When municipal water reticulation networks malfunction, a significant volume of water



is lost via leaks. According to Stats SA (2016) and CoGTA (2010), there are similar subpar infrastructure problems concerning stormwater drainage, roads, and electrical reticulation. The extent to which the municipality has maintained the quality of its water infrastructure is seen in Figure 2. Municipalities in rural provinces tend to have the lowest infrastructure quality scores, as may be observed. The National Treasury (2011) notes that although significant progress has been made in ensuring accessible services, more funding is necessary to maintain aging municipal infrastructure. Alternative infrastructure options should be investigated in rural communities where the cost of expanding infrastructure is either unaffordable or unsustainable.



**Figure 2: Municipality-level water infrastructure quality index, 2016**  
**Source:** Stats SA (2016)

Table 1 shows the performance of local government infrastructure delivery in a sample of six municipalities that were supported by the Municipal Infrastructure Grant (MIG) in 2017–18. The MIG appears to provide municipalities some latitude in choosing infrastructure projects that meet the requirements of their communities. Infrastructure improvements of roads and stormwater are typically given priority over other forms of infrastructure by municipalities. It is also clear that the municipality ignores the upkeep of the current infrastructure in favour of concentrating only on implementing new infrastructure. The majority of municipalities likewise struggle with project completion timelines. Despite having long missed their intended completion date, many of the sampled projects indicated as being under construction or finished are still listed as MIG-funded projects for 2018.



**Table 1: Municipal infrastructure delivery performance**

Municipality	Total sampled projects 2017/18	No of projects by sector					Delivery status	Project status			
		Roads & stormwater	Sports	Water and sanitation	Community facilities	PMU		Rehabilitation	Design & Construction	Completed	
Matatiele	30	23	4	-	-	2	29	0	5	15	7
Mbizana	31	18	1	1	11	1	27	4	7	11	12
Umzinyathi	15	-	-	15	-	-	14	1	1	13	1
Endumeni	4	2	-	-	2	-	4	-	1	2	1
Makhado	7	-	-	-	-	-	7	-	-	7	-
Collins Chabane	5	5	-	-	-	-	5	-	1	4	-

Source: CoGTA (2023)

The current condition of inadequate local government infrastructure delivery management is highlighted in further depth in the 2016–17 Auditor General (MFMA) report, along with its negative effects on service delivery, budget sustainability, and wider community stability and health concerns. The report highlights several issues related to the creation and upkeep of infrastructure, including late completion of projects, subpar workmanship, inadequate contractor oversight, excessively escalated budgets, noncompliance with supply chain procedures, and non-application of project management techniques (Auditor General, 2016).

**Table 2: Principal audit conclusions on the supply of infrastructure**

Infrastructure type	Audit findings	Audit findings	Audit findings
Road infrastructure	A maintenance plan or priority list for normal maintenance and renewal was absent from 55% of the municipalities.	Not all of the municipalities' roads had their conditions evaluated, making up 27%.	The completion dates were not met in 26% of the municipalities in charge of road improvements.
Water infrastructure	27% of the municipalities did not use the allotted project money.	Supply chain management policies were broken by 21% of municipalities.	26% of municipalities finished their projects later than expected.
Water infrastructure maintenance	22% of towns did not have a maintenance budget, while 46% of municipalities lacked a maintenance plan.	24% of the objectives for routine infrastructure maintenance were not reached.	More than 30% of municipalities experienced water losses.

Source: Auditor General (2018)

These results imply that the infrastructure supply chain contains flaws. For instance, lacking a project priority list or maintenance plan suggests poor planning. Careful planning is essential for the next stages of infrastructure delivery to proceed without interruption. Incapacity to evaluate the community's demands causes severe financial losses for dysfunctional councils that cannot supply infrastructure effectively. The Auditor General (2018) notes a case where a municipality installed two toilets in every home in a neighbourhood despite a 15,000-household sanitation backlog overall. A few instances of the financial effects of inadequate infrastructure delivery management are shown in Table 3.

**Table 3: Financial implications of poor infrastructure delivery management**

Municipality	Project type	Financial implications
Mangaung	Airport development node	Since 2013–15, the municipality has incurred R141 million in planning and setup expenditures; township planning has not received permission.
City of Johannesburg	Housing	After barely five months, the contractor abandoned an R221 million house project that was supposed to be finished in March 2016. Because there is no proof or consent for the extra work scope, the contractor was paid R22 million more than the original contract amount.
Alfred Duma and Umngeni	Roads	Contractor paid for partially completed roads
Govan Mbeki	Sewer reticulation network	A R25 million project was left unfinished for two years, and the municipality neglected to cancel the contract and assign a new contractor to address the issues. Sewage from these flaws seeped into the dwellings and onto the street.
Ngaka Modiri Molema	Water treatment plant	A project that began in 2011–12 and was scheduled to be completed by May 2014 was still unfinished as of June 2017, even though the budget had increased from R68 million to R104 million.
Rustenburg	Rapid transport system	Only 40% of the R3 billion project's Phase 1 was finished in 2017 and the remaining expenses were not recorded. Phase 1 had started in 2012 and was supposed to be finished by 2016.

**Source:** Auditor General (2018)

Financial losses brought on by subpar infrastructure delivery management merely reflect the fundamental inadequacy of that management. Several project-level errors lead to and aggravated financial losses. Table 4 presents the deficiencies in local government project management, ranked by significance, based on a study by the Construction Industry Development Board in 2014. The biggest project management problem identified by municipalities is inadequate contractor and site management, which is followed by corruption. These outcomes support the Auditor General's conclusions, which are listed in Table 2.

**Table 4: Project management shortcomings in local government ranked by significance**

Situations/ Interventions	Rank
Poor site management	1
Lack of contractor quality expertise	2
Corruption	3
Inadequate resourcing by contractors	4
Lack of understanding of quality	5
Level of subcontracting	6
Inadequate information	7
Detail	8
Focus on cost by contractors	9
Poor constructability	10

Source: CIDB (2014)

### **Implications of Ineffective Infrastructure Delivery Management that go beyond Money**

Recognising that inadequate infrastructure delivery management has consequences beyond just monetary losses is important. Inadequate delivery management can have detrimental impacts on the environment and human health. Several critical infrastructure delivery management elements, such as inadequate planning resulting in subpar plant designs and insufficient plant capacity, haphazard connections to new settlements, malfunctioning pump stations due to a lack of maintenance and skill shortages, limited financial resources, and high maintenance costs, have been linked to the declining state of wastewater and sewage treatment infrastructure in South Africa, according to numerous water quality studies. A confluence of these obstacles causes untreated or inadequately treated sewage to leak into ponds, rivers, streams, and groundwater—the primary water supply for both humans and wildlife—resulting in the spread of illnesses carried by the water. There were 380 cases of diarrhoea, 30 probable cases of typhoid fever, and nine confirmed cases of cholera in Delmas, Mpumalanga Province, according to reports published in *The Mail and Guardian* in 2004. Several South African provinces have also reported typhoid fever outbreaks, including KwaZulu-Natal, Limpopo, and the Eastern Cape. The most recent outbreaks were reported in Delmas, Mpumalanga. Numerous research studies linked defective machinery and equipment in sewage treatment facilities and municipal wastewater to overcrowding, design flaws, and water resource pollution (Memo, n.d.).

Continuous effluent dumping into the Vaal River system puts millions of people in the provinces of Gauteng and Northwest in danger of developing waterborne illnesses. This kind of catastrophe will likely ruin the healthcare system and result in massive financial obligations from lawsuits for both the federal and local governments. Every individual has the constitutional right to clean drinking water, and any violation of this requirement may be brought up in court.

### Financing Arrangements and their Consequences for the Management of Infrastructure Delivery

Municipalities' infrastructure delivery management systems are significantly influenced by the makeup and organisation of their local government infrastructure. The primary funding source for local government infrastructure is conditional grants, with national sector departments managing to carry out sector-specific initiatives. Ten grants comprise the majority of municipal infrastructure financing, further divided into direct and indirect funding and money for rural and urban areas. A breakdown of these funds is shown in Table 5. As seen below, in 2022–2023–19, non-urban municipalities received almost R58 billion in financing for infrastructure, with 75% of the grants being given directly to the municipalities. A larger percentage (67%) of all transfers of non-urban infrastructure are made up of the MIG. On the other hand, because of its ability to generate money, infrastructure financing for metropolitan municipalities—where issues with infrastructure delivery and administration are less—is relatively modest and is mostly provided through direct transfers.

**Table 5: Infrastructure grants to local government**

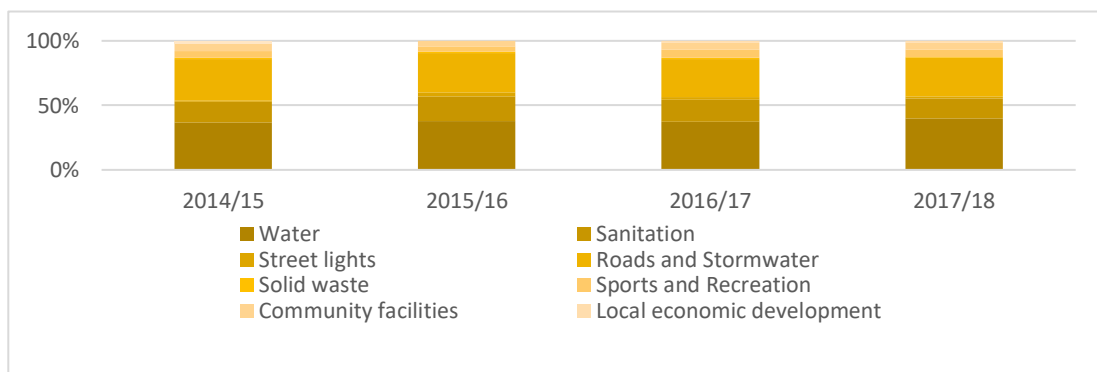
R million	Allocations Rural 2022/23				
	Custodian	Direct	%	Indirect	%
Municipal infrastructure	CoGTA	17545	67%		-
Regional bulk infrastructure	CoGTA	3 496	8%	3 607	37%
Water service infrastructure	DWS	3 864	15%	805	11%
Integrated national electrification	Energy	2 212	9%	3 821	51%
Rural roads asset management	DoT	115	0%		-
Municipal disaster recovery	CoGTA	321	0%		-
<b>Total rural allocations</b>		<b>22 850</b>		<b>7 472</b>	
<b>Urban municipalities</b>	<b>Custodian</b>	<b>Direct</b>	<b>%</b>	<b>Indirect</b>	<b>%</b>
Urban settlement development	DHS	8 149	62%		-
Public transport network	DoT	6 794	33%		-
Neighbourhood development partnership	NT	1 475	4%	101	100%
Informal settlement upgrading	NT	4 365	-		-
<b>Total urban allocations</b>		<b>18 499</b>		<b>29</b>	

Source: National Treasury (2023)



Delivery management and governance are affected by the makeup and structure of municipal infrastructure financing for several reasons. As mentioned, infrastructure funds are intended to support projects identified and authorised through the IDP processes. However, national grant administrators or custodians frequently attempt to control municipalities' investment preferences, undermining the legislation and guidelines established delivery management system. When implemented without accounting for life-cycle operations and maintenance expenses, indirect infrastructure conditional grants have a high degree of interference that can be disastrous. Furthermore, as municipalities try to prevent underspending, administrators' strict requirements linked to grant funds can delay project implementation or subpar craftsmanship (average spending on infrastructure conditional grants is typically below 90%). Owing to municipalities' insufficient capacity to carry out projects efficiently and quickly, the national sector department promotes indirect transfers.

Accountability between governmental levels and local project execution is further complicated by the grant framework's design. Function and responsibility ambiguities further lead to needless grant and procedure duplication and clog the infrastructure delivery management system. This can best be seen in the water sector, where the multi-sectoral Municipal Infrastructure Grant (which finances roads, sports facilities, and water) coexists with the Bulk Water Infrastructure Grant and the Municipal Water Infrastructure Grant. CoGTA is responsible for managing MIG and following expenditure criteria, sector agencies, including water, energy, and sports, must assist, oversee, and even identify municipal project execution. Such funding arrangements typically result in conflict between governments and delays in the delivery of projects. First, given their autonomy, municipalities will likely reject or give up on initiatives which are not part of the local IDP prioritisation procedures. Secondly, it defies logic to expect sector departments to take on responsibility for a role for which CoGTA administers money while also supporting the infrastructure initiatives of 253 municipalities. The money-follows feature appears to be broken by MIG. Figure 3 demonstrates that the cost of water and sanitation accounts for more than 50% of MIG spending, rising to 80% when roads are taken into account.



**Figure 3:** Spending on municipal infrastructure by industry

**Source:** CoGTA database – own compilation

### Interventions to Assist Infrastructure Delivery by Local Government

Local governments' management issues in delivering infrastructure are not new and should not be unduly criticised. The local government planning system for infrastructure delivery is a relatively recent government area, having been in effect for less than 15 years (Presidency, 2004). This is in comparison to the national and provincial governments. Local government changes have required municipalities to adjust swiftly. This includes developing the capacity to take in budgetary transfers and design, construct, and oversee infrastructure projects. In many cases, poor planning, project management, and asset care have compromised delivery efficiency when municipalities have invested heavily in new infrastructure, despite the good intentions behind the emphasis on redress and the large backlogs of historic infrastructure (National Treasury et al., 2014). Lack of governance and accountability and skilled labour, as well as insufficient financing are the key causes of delivery issues.

Acknowledging the perpetual obstacles local governments face in delivering infrastructure, the federal government has allocated significant funds to facilitate, optimise, and enhance municipal infrastructure delivery initiatives. There have been many introductions and experiments with various initiatives aimed at improving infrastructure delivery, such as those that fund skills, aim to enhance governance (from planning to project management), and include the direct deployment of technical experts in municipalities. Many measures to help local government infrastructure delivery management are seen in Table 6. In light of the abundance of available assistance programmes, this raises the issue of why the infrastructure delivery programme is still marked by wasteful spending, delays in project completion, and cost overruns—all indicators of subpar delivery management.

**Table 6: Infrastructure support programme by category**

Intervention type	Program
Management/ Governance	IDIP/IDMS
	Asset management standards for local governments by MFMA
	Local government guidelines for managing infrastructure assets
	Guidelines for creating a project management division
	Contracts for infrastructure frameworks and support from regional management
	An overview of unit costs and service delivery levels for infrastructure
	Performance strategies for the built environment
	Facilities for infrastructure funding
	Coordination committee for presidential infrastructure.
Funding	Conditional awards reserved
	Grant for the development of infrastructure skills
Direct technical assistance	Siyenza manje (DBSA)
	Municipal Infrastructure Support Agency

Source: Author (2023)

## **ISSUES WITH LG INFRASTRUCTURE DELIVERY FROM THE STANDPOINT OF THE NATIONAL GOVERNMENT**

### **Projects Falter because of Poorly Managed Consultations**

Involving stakeholders, including communities and other infrastructure users, is essential to enhancing planning quality and making long-term asset use productive. However, it is said that municipalities are holding cursory community meetings in which the community's needs and goals are not always considered. Since these towns deal with dispersed communities with disparate interests, their consultation procedures may be rather burdensome. Several issues arise when balancing the interests of the general public with the limited resources available to the municipality, including the timely completion of infrastructure projects and the sustainability of finished projects in the face of community demonstrations and property destruction. When locals are not involved in the project, access to the site may occasionally be restricted to contractors.

### **Inadequate Cooperation across Governments**

Procedures for managing infrastructure delivery become very complicated when a public investment includes a shared financial or policy responsibility across several governmental levels. The national sector ministries and municipalities involved in the infrastructure supply chain have long struggled with ambiguous mandates. Participation in municipal IDP procedures is appropriate for sector departments such as water, which may help municipalities with project evaluation, designs, and execution, as well as preparing plans for the supply of water infrastructure. However, the intricacy of IGFR connections in infrastructure delivery results in minimal or non-existent engagement. The first is that the Department of Cooperative Governance (CoGTA) and other sector departments do not clearly distinguish their tasks in terms of delivery and accountability. A different body mandates infrastructure delivery, and CoGTA is in charge of managing money for local infrastructure. Sector departments cannot provide planning, project execution, and supervision support to every municipality. A greater number of sector departments have been developing the ability to manage conditional grants rather than developing the technical ability to execute, oversee, and address project failures. Moreover, lastly, and perhaps most significantly, sector departments find it challenging to meddle in internal infrastructure delivery management activities owing to the autonomous character of municipalities or IGFR protections. The desire of sector departments to select contractors through conditional funds for infrastructure from the local government that are not direct has grown in the last several years.

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### **Small-Scale Initiatives with a High Degree of Administrative Instability**

The municipal infrastructure delivery programme consists of many modest projects spread over 257 municipalities, with an average of 2500 every year. Poor service delivery and reduced returns on public investment are common consequences of infrastructure delivery fragmentation. In addition to placing enormous administrative and financial strain on the oversight organisations, many projects need towns to carry out many feasibility studies that never go past the project conceptualisation stage. For municipalities to be accountable and responsible for carrying out different activities throughout the infrastructure life-cycle, they must hire and maintain a sufficient number of trained and experienced workers. However, owing to a lack of funding, organisational shortcomings within the municipality, and other structural issues, most municipalities find it difficult to develop, recruit, and retain the necessary talents. For example, inappropriate individuals are assigned to inappropriate roles. Furthermore, owing to legal obligations for competitive recruiting procedures, municipalities cannot retain some important staff members or execute succession planning. Towns depend on outside contractors when they lack competent staff members, and these contractors frequently suggest intricate project ideas that are inappropriate for the towns' goals and available resources.

### **Administrative and Political Interaction**

Project risks and the degree to which politicians meddle in the processes are exacerbated by the stability of the organisations managing infrastructure delivery and the arbitrary decisions made by developers and project managers. Council members must be involved in the planning and prioritising of local government infrastructure as part of the evaluation and consultation of community needs. Tensions can occur between political pledges and what is practically viable when responding to the voters' expectations. Politicians frequently prefer new infrastructure over capital asset upkeep or renovation. When political and technical interests are not balanced, bad judgments are made on infrastructure, work packages are not finalised on time, contract management skills are diminished, and corruption potential is raised.

### **Evaluation and Monitoring**

Creating enough capability to manage the infrastructure delivery programme's overall performance is significant for local government. Determining value for money, managing infrastructure investment across its lifespan, and making investment decisions depend on the availability of data on infrastructure performance. Monitoring is done solely for reporting expenditures in local government. The standard of the infrastructure being built is not closely examined. Even more concerning is that towns know very little about the state of the current infrastructure. It is required of municipalities to self-evaluate and self-report on the calibre of the infrastructure they provide. Without effective infrastructure units or project management, "new roads are often washed away a few months after completion."



## MUNICIPALITY-BASED APPROACH TO MANAGING INFRASTRUCTURE DELIVERY IN LOCAL GOVERNMENT

### Roles and Duties in Infrastructure Delivery and Issues in Coordinating

According to interviews conducted with the sampled towns, local administrators thoroughly understand infrastructure delivery's roles, responsibilities, and value chain. The primary infrastructure responsibilities of local governments are building access roads and bridges, little electrical reticulation, community halls, sports and hawking facilities, and landfills. On the other hand, district municipalities are mostly in charge of the water supply infrastructure that covers the whole district. Every municipality's infrastructure delivery programme is guided by a complex IDP planning process, including a scenario analysis, community engagement, and a list of projects prioritised based on wards. The yearly IDP review requirements undermine project plan execution and continuity, making projects appear abandoned. Local governments lament the effects of inadequate money on the legitimacy of their plans and project objectives, given that communities are frequently split apart to accommodate service requirements within the constraints of available funds. However, none of the towns surveyed have a long-term, reliable, and budgeted infrastructure plan. The lack of funding for the plans is the cause of this error.

Municipalities see a major barrier to efficient infrastructure delivery management as the absence or lack of intergovernmental collaboration related to the more general questions of roles and duties. Owing to the provincial department of roads' slowness in creating connected provincial highways, certain municipalities are now in charge of developing these roads and transferring ownership to them once they are finished. Road construction occurs in stages, often at a glacial rate of one kilometre per year, leading to expensive bidding procedures and unorganised wear and tear. Municipalities are occasionally required to construct income-generating reticulation networks for electricity via the Integrated National Electrification Grant (INEP), after which the networks are turned over to ESKOM for operation. A reticulation network for power and water can occasionally be constructed without enough bulk supply capacity, just as bridges can occasionally be constructed without accompanying roadways. As a result, there was severe conflict in the neighbourhood, and protesters destroyed the infrastructure.

Similar difficulties with intergovernmental coordination have arisen when building sports facilities and landfill sites. In these cases, national departments directly control project implementation, ignoring social risks that could arise from project failure and the municipalities' role in managing the infrastructure lifecycle. The consequences of inadequate intergovernmental cooperation between districts and local municipalities are equally clear and severe. Local municipalities mostly complain about the lack of communication during the district IDP-approved projects' discontinuation and the district's implementation of water projects, which disregards local rules (application for leeway).

Due to the functional structures for water services authority and provision, there are negative effects on the planning and efficient operation of linked sanitary infrastructure.



## Budgeting

The sampled municipalities show enough capacity to meet legal requirements regarding budgeting, an essential part of managing the infrastructure supply. Following grant criteria, projects are prioritised, given indicative budgets, registered on the MIG projects list, and Service Delivery and Budget Implementation Plans (SDBIPs) are created. However, all municipalities face a similar costing issue when projects are under-budgeted or under-cost, which causes project cancellation or completion delays. A community hall that was granted R100 million over three years but could only afford R5 million in the first year was the example provided by one municipality. Municipalities attribute the anomaly to using outdated costing rules, insufficient costing expertise, and the persistent decrease of MIG forward allocations.

## Capabilities for project management

Even though every municipality in the sample has a Project Management Unit (PMU), the most difficult part of managing infrastructure delivery appears to be project execution. The PMUs are most notable for being either understaffed or staffed by individuals lacking the necessary technological expertise. Particularly, rural communities draw attention to the widespread problem of having trouble finding qualified engineers. Fixed-term human resource contractual agreements protecting engineers can lead to cyclical staff turnover patterns as workers look for employment security, compromising project continuity. Municipalities entrust their project design, execution, and quality control to outside service providers. There is a chance of fraud (over-design, over-scoping) and project completion failures because of possible collusive agreements between contractors and consulting engineers if there is no internal capability to evaluate the adequacy of designs and the quality assurance reports. Litigation disputes between consulting engineers and contractors led to the abandonment of a reservoir project in one of the tested communities.

In particular, the PMUs and other municipalities are overrun by dishonest contractors who cannot complete some projects. When the PMU is effective, projects may be halted, and contracts may be terminated for many reasons, most commonly related to contractors' incapacity to finish work on schedule rather than their ability to provide high-quality work. Penalties for poor craftsmanship and late completion are infrequent, partly due to PMUs' subpar performance. Municipalities seem to think cancelling the contracts of failing contractors is a sufficient penalty because the project may still be completed with the remaining funds. Through the National Treasury database, contractors are only placed on a blacklist under specific circumstances.

The protracted process of considering numerous tender applications within the allotted 90-day tender validity period and the increasing reluctance of local officials to serve on bid evaluation committees are among the issues impeding efficient infrastructure delivery management. Weather and terrain have also come to light as significant factors influencing project completion delays and cost overruns. Municipal roads being built, for instance, are primarily made of gravel and are consequently vulnerable to wet weather. Similarly, to combat tight budgets and rising infrastructure needs, municipalities are experimenting increasingly with less expensive alternative



building materials that degrade quickly. Social factors typically precede technical judgments made by PMUs, even if these decisions are free from political influence. In one case, the engineers recommended against the town moving the community hall building from one location to another after financing had been committed. A common trend throughout the towns in the sample is underfunding, which has been identified as a significant barrier to timely and high-quality project completion and appropriate asset lifecycle management.

### Inactive infrastructure

Although there is much anecdotal evidence on the common occurrence of abandoned municipal buildings, or so-called “white elephants,” in the public debate and media (see Matlala, 2018; Nketo, 2017), very few examples were found during the case studies. Municipalities stated that, to the best of their knowledge, every finished infrastructure project is included in the asset registry and is being used to its maximum potential. Nevertheless, more conversations with local experts indicated that underutilised infrastructure exists. Figure 4 shows an abandoned taxi rank and a municipal office building that has been under construction for numerous years because of subpar contractor performance.

Unused taxi rank



Delayed completion of municipal offices



**Figure 4:** Examples that demonstrate ineffective management of infrastructure delivery Source: Author (2023)

### Support and Monitoring

An essential part of municipal infrastructure delivery management is external assistance monitoring and evaluation for the built infrastructure programme. Municipalities cannot plan, carry out, and supervise infrastructure projects; if they do, the consequences will be detrimental to society and the economy. The national and local governments have implemented various interventions and programmes in addition to being tasked with monitoring and support duties. These strategies' effects on municipalities show a range of outcomes. While some towns claim to have



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received nothing from the MISA after making many requests, others have received and are still receiving short-term technical help from the organisation. The Department of CoGTA primarily oversees expenditures and appears strict about meeting spending goals while disregarding the fundamental difficulties in delivering infrastructure. Municipalities generally think that the interventions in infrastructure delivery that are made public are invisible.

## CONCLUSIONS

This study focuses on the expenditure efficiency and infrastructure delivery management systems used by local governments to find bottlenecks that prevent the creation of sustainable, effective, and efficient infrastructure life-cycle management. The study found that the municipal infrastructure delivery programme is characterised by poor management and expenditure, including underutilisation, budget overruns, fast asset deterioration, and project completion delays. Scholarly works attribute these difficulties to a lack of foundational knowledge in infrastructure delivery management; that is, inadequate project management skills, stricter laws, and less effective intergovernmental collaboration. In other words, lapses in planning and prioritisation procedures. Despite the comprehensive delivery management system, municipalities still exhibit grave deficiencies in infrastructure development upkeep and cost-effectiveness. Specifically, several issues include late completion of projects, subpar workmanship, inadequate contractor oversight, excessively escalating budgets, noncompliance with supply chain procedures, and improper project management techniques. The study recommends that beyond only implementing new infrastructure, there is a need for increased focus on peer learning across municipalities and the whole life-cycle management of municipal infrastructure. The secret to managing the delivery of sustainable infrastructure is to plan for suitable infrastructure that adapts to local conditions, maintains existing infrastructure, and renovates infrastructure that has outlived its original design. Without addressing the underlying structural intergovernmental delivery arrangements, tinkering with the grant structures and stepping up technical assistance interventions alone are unlikely to have a significant impact.

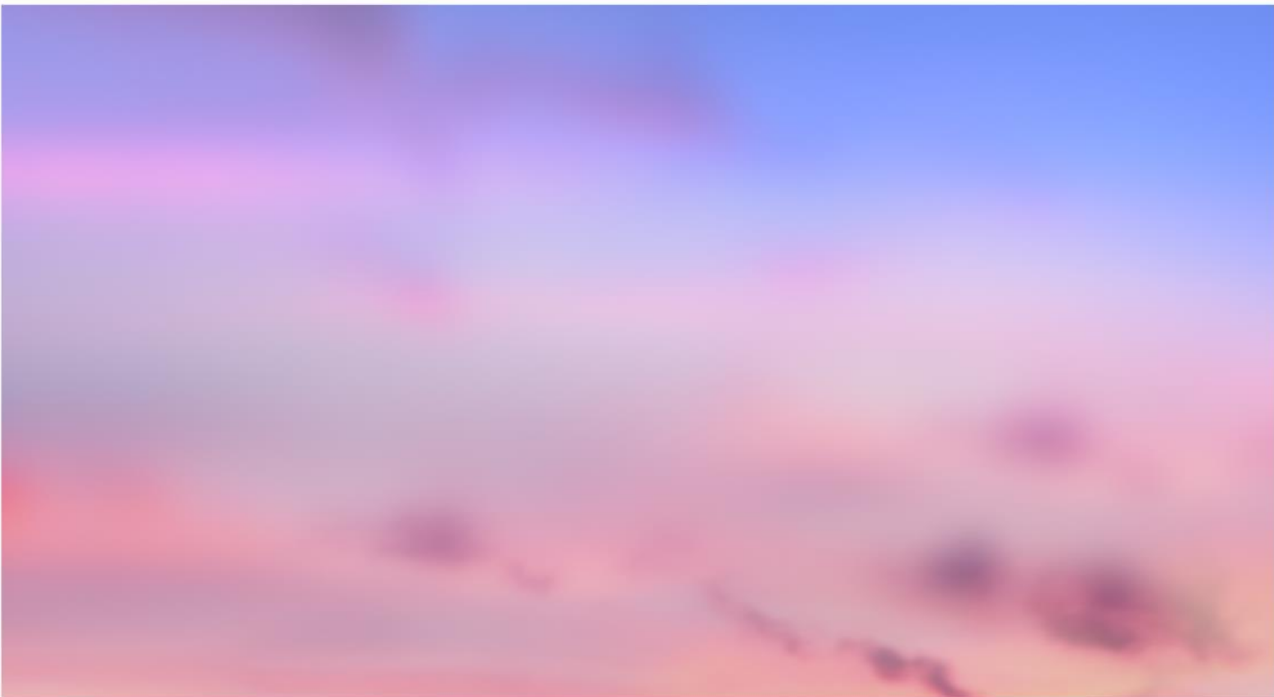


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