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DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE

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NATIONAL INFRASTRCTURE PLAN 2050 (NIP 2050) PHASE I

I, **PATRICIA DE LILLE, MP,** Minister of Public Works and Infrastructure, hereby in terms of section 4 (a) of the Infrastructure Development Act (Act No 23 of 2014), publish Phase I of the National Infrastructure Plan *2050* for implementation.

A copy of the National Infrastructure Plan *2050* is attached hereto.

P. de Lille

MS PATRICIA DE LILLE, MP
MINISTER OF PUBLIC WORKS AND INFRASTRUCTURE

Date: 11 March 2022

South Africa's

National Infrastructure Plan 2050

February, 2022

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EXECUTIVE SUMMARY

Infrastructure development is critical to attaining South Africa's long-term economic and social goals. In the context of a developing country seeking significant structural change, the public sector must lead this effort. Infrastructure delivery will be one of the most significant contributors to South Africa's transition from a historically closed minerals economy to one that is globally and regionally integrated, low carbon, inclusive and promoting of dynamism in the industries of the future.

Public infrastructure investment is central to achieving greater productivity and competitiveness, reducing spatial inequality and supporting the emergence of new job-creating sectors. It is therefore one of the non-negotiable foundations of transformation and inclusive growth. The construction of infrastructure generates employment and broad-based black economic empowerment opportunities, further contributing to the goals of the National Development Plan (NDP).

The NDP targeted a 30% investment-to-GDP ratio, one-third of which would be delivered by the state. This is primarily delivered through provincial and local government and state-owned enterprises (SOEs). A small proportion of spending is directed through national government. The cost of delivering infrastructure to meet NDP development objectives is estimated to exceed R6 trillion between 2016 and 2040, with energy and transport accounting for over 72% of this spend.

The National Planning Commission (NPC) prepared an extensive review of public sector and SOE infrastructure delivery and performance, culminating in its December 2020 Review of Economic Progress[1]. It found that the delivery of public sector infrastructure is below that required to support the NDP objectives. The NPC makes constructive and concrete recommendations for course correction.

The goal of the National Infrastructure Plan 2050 (NIP 2050) is to create a foundation for achieving the NDP's vision of inclusive growth. Prepared by Infrastructure South Africa (ISA), the NIP 2050 offers a strategic vision and plan that link top NDP objectives to actionable steps and intermediate outcomes. Its purpose is to promote dynamism in infrastructure delivery, address institutional blockages and weaknesses that hinder success over the longer term, as well as guide the way towards building stronger institutions that can deliver on NDP aspirations. The NIP2050 identifies the most critical actions needed for sustained improvement in public infrastructure delivery. The NIP 2050 will have impact in the short term, but with longer-term imperatives also in view.

This phase of the NIP 2050 focuses on four critical network sectors that provide a platform: energy, freight transport, water and digital infrastructure. There will be a second phase that focuses on distributed infrastructure and related municipal services, as well as approaches to strengthening coordination through DDMs.

The NIP 2050 is organised into six main sections. The first section offers insight into the four mission-critical infrastructure areas, namely energy, freight transport, water and digital communications. There are then five cross-cutting sections focused on the regional agenda for infrastructure, finance, strengthening institutions for delivery, rebuilding the civil construction and supplier sector and the approach to monitoring and reporting on progress. Each section follows the same format: (1) stating the vision, (2) offering a frank assessment of the current status, (3) outlining essential conditions for success and (4) stating what will be done to achieve the vision. With an eye to long-term success, there is significant emphasis on near-term course correction. To this end, the NIP 2050 outlines the changes and

[1] The NPC reports are available at www.nationalplanningcommission.org.za/publications_reports.

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augmentation to government's Strategic Integrated Projects (SIPs) that are relevant to the four sectors, as well as three-year action plans.

The NIP 2050 gives guidance on themes common to the four sectors, with significant emphasis in building capacity in the following:

- **Knowledge and innovation services**, for capability in planning, monitoring, budgeting, finance, procurement, project preparation, project management and sector-specific innovation. This enables evidence-based decision-making, improves cost-effectiveness, mitigates risk and helps optimise and can contribute significantly to improving infrastructure quality, delivery and sustainability. Building these capabilities will be the NIP's top priority.
- **Public-private cooperation and stimulation of competition**, where appropriate, in the delivery of public infrastructure.
- **Spatial transformation** to promote more inclusive development in line with the National Spatial Development Framework (NSDF).
- **Blended project finance** and innovative green finance.
- **Executive management and technical capability within the state and its entities**, so that they are stable and can lead and deliver with confidence.
- **Economic regulation.**
- **Industrial development and localisation** in the design and approach to implementation. Examples are localisation of supplier industries to infrastructure projects, driving the establishment of Special Economic Zones around intermodal transport linkage nodes, and the stimulation of the civil construction and supplier industries.
- **Efficient modes of delivery.**
- **A safe, secure and ethical environment for public infrastructure delivery**
- **Delivery of an Africa regional infrastructure programme.**
- **South African civil construction and supplier industries**, so that local industry gains from state infrastructure investment.

SIGNS OF PROGRESS

Stimulating momentum in public infrastructure delivery is a commitment taken seriously. Concrete movement has been driven by ISA and through Project Vulindlela, amongst others. Some of the most important requirements of the NIP 2050 are already being implemented. Examples are as follows:

- Eskom has made good progress in splitting up into generation, transmission and distribution divisions and is on track to establish an independent transmission entity in this financial year. Eskom has now made a commitment to transition into clean generation and to roll out transmission infrastructure in support of new generation. The Department of Mineral Resources and Energy (DMRE) has lifted the licence limit for embedded generation from 1 MW to 100 MW. These two reforms will have a dramatic effect on available electricity.
- Transnet Freight Rail (TFR) is introducing third-party operators into its branch network and is preparing for the introduction of third-party operators in its main lines. To do so, TFR is commercially separating rail infrastructure from operations, with a target date of 2022/3. TFR is further developing a hook-and-haul service to promote private wagons. The reform in port services has begun with the commitment to establish the Transnet National Ports Authority as an independent subsidiary. These reforms will dramatically improve the freight transport services in rail and ports, with the added value of reducing pressure on the roads.

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- SANRAL has made significant progress in its road projects around the country with nine construction projects valued at R18 billion in progress, and a further eight major projects valued at R 20 billion being awarded in 2021.
- There has been significant improvement in water use efficiency over the past decade. The Presidential Infrastructure Coordinating Commission (PICC) and Department of Water and Sanitation (DWS) are already taking steps towards the implementation of many NIP 2050 requirements.
- There has been good performance in digital infrastructure rollout over the past decade; by 2019, 93% of the population was covered with 4G/LTE, up from 53% in 2015. Over 85% of the population live within 10 km of a fibre access point. This coverage bodes well for NIP 2050 efforts to improve digital access for low-income communities.
- There are signs of emerging appetite and capability in South African capital markets to innovate in financing infrastructure. For example, South Africa has issued the most green bonds in Africa, with a cumulative issuance of US$2,4 billion. A growing commitment by the South African state to public-private partnerships is demonstrated in the establishment of the Infrastructure Fund. This has been structured through the Development Bank of Southern Africa (DBSA) with aim to use R100 billion of public funding over the next 10 years to crowd in private sector investment through blended finance models.

Energy infrastructure

Energy supply will enable economic growth and development. The energy mix will be bolder on sustainability and in achieving least cost. This will require reduced reliance on coal and growing reliance on renewable energy, especially solar and wind, which play a dominant role as part of a least-cost energy mix and where South Africa has a significant advantage.

By 2050, energy demand is projected to double. Installed generation capacity will therefore need to expand, from 53 GW in 2018 to between 133 GW and 174 GW by 2050, depending on energy demand at that time. By 2030, at least 25 GW will have to be added to installed capacity with the requisite supportive transmission and distribution network infrastructure.

To achieve this vision for energy infrastructure, the NIP 2050 says that:

- the approach to defining the energy mix will become technically strong and responsive. Expanded capacity in a context of accelerated technological change and a changing energy mix requires that the institutional planning and delivery mechanisms become more adaptive, responsive and dynamic, as well as guided by evidence. The Integrated Resource Plan (IRP) will be revised to extend to 2050, and medium-term targets will be updated in 2021/2 to reflect a focus on sustainability and least cost. The IEP will be finalised.
- the market structure will facilitate more responsive and sustainable supply. This will require stabilisation and separation of Eskom, the introduction of greater private participation and more decentralisation in energy generation.
- capacity in the state and its entities will be strengthened to effectively regulate, plan and oversee energy delivery.
- electricity will be delivered in a financially sustainable way.
- energy efficiency policies and measures will be given high priority.
- the transition away from fossil fuels will progress in a measurable, just and sustained manner. New installed capacity consists primarily of wind and solar, where South Africa has a comparative and competitive advantage. Stakeholders, whether business, workers or communities, involved in fossil fuels will be supported through this transition.
- industrial diversification will be promoted through energy infrastructure delivery.

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- a centralised database will be maintained, with the requisite confidentiality protection, for the reporting of existing and expected generation capacity investments by market players to enable informed power system planning and investments for all stakeholders.
- Research infrastructure for using nuclear technology will be sustained through the replacement of SAFARI-1 research reactor with a Multi-Purpose Reactor (MPR) by 2030.
- Effective management of waste emanating from energy generation to support environmental sustainability.

The SIPs will be augmented and 3-year priority actions to 2023/4 are outlined. For example, the independent transmission entity will be established and the 100 MW embedded generation will be regulated in 2021/2. At least 10 municipalities that deliver to large populations will be given support and/or have their capacity developed to adequately maintain distribution systems. A plan to reduce reliance on coal, including elements of a just transition, will be finalised in 2021/2, with implementation starting in 2022/3. The specifics on energy procurement are as follows: regularised prescheduled bi-annual bid windows procuring about 5GW of renewable power annually from independent power producers (IPPs), municipalities enabled to procure power from IPPs, acceleration of transmission and distribution infrastructure investment, and up to 1 000 MW battery storage procured by 2023/4.

Freight transport infrastructure

Freight transport will facilitate domestic and cross-border movement of goods to enable industrialisation, diversification, trade and development. It will deliver in respect of its three roles of supporting economic and industrial progress as well as enabling rural development, while ensuring environmental objectives are met regarding the reduction of emissions, congestion, accidents and waste.

To achieve the vision for freight transport, the NIP 2050 says that:

- transport policy will be integrated and oriented around supply chain needs and the mix drives efficiency. Transport services will become aligned with best practice, ensuring globally competitive economic growth.
- the reform of the freight transport sector will be done in a way that is sustainable and progressive. Market structure should become competitive. Scale is built into the dominant freight corridors to lower cost and improve competitiveness.
- state institutions will become increasingly capable of driving transport sector reform and delivery.
- funding and finance will be increasingly sustainable and make optimal use of opportunities to attract private finance.
- Africa regional transport networks will support interregional trade and better connectivity to global supply chains. South Africa's position will be enhanced as a global maritime hub for Africa and the southern hemisphere.
- transport hubs will stimulate industrial diversification and clustering.

The freight transport SIPs will be augmented and 3 year priority actions to 2023/4 are outlined. For example, the balance of transport projects will be reassessed in anticipation of the shift of cargo off the road to rail; that TFR will complete its accounting and commercial separation and meaningfully accommodate third-party operators by 2022/3; that both the independent ports authority and a single transport economic regulator will be established by 2022/3; that there will be a plan to integrate rail, road, ports and intermodal hubs and freight villages by 2022/3; that a plan for Africa regional freight logistics will be prioritised; that the Port Master Plan, the National Rail Policy and the Road Funding Policy will be finalised; and that the upgrading of the six ports of entry to become one stop border posts be complete by 2025.

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Water infrastructure

There will be universal and reliable access to water of an acceptable quality and quantity in support of a strong inclusive economy and a healthy environment. The institutions involved in managing water resources and services will be effective in achieving this objective.

To achieve the vision for water infrastructure, the NIP 2050 says that:

- decision-making will be accountable and the institutions involved in managing water made effective.
- water resource planning will become proactive, robust, responsive and guided by evidence.
- there will be coherence in water sector policy and support for implementation at the municipal level.
- capacity to finance and deliver water projects will be strengthened, with the private sector being used effectively. The water sector will become financially sustainable.
- existing water infrastructure will be rehabilitated and maintained and water use efficiencies improved.
- ecological infrastructure will be rehabilitated and protected.
- regulatory oversight and licensing regimes will become more robust, addressing both water quantity and quality, as well as pricing and the technical performance and financial sustainability institutions.
- roles and responsibilities will be aligned and consultation should be meaningful.

The existing water SIPs will be reviewed for their viability and augmented as indicated in the NIP. In addition, 3-year priority actions to 2023/4 are outlined. For example, the National Water Resources Infrastructure Agency will be established by 2023/4; a single national water regulator will be established in 2022/3; the raw water pricing strategy will be finalised in 2021/2; that the National Water Programme (NWP) project management office to support municipalities in water management and project development will be established in 2021/2; a plan for ensuring the viability of municipal wastewater plants will be created; a policy for water use in agriculture will be finalised in 2022/3; reconciliation strategies for all water systems will be finalised by 2022/3; at least two irrigated agricultural projects aimed at food production will be driven to implementation by 2023/4; that the viability of the water SIPs will be reviewed and other specific SIP projects will be added such as dam-raising projects for the Tzaneen and Clanwilliam dams, Sundays River subsystem expansion to serve Gqeberha, and water supply augmentation for Mbombela.

Digital communications infrastructure

Communications are the lifeblood of a market economy, and digital communications are increasingly central to that. The increasingly foundational role of digital transformation means that the benefits of becoming a fully digitally enabled society and economy outweigh the costs.

The NDP envisages a seamless information infrastructure that is universally available and accessible, at a cost and quality at least equal to South Africa's peers and competitors.

While South Africa is far off the NDP's goals at 2021, the 2030 goals must remain in place. There is evidence of sufficient capacity to deliver on these objectives if they are implemented through private-public cooperation.

To achieve the vision for digital infrastructure, the NIP 2050 says that:

- high-speed broadband will be universally accessible.
- regulation will enable competitive and universally accessible broadband.

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- public sector capacity will be strong and able to drive the required policy agenda.
- partnerships will be strong and there should be centres of digital excellence promoting a growing knowledge base of delivery and innovation.
- the information and communications technology (ICT) skills base will be broad, robust and ready for the future.
- government services and buildings will be digitally enabled.
- private sector participation in achieving universal broadband access will be prevalent.

The digital SIPs will be deepened and augmented and 3-year priority actions to 2023/4 are outlined. For example, digital migration and spectrum auctions will take place in 2021/2, in that sequence; that the policy for rapid deployment of electronic communications networks and facilities will be finalised in 2021/2; that arrangements will be made to enable private participation in public interest digital delivery projects from 2022/3; that 80% of public buildings will be digitally enabled by 2024/5; that high-speed broadband will be accessible in every community by 2024/5; that there will be consideration of free basic data for low-income users; that government services be digitised; that a data centre strategy will be finalised in 2021/2; and that a satellite communications strategy will be finalised in 2021/2 for implementation beginning by 2022/3.

The NIP 2050 gives direction in respect of participation in regional infrastructure, infrastructure finance, the strengthening of institutions for delivery, an approach to rebuilding an empowered civil construction and supplier industry, and finally the monitoring and evaluation of infrastructure delivery.

Building a regional agenda for infrastructure

South Africa will demonstrate and execute on a bold vision for its infrastructure cooperation in the Africa region.

Initially, the NIP 2050 focuses on enabling delivery on regional projects that are critical to South Africa's domestic needs and are also beneficial to regional development. In the near term, critical energy and water projects will be implemented with greater vigour, as will the development of high-efficiency border posts. In the medium term, South Africa will be an active driver of regional transport corridors in rail, road and ports that will greatly enhance the ease of regional trade. South Africa will also drive regional digital connectivity. As its construction sector is invigorated and infrastructure finance deepened, South Africa will play a greater role as a gateway into Africa and as a participant in delivering regional infrastructure projects and finance.

To achieve the vision for South Africa's participation in regional infrastructure, the NIP 2050 says that:

- projects will progress timeously, with enhanced capacity, political commitment and focus.
- regional capacity to drive projects will be strengthened.
- project monitoring will enable action.
- South Africa will gain from foreign infrastructure investment in Africa
- a Financial Centre of Excellence will be established.
- a top-priority regional infrastructure integration strategy and project pipeline will be developed and implemented.

Infrastructure finance

Capacity will be in place to sustainably fund and finance infrastructure build, operations and maintenance. It is estimated that achieving the United Nation's Sustainable Development

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Goals (SDGs) related to infrastructure and NDP infrastructure goals will cost R6,224 trillion between 2016 and 2040, with transport and energy likely accounting for over 72% of the investment required. As of 2021, the finance gap that needs to be closed is estimated at R2,15 trillion.

South Africa will have a thriving private sector infrastructure investment sector that will be supported by an efficient and reliable public sector procurement framework. This framework will deliver world-class procurement through both on-budget general government procurement and world-class capability in creating partnerships and alliances with the private sector in infrastructure finance, build and operations. Infrastructure projects will be considered from a full-life-cycle perspective: planning from procurement to decommissioning, budgeting, and setting out maintenance schedules that minimise costs over the life of the infrastructure. The public sector will partner with the private sector and development finance agencies to fill a finance gap of approximately one-third of the amount that needs to be invested until 2050. Projects will be chosen for these partnerships where they clearly enhance the value of the infrastructure to the public. Such partnerships will be structured to maximise this value, considering all public policy objectives, with projects designed with risks allocated to partners that are best positioned to manage them. The NIP envisages government-wide capacity to design and launch partnerships with the private sector, eliciting an enthusiastic appetite for investment by the private sector and global development funders.

To achieve the vision for infrastructure finance, the NIP 2050 says that:

- a full-life-cycle planning approach will be adopted.
- value for money will be optimised.
- projects will be designed to meet the risk and return needs of investors.
- projects will be designed to minimise risk.
- partnerships with the private sector will be embraced where they deliver better value for money.
- development of the capital market will be supported by a steady and reliable pipeline of new projects.
- monitoring and reporting will be done in a way that builds investor confidence.

The institutional framework in support of infrastructure delivery

Strengthening institutions responsible for infrastructure planning and delivery will be the top priority of the NIP 2050. There must be a step change in the institutional capability that drives material progress in South Africa's infrastructure ambition. Planning, procurement and execution systems and capabilities will be operating at the highest global standard, commensurate with the country's significant infrastructure transformation agenda. Robust and ever-developing partnerships and alliances between the private and public sectors will be a significant feature in planning and implementation, whether they involve think tanks, financial institutions, business or communities. There will be confidence to drive an increasingly dynamic, high-performance delivery machinery.

The vision recognises that efficient and timeous delivery of public infrastructure requires an environment that is safe, secure and ethical.

To achieve the vision for institutional capacity, the NIP 2050 says that:

- there will be significant capacity development within infrastructure procurement and delivery management.
- the regulatory and institutional framework will enable network infrastructure procurement and delivery.

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- a strategic approach will be taken to infrastructure procurement.
- systems of accountability will become aligned with effective infrastructure delivery.
- the asset management function will become robust.
- knowledge and innovation capabilities and services for planning, monitoring, budgeting, finance, procurement, project preparation, project management, risk mitigation (including opportunities for corruption) and sector-specific innovation will be strengthened.
- There will be significant attention to reducing crime and corruption and mitigating its impacts on public infrastructure delivery, especially in relation to: corruption in infrastructure procurement; extortion, political violence and unrest that halts infrastructure project progress; and vandalism and theft of infrastructure assets.

The civil construction and supplier sector

The South African civil construction and supplier sector will be a vibrant and respected, world-class African full-service built-environment delivery provider that supports Southern African development and beyond. It will be cost-effective and offer safe and reliable service with an experienced and skilled workforce as well as world-class products relevant to the development context. It will be an industry that is inclusive in terms of representative ownership and business practices. The industry will have a wide range of continuously improving products and services delivered by companies that range from small domestic-oriented ones to large companies that can deliver regionally and globally.

To achieve the vision for the construction sector, the NIP 2050 says that:

- an explicit effort will be made to enable South Africa's construction and supplier industries to deliver on the national development objectives.
- the state will oversee the procurement and delivery of infrastructure with a high-level of capability.
- the national infrastructure champion will be consolidated with supporting mechanisms and systems established.
- there will be a continuous pipeline of bankable projects that enables the construction sector to plan, invest and develop its people.
- regulations and the issuing of permits will be streamlined.
- there will be active and explicit support to strengthening emerging construction and supplier businesses and empowerment of historically disadvantaged entrepreneurs, while also eliminating mis-use of preferential procurement policies.
- There will be a drive to reduced carbon emissions in materials use and supplier industries.

Monitoring and reporting of major network infrastructure projects

Working with project owners, Infrastructure South Africa (ISA) will monitor the implementation of the NIP 2050. Monitoring and reporting to ISA and the PICC will focus on progress in implementing critical institutional reforms, the required capacity development and high-level information on the most important infrastructure projects. This will be done in a way that is transparent and up to date. ISA will report to the Presidential Infrastructure Coordinating Commission (PICC) Council from time-to-time on progress made in achieving the country's infrastructure delivery vision and strategic objectives. The PICC Council is chaired by the President of South Africa and is comprised of elected representatives from all three spheres of government.

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1 INTRODUCTION: LAYING THE FOUNDATIONS TO ACHIEVE NDP ASPIRATIONS

Infrastructure development is critical to attaining South Africa's long-term economic and social goals. In the context of a developing country seeking significant structural change, the public sector must lead this effort. Infrastructure delivery will be one of the most significant contributors to South Africa's transition from a historically closed minerals economy to one that is globally and regionally integrated, inclusive and host to the dynamic industries of the future.

Public infrastructure investment is central to achieving greater productivity and competitiveness, reducing spatial inequality and supporting the emergence of new job-creating sectors. It is therefore one of the non-negotiable foundations of transformation and inclusive growth. The construction of infrastructure generates employment and broad-based black economic empowerment opportunities, further contributing to the goals of the National Development Plan (NDP).

The NDP targeted a 30% investment-to-GDP ratio, one-third of which would be delivered by the state. This is primarily delivered through provincial and local government and state-owned enterprises (SOEs). A small proportion of spending is directed through national government. The cost of delivering infrastructure to achieve meet NDP development objectives is estimated to exceed R6 trillion between 2016 and 2040, with energy and transport accounting for over 72% of this spend.

The National Planning Commission (NPC) prepared an extensive review of public sector and SOE infrastructure delivery and performance, culminating in its December 2020 Review of Economic Progress[2]. It found that the delivery of public sector infrastructure is below that required to support the NDP objectives. The NPC makes constructive and concrete recommendations for course correction.

The goal of the National Infrastructure Plan 2050 (NIP 2050) is to create a foundation for achieving the NDP's vision of inclusive growth. Prepared by Infrastructure South Africa (ISA), the NIP 2050 offers a strategic vision and plan that link top NDP objectives to actionable steps and intermediate outcomes. The aim is to promote dynamism in infrastructure delivery, address institutional blockages and weaknesses that hinder success over the longer term, as well as guide the way towards building stronger institutions that can deliver on NDP aspirations. The NIP 2050 does not seek to be comprehensive – it is not meant to be a database of all projects, a consolidation of masterplans, a spatial mapping of projects or a mechanism for centralised decision-making. Rather, its purpose is to identify the most critical actions that are needed for sustained improvement in public infrastructure delivery and that will have impact in the short term, but with the longer-term imperatives also in view.

This phase of the NIP 2050 focuses on four critical network sectors that provide a platform: energy, freight transport, water and digital infrastructure. There will be a second phase that focuses on distributed infrastructure and related municipal services, including approaches to improving coordination through DDMs.

MUNICIPAL SUPPORT TO STRENGTHEN PERFORMANCE IN INFRASTRUCTURE DELIVERY

While this phase of the NIP 2050 focuses on national delivery of bulk infrastructure, some drivers of change at the local level are indicated. Capacity building in respect of maintenance and billing systems stand out as a top priority. In the interests of gaining momentum in a troubled context, the NIP 2050 drives a step-by-step approach with a clear 3-year view on every area of delivery. The initial focus of the NIP 2050 municipal capacity

[2] The NPC reports are available at www.nationalplanningcommission.org.za/publications_reports.

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development for infrastructure delivery will focus on the 17 non-delegated municipalities for which National Treasury has oversight. This includes the eight metros, the ten largest secondary cities and one district municipality. They account for 71% of local government spending power. This approach will enable more opportunity for performance-based support programmes, and will leverage National Treasury's broader capacity development efforts in municipal budgeting and financial management.

The NIP 2050 will specifically earmark a subset of the non-delegated municipalities for capacity support in relation to performance in their electricity and water and sanitation business. Those that show political commitment will be incentivised and provided with support for the professionalisation of the service (management and technical capability), with sound and protected governance, and finance linked with performance improvements.

This is an intervention that the City Support Programme in National Treasury has tested and is developing further. The idea is to link turnarounds with financial incentives (grants or private) that are conditional on improved institutional and operational performance.

The NIP 2050 is organised into six main sections. The first section offers insight into the four mission-critical infrastructure areas, namely energy, freight transport, water and digital communications. There are then five cross-cutting sections focused on the regional agenda for infrastructure, finance, strengthening institutions for delivery, rebuilding the civil construction and supplier sector and the approach to monitoring and reporting on progress. Each section follows the same format: (1) stating the vision, (2) offering a frank assessment of the current status, (3) outlining essential conditions for success and (4) stating what will be done to achieve the vision and conditions for success. With an eye to long-term success, there is significant emphasis on near-term course correction. To this end, the NIP2050 offers direction in strengthening and augmenting government's Strategic Integrated Projects (SIPs) that are relevant to the four sectors, as well as three-year action plans.

The NIP 2050 gives guidance on themes common to the four sectors, which would see significant emphasis in building capacity in the following:

- **Knowledge and innovation services**, for capability in planning, monitoring, budgeting, finance, procurement, project preparation, project management and sector-specific innovation. This enables evidence-based decision-making, improves cost-effectiveness, mitigates risk and helps optimise and can contribute significantly to improving infrastructure quality, delivery and sustainability. Building these capabilities will be the NIP's top priority.
- **Public-private cooperation and stimulation of competition**, where appropriate, in the delivery of public infrastructure.
- **Spatial transformation** to promote more inclusive development in line with the National Spatial Development Framework (NSDF).
- **Blended project finance** and innovative green finance.
- **Executive management and technical capability within the state and its entities***,* so that they are stable and can lead and deliver with confidence.
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- **A safe, secure and ethical environment for public infrastructure delivery**

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- **South African civil construction and supplier industries**, so that local industry gains from state infrastructure investment.

The NIP 2050 does not seek to be comprehensive – it is not meant to be a database of all projects, a consolidation of masterplans, a spatial mapping of projects or a mechanism for centralised decision-making. Rather, the aim is to identify the most critical actions that are needed for sustained improvement in public infrastructure delivery and that will have impact in the short term but with the longer-term imperatives in view.

SIGNS OF PROGRESS

Stimulating momentum in public infrastructure delivery is a commitment taken seriously. Concrete movement has been driven by ISA and through Project Vulindlela, amongst others. Some of the most important requirements of the NIP 2050 are already being implemented. Examples are as follows:

- Eskom has made good progress in splitting up into generation, transmission and distribution divisions and is on track to establish an independent transmission entity in this financial year. The Department of Mineral Resources and Energy (DMRE) has lifted the licence limit for embedded generation from 1 MW to 100 MW. These two reforms will have a dramatic effect on available electricity.
- Transnet Freight Rail (TFR) is introducing third-party operators into its branch network and is preparing for the introduction of third-party operators in its main lines. To do so, TFR is commercially separating rail infrastructure from operations, with a target date of 2022/3. TFR is further developing a hook-and-haul service to promote private wagons. The reform in port services has begun with the commitment to establish the Transnet National Ports Authority as an independent subsidiary. These reforms will dramatically improve the freight transport services in rail and ports, with the added value of reducing pressure on the roads.
- SANRAL has made significant progress in its road projects around the country with nine construction projects valued at R18 billion in progress, and a further eight major projects valued at R 20 billion being awarded in 2021.
- There has been significant improvement in water use efficiency over the past decade. The Presidential Infrastructure Coordinating Commission (PICC) and Department of Water and Sanitation (DWS) are already taking steps towards the implementation of many NIP 2050 requirements.
- There has been good performance in digital infrastructure rollout over the past decade; by 2019, 93% of the population was covered with 4G/LTE, up from 53% in 2015. Over 85% of the population live within 10 km of a fibre access point. This coverage bodes well for NIP 2050 efforts to improve digital access for low-income communities.
- There are signs of emerging appetite and capability in South African capital markets to innovate in financing infrastructure. For example, South Africa has issued the most green bonds in Africa, with a cumulative issuance of US$2,4 billion. A growing commitment by the South African state to public-private partnerships is demonstrated in the establishment of the Infrastructure Fund. This has been structured through the Development Bank of Southern Africa (DBSA) with aim to use R100 billion of public funding over the next 10 years to crowd in private sector investment through blended finance models.

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2 INSIGHTS INTO MISSION CRITICAL NETWORK INFRASTRUCTURE

2.1 ENERGY

HIGHLIGHTS

Features of South Africa's energy profile by 2050

Energy supply will enable economic growth and development. The energy mix will be bolder on sustainability and in achieving least cost. Reliance on coal will be reduced and reliance on renewable energy will be dramatically lifted, especially solar and wind, which play a dominant role as part of a least-cost energy mix and where South Africa has a significant advantage. The goals are to ensure financial and environmental sustainability as well as to ensure that South African exports have lower levels of embedded carbon and hence less susceptible to planned border carbon taxes in our major trade partners.

By 2050, energy demand is projected to double. Installed generation capacity will therefore need to expand, from 53 GW in 2018 to between 133 GW and 174 GW by 2050, depending on energy demand at that time. By 2030, 25 GW will have to be added to installed capacity with the requisite supportive transmission and distribution network infrastructure.

How this will be done

- The approach to defining the energy mix will become technically strong. Expanded capacity in a context of accelerated technological change and a changing energy mix requires that the institutional planning and delivery mechanisms become more adaptive, responsive and dynamic.
- The market structure will facilitate more responsive and sustainable supply. This will require stabilisation and separation of Eskom, the introduction of greater private participation and greater decentralisation of electricity supply.
- State capacity will be strengthened to effectively regulate and oversee energy delivery.
- Electricity will be delivered in a financially sustainable way.
- The transition away from fossil fuels will progress in a measurable, just and sustained manner. New installed capacity will consist primarily of wind, solar and nuclear, where South Africa has a competitive and comparative advantage.
- Industrial diversification will be promoted through energy infrastructure delivery.
- A centralised database will be maintained, with the requisite confidentiality protection, for the reporting of existing and expected generation capacity investments by market players to enable informed power system planning and investments for all stakeholders.
- Research infrastructure for using nuclear technology will be sustained through the replacement of SAFARI-1 research reactor with a Multi-Purpose Reactor (MPR) by 2030.
- Effective management of waste emanating from energy generation to support environmental sustainability.

2.1.1 The vision for the energy sector

In line with the National Development Plan (NDP), the energy sector will promote:

- *"Economic growth and development through adequate investment in energy infrastructure" (generation, transmission and distribution) and "reliable and efficient energy service at competitive rates, while supporting economic growth through job creation" by stimulating supply chains.*
- *"Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households."*
- *"Environmental sustainability through efforts to reduce pollution, reduce water usage and mitigate the effects of climate change."*

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The NDP set a target that more than 90% of the population should enjoy access to grid-connected or off-grid electricity by 2030. To realise this vision, South Africa's energy system will be supported by effective policies, institutions, governance systems, regulation and, where appropriate, competitive markets. Coal will contribute significantly less to primary-energy needs in the future, while other thermal fuels (distillate and gas) will have an important role in supporting system adequacy. Energy supply will be increasingly dominated by renewable energy resources – especially wind and solar, which are least cost and where South Africa has an advantage. Off-grid innovations such as micro-grid solutions will increasingly contribute to electrification while providing opportunities for industrialisation and empowerment where appropriate. In addition, investment in associated new industries will be promoted, such as the production of green hydrogen, green chemicals and sustainable aviation fuels.

As 11,000MW of coal baseload generating capacity is planned for retirement post 2030 and with the extent and negative impact of load shedding nationally especially when the ageing plants such as Koeberg Nuclear Power Plant in the Western Cape encounter unplanned outages, the implementation of decision 2 (on Koeberg Life Extension) and Decision 8 (on the 2,500MW of nuclear generating capacity) of the 2019 Integrated Resource Plan becomes even more pertinent).

2.1.2 Status of the energy sector in 2021

South Africa has long depended on electricity from coal-fired power stations, delivered by Eskom as a vertically integrated monopoly. In 2010, 87% of 254 TWh of power was coal-fired. By 2019, annual electricity production was 3,5% less, at 245 TWh, with coal accounting for 79% and renewables for 12%. The twin units of Koeberg nuclear power plant contributes about 1,800MW and 5% of the total energy as well as providing stability to the national electricity grid. Of the 18,000 MW of new generation capacity committed to the national Integrated Resource Plan (IRP) 2010, about one-third was from renewable energy independent power producers (IPPs) (with only half of that operational by 2020). Procurement via the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) was globally recognised as one of the leading initiatives of its kind.

The National Infrastructure Plan 2020 (NIP 2050) aims to create certainty in energy sector reforms, which are expected to address critical blockages to potential economic growth and development.

Load shedding since 2008 has been caused by a combination of factors such as delayed commissioning of new generation capacity, underperformance of existing and new-build coal generation capacity and degradation of the existing Eskom coal fleet, with the result that energy availability factor declined from 94% in 2002 to 67% in 2019. The need for regular maintenance of ageing baseload coal fleet has been a contributing factor. Nevertheless, the Koeberg nuclear power plant scheduled for long term operation beyond 2024/25, is a critical important of the Eskom portfolio and remains a cash-cow to the enterprise. The Koeberg nuclear power plant, since amortised, has been a back-bone of the national electricity grid providing reliable and cheapest electricity within the Eskom’s fleet.

Until recently, Eskom’s form had not substantially altered. Policy indecision over the past two decades has significantly contributed to Eskom’s financial demise, with its pricing not historically in line with depreciation, constraining its ability to retain earnings for future investment. Eskom has declined from a world-leading utility to one that is financially unsustainable, operating at very low levels of energy availability and struggling under the load of poorly designed and project-managed new mega coal projects and the absorption of intermittency costs emanating from off-take agreements for renewable energy.

Sector reform that introduces competition and alternative funding models will be essential going forward: this is for energy security, as well as financial sustainability in energy, for the fiscal stability and for the economy as a whole. It is for this reason that the ring-fencing of Koeberg nuclear power station within the Eskom portfolio is proposed for associated revenues

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to provide the necessary capital fund for future nuclear new build programme. Providing alternative funding models, a portion of c/kWh generation from Koeberg nuclear power station should be directed to funding of research and development for advanced and innovative nuclear energy system such as small modular reactors that are currently attracting global interest in terms of ease of deployment, modular approach to construction, alternate coolant used as opposed to water especially in the midst of climate change impacts on water scarce regions.

Significant strides have been made in addressing challenges at Eskom, as evidenced by the unbundling of the entity into separate Generation, Transmission and Distribution divisions with ring-fenced balance sheets and governance structures. The Transmission division is on track for separation by the end of 2021, giving life to an independent transmission entity.

The lifting of the licence limit for embedded generation from 1 MW to 100 MW is another recent show of government's commitment to market reform and to ensuring electricity supply is available for customers.

There are meant to be two long-term plans issued and regularly updated to guide energy investments. The IRP provides guidance on forecast electricity demand, indicates how that energy demand will be served and at what cost. The National Energy Regulator of South Africa (NERSA) is required by the Electricity Regulation Act, No 4 of 2006, to issue rules designed to implement the IRP. It is meant to be a living document, updated every two years. The Integrated Energy Plan (IEP) is meant to guide infrastructure investments for the entire energy sector, consider all viable energy supply options and guide the selection of appropriate technologies to meet overall energy demand. The National Energy Act, No 34 of 2008, requires the Minister of Mineral Resources and Energy to develop the IEP and then review and update it annually. An IRP 2010–2030 was published in 2011 and then updated in 2019, still with a horizon to 2030.

The approach to electricity planning needs to be substantially strengthened to meet changing demand and supply conditions more effectively, as well as to enable global technological advancements and delivery options. It is also important for the PLEXOS energy planning and modelling tool to be benchmarked and compared with other integrated tools that takes into consideration total system costs (plant-level costs and grid level costs) to level the playing fields for different sources in the energy mix as opposed to the narrow least cost approach. The NDP's electricity sector reforms related to planning, decision-making, institutions and delivery models continue to be relevant in this regard.

The IRP 2019 projects energy demand and supply to 2030, and the Council for Scientific and Industrial Research (CSIR) extended the IRP's view to 2050.[3] This assists us to envisage a longer-term result of current plans. The IRP 2019 energy mix sees a falling but still significant role for coal, and a growing role for gas, so that 'dirty power' accounts for 40% of installed capacity by 2030 and includes plans for 'new coal' and peaking gas. By 2050, this path would see coal and gas respectively accounting for about 27% of the energy mix. In contrast, a least-cost path would see coal and gas respectively accounting for about 15% of the energy mix. Storage is very lightly recognised in the IRP2019, whereas it accounts for over 7% of installed capacity in a least-cost scenario by 2050. By then, about 57% of installed capacity would be accounted for by solar and wind as compared with 40% in an extended IRP 2019 view.

The IRP 2019 will need revision and updating to adequately account for the pace of global innovation and cost reductions realised in the renewable energy sector in determining the least-cost electricity plan for the country. Moreover, South Africa is a signatory to the Paris

3 Wright, J and Calitz, J (2020). Systems analysis to support increasingly ambitious CO_2 emissions scenarios in the South African electricity system. Technical report prepared for Meridian Economics. Available at: https://researchspace.csir.co.za/dspace/bitstream/handle/10204/11483/Wright_2020.pdf

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Agreement, under which the world aims to achieve net zero greenhouse gas emissions by 2050. The role of nuclear energy in achieving net-zero emission goals cannot be over emphasised as it is evident in some countries of the G20 that already have Paris Agreement compatible plans and are aggressively deploying or considering ramping the share of nuclear in the energy mix such as France (operating about 58 nuclear power plants) and Canada, Ontario. Seeing that no economy of the world can be powered wholly from renewables, there is room for co-existence of baseload energy source such as nuclear and renewables in so called hybrid energy systems wherein the baseload energy source would kick in to fill the demand /supply curve when intermittent renewables are not available. The shift to a least-cost path that is increasingly reliant on renewables is imperative for four main reasons:

- South Africa cannot afford to overspend while dramatically expanding capacity.
- Renewables can be built quickly and in modular form, thereby avoiding many of the challenges associated with mega projects.
- Trade partners are expected to increasingly impose border carbon taxes, harming South African exports.
- South Africa has committed to emission reductions as a global citizen and will need to demonstrate this commitment to access green finance.

The energy sector globally is experiencing the fastest rate of technological change and innovation ever in history, with significant growth in private participation at all stages of the value chain. However, it should be stated that the markets are indicative of lower costs of clean nuclear energy with the introduction of Small Modular Reactors, this is a game changer in the future energy planning as the latter reactors could also be used in hybrid systems for hydrogen production, industrial process heat and in water desalination. There is clearly appetite in the South African private and public sectors to leverage these opportunities for a course correction.

Scaling-up Energy Efficiency interventions in South Africa is definitely considered one of the most promising solutions to ensure energy security in the country and achieve rapid, ambitious and cost-effective emission reductions. Without the introduction of Energy Efficiency interventions on the demand side, the country will continue to ‘oversize’ the necessary specifications for installing Renewable Energy technologies on the supply side, which is an expensive, wasteful and very inefficient course of action to take.

2.1.3 Conditions required to ensure that the electricity sector delivers on South Africa’s 2050 vision

The significant transformation of achieving least-cost sustainable electricity in quantities that fuel economic development and growth will require public institutions that are responsive and that enable competition and private participation.

The IRP must adequately incorporate the rapid pace of change in the global energy sector, especially in a post-Covid-19 context that has seen a rapidly accelerating global energy transition.

Five conditions must be met to achieve the 2050 vision for the electricity sector:

1 The reform of the energy sector must be sustainable and progressive.

- Sector policy and regulation must become forward-looking, become aligned with global energy transition leading practice and ensure access to energy for all South Africans.

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- There must be recognition of South Africa's commitment to climate mitigation in line with the Paris Agreement, as well as the importance of remaining competitive in this emerging global context.
- Energy markets must be opened and competitive, with reformed state utility functions focused on ensuring robust national infrastructure energy networks.

2 Best-practice energy services must be in play, ensuring globally competitive economic growth.

- Global technology learning curves must be leveraged to ensure benefits as well as lowest-cost energy and quality of supply for South Africa.
- A robust national grid capability must be developed, enabling rapid and deep penetration of renewable technologies, including development of storage.
- The full cost of electricity, including externalities, must be accounted for in regulated pricing.
- Energy efficiency measures must be given high priority.[4]

3 There must be a pivot to a low-carbon energy sector, including a just transition.

- There must be a significant migration from South Africa's aging fossil fuel asset base to renewable technologies that lower the levelised cost of electricity and supports a low-carbon pivot for the economy.
- South Africa should embrace the global recognition of nuclear as a clean energy source as already acknowledged in the Nuclear Energy policy of 2008 and the IRP 2019 and take cue from economies of the world that are already compliant with the Paris Agreement on Climate Change through either aggressive deployment of nuclear (planned or installed). The lifecycle GHG emissions from nuclear are comparable with those of intermittent renewables.
- Low-carbon technology pathways that attract foreign direct investment and stimulate economic activity – such as accelerated rollout of significant renewables capacity, electric vehicles and, in the longer term, green hydrogen – should be accelerated.
- There should be consideration of thermal fuels (distillate and gas) as a key enabler to support system adequacy in the transition from coal to renewable power and industrialisation.
- Significant support must be made available to enable the energy transition for communities and companies.

The transition from the IRP 2019 to a least-cost energy mix currently looks like the figure below. This picture needs to be painted to be more accurate through a benchmark and comparison exercise with the use of energy planning and modelling tools that are integrated in approach to include total system cots as opposed to narrow least approach. This is indicative of conditions in 2020 and would have to be updated at least every two years.

[4] Energy efficiency reduces potential electricity demand, and must become significant contributor to the NIP's effort to promote environmental and financial sustainability. This is particularly done by ensuring that new and existing buildings are as energy efficient as possible and that the materials used in their construction are also lighter and less carbon intensive. Global evidence shows that building and construction account for about 38% of global greenhouse gas emissions, related to energy consumed directly and the materials and services used in their construction.

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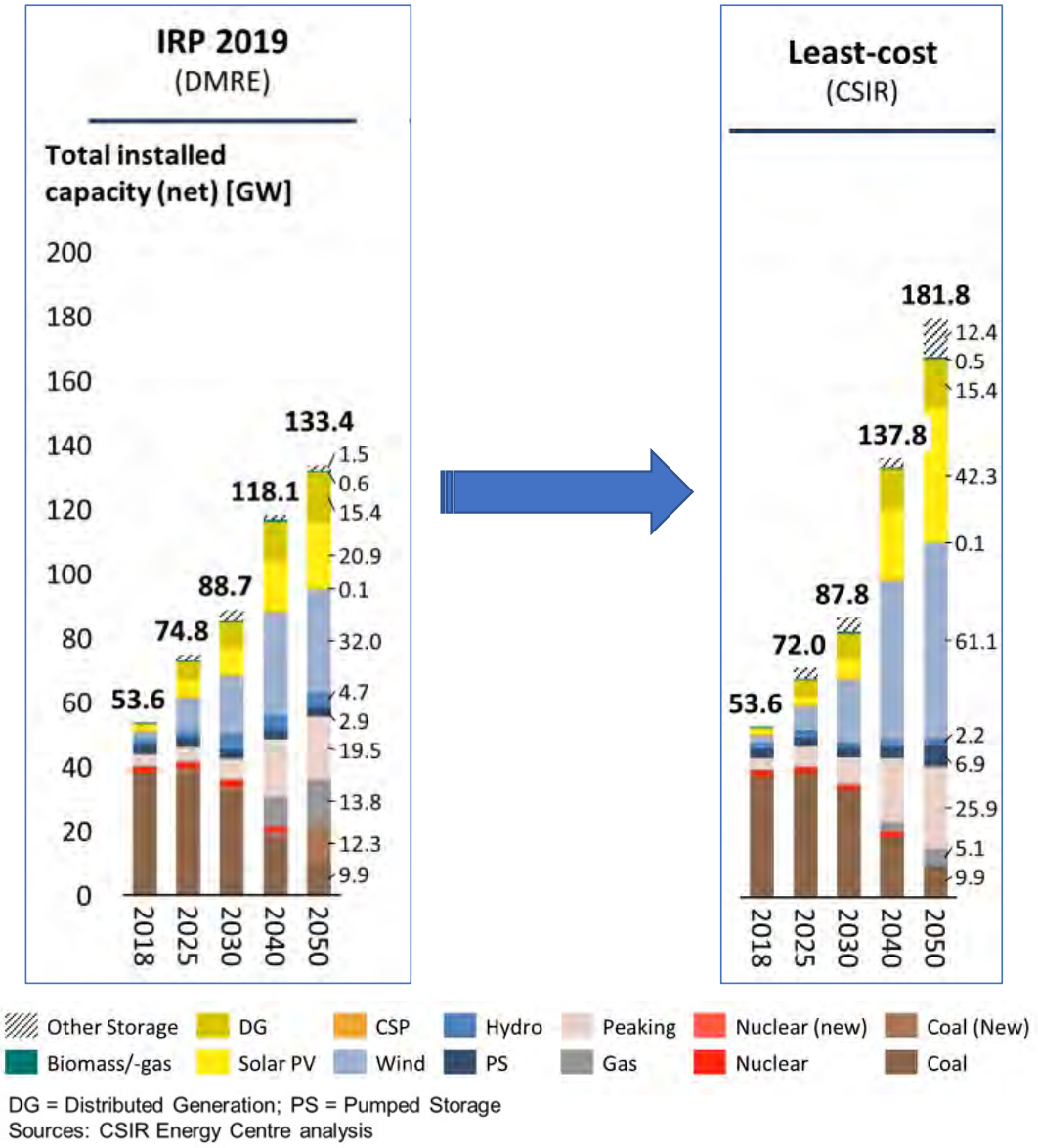

DG = Distributed Generation; PS = Pumped Storage
Sources: CSIR Energy Centre analysis

4 Access to energy sector opportunities must be enabled.

- Clear, consistent and complementary energy, environmental and industrial policies and regulatory frameworks should incentivise investment and optimises local content and private sector opportunities in the transformation of South Africa's energy sector asset base.
- New technologies and multiyear capital programmes should enable state companies, new local industries and local business to empower youth and create new-age skills and digital capabilities.

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5 State institutions must be capable in driving energy sector reform and delivery.

The regulator (NERSA) must be strong, capable and responsive, and a policy department (the Department of Mineral Resources and Energy – DMRE) must guide and support energy sector reform and delivery. At a minimum this requires the following:

- Eskom's generation, distribution and transmission functions must be separated into legally separate entities.
- Consideration must be given to ring - fencing Koeberg and PBMR technology to form one generation company for effective implementation of the successful Nuclear New Build Programme.
- Eskom must be stabilised financially and operationally, with clarity for its role as a vibrant contributor to an emerging energy sector achieved.
- State oversight must be designed simply. Functions and mandates must be clearly delineated according to proper governance rules.
- The Eskom board must be appointed based on independence and skills as required to strategically guide the organisation.
- Planning systems must be regularised and integrated into policy planning and execution on a regular basis. In addition, reliance on a single energy planning tool (PLEXOS) should be avoided and rather multiple tools be deployed to introduce integrated and holistic modelling approach that take into consideration wider parameters such as total system cots as opposed to narrowing to least cost approach.
- NERSA capacity must be strengthened and decision-making must be independent
- State entities responsible for management waste emanating from energy generation (e.g. National Radioactive Waste Disposal Institute) must be supported to develop and implement technologies to ensure environmental sustainability. examples include the Centralised Interim Storage Facility for spent fuel, and clean coal technologies.
- Energy innovation in the area of sustainable, green energy solutions and the efficient use of available energy resources are two key components that can assist in mitigating the current energy and infrastructure challenges in the country. The South African National Energy Development Institute's (SANEDI) efforts of the promoting awareness and uptake of green energy in South Africa, through a number of strategic programmes should be accelerated. SANEDI is well positioned to make a significant and critical contribution to the rising energy and associated challenges in the country.

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2.1.4 How the 2050 vision will be achieved

Strategic element	2050 Vision – How it will be done
The approach to defining the energy mix becomes technically strong	• The vision and pathway will be identified for the energy mix to 2050, with a focus on sustainability and lowest lifecycle cost. • The energy capacity planning process will be pursued with a techno-economic approach. • Security of supply at least cost and considering total system costs and other externalities such as environmental considerations will become paramount. • Energy projects become increasingly modular and more geographically distributed.
Market structure comes to enable supply that is more responsive and sustainable	• Competition will be stimulated where appropriate, starting with the establishment of an independent transmission entity in 2021/2. A Distribution System Operator will be established to enable distributed energy resources integration, smart grid and enable competitive energy markets. Consideration will be given to transition of the independent transmission entity to a publicly owned company, which in turn, removes need for sovereign guarantees for IPPs. • Multi-markets will be stimulated, with centrally procured IPPs selling to the grid and other IPPs selling to traders or qualifying customers; there will be an introduction of electricity consumers acting as suppliers. It is noted that central procurement may bear a lot more risk than the liberated market and appropriate regulation will be considered to transition to a market. • There will be clarity in the construction of electricity tariffs in respect of generation and transmission. • The independent transmission entity will ensure there is regular market-serving data available such as on system flows. • The inclusion of nuclear energy systems in the Green Taxonomy is essential to ensure that a low carbon future can be attained and net- zero is realistically achievable on a fair playing field.
State capacity is strengthened to effectively regulate and oversee energy delivery	• Capacity in the DMRE will be strengthened in respect of policy coherence, stability and leadership. • Energy planning capacity and link to policy planning will increasingly work with independent centres of energy planning excellence. • Build capacity within the DMRE for energy planning and modelling to benchmark and compare with the of independent centres. • The IRP will be extended to 2050. It will be reviewed on a regular basis (at least every two years) to be adapted to new circumstances, while still offering certainty to stakeholders. • The appointment of regulators will be done in a way that enables NERSA to operate independently, with a transparent appointments committee. Clear criteria will exist for qualifications and experience, which should include some regulators with regulatory economics capability. • An appeal process similar to that found in the Competition Act, No 89 of 1998, will be created to strengthen accountability for regulatory decisions. • Systems of accountability will be introduced to ensure DMRE and NERSA are implementing planning, rulemaking and regulating according to legislative requirements (as set out in the ERA and NERA).

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Strategic element	2050 Vision – How it will be done
	• SOE capacity will be strengthened, starting with stable and capable top executive and boards appointed according to acceptable governance norms. • Municipal capacity to maintain distribution systems and billing will be strengthened.
Electricity is delivered in a financially sustainable way	• Blended finance models and private participation in energy infrastructure projects will become a prominent source of energy finance. • Eskom finances will be stabilised and the Eskom corporate model serves long-term sustainability in respect of Eskom and the sector in which it operates. • Revenue collection will be strengthened. • Ring-fence the Koeberg nuclear power plant portfolio within Eskom Enterprises so that generated revenues provide capital fund for nuclear newbuild programme. • A short-term solution will be found to ensure that companies that pay for electricity in municipalities that do not in turn pay Eskom are not shut off. • Externality costs will be internalised in the pricing of electricity. • New and innovative revenue streams will be sought. • Pricing policy will reflect costs of investment and operations and reduce reliance on the state to underwrite or provide guarantees for new capacity. There will be a move away from government guarantees towards assessing new forms of guarantees, such as performance guarantees. Clarity will be given in respect of planned models such as a BOT, concessions, sales and leasebacks, amongst others, so that there is a well understood and fair sharing of risk. • Energy efficiency will be given high priority, with the aim of promoting continuous improvement in regard to new and existing buildings and construction. • The introduction of private sector participation in electricity distribution through long term grid concessions with SLAs will be considered as an option.
The transition away from fossil fuels progresses in a convincing and just manner	• Reliance on coal will be significantly reduced and the reliance on renewable energy dramatically lifted, especially in solar and wind, where South Africa has a significant advantage. • Consider both repurposing and retrofitting baseload coal fleet with advanced and innovative baseload nuclear energy systems that can be deployed inland which provide an opportunity for reskilling and retention of the existing coal workforce. • Incentives will encourage transition and discourage resistance to this change. • Green finance opportunities will abound. • Stakeholders involved in traditional energy sources (business, workers, communities) and coal plan decommissioning will be supported through the energy transition. • The Just elements of the Just Energy Transition will be prioritised.
Energy infrastructure delivery stimulates industrial diversification	• Manufacturing and services related to energy delivery will be stimulated ultimately due to the predictability and certainty of investment in renewable energy. • Digital services will become the norm across the sector (advanced metering, distribution system monitoring, etc). • Energy diversification opportunities will be found in sectors such as green hydrogen, electric vehicle manufacture, and mining needed for new technologies including rare-earth mining for batteries and similar.

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Strategic element	2050 Vision – How it will be done
	• Innovation in related products and services will be stimulated to the point that they become leaders globally. • Infrastructure will be supportive of green energy diversification. The Green Hydrogen Society Roadmap that was re-endorsed by Cabinet in Sept 2021 will be pursued, with the Department of Science and Innovation's partnership with the private sector in the Hydrogen Valley initiative being one example of programmes giving life to this agenda. Critical infrastructure will include sufficient renewable energy, energy storage, hydrogen pipeline distribution networks, hydrogen refuelling mobility infrastructure and port infrastructure for hydrogen and hydrogen derivative exports. • The Energy Diversification opportunities in nuclear does result in establishment of waste management solutions such as the centralised Interim Storage Facility for spent nuclear fuel, which then contributes to environmental sustainability.
There is a comprehensive database of energy projects	A centralised database will be maintained, with the requisite confidentiality protection, for the reporting of expected generation capacity investments by market players to enable transmission and distribution planning.
Top-priority Strategic Integrated Projects (SIPs)	• **SIP 8** includes green energy projects, including procurement of renewable energy under the REIPPPP. • **SIP 9** includes the expansion of electricity generation capacity, including that from Kusile and Medupi, with attention to reducing the carbon footprint being given. • **SIP 10** includes the expansion of electricity transmission and distribution network. • **SIP (no 20)** includes the following: o Emergency or Risk Mitigation Power Purchase Procurement Programme (2,000 MW) – national. o Embedded Generation Investment Programme (EGIP) (400 MW) – national. • **The energy SIPs will be augmented as outlined in the three-year actions below.** • With the 2,500MW of nuclear generating capacity as provided for by Decision 8 in the 2019 IRP and same being identified in the Economic Recovery and Reconstruction Plan of Government, consider designating the project as a SIP • Replacement of the SAFARI-1 reactor with a Multi-Purpose Reactor by 2030 will be crucial to sustain and grow South Africa's leading role in medical isotopes production and research and development in almost every industrial and scientific field including energy.
Three-year actions	• The IRP 2019 will be revised to extend to 2050 and the medium-term targets will be updated and revised in 2021/2 and in 2023/4, with focus on sustainability and least cost. The IEP will be finalised. • Eskom will be restructured into three legally separated entities for generation, transmission and distribution. The independent transmission entity will be established by 2021/2. An energy planning centre of excellence will be established in 2022. • The commitment to lift the licence limit to 100 MW self-generation will be implemented in 2021/2. This will include distribution infrastructure with a focus on electrification through micro-grids to drive industrialisation and localisation. There will be a central database of projects to enable effective planning, especially of transmission and distribution infrastructure.

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Strategic element	2050 Vision – How it will be done
	• The process of appointing NERSA councillors will be reviewed to ensure independence. An appeals process will be created to ensure accountability for regulatory decisions. • SOE leadership capacity, starting with Eskom, at board and executive levels will be according to acceptable governance norms by 2022. There will be an approved plan to stabilise Eskom as well as a turnaround pathway to long-term viability and vibrancy. • At least 10 non-delegated municipalities that deliver to large populations and that demonstrate significant challenges will have support and/or capacity to adequately maintain distribution systems and billing systems. They will be chosen on the basis of demonstrated political commitment, and support will be contingent on performance (see page 12). • There will be a plan to reduce reliance on coal including a just transition by 2021/2, with meaningful implementation beginning 2022/3. • Plans will be finalised in respect of thermal fuels (distillate and gas) to enable associated infrastructure planning in ports, pipelines, terminals and storage, and potentially refining infrastructure of bio-derived fuels. • Progress in implementing the SIPs by 2023/4 will include the following: o There will be procurement of about 5 GW power from renewable IPPs annually, through regularized bi-annual scheduled bid windows. o 800–1 000 MW battery storage will be procured by 2023/4, of which 513 MW battery storage procured by 2022. Substantially more is required, with targets determined in 2021 and added to SIPs. o Municipalities will be enabled to procure power from IPPs. o Target for embedded generation investment will be increased to 4 500 MW by 2030 o SIP 9 accelerated to be completed by 2023. o SIP 10 accelerated, with a national plan for transmission and distribution infrastructure investment finalised and funded in 2021/2, with implementation beginning in 2021/2. o A green hydrogen strategy finalised by 2022/3. o The Feasibility Report, Basic Design, site License and Environmental Impact Assessment for the Multi-Purpose Reactor will be completed by 2024, and the project will be at a shovel ready stage.

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2.2 FREIGHT TRANSPORT

HIGHLIGHTS

Features of freight transport by 2050

Freight transport will facilitate domestic and cross-border movement across supply chains to enable industrialisation, diversification, trade and development. It will deliver to its three roles in supporting economic and industrial progress, enabling rural development, while ensuring environmental objectives are met in respect of the reduction of emissions, congestion, accidents and waste.

How it will be done

- Transport policy will be integrated and oriented around supply chain needs and the mix will drive efficiency. Transport services will become aligned with best practice, ensuring globally competitive economic growth.
- The reform of the freight transport sector will be done in a way that is sustainable and progressive. The market structure will become competitive.
- State institutions will become increasingly capable of driving transport sector reform and delivery.
- Funding and finance will be increasingly sustainable and makes optimal use of opportunities to attract private finance.
- Africa regional transport networks will support interregional trade and better connectivity to global supply chains.
- Transport hubs will stimulate industrial diversification and clustering.

2.2.1 The vision for freight transport

The NDP envisages a freight transport sector that facilitates domestic and cross-border movement across supply chains to enable industrialisation, diversification and trade and development. To do so, it will be efficient, reliable, resilient, financially sustainable and consistent with a low-carbon future. The NDP envisaged "*smooth flowing corridors linking its various modes of transport (road, rail, air, seaports and pipelines)"* to ensure that industrial supply chains are globally competitive and make the best use of available infrastructure platforms.

Part of this effort includes upgrading and modernising the infrastructure networks, particularly for rail and ports, to improve predictability and reliability, reduce costs and enhance intermodal linkages. Shifting to intermodal solutions will lift pressure off the road network, reduce carbon emissions and reduce transport costs. A reformed transport system must support a reorientation of production away from the apartheid legacy of a spatially separate economy and enable the industries of the future. It must also enable Africa regional trade and investment.

The freight system will be comprised of globally competitive supply chains for all industries and sectors that enable industrial diversification and trade growth. A number of strategic challenges confronting the freight system will be addressed by improving cross-border trade corridors, shifting long distance freight from road to rail and improving maritime connectivity. This will reduce the cost and carbon intensity of supply chains, while also increasing supply chain speed and reliability.

The state oversees the transport system and as such must have the competence, information gathering, planning facilities and the necessary leadership to achieve these goals. Outside of natural monopolies, competition will be promoted to give customers choice, spur innovation and reduce the need for economic regulation. Government will enable an appropriate regulatory framework and associated licensing mechanisms to enable this to happen.

Some of the elements in this vision include:

- An integrated, efficient freight transport system covering rail, road, ports and aviation that supports industrial progress.

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- Supply chains and logistics that are optimised to counterbalance the competitive disadvantage in unavoidable costs of an economy that is small relative to the country's land mass, and far away from foreign markets, making South Africa a spatially challenged country.
- Globally competitive supply chains for key industries and sectors such as mining, fuel, manufacturing, agriculture and others that enable economic growth, industrialisation and diversification.
- Economies of scale in export channels that minimise cost and improve competitiveness.
- A Durban hub port connections with dominant international shipping flows that reduce the cost of container exports from the region to global trading partners.
- Rural and developing commercial farmers, miners and producers that can reach domestic and international markets easily and competitively.
- A step change in logistics services for non-traditional export sectors and agriculture.
- Intermodal hubs that become core elements of logistics and industrial clusters and drive economies of scale to reduce costs.
- Institutional reform that makes freight transport more dynamic and adaptive as well as enables a wider investment base.
- Alternative fuel options that are studied, with standardised solutions for classes of freight vehicles adopted and institutionalised (battery size, type, highway in-motion charging, road catenary system, hydrogen powertrains and refuelling infrastructure).
- The flow of goods between South Africa and key African trade partners that is facilitated by road, rail and ports networks, South Africa's non-traditional manufactured exports to the African region growing by at least 10% pa, and regional industrialisation being stimulated.
- Logistics costs as a percentage of gross domestic product (GDP) that are less than 10%.

2.2.2 Status of the freight transport sector in 2021

South Africa is a country that has a disproportionately large land mass and coastline. Rail freight transport tends to favour traditional basic mining and minerals industries. Road is the main transport mode for higher-value goods. The country faces built-in comparative disadvantage in its distance from global markets and the challenges of Africa regional trade arising from poor logistics infrastructure in the continent. This intensifies the importance of delivering super-competitive logistics since it is one way to counterbalance this disadvantage. It is one of the few cross-cutting factors that is within our power to do and that would help myriad newer industries. It is estimated that 'waste' alone (such as inefficiency in ports and intermodal connections) creates a 10,5% elevation in the cost of trade logistics.

The freight transport system has served traditional industries relatively well. However, it has not sufficiently improved service to non-traditional industries and agriculture – the sectors meant to drive future growth, dynamism and employment creation. Rigidity is partly explained by an institutional context of state monopoly provision, very limited private participation, and weak regulation. Policy integration between modes of transport has been limited, in a context where multimodal transport is essential, particularly in the industries that are meant to drive South Africa forward.

The freight transport network is sufficient in the sense that there is a mature road, rail and ports network. From an installed-network perspective, South Africa's road, rail and port network benchmarks well. However, the transport mix does not support an efficient result, mainly because of poor efficiency, quality, positioning and pricing in rail, ports and rural and district roads. Intermodal transport connections are hardly present.

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Freight traffic in South Africa is dominated by road use, with around 63% of tonne-kilometres (tkm) of all freight moving on road. If ring-fenced export machines such as the bulk export lines are removed, the figure is 90% of tonne-kilometres on road. While not all freight rail is suitable, there is significant potential to shift from road based to intermodal solutions, particularly on the corridors linking the major cities in South Africa.

Major road corridors are overly congested, often suffering from overloading, and are a major contributor to South Africa's carbon emissions. Axle load regulations on the primary network are now increasingly enforced: SANRAL has now set up weighbridges on national routes that saw about 5.6 million heavy vehicles screened in 2020/1, working with local law enforcement authorities to impose penalties for overloading. The rural road network is limited and outdated. Further, the rural road network in some areas carries large volumes of minerals that should be on rail – something for which it was not designed.

The combination of excessive freight demand, caused by long transport distances, and inefficient supply, due to modal imbalance and infrastructure deterioration, causes transport costs to be higher than in competing economies.

Rail has an important role to play in a low-carbon freight system.

SA has the most comprehensive freight rail network in Africa, all in the domain of Transnet. Even though South Africa's GDP is 0,4% of global GDP, 2% of the global rail network is in South Africa. Rail is currently very competitive in a number of segments, particularly in the export of bulk minerals, where a number of growth opportunities exist. In most other market segments, goods are transported by road, especially in supply chains linked to activities meant to contribute to South Africa's future industrial profile. The envisaged road-to-rail migration of freight has not materialised, leading to higher costs, congestion and carbon emissions.

The reforms in freight rail transport outlined in the NIP 2050 have begun with some initial significant steps. Recent examples are the following:

- Transnet Freight Rail (TFR) is introducing third-party operators into its branch network through concessions and is preparing the ground for the introduction of the third-party operators into the main lines in the future.
- To do so, TFR is implementing a process of commercially separating rail infrastructure from operations. This will ultimately enable the railway to formulate tariffs for third parties. This was an essential action for Telkom previously to enable wholesale-retail separation, and is also essential for Eskom's divisional separation. TFR will complete this accounting separation by the end of 2021. It will complete its commercial separation in 2022/3.
- TFR is also developing a hook-and-haul service offering to encourage private wagons. Private wagons are predominant in Russia and in North America, two very large and successful freight rail markets.

Ports are critical connection points to the global freight system.

South Africa has a relatively well-developed port system, with specific regulation under the National Ports Act, No 12 of 2005. High port tariffs and relatively low efficiency, as benchmarked globally, harm South Africa's competitive positioning and hamper further diversification in South Africa's trade.

South Africa's port efficiency generally lags global averages, which is adding to the high cost of logistics and is eroding the competitiveness of South Africa's economy through the elevated total cost of transport. Many of these problems have been attributed to the monopolistic nature of port operations for key segments such as container terminals and automotive terminals, which are provided by Transnet Port Terminals. Steps must be taken to promote a more competitive environment in port terminal operations.

The reforms in port services outlined in the NIP 2050 have begun, starting with the commitment to establish the Transnet National Ports Authority as an independent subsidiary

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of Transnet, in line with the National Ports Act No, 12 of 2005. This will require the end of cross-subsidies between rail and port operations and will ensure the ring-fencing of port charges for reinvestment in the port system.

For the container freight system, international container shipping prices is a key limiting factor to the competitiveness of export-focused manufacturers, domestically and regionally. High prices are largely a function of three drivers: weak maritime connectivity, terminal efficiency and challenged hinterland connectivity caused by port congestion. Consolidation of container volumes and massively improving vessel turnaround at a 'hub'-focused port would drive improved connectivity and attract larger vessel sizes that now dominate global trade. This would over time reduce the price of container shipping and facilitate improved transhipment and feeder services to neighbouring ports in the region. Terminal competition should promote terminal efficiency and port congestion to the hinterland, which will also be improved by capitalising on the existing rail connections into ports.

Three key interrelated strategic actions are envisaged to enhance South Africa's global trade positioning: a review of the investments and positioning in the Port of Durban to enhance its attractiveness as a global shipping hub, a significantly more competitive rail solution on the corridor between Durban and Gauteng, and a review of the entry point and support of the industrial base of Gauteng through more attractive locations for intermodal transfers within the province.

Transnet should explore a range of partnerships designed to improve the competitiveness of the key supply chains in which it is involved, and it has started to do so. Transnet's strategy should be directed towards improving the competitiveness, capacity and profitability of key market segments by partnering with the private sector to grow, fund and implement identified growth opportunities.

Air freight expanded five-fold between 1994 and 2012, but then declined by more than 50% to 2019. Domestic air freight has a relatively small share when surface freight is efficient. Surface capacity should nearly always suffice. Air freight capacity and processes are more important for high-value global connections.

The following are noted:

- Containerised air freight is expected to penetrate and increase in the air freight market in future. Research is required into the future potential industrial development that will support demand for air freight, especially around the major air freight hubs in Gauteng, Cape Town and eThekwini.
- Planning for air freight capacity has been focused on the OR Tambo International Airport, the Cape Town International Airport and the new Dube Trade Port at the King Shaka International Airport. Space constraints at the OR Tambo International Airport will become a problem within the planning horizon.
- The freight village concept should include airports, but with more expansive modal integration than, for instance, the Dube Trade Port.

South Africa's perspective on the freight system has to extend beyond its own borders and assume a more regional concern. Deeper regional economic integration is a critical foundation pillar for any post-covid-19 economic plan. For South Africa to enjoy reconstructive, transformative and inclusive growth, it is necessary for the region and continent to prosper. In this respect, particular attention has to be given to the efficiency and effectiveness of cross-border infrastructure networks, reducing truck standing time at borders, and increasing regional road, rail, maritime and air connectivity.

Cross-border production networks have yet to fully blossom in Africa and as a result intraregional trade is low. Part of the reason is the absence of good-quality cross-border infrastructure networks (and services) for road, rail, sea and air travel. The development of

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such networks can stimulate intraregional trade while its absence tends to make trade impossible.

Freight transport across Africa has tended to follow historical colonial imperatives that sought to extract minerals with their north-south direction from the northern hinterland (as far north as the Congo) through southern ports, especially Durban. There are efforts, albeit very slow to implement, to create more future-oriented regionally integrated freight transport networks. There are indications that South Africa may be losing ground in these processes.

There are a number of reasons that South Africa should instead be a 'vanguard' in the effort to ease the flow of goods across Africa, given that African markets are the most significant destination for South Africa's manufactured exports. There is mutual advantage to promoting a thriving interconnected region, which will become an even more important source of trade in the context of the African Continental Free Trade Area (AfCFTA).

At the most basic level, there are significant delays at important border posts such as Beitbridge and Komatipoort, with long-standing but unrealised commitments to improving their efficiency. By example, the border post elevates the cost of transporting one truck between Johannesburg and Harare to more than double the cost between Johannesburg and Cape Town, despite Harare being 15% closer.

2.2.3 Conditions required to ensure that freight transport delivers on South Africa's 2050 vision

Four conditions must be met to achieve the 2050 vision for freight transport:

1 The reform of the freight transport sector must be sustainable and progressive.

- Sector policy and regulation must be forward-looking and aligned with "Transport 4.0". This aligns freight transport with Fourth Industrial Revolution (4IR) principles, eliminating waste and fostering growth through the dynamic linking of the cybernetic and physical world, encouraged and supported by relevant policy and regulation.
- Transport markets must be liberalised to enable competition and private participation, with reformed state utility functions focused on ensuring robust national infrastructure transport platforms.
- Points of production and consumption should be brought closer together, mitigating South Africa's spatially challenged position.
- Freight transport systems and supporting infrastructure should be supply-chain-centric and stimulate industrialisation, diversification, inclusive business, agriculture and regional and global trade.

2 Transport services must be in line with best practice, ensuring globally competitive economic growth.

- The freight system must be designed around customers' needs, with greater focus on understanding supply chain performance for key customers and industries such as fuel importers, export-focused manufacturers, domestic-focused manufacturers, farmers and similar.
- Efficiency should be optimised in three ways:
  - **Systemic change** – shifting from road to rail, and seamless synchromodality.
  - **Logistics improvements** that reduce the number of kilometres per task, eg leveraging productive freight villages and maximum use of freight capacity.

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- **Technical improvements** that render more efficient kilometres, eg new drive trains, driver training, infrastructure use culture shifts. These reduce cost as well as carbon emissions.

- Global technology should be leveraged to ensure benefits as well as lowest-cost transport. Technological and digital solutions must be integrated into transport infrastructure investments There is preparation underway for hydrogen-powered vehicles and EVs.

- There must be a shift to a more optimal transport mix, with more freight transported by rail and deeper investment in intermodal linkages and supporting transport hubs. It is envisaged that the ratio of road to rail will transform the current deficit of 40 billion tkm on road that should be on rail as follows:

Split of freight transported by road and rail in South Africa (billion tkm)

	Road	Rail
Current split	164	141
Current optimal split	124	181
30-year target	239	276

Source: Prof Jan Havenga, University of Stellenbosch

- Intermodal connections should facilitate optimal transport decisions. Intermodal hubs such as freight villages should enable modal shift, improve logistics, counter the intermediate scattering of supply and demand, and enable technology deployment. Decisions and Master Planning on the locations of these hubs are critical to city planning processes.

3 Africa regional transport networks must support interregional trade.

- Border posts must be efficient and larger to accommodate well-designed freight villages.

- South Africa should be at the vanguard of efforts to create more future-oriented regionally integrated freight transport networks, actively participating and leading regional trade and investment-facilitating transport routes in road, rail, air and sea.

4 State institutions must be capable in driving transport sector reform and delivery.

- A strong, capable and responsive regulator and policy department must be capable of guiding and supporting transport sector reform and delivery. Policy positioning and regulatory frameworks must be clear and consistent, creating incentives for private investment and optimising local content.

- Transnet must be financially and operationally sustainable, with clarity for its role as a vibrant contributor to an emerging transport sector.

- State oversight must be simply designed. Functions and mandates must be clearly delineated according to proper governance rules.

- Planning systems must be regularised and integrated into policy planning and execution on a regular basis. Planning must be bolstered by robust information systems and evidence.

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2.2.4 How the 2050 vision will be achieved

Strategic element	2050 vision – How it will be done
Transport policy is integrated and the mix drives efficiency	• Transport policy will be integrated in its vision for rail, road, aviation and ports and oriented around the needs of supply chains. • Points of production and consumption will be driven closer together. • All rail-friendly freight transport currently on road will shift to rail. Road will carry lighter, high-value and time-sensitive cargo, with the balance moved by rail through effective intermodal corridors. • The 26% of rail-friendly freight (as found in 2021) of mainly palletised long-distance freight will shift off road. These proportions may change over time. • Half of the 12 billion km driven by trucks (as found in 2021) will shift off road, with 25% eliminated by modal shift and 25% reduced with better logistics. • The shift from road to rail will be implemented by appropriate investments in rail and road (primary, district and rural) that encourage the switch, improved terminal densities, attention to product uniformity in palletised freight services (with freight villages, consolidation processes to pallets and containers, and bulk handling) and a policy regime that commits to 'the user pays' principles and externality charging. Incentives to business to encourage the shift from road to rail may be considered for temporary period. • Ports will be integrated into freight transport corridors, linking into a small number of mega hubs and 20–30 associated nodes, including privately developed freight villages and dry ports.
Market structure is competitive	• Private participation and competition will be stimulated, starting with ports and rail.
State capacity is in place to effectively regulate and oversee freight transport delivery	• A centre(s) of transport planning excellence will be promoted. • Transport regulation will be integrated and strengthened, starting with the Single Transport Economic Regulator (STER). • Department of Transport (DoT) technical capacity will be strengthened and leadership will be stabilised.
Funding and finance are sustainable	• Blended finance models and private participation in transport infrastructure projects will be stimulated and prevalent. • Transnet will become sustainable financially and operationally. Finances will be transparent and cross-subsidies will no longer be found between port and rail, acting as one enabler of change in pricing and encouraging private participation. • Revenue collection will be strengthened and become more robust. • The transition will be made to lower-price and higher-volume rail and ports. • SANRAL financial pressures will be addressed as demand for new roads are eased.
Industrial diversification is stimulated	• The transport investments will be driven in a way that promotes jobs and industrialisation in supplier industries.

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Strategic element	2050 vision – How it will be done
through transport hubs	• Special Economic Zone (SEZ)-type developments will surround intermodal linkage nodes. These will be owned and driven by local authorities and/or privately with private investment and monetisation: o "Super hubs" (freight villages, ports, dry ports and border posts). o Logistic service centres and intermodal terminals. o Rural hubs.
Regional logistics enable manufactured exports	• Regional transport systems will be developed that lift trade and investment. A clear, concrete and transparent plan for freight transport will be created, with concrete projects developed, financed and implemented. This will include upgrading of critical cross-border roads, rail and ports, as well as freight hubs and villages, in a network that optimises efficiency in support of regional value chain development and trade. • Regional shipping will be promoted to create new freight corridors and to support the development of regional load centres for containers. • Amongst other things, this will include the North-South Corridor linking Durban and Dar es Salaam, and the development of regional ports linked to multimodal surface and maritime transport networks. • Six ports of entry will be redeveloped as one stop border posts by 2025, including Beitbridge, Lebombo, Maseru Bridge, Kopfontein, Oshoek and Ficksburg.
Top-priority SIPs	**SIP (no 2) includes:** The Durban-Free State-Gauteng logistics and industrial corridor. This includes strengthening logistics and transport corridors between the main industrial hubs, improving access to Durban's export and import facilities, integrating the Free State industrial strategy activities into the corridor, establishing Durban as a hub port and an aerotropolis around OR Tambo Airport. **SIP (no 5) includes:** Saldanha-Northern Cape development corridor, including integrated rail and port expansion and back-of-port industrial capacity. **SIP (no 21) includes:** • Road upgrading or maintenance of the N1, N2 and N3 in the Free State, Limpopo and KwaZulu-Natal. • Small Harbours development – national. • Boegoebaai Port and Rail Infrastructure Project – Northern Cape. **The SIPs will be augmented with the following priorities:** • Review of the balance of SIP projects to reflect that the role of road will change in freight transport. • The development of critical strategic projects to facilitate the integration of rail, roads, ports and freight villages within South Africa and across Africa into key trade and investment partners.The development of a national freight intelligence system that includes detailed origin and destination data for different commodities and modes between districts, imports, exports and long-term forecasts to inform planning. • Implementation of emergency measures turnaround decline in the Durban port, Natal corridor and Gauteng link.

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Strategic element	2050 vision – How it will be done
	• The protection of rail freight assets [and Passenger Rail Agency of South Africa (PRASA) assets that rail freight requires] from further decline and waste through vandalism.
Three-year actions	• Transnet Freight Rail will implement accounting and commercial separation by 2022/3, providing a sound basis to evaluate and accommodate third-party rail operators into the future. • The independent National Ports Authority will be established by 2022/3. • A 25-year plan for integrating rail, road, ports, intermodal hubs and freight villages to facilitate freight handling for key sectors of the economy will be finalised by 2022/3. SEZ projects will be framed to leverage industrialisation opportunities. Private-sector-led implementation of intermodal hubs will begin in 2021. • A regional freight transport plan with top-priority projects connecting rail, road and ports with freight hubs will be developed by 2022/3. Amongst these priorities will include South Africa's role in the North-South Corridor and the exploration of the development of a regional ports network linked to multimodal surface transport. • A centre of transport planning excellence will be established in 2022/3. • The STER will be established in 2022. • The balance of SIPs transport projects will be reviewed with the expectation that the pressure of freight on the road system will fall. • With a view to integration, the Port Master Plan, the National Rail Policy and the Road Funding Policy will be finalised. There will be stakeholder consultation in the process to ensure alignment to social and economic needs. • Six ports of entry will be redeveloped as one stop border posts by 2025, including Beitbridge, Lebombo, Maseru Bridge, Kopfontein, Oshoek and Ficksburg.

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2.3 WATER

HIGHLIGHTS

Features of water infrastructure by 2050

The NDP envisages universal and reliable access to water of an acceptable quality and quantity in support of a strong, inclusive economy and a healthy environment by 2030, a commitment that is sustained thereafter. This will be supported by an efficient, resilient, well-managed, and sustainable integrated national bulk water supply system that responds to the economic needs of the country. The institutions involved in managing water resources will be effective in achieving this objective.

How it will be done

- Decision-making will be accountable and the institutions involved in managing water made effective.
- Water resource planning will become proactive, robust and responsive.
- There will be coherence in water sector policy and support for implementation at the municipal level.
- Capacity to finance and deliver water projects will be strengthened, and the private sector will be used effectively. The water sector will become financially sustainable.
- Existing water infrastructure will be rehabilitated and maintained and water use efficiencies improved.
- Ecological infrastructure will be protected.
- Regulatory oversight and licensing regimes will become more robust, addressing both water quantity and quality, as well as pricing and the technical performance and financial sustainability institutions.
- Roles and responsibilities will be aligned and consultation will be meaningful.
- Cross-sectoral cooperation for planning and managing water efficiently will be put in place. For example, a transition to renewables in the energy sector will make significant volumes of potable water available for other uses.

2.3.1 The vision for water infrastructure

The vision for the water sector, set out in the NDP, is for universal and reliable access to water of an acceptable quality and quantity in support of a strong inclusive economy and a healthy environment.

The draft National Water and Sanitation Master Plan identifies key elements necessary to achieve this vision: resilient and fit-for-use water supply; universal water and sanitation provision; equitable sharing and allocation of water resources; effective infrastructure management, operation and maintenance; and a reduction in future water demand, protecting and restoring ecological infrastructure[5] and addressing declining water quality.[6]

2.3.2 Status of the water sector in 2021

South Africa can be characterised as a water-scarce country, with low rainfall and high variability, with increasing uncertainty as a result of climate change, including higher risks of drought in some regions. Only 10% of land area accounts for 50% of river water, supporting more than 64% of the economy, and 70% of irrigation water and more than 50% of the population. About 35% of South Africa's annual fresh renewable water resources have been

[5] Ecological infrastructure, for the purposes of this document, is defined as functioning natural ecosystems that 'catch' and supply water in and from the important water catchments.

6 The National Water and Sanitation Master Plan has not yet been approved by Cabinet.

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exploited to date. It may be possible to increase this to about 45% but new freshwater schemes will become increasingly expensive.

Water is essential to life and to supporting economic activity, including the operation of numerous industries. In this context, sound management of water resources is critical to supporting economic growth and well-being. Without timely and effective interventions, attempts to ensure a decent life for all will be undermined.

According to the National Water and Sanitation Master plan, in the absence of timely interventions, the demand for water will exceed the available supply at the planned level of assurance by between 1,6 billion and 2,7 billion cubic metres by 2030, a deficit of around 10% to 15% of required water.[7] Without significant changes in how water is managed, this deficit will continue to grow, with an increasing constraint on investments, job creation and economic growth. There is a high risk of water restrictions being imposed in all of South Africa's metropolitan areas over the next five years, with restrictions currently in place in six of the eight metros. Current estimates indicate that seven out of 13 major water systems could be in deficit in 2040.[8] Although interventions have been identified for all the major water systems, decisions and implementation have been delayed.

Addressing South Africa's water management challenges will not get easier.

Water demands will continue to grow as a result of economic growth, urbanisation and rising standards of living. Non-agricultural water demands are projected to increase by more than 40% between 2020 and 2050, much of this driven by an increase in demand for water in urban areas. Simply to maintain current crop yields, irrigated water use (which accounts for 60% of current use) may need to grow by 6%[9]. Increases in irrigated area will need to be achieved through a combination of expanded water availability and more efficient use of existing water use rights. Water use in South Africa's urban areas is high and there are high levels of non-revenue water and water losses.

Water quality is declining in the rivers and wetlands are being degraded as a result of increases in pollution from urban, industrial, mining and agricultural activities, reducing water availability and increasing treatment costs. Of particular concern is the poor state and performance of wastewater treatment plants. Many plants are under-capacity and have been poorly maintained.[10] This has significant economic impacts, particularly for downstream users.

Changes in temperature and rainfall patterns are anticipated due to climate change, resulting in increases in evaporation and greater uncertainty in the amount and distribution of rainfall.

Robust government planning systems and execution capability are especially critical in this context of growing demand, limited and increasingly costly supply interventions, increasing water quality challenges and higher levels of uncertainty as a result of climate change.

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7 The national reconciliation of demand and supply needs to be updated. The estimates provided are uncertain.

8 The 13 major water systems refer to the Vaal, Orange River, Crocodile West (Rustenburg), Western Cape, KwaZulu-Natal Coast, Olifants, Limpopo (Polokwane), uMhlathuze/Richards Bay, Levuvhu & Letaba, Algoa (NMB/Gamtoos), Amatola (Buffalo City), Mangaung and Mbombela (Crocodile East) water supply systems. The first three systems accounted for over 70% of water use in 2020. These three systems are interconnected and the overall system is at risk until Phase 2 of the Lesotho Highlands Water Project is completed (now due in 2027, after delays). Further significant augmentation will be necessary over the planning period to 2050. The Western Cape Water Supply System is also at risk until new sources of water are commissioned (surface water, groundwater, reuse and desalination) over the next 10 years and beyond. The Nelson Mandela Bay system is currently in crisis. A significant new augmentation scheme is needed to supply eThekwini and surrounding regions.

9 Cullis et al (2017).

10 South Africa has internationally recognised legislation for environmental flow requirements and DWS has made progress in undertaking reserve studies and developing resource quality objectives (RQOs) to protect critical ecosystems. Implementation is now required, particularly where it comes to water quality issues as well as managing EWR releases and ensuring compliance (ie preventing illegal pumping).

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The NIP 2050 addresses specific gaps in government's water resource planning capacity. This capacity and associated institutional memory have diminished and water system reconciliations are out of date. Important supply interventions have experienced significant delays and efforts to improve water use efficiency have had mixed success.[11] Transparency and accountability in decision-making related to measures to balance water supply and demand have declined and there is contestation between spheres of government that appears to hinder progress in critical interventions.[12]

The legally mandated National Water Resources Strategy (NWRS 2013), the water sector's equivalent of the IRP in the energy sector, urgently needs to be updated. A proper census of water resources needs to be done urgently and regularly updated. Information provided at a national level on water requirements, the quantity of water available and the resulting water balances can be seen as only indicative, as they are based on outdated information.

Water systems are both local and interconnected. Current institutional arrangements must be altered so that there are catchment management agencies with devolved mandates set up with appropriate boundaries.[13]

Much of irrigated agriculture water use, which accounts for about 60% of South Africa's water at a lower level of assurance, does not compete directly with stressed and higher-cost water systems serving the power generation sector, industry and the major urban areas.[14] Irrigated water quality requirements are also lower and much of this water is sourced from return flows. Nevertheless, there is scope for further water use efficiency improvements. For example, the large government irrigation schemes reported an average water loss of 27%, which is above unavoidable seepage and evaporation losses in concrete canals of about 12%.[15]

Mining, which accounts for about 2% of water use, has a major impact on water quality, affecting the availability and cost of water. Particular concerns are degradation and acidification[16] of current or potential water supplies, the licensing backlog, illegal mining and corruption in licensing processes.

Water supplied through municipal-managed systems accounts for about 30% of water use. This use includes domestic, industrial, commercial and institutional use. The vast majority of this use is in urban areas.[17] It is anticipated that urban water demand may increase by 43% by 2050. The water business is poorly managed in many municipalities, with high levels of water losses, low reliability of supply, weak revenue collection, poor financial performance, inadequate maintenance and replacement of assets, and deteriorating services.

Very significant investments are needed in the rehabilitation of existing infrastructure as well for providing for additional capacity for both water resources infrastructure (for which national government is responsible) and the water services infrastructure (for which municipalities are

11 Water demand in Cape Town was reduced by about 50% during its drought crisis. Water use has not been effectively reduced in Nelson Mandela Bay during the current water crisis.

12 System status reports and steering committee minutes are no longer routinely available to the public. There has been a long-running dispute over the next augmentation scheme to supply the Mangaung metro.

13 For example, the integrated Western Cape Water System straddles both the Berg and Breede River catchments that are overseen by separate institutions. The Berg River is managed by DWS (as a "proto-CMA") and the Breede by the Breede-Gouritz CMA.

14 There are some exceptions. The Western Cape Water Supply System serves both urban users (mainly Cape Town) as well as irrigated agriculture. Illegal irrigation use in the upper Vaal extracts expensive water from the Lesotho Highlands Water project.

15 According to the draft National Water and Sanitation Master Plan.

16 Including the phenomenon of acid mine drainage related to gold mining on the Witwatersrand.

17 Water supplied to households living in rural areas accounts for a small fraction of total municipal use nationally.

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responsible). The capacity of the sector to support the financing of these investments is weak as a result of low water tariffs, high levels of non-revenue water and weak revenue collection.

However, the corner is turning in the use and management of water resources:

- South Africa has a set of well-developed, integrated water supply systems that are, on the whole, well adapted to South Africa's unique water challenges. These need to be well maintained and expanded as is appropriate in response to growing demand. The National Water Policy and National Water Act, No 36 of 1998, have been acclaimed internationally as providing a sound basis for water management. The Lesotho Highlands Water Project offers a good model for international cooperation on shared water resources.
- There have been meaningful improvements in water use efficiency by some water use sectors, and the DWS is driving the effort to succeed through further savings and efficiencies.
- Water for power generation, which accounts for an estimated 2,5% of water demand at present, has been steadily declining and the transition away from coal to renewables will significantly reduce water demand for energy production.
- Companies using water in their industrial processes have become more efficient and have played a leading role in initiatives promoting water stewardship.[18] Direct industrial use accounts for about 3% of total use.[19]
- South Africa is a world leader with regard to investing in ecological infrastructure, through the Working for Water programme, wetland rehabilitation and other invasive-alien-clearing programmes, and is pioneering direct potable reuse in Beaufort West and Cape Town.
- Hydrology and reconciliation studies for all the major systems and a national water balance study have been commissioned. Studies to define and implement water resource quality objectives have been initiated and the National Climate Change Strategy is being updated.
- In April 2021, the Presidential Infrastructure Coordinating Commission (PICC) Council approved actions that would address many of the institutional challenges, mostly through the DWS. Furthermore, an Inter-ministerial Committee is being established to improve coordination on water and sanitation. The approved actions include the following:
    - Fast-tracking the establishment of the National Water Resource Infrastructure Agency. In this regard, a critical path for its establishment has been developed and resources allocated.
    - Attending to the backlog on water licensing, with a commitment to providing an answer to licence applications within 90 days.
    - Establishing catchment management agencies.
    - Establishing an independent national water regulator and separating regulation from water resource management and water services provision.
    - Developing a transparent national water tariff policy and a rigorous revenue collection or management strategy at all stages of the water value chain to ensure sustainable revenue for the water sector, and fast-tracking the review of the Raw Water Pricing Strategy to ensure effective pricing and cost-reflective tariffs.
    - Enabling the planning and coordination function of the water component of the District Development Model through the implementation of a national water

18 For example, the CEO Water Mandate (https://ceowatermandate.org/developer/sasol/).

19 Use that is not included as part of municipal (urban and domestic) use.

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programme management office, jointly owned by the DWS and Department of Cooperative Governance and Traditional Affairs (COGTA).

- o Strengthening the preparation and planning of municipal water infrastructure to enable so that blended finance can be accessed in the Infrastructure Fund.

2.3.3 Conditions required to ensure that the water sector delivers on South Africa's 2050 vision

There are seven critical conditions that need to be in place to achieve the 2050 vision for the water sector:

1 Water resource planning capacity must be proactive, robust and responsive.

- Water resources planning must be proactive, programmatic and well-resourced, informing strategy and implementation.
- Data informing planning must be comprehensive and up to date.
- Planning must be done with recognition of the local characteristics, complexity and interconnectedness of major water systems.[20]
- There should be cross-sectoral cooperation to optimise national water use.

2 Decision-making must be accountable and institutions effective.

- Institutional accountabilities and mandates must be aligned for effective decision-making.
- There must be accountability for building water security and resilience in each major water system and at the municipal level.
- Decision-making must be transparent and water users should be able to provide inputs into the decision-making processes.
- Institutional mandates and roles and responsibilities should be clearly defined.
- Leadership in key institutions – government (national, provincial, municipal), regulators, Trans-Caledon Tunnel Authority (TCTA), water infrastructure agency, water boards, water service providers, water user associations and other irrigation institutions – must be capable and stable.
- Management must be effective, and human resources capability must match roles and responsibilities.
- Revenue sources must be sufficient and sustainable.
- Institutions must become soundly governed, open and transparent.
- Institutions must regularly achieve clean audits.

3 Capacity to finance and deliver water projects must be robust, with the private sector being used effectively, and the water sector must become financially sustainable.

- Financing and implementation arrangements must be clear for all priority projects and execution capacity must be robust.
- Private sector capacity must be effectively used to contribute skills and financing and to improve sector efficiencies.

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20 For example, the seven major dams in the Integrated Vaal River System need to be managed as an interconnected system to increase security of supply and reduce evaporation losses.

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- Revenues from tariffs, together with secure and predictable government budgets, must be sufficient to finance and fund the necessary capital expenditure and meet efficient operating costs.
- Robust procedures must be in place to review, set and approve tariffs in the water sector through the full value chain.
- Conditions must be created for the increased use of commercial finance in the sector.

4 Existing water infrastructure must be rehabilitated and maintained and water use efficiencies improved.

- Institutions involved in managing water infrastructure must pay as much attention to the maintenance and rehabilitation of existing infrastructure as to the creation of new infrastructure.
- Water leakages must be addressed.
- Asset management best practices must be implemented.
- Effective use must be made of the private sector to increase institutional capacity to operate and maintain infrastructure.
- Non-revenue water must be significantly reduced and overall water use efficiency improved.
- Irrigation water use efficiencies must be improved where appropriate, especially in water-stressed systems.[21]

5 Ecological infrastructure must be protected.

- Institutional responsibilities must be clarified for the protection of key natural ecosystems supplying the major share of South Africa's water.
- Reserve requirements should be enforced and resource quality objectives implemented.
- Financing mechanisms to support ecosystem protection and rehabilitation must be established.

6 Regulatory oversight and licensing regime must become robust.

- Local government and national legislation should be aligned.
- The water allocation and licensing processes must become just, equitable, predictable and stable.
- Sufficient professional and administrative capacity must be created and maintained for the sector's important economic regulation and licensing functions.
- Regulatory and licensing administrative processes must be effective and efficient.

7 Roles and responsibilities must be aligned and consultation meaningful.

- Roles and responsibilities of all role players should be well aligned, from the line department, catchment management agencies (CMAs), regulator, TCTA, National Water Infrastructure Agency, water boards, water user associations, water services providers, private sector and social partners.
- The consultative processes must be deep and meaningful.

21 There are areas where low capital-intensive irrigation makes sense and water use efficiencies will be lower.

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2.3.4 How the 2050 vision will be achieved

Strategic element	2050 Vision – How it will be done
The institutions involved in managing water are effective	• Executive leadership in DWS, the water boards and other institutions managing water will be stabilised and appointed based on capability. • The National Water Resources Infrastructure Agency will be operational and robust. • There will be an infusion of management capability into the sector, resulting in the turnaround of municipal water businesses (financial and technical performance), financial viability (revenues matches expenses), reduction in non-revenue water and water losses, and management of demand. There will be a particular focus on the top 12 municipalities accounting for 65% of urban water demand. • Irrigation systems will be rehabilitated and maintained and water use efficiencies improved.
Water resource planning is robust and enables responsiveness	• The legally mandated **National Water Resources Strategy** will be updated every five years. • A robust water resources planning, regulation and management monitoring framework will be established. • The collection, analysis and accessibility of hydrological, rainfall and other base data will enable effective planning and adaptation. • Monitoring information will be transparent and accessible to the public and researchers; will be useful in informing policy, strategy and implementation; and will be published regularly is accessible formats. • Climate change mitigation and adaptation will be integrated into water resources management at national, catchment and water system levels. • Steering committees will be functioning, representative and transparent. Users will participate in governance of catchment management agencies and in steering committees overseeing water systems. Processes and decisions will be transparent and feedback loops for effective remedial and corrective actions will be in place. • Water use policy for agriculture will be clear and enable agricultural production, water use efficiency, fair distribution of the water resource and cost recovery.
There is coherence in water sector policy and support for implementation at the municipal level	• A National Water Programme (NWP) that acts through a PMO centre of excellence will be established to support water and sanitation project development and implementation at the municipal level. • Key expertise and support will be housed and developed, in partnership with universities, centres of learning and research entities. • The NWP PMO will house advanced capability in blended finance solutions for water projects, especially at the municipal level. This will draw together public sector, private sector and development finance for funding of water and sanitation projects. • The NWP PMO will work with government's Infrastructure Asset Management Programme, once it has been established in 2022, which is intended to assist municipalities with planning, budgeting and executing asset care and management responsibilities. This will enable the extension of life of assets as well as the efficient replacement and renewal of existing assets.
Decision-making is accountable	• Institutional accountability will be created at the level of the major water systems (and not by individual catchment).

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Strategic element	2050 Vision – How it will be done
	• Systems will be established to oversee, make, implement, monitor and report on decisions on critical-path items to build water security and resilience in each major water system. • Active steering committees will be maintained for each major water system, with user involvement, transparent decision-making and public reporting of minutes and status reports.
Capacity to finance and deliver water projects is robust, and the private sector is used effectively	• Key interventions will be identified for each major water system, and programmes and projects to implement these interventions will be clearly specified. • Capacity will be created to support effective planning and implementation of wastewater treatment expansion and rehabilitation, water reuse and desalination (because these will increase in importance over time). • The most promising opportunities for expanding food production through irrigated agriculture will be identified, and programmes and projects to implement these interventions will be clearly specified. • A national priority project pipeline will be maintained and regularly reviewed. • Dedicated capacity will be created to support effective use of the private sector for project implementation, including the use of development and commercial finance, especially for wastewater treatment, reuse and desalination projects. • Programme and project decision-making and implementation progress will be tracked and reported regularly in an accessible way to the public.
The water sector is financially sustainable	• The raw water pricing strategy will be finalised: cost recovery, infrastructure financing, irrigation subsidies, waste discharge charges and water resource management charges (and how these are used) will be addressed. • Norms and standards will be finalised for all bulk WSPs • Raw water, bulk potable and municipal tariffs will be regulated to ensure predictable cost recovery pricing with sufficient institutional and technical capacity. • Specific initiatives to make greater and effective use of development finance institutions (DFIs) and commercial financing for the sector will be undertaken.
Existing water infrastructure is rehabilitated and maintained, and water use efficiencies are improved	• Critical national and regional water infrastructure systems will be rehabilitated and well maintained, including dam safety. • Irrigation systems will be rehabilitated and initiatives to improve water use efficiencies undertaken. Water policy and management in agriculture, accounting for 61% of water usage, will get explicit attention. There will be a step change in capabilities for continuous improvement in water use efficiency and technological innovation, monitoring of usage, tariff structures (which will be fair, predictable and efficient) and the approach to allocating water to agriculture. • Municipal water and wastewater infrastructure will be rehabilitated and well maintained, non-revenue water will be reduced and water and wastewater treatment plants will meet regulated quality standards. • Free basic water services funding formula will include the need to cover associated rehabilitation and similar costs.
Ecological infrastructure is protected	• Priority areas for ecological infrastructure will be identified. • Programmes will be developed and implemented. • A monitoring and reporting framework will be developed and implemented.

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Strategic element	2050 Vision – How it will be done
Regulatory oversight and licensing regime are robust	• Licensing administrative processes will be robust and responsive, with strong capacity in place. • The regulatory framework will be reformed to enable private participation in water provision, especially for financing and implementation of desalination, reuse and wastewater upgrade projects. • Capacity for effective economic regulation will be developed and continuously improved.
Roles and responsibilities are aligned, and consultation is deep and meaningful	• Roles and responsibilities of all role players will be well aligned, from the line department and CMA or regulator to institutions managing water infrastructure, water user associations, private sector and social partners. • The consultative processes will become deep and meaningful.
Top-priority SIPs	• SIPs (Project 19) include the following projects: o Vaal River System, including Phase 2 of the Lesotho Highlands Water Project – Gauteng. o Phase 2A of the Mokolo Crocodile River (West) Augmentation Project – Limpopo. o Olifants River Water Resource Development Project: Phase 2 – Limpopo. o Groot Letaba River Water Development Project: Nwamitwa Dam – Limpopo. o uMkhomazi Water Project – KwaZulu Natal. o Umzimvubu Water Project – Eastern Cape. o Berg River Voëlvlei Augmentation Scheme – Western Cape. o Orange-Riet Canal Increase of Bulk Raw Water Supply – Free State. o Rustfontein Water Treatment Works – Free State. o Vaal-Gamagara scheme to improve water security for mines in the Northern Cape. o Rehabilitation of the Vaalharts-Taung Irrigation Scheme – Northern Cape and North West. • The SIPs will be reviewed and potentially augmented with the following priorities: o Dam-raising projects for Tzaneen and Clanwilliam dams. o Review of projects in ensuring viability of municipal wastewater plants as has been done for Emfuleni. o Expansion of the Sundays River subsystem and other projects to serve Gqeberha. o Water supply augmentation for Mbombela, Mpumalanga.
Three-year action steps	• The National Water Resources Infrastructure Agency will be established and functioning in 2023/4, providing direction to bulk water and national water security. • An independent single national water regulator will be established in 2022/3. Regulation to enable private participation will be implemented by 2023/4. Water tariffs will be regulated by an independent water regulator that will be established in 2022/3 and regulate tariffs by 2023/4. The National Water Resources Strategy is being updated in 2021/2. • The water licensing backlog will be addressed.

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Strategic element	2050 Vision – How it will be done
	• The raw water pricing strategy will be finalised in 2021/2. • The NWP PMO is being established in 2021/2 to support municipalities, with partnership agreements signed and functioning. The NWP Centre of Excellence for blended finance solutions in water and sanitation will be established and housed in the NWP PMO in 2021/2. A water planning centre of excellence for municipalities will be established in the NWP PMO in 2022/3 with legally mandated functions. The NWP PMO will build capacity in planning and implementation of municipal level wastewater treatment, non-revenue-water, water reuse and desalination, and will be finalised in 2021/2. Implementation will begin in 2022/3. Government's municipal infrastructure asset management programme will be established in 2022/3 by COGTA or Municipal Infrastructure Support Agent (MISA). The NWP PMO will work with government's Municipal Infrastructure Asset Management Programme and assist municipalities with planning, budgeting and executing asset care and management responsibilities. • A strategy for climate change mitigation will be finalised in 2022/3. Aspects of ecological infrastructure will be addressed and included in the scope and mandate of the NWP PMO. • A policy for water use in agriculture will be gazetted in 2022/3, after public consultation in 2021/2. • All major water systems will have active steering committees established, which committees will engage with users. • At least 10 non-delegated municipalities that deliver to large populations and that demonstrate significant challenges will have support and/or capacity to adequately maintain distribution systems and billing systems. They will be chosen on the basis of demonstrated political commitment, and support will be contingent on performance (see page 12). They will be assisted with technical and financial capacity to achieve acceptable levels of financial viability in water delivery and a meaningful reduction in non-revenue water. • The SIP water project priority list will be updated to be aligned with the NIP 2050 in 2021/2. The following applies: o The water SIPs will be reviewed for their viability. They will be subjected to cost-benefit analysis applying robust methodology and in a transparent way. o Reconciliation strategies for the four major water systems that serve large populations will be updated and finalised in 2021/2. This will include the Vaal, Orange and Crocodile West (Rustenburg) Rivers, which account for 70% of water use, and the Western Cape system, which is severely at risk. Reconciliation strategies will be finalised for the other nine water systems in 2022/3. Implementation in the first four water systems indicated will be underway by 2022/3. o Targets for a minimum number of irrigation systems to be rehabilitated and maintained from 2021/2 to 2023/4 will be set. At least two irrigated agricultural projects aimed at food production will be identified in 2022 and driven to implementation by 2023.

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2.4 DIGITAL COMMUNICATIONS

HIGHLIGHTS

Features of digital communications infrastructure by 2050

Communications are the lifeblood of a market economy, and digital communications are increasingly central to that. The increasingly foundational role of digital transformation means that the benefits of becoming a fully digitally enabled society and economy outweigh the costs.

The NDP envisages that, by 2030, a seamless information infrastructure should be universally available and accessible, at a cost and quality at least equal to South Africa's peers and competitors.

While South Africa is far off the NDP's goals in 2021, the 2030 goals must stay. There is evidence of sufficient capacity to deliver on these objectives if they are implemented through private-public cooperation.

How it will be done

- High-speed broadband will be universally accessible.
- Regulation will enable competitive and universally accessible broadband.
- Public sector capacity will be strong and able to drive the required policy agenda.
- Partnerships will be strong and there will be centres of digital excellence promoting a growing knowledge base of delivery and innovation.
- The information and communications technology (ICT) skills base will be robust.
- Government services and buildings will be digitally enabled.
- Private sector participation in achieving universal broadband access will be prevalent.

2.4.1 2050 vision for digital infrastructure

Communications are the lifeblood of a market economy, and digital communications are increasingly central to that. The increasingly foundational role of digital transformation means that the benefits of becoming a fully digitally enabled society and economy outweigh the costs.

The NDP envisages that, by 2030, a seamless information infrastructure that is universally available and accessible, at a cost and quality at least equal to South Africa's peers and competitors. There should be continuous improvement thereafter.

More specifically, by 2030, 100% of the population should have easy access to affordable broadband of at least 10 Mbps. All government buildings should have high-speed broadband of at least 100 Mbps, and where relevant participate in leveraging this to underserved areas and communities.

The vibrancy of private investment in telecommunications and digital infrastructure, products and services will be continuously encouraged. There will be an ever-growing ability to forge public-private partnerships in the development and delivery of digital solutions, always at the cutting edge of global capability as relevant for South African society and economy.

Government will be enabled to strengthen the delivery of services digitally, and the private sector will evolve innovative digital solutions that create ever-increasing access by low-income communities to commercial and social services.

While South Africa is far off the NDP's goals at 2021, given the increasingly essential nature of connectivity, the 2030 goals must remain in place. There is evidence of sufficient capacity in South Africa to deliver on these goals if they are coordinated and implemented through private-public cooperation.

2.4.2 Status of digital infrastructure delivery in 2021

There has been good performance on infrastructure rollout over the past decade. South Africa performs well in global digital infrastructure indices. For example, by 2019, 93% of the

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population were covered with 4G/LTE, a dramatic improvement from 53% in 2015. Urban areas were fully covered with 4G/LTE and most provinces had rural coverage of 4G/LTE exceeding 80%.

In 2013, 86% of the population lived within 10 km of a fibre access point. Since then, there has been further fibre rollout, including to base stations in the delivery of LTE. Nevertheless, fibre tends to be located in urban areas, with significant network duplication.

International bandwidth usage more than doubled between 2016 and 2018, enabled by competition in international submarine cables that expanded capacity and reduced prices.

South Africa ranks 96th and 60th globally in its fixed-broadband and mobile download speeds, respectively [see Independent Communications Authority of South Africa (ICASA), 2020, and OOKLA Speedtest Intelligence]. While fixed-broadband speeds in South Africa are uncompetitive, mobile upload and download speeds compare favourably with those of BRICS and many other peer countries.

Between 2015 and 2019, there was investment in telecommunications of about R177 billion, driven by the private operators (ICASA, 2020). The public sector has lagged rather than led in this domain. This poor progress in digital inclusion is due to the network high prices even as the network is available, and the last mile is required for lower-income communities and to public services.

However, **digital access is poor**. This does not contradict the previous statement: While there is excellent broadband availability across the country, it is not easily accessible to most households in a way that would indicate meaningful digital connectivity.

South Africa performs poorly in global indices on demand-side indices such as internet use, skills and digital awareness. This is the main explanation for South Africa's slippage down the International Telecommunication Union (ITU) ICT Development Indices from 78th to 92nd (of 192 countries) between 2002 and 2018. For example, government had targeted connecting 90% of the population with at least 5 Mbps by 2020. There was significant improvement in the percentage of the population with access to a cell phone, rising from 76% in 2011 to 90% in 2018. While broadband access improved, its accessibility was still poor. The percentage of households with at least one person who had access to the internet rose from 33% to 64,7%, almost completely explained by mobile connectivity. Only 10% had access to internet in the home and/or an internet café or school facilities. Internet penetration varies significantly by region, where, as an example, 75% have some connectivity when compared with 46% in Limpopo[22].

The majority of mobile subscribers are prepaid, at a cost significantly higher than with postpaid. For example, in 2020 the cost of 1 GB of prepaid data was about R100 to R120 – more than double that of postpaid data, at R40 to R79[23].

There has been very **poor progress on digital enablement of government services**. Broadband has the potential to enhance the provision of government services, including e-health, e-education and e-government. Importantly, the digitisation of government services could be used to improve the quality of service delivery, reduce costs to the fiscus and access marginalised and remote areas and communities. E-services have the potential to reduce the cost of living of citizens, for instance by reducing or eliminating the need to travel and queue

[22] Statistics South Africa (2017). Poverty trends in South Africa: An examination of absolute poverty between 2006 and 2015. Available at: http://www.statssa.gov.za/?p=10341.

[23] ICASA (2020). The State of the ICT Sector Report in South Africa 2020. March 2020. Available at: https://www.icasa.org.za/uploads/files/State-of-the-ICT-Sector-Report-March-2020.pdf.

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for many government services. They could offer a key accountability and feedback loop mechanism through real-time data tracking and other methods.

State capacity in ICT is weak in respect of design and procurement. There has been institutional instability across the ICT state institutions – ministers and directors-general have changed almost annually over the past 12 years. This frequent change in leadership has caused disruption and discontinuity, resulting in delayed implementation and learnings have been lost. Policy levers that could have been used to drive pricing down and stimulate the industry, like spectrum, have been delayed and therefore their benefits not realised. There have been high expectations of ICT SOE delivery to roll out broadband and digital services across government [amongst others, the State Information Technology Agency (SITA), Broadband Infraco (BBI) and Sentech], but SOEs do not have the capacity nor scale to deliver as needed. Funding has also been a major constraint to faster deployment of broadband.

After a number of false starts in implementing South Africa Connect (2013), the National e-Government Strategy and Road map and the National e-Strategy (2017), attention shifted to piloting broadband rollout to public buildings in National Health Insurance sites located in eight district municipalities and seven provinces. This was to be implemented by BBI and SITA. This 'Phase 1' was initiated in 2017/18 and was meant to connect 6 135 government buildings but to date has connected only 970 government sites – mainly clinics and schools. A further 35 211 government sites still need to be connected to achieve the goals of South Africa Connect. It is estimated that doing this would cost a minimum of about R30 billion and potentially up to R80 billion, depending on the pace and design of the programme. Slow delivery and constrained finances have resulted in the South Africa Connect budgets being cut dramatically, with about R 581 million allocated over 2020/1 to 2022/3.

The Universal Service Access Fund (USAF), now rolled into the new Digital Development Fund (DDF), was meant to drive an accelerated delivery of digital services to underserved communities. It has not made a mark on this goal: its expenditure is simply too small, at less than R 300 million annually, and its 2018/19 Annual Report says it failed to achieve on 90% of its objectives. It has also suffered with governance challenges similar to those found in other SOEs and was in administration.

ICT procurement is fragmented, rife with uncertainties in respect of mandates and responsibilities. The approach to investment in connecting public buildings and in enabling digital services and platforms is essential to enabling e-government and digital infrastructure expansion. The capabilities for oversight and implementation of digital public platforms are very limited. The result is that there are targets, policy frameworks, plans and commitments but very limited progress in critical deliverables. Important foundational work has been done to initiate open-data policy, government data systems, national back-office digitisation, a national ID system, and movement to a national e-government central portal. The Covid-19 pandemic has pushed some processes forward. Interesting partnerships such as those surrounding CovidConnect, CovidAlert and GovChat.org have emerged.

Most notable is the delay in digital migration and spectrum reassignment, which, once implemented, could have the effect of improving quality and reducing mobile pricing. Parts of this spectrum is also suitable for 5G coverage requirements (a key enabler for 4IR applications). This spectrum, which is in the 700 MHz and 800 MHz bands, is still in the process of being migrated from analogue television broadcasting. The regional deadline for this migration was 2015. South Africa has not released sub-1 GHz spectrum since 1993, nor mid-band spectrum since 2003.

The National Broadband Plan should have seen delivery against South Africa Connect targets, especially in respect of connecting public buildings. All schools should have been connected by 2020 but only 30% were. More information that is actionable will be needed going forward on the quality of connectivity and how it is being used to optimise service delivery impact. Other critical areas of digital rollout – such as in the commitment to interoperability of services

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and of a central government portal – will benefit from clearer road maps and better monitoring of progress and impact.

2.4.3 Conditions required to achieve the 2050 vision for digital infrastructure

Eight conditions must be met to achieve the 2050 vision for digital infrastructure:

1 There must be continuous improvement in driving towards universal readiness for a digital world, including the achievement of universal broadband access, digitisation of government services, deepening of ICT skills and capabilities, and enablement of e-commerce, digital finance and digital entrepreneurship.

2 There must be a strong and competitive base of private sector that continues to invest, maintain, upgrade and innovate.

3 A public sector broadband and digital services delivery model must effectively engage the private sector, through a growing range of innovative ways of partnering and cooperating.

4 There must be sufficient and sustainable public and private finance that enables continuous improvement in delivering universal broadband and supportive ICT services to currently underserved communities and households and to public institutions.

5 Government must have substantial internal professional and technical capability in procuring and overseeing the implementation of universal-broadband delivery and e-government services that operate at a global standard suited to South African conditions and that are continuously improving.

6 The regulator must deliver effectively in enabling progress of digital enablement and 4IR progress, including that related to competition, spectrum allocation and price regulation, amongst other areas. The regulator must be stable, independent and accountable. It should have oversight and staff with the appropriate level and balance of skill, experience and qualifications.

7 Spectrum must be treated as a national resource that is optimised for South Africa's development. It should be done in a way that supports enhanced competition as well as universal access obligations. Wholesale network services should enable sustainable services that are accessible and promote appropriate levels of competition.

8 There should be centres of excellence and think tanks that support private and public sectors to operate inclusively and innovatively to deliver on South Africa's digital imperatives in development.

2.4.4 How the 2050 vision for digital infrastructure will be achieved

Strategic element	2050 Vision – How it will be done
High-speed broadband is universally accessible	• High-speed broadband will be available in underserved areas and will be affordable and accessible to low-income communities. • Investment in last-mile connectivity, mainly through a complementary mix of wireless broadband technologies, targeting rural and underserved populations, will take place. • Lessons from South Africa Connect and universal-access initiatives will be reviewed to improve delivery and impact in future. • There will be better coordination of infrastructure projects to leverage complementary resources (such as roads or electricity).

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Strategic element	2050 Vision – How it will be done
Government services and buildings are digitally enabled	• All government buildings will be connected with high-speed broadband and have sufficient services to make the broadband usable (local area network – LAN, wide area network – WAN, equipment). • All government buildings will offer low-income users free Wi-Fi. • Government will implement the National e-Strategy and e-Government Strategy and Roadmap (2017). There will be clear role identification and approaches to ensure interoperability and data sharing. • Government e-enablement will be leveraged to promote a digital society and universal connectivity. There will be a target of 10GB to home by 2023/4 and 50GB to home by 2025/6. There will be an accelerated focus on enhancing service delivery with eHealth and eEducation. • Universal access and public sector connectivity will primarily rely on government as procurer and regulator, with SOEs and private sector implementing. The Western Cape and Tshwane offer two different examples. • Digitisation in transport, energy and water infrastructure will be prioritised as a way of modernising and strengthening efficiencies in maintenance and operations. • There will be transparent monitoring and evaluation of digital services in the public sector.
Regulation enables competitive and universally accessible broadband	• ICASA's regulatory capability will be benchmarked as the best globally. • The appointment of ICASA regulators will be transparent, with clear criteria. • ICASA will be held accountable for the quality of regulation with respect to spectrum, pricing, infrastructure sharing and similar. • There will be a robust model for wholesale data services that is effectively regulated.
Public sector capacity is strong and can drive the required policy agenda	• Government capacity to design and procure digital infrastructure and services projects will be technically sound. • There will be commitment to institutional stability, good governance and appropriate capacitation through senior appointments. • There will be attention to leveraging state infrastructure from non-ICT SOEs to enable faster deployment of broadband.
Private sector participation in achieving universal broadband access is prevalent	• The model of delivery will increasingly leverage vibrant private sector participation and blended financing. It is envisaged that R30 billion to R80 billion will be raised to finance the rollout of government broadband and services in the medium term. • There will be special vehicles promoting blended finance in public broadband infrastructure. Amongst other things, these provide incentives for de-risking private sector investments in rural areas and accelerating broadband delivery in peri-urban areas, demand-side schemes for subsidising low-income consumers' communication costs, and innovative use of unlicensed spectrum (Wi-Fi, TV whitespace). • The allowable period for public procurement of telecommunication companies (telecoms) and digital services will be lengthened, to enable private provision in ways that also deliver services to underserved communities, and monetised over 10–20 years.

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Strategic element	2050 Vision – How it will be done
	• The capability and regulatory frameworks will be strengthened to enable different forms of partnership and alliances between public and private sectors, as discussed in section 4 of the NIP 2050
Partnerships are strong and there are centres of digital excellence promoting a growing knowledge base of delivery and innovation	Globally, governments and regulators struggle to keep up with fast-moving digital trends. This is also true for South Africa. Meaningful sustained partnerships and knowledge forums will be leveraged and engage government, business and other stakeholders in a focused practical manner. These will enable governments and regulators to keep up with fast-moving digital trends and contribute to strengthening private-public cooperation and joint learning. There will be a number of formations that could serve this need, such as the Presidential Commission on 4IR (PC4IR) and/or the Public-Private Growth Initiative (PPGI).
The ICT skills base is robust	The ICT skills base will be continuously improving, creating an e-savvy nation and offering sufficient support to private and public investments. Some of the priorities include the following: • Connecting all schools by 2023, with supportive digital services in the school and in the cloud, and providing free Wi-Fi to low-income households nearby. • Centres of excellence being supported to innovate in digital teaching and learning methodology from school to post-school education and training (PSET). ICT training would need to be core in teacher professional development curriculum and in ongoing professional development. • Stronger partnerships between vocational training and industry, to ensure relevance of curriculum and pathway into digital apprenticeships and workplace learning. • The causes of poor throughput of high-quality ICT graduates being identified and addressed. • Opportunities for unemployed youth to gain digital literacy and related vocational skills being created and acting as a significant channel to work. • Critical technical skills to operate and maintain digital infrastructure being developed and available in South Africa. • Innovation in the ICT industry and testing of newer cost-effective technologies for broadband penetration taking place. • Links to international accelerator programmes through ICT organisations like ITU and GSMA to boost the youth e-readiness being enhanced.
Top-priority SIPs	**SIPs:** • Square Kilometre Array (SKA) and MeerKAT – no 16. • Space Infrastructure Hub – South African National Space Agency (SANSA) – no 22. • Digitising of government information – no 30. • South Africa Connect Programme – no 35. **Priority projects to augment the list of SIPs:** • To be augmented as listed in the 'three-year action steps' below.
Three-year action steps	• Digital migration will be concluded and spectrum will be released in 2021/2. Spectrum auction will be done with careful attention to competition objectives.

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Strategic element	2050 Vision – How it will be done
	• Policy will be concluded for rapid deployment of electronic communications networks and facilities in 2021/2. • Executive leadership of government departments, entities and the regulator responsible for digital delivery will be stabilised and appointed according to capability. • Review of approach to wholesale regulation and service provision will be done by 2021/2. The wholesale regulatory approach will be evaluated – whether a wholesale open-access network (WOAN) or promoting competition through stronger wholesale regulation and obligations tied to spectrum allocation and/or spectrum set-asides to encourage access by operators with less access to capital. • Arrangements required to enable private participation in public interest digital delivery will be in place by 2022/3. Most immediately, this will include special vehicles to promote blended finance and procurement rules that enable long-term partnerships such as the proposed Broadband Fund. • 80% of public buildings, especially schools, health facilities and police, will be connected by 2024/5, in line with the targets of government's Medium-Term Strategic Framework (MTSF). • High-speed broadband will be available and accessible in all communities by 2024/5, achieving access comparable to competitor nations . There will be consideration of free basic data for low-income users, similar to such access to water and electricity. • SIPs reviewed in 2021/2 will include e-enablement of all government buildings. Amongst others, this includes the following: o At least 80% of schools being connected by December 2022. o Local and provincial government broadband and related ICT initiatives being streamlined and rationalised, with mandates, roles and responsibilities being clarified. o The model for public-private partnerships being progressed with material impact on delivery. Government will identify three top-priority pilots where partnerships are used to introduce overarching digital modernisation. Examples are policing, health, education, water and smart cities. • Digitisation of government services will be scoped and projects identified and funded. • A data centre strategy will be finalised in 2021/2. • A satellite communications strategy will be finalised in 2021/2 and implementation will begin 2022/3. • A SKA regional digital rollout strategy will be finalised in 2021/2. • There will be consideration of smart-city policies.

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3 BUILDING A REGIONAL AGENDA FOR INFRASTRUCTURE

HIGHLIGHTS

Features of South Africa's interface with regional infrastructure by 2050

South Africa will demonstrate and execute on a bold vision for its infrastructure cooperation in the Africa region.

Initially, the vision is to enable delivery on regional projects that are critical to South Africa's domestic needs and are also beneficial to regional development. In the near term, critical energy and water projects will be implemented with greater vigour, as will the development of high-efficiency border posts. In the medium term, South Africa will be an active driver of regional transport corridors in rail, road and ports that greatly enhance the ease of regional trade. South Africa will drive regional digital connectivity. As South Africa's construction sector is invigorated (section 6) and infrastructure finance deepened, the country will play a greater role as a gateway into Africa and as a participant in delivering regional infrastructure projects and finance.

How it will be done

- Projects will progress timeously.
- Regional capacity to drive projects will be robust.
- Project monitoring will enable action.
- South Africa will gain from foreign infrastructure investment in Africa
- A financial centre of excellence will be established.
- A top-priority regional infrastructure integration strategy and project pipeline will be implemented.
- Predictability and certainty will stimulate local manufacturing in regional corridors.

3.1 Vision for regional infrastructure by 2050

South Africa will demonstrate and execute on a bold vision for its infrastructure cooperation in the Africa region.

Initially, it will enable delivery on regional projects that are critical to South Africa's domestic needs and are also beneficial to regional development. In the near term, critical energy and water projects will be implemented with greater vigour, as will the development of high-efficiency border posts. In the medium term, South Africa will be an active driver of road-, rail- and sea-based regional transport corridors that will support the development of cross-border production networks and greatly enhance the ease of regional trade. South Africa will drive regional digital connectivity. As South Africa's construction sector is invigorated (section 6) and infrastructure finance deepened, the country will play a greater role as a gateway into Africa and as a participant in delivering regional infrastructure projects and finance.

3.2 Status of regional infrastructure participation in 2021

The South African government has prioritised a number of important regional infrastructure projects such as the Inga III Hydropower involving the Democratic Republic of Congo (DRC) and the Lesotho Highlands Water Project Phase II. These will provide critical energy and water supply to South Africa.

- Inga is envisaged to create hydropower generation capacity of more than 44 GW and is one of 13 flagship projects under the Programme for Infrastructure Development in Africa (PIDA). Inga I was commissioned in 1972 and Inga II in 1982. The African Development Bank (AfDB) financed a development study in 2010 and to date has committed US$100 million in technical assistance to the DRC for potential projects of more than US$80 billion. It has received the high-level advocacy it requires, from the African Union (AU), United Nations Economic Commission for Africa (UNECA), African Union

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Development Agency (AUDA), AfDB, DRC and South Africa. However, so far there are no confirmed off-takers nor committed creditworthy developers. The memoranda of understanding (MoUs) with funders have been signed but there are no power purchase agreements. Multiple challenges exist, specifically various political, governance, procurement and technical challenges.

- The Lesotho Highlands Water Project Phase II is critical to water security as previously discussed. The water delivery system to augment water supply to South Africa is paid for by South Africa. It includes a hydropower generation system to enhance electricity generation for Lesotho paid for by South Africa. It is one of the largest development projects globally, involving complex engineering. It is therefore vulnerable to many risks, notwithstanding the delays posed by Covid-19. It is already running three to six years behind schedule.

There are other similar regional infrastructure projects that South Africa participates in, but they are not treated with similarly high priority. They are also being developed at a slow pace, belying their strategic importance for South Africa and the region. Amongst others, they include the Southern African Power Pool (SAPP), other potential regional water projects and regional digital connectivity.

Infrastructure to facilitate regional trade is also a critical NDP objective and continues to be a stated strategic objective of the South Africa Government. The majority of South Africa's manufactured exports are destined for African markets, especially into Southern Africa. The NDP sought growth of non-traditional exports of 10% per annum and expected 25% to 30% of trade to ultimately be with the region. Moreover, two-way trade and investment are critically important for South Africa and regional growth and development. South Africa, with its deep capacity, is best placed to act as a pivotal driver and contributor to the opening up of these channels.

Yet, transport infrastructure has been a binding constraint. UNECA estimates that African firms lose 13% of sales due to inefficient infrastructure, thin credit markets and a poor regulatory environment. Moreover, South Africa is losing ground and being bypassed in regional infrastructure development as previously indicated.

By global comparison, sub-Sahara Africa (SSA) has the longest time to export, the highest cost to export, and the highest cost to import from a border compliance perspective, with SSA also the poorest performer on the World Bank's Logistics Performance Index. Transport costs along Southern African Development Community (SADC) corridors are the highest in the world: For example, almost eight days is needed to cover 2 000 km from the Durban port to Lusaka. Border posts impose significant costs, adding monetary cost and time delays.

There has been significant commitment to improving productivity at the Beitbridge border post and to promoting South Africa as a hub for manufacturing and supply of rail stock for the continent.

- Beitbridge is the busiest road border post in Southern Africa, recording the movement of 5,4 million people per annum. In 2015, a PPP was assembled to redevelop it and five other posts as one-stop border posts (OSBPs) with the aim of enhancing trade competitiveness through reducing trade time and costs incurred. The Infrastructure Investment Committee (IIC) in April 2021 approved for the project to be placed on the Infrastructure Fund's blended financing pipeline. This is a prime example of the potential role of blended finance. A draft OSBP policy is expected to be released for public comment in 2021. It is also expected that a preferred bidder will be appointed in 2021, with construction and redevelopment envisaged to take three years (completion in 2024/25) based on a 20-year concession. There are a number of regulatory matters still to be addressed. For example, the development requires finalisation and enactment of the Border Management Authority Bill to clarify the role of key organs of state in

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implementation. A memorandum of agreement (MoA) must still be signed with neighbouring countries.

- There is a process to develop South Africa as a rail manufacturing hub for Africa. An AU resolution endorsed appointing South Africa in this regard. Stakeholders involved include Transnet, PRASA, the private sector, international original equipment manufacturers (OEMs) and DBSA.

There are other critical regional projects that South Africa is involved in and that should be treated with far higher priority. In particular, these relate to regional transport projects that could facilitate the movement of goods regionally via ports, rail and road with support of intermodal linkages and freight hubs. An example is the North-South Corridor Railway System. The five railway companies on the North-South Corridor have agreed to prepare a single, coordinated corridor development plan to address the modal imbalance between road and rail on the North-South Corridor. The North-South Rail Corridor infrastructure and logistics study will focus on the rehabilitation and upgrade of the rail corridor and is being financed by the SADC Infrastructure Project Preparation Fund, managed by the DBSA through the New Partnership for Africa's Development (Nepad) Business Foundation (NBF). This project will provide support to the railway corridor development plan. Its development is at feasibility stage. There is potential to promote a system of ports, facilitating sea transport with shorter overland freight transport required.

For South Africa and the region, international container shipping prices are a key limiting factor to the competitiveness of export-focused manufacturers. High prices are largely a function of weak maritime connectivity (the number and frequency of sailings to and from ports).

Consolidation of container volumes into a regional network of hub ports will drive improved maritime connectivity, both regionally and globally, and will enable new freight routes and allow manufacturers to plug into global value chains (GVCs) more easily.

PIDA has forecast significant capacity gaps across Africa's Regional Transport Infrastructure Network (ARTIN) to 2040. PIDA, the AU, the AfDB, Nepad and other actors have identified 51 programmes of regional importance across network industries that require US$360 billion to 2040. Southern Africa's share of this cost is 18,6%. PIDA's transport infrastructure plan estimates potential efficiency gains of US$172 billion.

North American and European countries play a very significant role in the finance of African infrastructure. The role of China also deserves mention, given its significant position in internationally contracted infrastructure projects in Africa. South Africa has a relatively sophisticated financial and industrial base and emerging financial partnerships such as that with Standard Bank and the Industrial and Commercial Bank of China (ICBC). In the medium term, it would be strategic for South Africa to partner with China and with North American and European nations as an African hub for regional infrastructure finance and support.

Regional infrastructure projects globally are a great challenge to implement, and progress in Africa is even more challenging. Despite broad political consensus on the need for infrastructure integration, progress on implementing regional commitments has been slow and is frequently blamed on political will, regulatory barriers and capacity constraints. The regional infrastructure project information is quite opaque and obscure, and roles and responsibilities require greater clarification.

3.3 Conditions required to achieve the 2050 vision for regional infrastructure

The following conditions must be met to achieve the 2050 vision:

1 There must be momentum in the rollout of critical regional infrastructure projects, so that they progress timeously.

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2 Regional capacity to drive projects must be robust.

3 Project monitoring must be updated timeously and enable early intervention to keep projects on course.

4 South Africa and its regional partners must optimise gains from China's involvement in Africa.

5 South Africa should establish a financial centre of excellence that supports regional infrastructure projects.

6 A top-priority regional infrastructure integration strategy and project pipeline must be implemented.

7 A New Open City Initiative should be expedited.

3.4 How the 2050 vision will be achieved

Strategic element	2050 Vision – How it will be done
Projects progress timeously	The reasons for slow progress in regional infrastructure projects will be attended to. At a minimum, this will include ensuring there is sufficient political championing of projects, and that South Africa invests in commercial diplomacy as recommended in the NDP.
Regional capacity to drive projects is robust	Capacity will be developed in cooperation with regional partners for project preparation and execution, finance and enablement of private participation.
Project monitoring enables action	Monitoring of top-priority regional projects will be strengthened, with high-quality data communicated transparently.
South Africa gains from foreign infrastructure investment in Africa, with special attention given to China	South Africa will determine more strategic partnerships with foreign national investors in African infrastructure, with special attention given to China.
A financial centre of excellence is established	South Africa will establish a regional financial centre of excellence for promoting blended project finance.
A top-priority regional infrastructure integration strategy and project pipeline are implemented	• Projects that deliver to South Africa needs are as follows: Inga and Lesotho Highlands, which are both mentioned in the MTSF and both need greater attention and are badly delayed. More active involvement is required in the SAPP, Regional Digital Connectivity and other regional water projects. • Projects to facilitate trade will be as follows: The Beitbridge border post, which will be expedited along with others in Southern Africa as part of the One-Stop Border Posts infrastructure investment programme. Strategic regional infrastructure projects such as the North-South Corridor Rail System will be elevated and/or identified and pursued such that a system of ports to support interregional trade and regional roads is established.
The New City Open City Initiative	• A Strategy and Plan of Action that will enable informed decisions related to the development of a new, open city inSouth Africa • An evaluation framework and methodology for a brief that can be used by Government to procure services related to a new, open city. The evaluation framework should ensure value-for- money; best practice in planning, design

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	and implementation; inclusive and accountable governance and delivery; innovativetechnology and operations; and stakeholder engagement.
Top-priority SIPs	**SIP 17** – Regional integration for African cooperation and development. **SIP no 17 needs to be restructured, augmented and executed on, as indicated below:**
Three-year action steps	• A top-priority regional infrastructure integration strategy and project pipeline action plan will be finalised in 2022/3. SIP 17 will be expanded to include these top-priority projects. A top-priority project pipeline will be funded and moved to readiness and implementation from 2022/3. • Six ports of entry will be redeveloped as one stop border posts by 2025, including Beitbridge, Lebombo, Maseru Bridge, Kopfontein, Oshoek and Ficksburg. • Capacity (technical, financial, diplomacy) to drive regional projects will be reviewed and strengthened, in conjunction with regional partners. • Regional project monitoring information will be introduced and made transparent. • A proposal for a regional financial centre of excellence will be finalised. • A strategy will be finalised to strengthen gains from foreign infrastructure investment in Africa. • Centres of research excellence will be established to improve strategic capability and intelligence in these domains. • Strategy and Plan of Action for the new, open city in South Africa.

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4 FINANCING INFRASTRUCTURE AND MAINTENANCE

HIGHLIGHTS

Features of infrastructure finance by 2050

Capacity will be in place to sustainably fund and finance infrastructure build and maintenance. It is estimated that achieving SDGs and NDP goals related to infrastructure will cost R6,224 trillion between 2016 and 2040, with transport and energy likely accounting for over 72% of the investment required. As of 2021, the finance gap that needs to be closed is estimated at R2,15 trillion.

South Africa will have a thriving private sector infrastructure investment sector that will be supported by an efficient and reliable public sector procurement framework that will deliver world-class procurement through both on-budget general government procurement and world-class capability in creating partnerships and alliances with the private sector in infrastructure finance, build and operations. Infrastructure projects will be considered from a full-life-cycle perspective, planning from procurement to decommissioning, budgeting and setting out maintenance schedules that minimise costs over the life of the infrastructure. The public sector will partner with the private sector and development finance agencies to fill a finance gap of approximately one-third of the amount that needs to be invested until 2050. Projects will be chosen for these partnerships where they clearly enhance the value of the infrastructure to the public. Such partnerships will be structured to maximise this value, as PPPs or other forms of partnership, considering all public policy objectives, with projects designed with risks allocated to partners that are best positioned to manage them. PPPs are particularly important in economic infrastructure, but in some circumstances may also be the optimal approach for social infrastructure. The NIP envisages government-wide capacity to design and launch partnerships with the private sector, eliciting an enthusiastic appetite for investment by the private sector and global development funders.

How it will be done

- A full-life-cycle planning approach will be adopted.
- Value for money will be optimised.
- Projects will be designed to meet the risk and return needs of investors.
- Projects will be designed to minimise risk.
- Partnerships with the private sector will be embraced where they deliver better value for money.
- Capital market development will be supported by a steady and reliable pipeline of new projects.
- Monitoring and reporting will build investor confidence.
- There will be a shift away from government guarantees towards new forms of guarantees, such as performance guarantees for decarbonisation.

4.1 Vision for finance and funding to deliver network infrastructure

South Africa will have a thriving private sector infrastructure investment sector, supported by an efficient and reliable public sector procurement framework that delivers world-class procurement through both on-budget general government procurement and world-class capability in creating partnerships and alliances with the private sector in infrastructure finance, build and operations. Infrastructure projects will be considered from a full-life-cycle perspective: planning from procurement to decommissioning, budgeting, and setting out maintenance schedules that minimise costs over the life of the infrastructure. The public sector will partner with the private sector and development finance agencies to fill a finance gap of approximately one-third of the amount that needs to be invested until 2050. Projects will be chosen for these partnerships where they clearly enhance the value of the infrastructure to the public. Such partnerships will be structured to maximise this value, considering all public policy objectives, with projects designed with risks allocated to partners that are best positioned to manage them. The NIP 2050 envisages government-wide capacity to design and launch partnerships and alliances with the private sector, eliciting an enthusiastic appetite for investment by the private sector and global development funders.

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4.2 Status of infrastructure finance and funding in 2021

The South African government has an explicit ambition to expand infrastructure investment, in support of economic and social objectives. This move is also meant to act as an economic stimulus. Since the election of President Cyril Ramaphosa, several initiatives have been launched to improve infrastructure investment, in support of economic and social objectives, and to stimulate the economy. These initiatives are aimed at reversing a negative trend: Between 2015 and 2019, spending by general government on infrastructure fell from 3,5% to 2,7% of GDP, while spending by SOEs fell from 3,8% to 2,7%. This negative trend reflects both pressure on budgets and capacity shortages in the public sector.

About R6,224 trillion is estimated to be needed in infrastructure finance between 2016 and 2040. There is a finance gap driven largely by fiscal pressure, a weak credit outlook for government and SOEs, and high commodity costs. This is the difference between current available financing and the amount needed to meet infrastructure requirements for economic growth. The gap that will need to be closed is estimated at R2,15 trillion[24]. Electricity and transport may account for about 72% of the investment required[25]. In a context of constrained public finances, the funding gap will have to be filled by new sources of funding, including new instruments that access domestic and foreign private sector capital, and global development funding.

Ultimately, infrastructure can be funded only by two sources: taxes and user payments[26]. While finance can be raised from multiple sources, its availability and cost depend on the reliability of funding plans to service and ultimately repay any finance.

Historically, infrastructure has been financed by tax revenue and through debt issued by government or SOEs. However, the opportunities to raise finance through other means have developed considerably over the past two decades. Several specialist infrastructure funds have developed in the private sector and banks have built capabilities in infrastructure finance. Increasingly, pension funds and insurance companies are also investing in infrastructure.

South Africa primarily leverages PPPs for private sector infrastructure finance, having begun doing so in the 1990s with toll road projects. Despite this history, PPPs are an underutilised opportunity to raise private investment in public infrastructure, with the exception of the Renewable Energy Independent Power Producers Programme (REIPPP), which used a form of PPP to commission over 100 energy projects that collectively raised investment of over R200 billion. Outside of REIPPPP, there is very little PPP activity and it is dwindling. Of the R791 billion planned infrastructure spending over the 2021/2–2023/4 Medium-Term Expenditure Framework (MTEF), PPPs account for just R18,5 billion or 2% of the public sector infrastructure budget.

On some projects, government guarantees a minimum revenue stream, or that public entities will procure output, imposing contingent liabilities. Amongst PPPs, office accommodation and

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[24] The method to calculate the finance gap is sourced from the G20's Global Infrastructure Outlook and includes only economic infrastructure. In future, ISA and National Treasury will ensure that independent and periodically updated assessments are done.

[25] Estimates are highly sensitive to the following:

- Cost of new infrastructure (new energy generation has been falling, but commodity prices have driven up general construction costs).
- Existing financing conditions (deteriorating balance sheets of SOEs are reducing the fundraising capacity and cost of funding for SOEs).
- Economic growth rate and infrastructure intensity of that growth.

[26] States can also raise funding by selling assets or generating profits through some activities.

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the Gautrain are the biggest contributors to current contingent liabilities, which stand at R8,7 billion, down from 13,7 billion in 2017/18. The contingent liabilities are also incurred by projects under the REIPPPP, which are expected to amount to R156 billion in 2021/22. However, contingent liabilities do not all have the same probability of becoming actual liabilities and in many PPPs the contingent liabilities have a very low risk of being called.

The number of new project transactions has decreased over the past decade. There are a number of PPPs under review, including the expansion of the Gautrain, the redevelopment of six border posts and the construction of government offices. There are some notable reforms currently underway, including a review of Regulation 16 of the Public Finance Management Act, No 1 of 1999 (PFMA), which governs PPPs, the Infrastructure Fund, the Municipal Investment Programme Project Preparation Facility, and the establishment of Infrastructure South Africa, together with the SIDS methodology.

Most public sector infrastructure is procured by general government through the Framework for Infrastructure Delivery and Procurement Management (FIPDM) guidelines by National Treasury. This concerns procurement of infrastructure on government budget by organs of state under the PFMA.

The FIPDM does not require or encourage organs of state to consider forms of procurement that would attract private funding. In particular, there is no early-stage requirement to consider PPPs as an alternative procurement mechanism. FIPDM and Regulation 16 are currently being reviewed to improve functioning and efficiency of PPP and other procurement mechanisms and improve attractiveness for private investment.

Regulation 16 of the PFMA and equivalent regulations in terms of the Municipal Finance Management Act, No 56 of 2003 (MFMA) governing PPPs at national, provincial and municipal levels entail a heavy requirement to demonstrate that PPPs are preferable to normal on-budget procurement. The MFMA makes it difficult to encumber future cashflows from rates to fund PPPs.

Certain other organs of state, particularly SOEs, and, through recent changes, financially stable municipalities can issue debt to raise finance for infrastructure. However, poor credit ratings have made this increasingly difficult.

There are signs of emerging appetite and capability in South African capital markets to innovate in financing infrastructure. Therefore, this has primarily been evident in green finance and green bonds. South Africa has issued the most green bonds in Africa, with a cumulative issuance of US$2,4 billion (although some are offshore-listed), followed by Morocco (US$400 million) and Nigeria (US$136 million). Overall, South Africa leads in Africa but lags Europe (USD$455 billion), Asia-Pacific (US$287,4 billion), the United States (US$194,4 billion) and Latin America (US$103,8 billion)[27].

A growing commitment by the South African state to partnering with the private sector is demonstrated in the establishment of the Infrastructure Fund. This has been structured through the DBSA with aim to use R100 billion of public funding over the next 10 years to crowd in private sector investment through blended finance models. It has assembled a project origination team to work with public sector institutions to develop projects for financing through blends of public and private sources. The Infrastructure Fund will work with Public Facility for Infrastructure in National Treasury to access public budgets for projects. Moreover, National Treasury is currently revising the frameworks for on-budget and PPP procurement to facilitate an increased flow of PPPs.

[27] https://www.climatebonds.net/market/data/

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4.3 Conditions required to achieve the 2050 vision for infrastructure finance

The following conditions must be met to achieve the 2050 vision:

1 A full-life-cycle planning approach must be adopted.

The costs and benefits of infrastructure can span decades. These full infrastructure life cycles must be budgeted for upfront, covering planning, construction, operations, maintenance, and in some cases, through to decommissioning. This shows the "real" project cost, which should be weighed against the multi-decade benefits of a potential project.

Budget and funding decisions often focus on the capital expenditure for the creation of the infrastructure. This contributes to poor maintenance planning and misleading estimates for the lifecycle cost of infrastructure. Life cycle budgeting is critical to the appropriate financing and prioritisation of infrastructure.

Much public infrastructure currently faces a "run to failure" approach, with maintenance only conducted when the infrastructure fails. Most public sector procurement currently focuses on the MTEF period (three to five years) and budgets are not structured for the full lifetime of infrastructure. Maintenance is often excluded in infrastructure budgeting, contributing to the lack of planned maintenance. The Department of Public Works and Infrastructure (DPWI) has set a strategic aim to move to a maintenance budget that is 80/20 in favour of scheduled maintenance.

While there are no reliable estimates of the cost of reactive or emergency maintenance when compared with scheduled planned maintenance, it is widely accepted that reactive maintenance is far more expensive as failure can cause knock-on failures and wider costs to the economy stemming from the unavailability of the infrastructure. Planning upfront allows for a project design that minimises lifecycle costs.

Lifecycle planning considers the full cost of planning, constructing, operating and maintaining infrastructure as well as the full benefits of the infrastructure. It is defined as "the combination of management, financial, economic, engineering and other practices applied over the full lifecycle of physical assets to provide the required level of service for present and future customers in the most cost-effective way" (NAMS Group 2006).

2 Value for money must be optimised.

Multiple policy objectives must be traded against each other to determine an optimal procurement strategy. Explicit upfront decisions must be taken on how to balance cost, time, quality and other public policy objectives like employment, local content and BEE. Once priorities have been determined, focus must be trained on maximising returns to each priority through the procurement design.

Lifecycle plans should reduce overall costs, reduce risks and maximise benefits, leading to lower finance requirements and more reliable funding sources. The reduced costs lead to a reduced capital requirement, which in turn lowers the cost of finance and raises the viability of the asset.

Costs must be minimised by ensuring that:

- the procurement framework has a clear legal basis, reliable timetable and high-quality documents (for both on-budget procurement, and those involving cooperation between public and private sectors);
- project risks are reduced where appropriate through guarantees and other measures (where the public value impact on the project is greater than the cost to the government of absorbing risk); and

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- risk allocations can be fine-tuned through PPPs to ensure better-value-for-money projects.

3 There must be sufficient access to additional sources of finance to deliver on South Africa's Infrastructure aspirations.

Infrastructure finance has developed significantly over the last decade around the world. The global movement towards investment linked to environmental, social and corporate governance (ESG) indicators has supported this innovation as private sector investors seek to support environmental and social objectives. Innovation in instrument-type and project structures makes it possible to access new funding pools (eg ESG specialist funds for impact, green and social finance instruments).

However, the vast majority of infrastructure in South Africa continues to be financed by standard debt instruments like general government and SOE bonds.

Economic infrastructure is more amenable to private sector funding, especially where there are cashflows from the users of infrastructure. This is especially so for pure economic infrastructure such as commercial ports and for mixed economic infrastructure such as that related to municipal water or electricity supply, for which minimum amounts are provided free to consumers and they can be paid for by users or a third party. Social infrastructure such as schools, clinics and police stations are less amenable to private sector financing, although various options have been used around the world such as availability payments through which government pays private partners to ensure public infrastructure is available.

Both domestic and international investors are eager to invest in infrastructure assets if projects are designed appropriately. Investors have different risk appetites and liquidity needs that projects designs must accommodate. For example, the range of risk tolerance is indicated as follows:

- Banks – short term (0–5 years); high risk tolerance.
- Private equity – medium term (5–7 years); high risk tolerance.
- Pension funds – long term (20 years); low risk tolerance.
- Insurance companies – long term (20 years); low risk tolerance.
- Multilateral financiers – long term; high development impact.

Critically, funding (tax or user payments) must be clearly determined to make projects bankable – ie the cashflows must reliably meet the financing costs.

South Africa has a sophisticated and sizeable institutional investment market. Pension funds hold R4,3 trillion in assets, with the Government Employees Pension Fund being the largest, holding assets of R1,8 trillion. The private equity industry is a key catalyst in infrastructure projects by providing equity and absorbing the most risk. Banks hold R5,8 trillion in assets and can finance debt into infrastructure projects using sophisticated risk-pricing models. Insurance companies often hold debt and private equity instruments that back infrastructure with part of their R2,7 trillion in assets. These domestic investors should be complemented by global investment into infrastructure.

Different public institutions should be enabled to issue different types of instruments. Typically, government raises funding to cover the budget deficit through its bond issuance programme. Recently, governments elsewhere have also issued green and social bonds to raise finance for specific infrastructure and other social objectives. Such finance is earmarked for specific expenditure that meets the social and environmental objectives of the investor. Such bonds typically impose more stringent reporting and monitoring standards on governments to provide investors with information to verify that the social or environmental goals are being met. SOEs can also issue such specialised bonds, and banks and other private financiers can as well, which can then finance partnerships and alliances between public and private sectors. South

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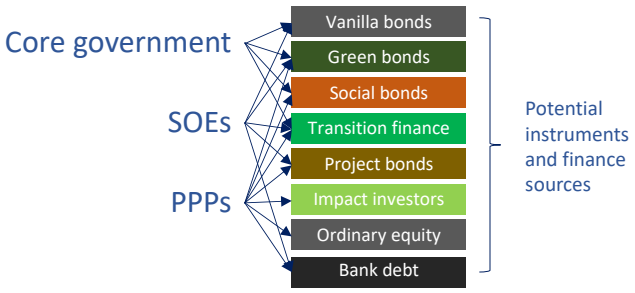
Africa's banks and finance SOEs have issued several such instruments over the past decade, particularly in the last year.



4 Projects must be designed to minimise risk.

Risks must be allocated to the party best able to absorb and manage them: this is the party best able to control the probability of risk eventuating, able to reduce the impact of risk if it does eventuate, and has the balance sheet (size or correlations) best able to absorb eventuated risk. Where risks are inappropriately allocated, costs balloon and projects can become unsustainable. Some risks should be absorbed by government, but others are more appropriately absorbed by private sector partners. Typically, operating risks should be absorbed by the private sector, on the assumption that private partners can innovate and tap global expertise to ensure operations run according to plan. Demand risks, being the risk that user demand is less than predicted, can be carried by either private or public sector partners, depending on the details of the infrastructure. Finance risks should be tailored to the particular risks a project faces, with government absorbing low-probability risks to ensure projects are bankable.

5 Partnerships and alliances between the public and private sectors must be embraced.

Partnerships and alliances between the public sector and the private sector must allow for tailored project designs that assign roles to multiple partners to maximise value and meet policy goals. The legal and regulatory framework must be shaped to reduce the cost and complexity of all forms of partnerships and alliances between public and private sectors that enhance public interest value in infrastructure finance, build and operation, to encourage more such activity. This requires substantial investment in public sector capacity to be able to decipher value and manage these relationships in the public interest with confidence.

Partnerships between public and private sectors are designed to be partly or fully privately financed. This is the key differentiator from normal infrastructure procurement, which is always financed by the government. Risks are allocated between public and private sectors and are calibrated to reduce the cost of finance and maximise the public benefit from the infrastructure. Partnerships are not always the optimal mechanism for procurement, particularly where transaction costs are higher than the benefits when compared with standard on-budget public financing of infrastructure. However, private sector financing typically comes at lower cost in terms of the engineering, procurement and construction of projects, as well as the operations and maintenance of infrastructure. Partnerships between private and public sectors can assign the private sector various roles, including build, own, operate, finance and ultimately transfer to the state. The requests for proposals in any framework aimed at crowding in private sector finance or participation should specify clear public benefit requirements, optimising for the competing public policy goals.

There are many ways that the public and private sector can partner in infrastructure

There are many ways that the public and private sectors can work together to deliver infrastructure. One of these are through formal public-private partnerships (PPPs), which

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are regulated by specific regulations under the Public Finance Management Act and Municipal Finance Management Act. But there are many other examples of partnerships in a more generic sense, ranging from specific programmes like the Renewable Energy Independent Power Producers Programme to concessions that are granted for private businesses to operate on public property. Many examples of procurement also include a level of partnership where there is some degree of risk sharing involved - for instance, the procurement of new infrastructure can require private operators to build, but also design, operate and finance infrastructure. These forms of partnerships are not PPPs in the formal sense but are also important ways that infrastructure can be delivered by drawing on the resources and capabilities of both the public and private sector in partnership. In the NIP 2050, the term PPPs refers to the specific construct under PPP regulations, and "partnerships" refer to a more generic concept of joint risk sharing and work between public and private sectors through different procurement or other contracting models

6 Capital market development must be supported.

South African capital markets should be encouraged to build on their recent initiatives in developing green bonds and other innovative financing instruments to fund infrastructure, in tandem with global developments. Such innovation should be spurred by appropriate procurement strategies that allow for investors with different risk appetites at different points of project lifecycles to participate, and that provides a steady pipeline of new projects entering the market to raise finance. If procurement is gradual, it will allow financing innovation to evolve. Given the prospect of an accelerated infrastructure pipeline for public sector projects, the financial sector has been in discussion regarding new instruments that can be developed to direct institutional funding into greenfield projects, while several infrastructure finance specialist funds have been building capacity. A clear and reliable flow of projects will allow such tentative steps to accelerate and build institutional capability for a substantial flow of investment into public infrastructure. The public sector will support these efforts by embracing financial innovation, including the use of green bonds and other infrastructure instruments, to build capital market capacity and volumes alongside the private sector.

7 Monitoring and reporting must build investor confidence.

As infrastructure is seen as an important asset for investors' ESG mandates, projects must build in appropriate monitoring and reporting frameworks to be able to give investors feedback on the performance of the asset. These functions do add to the cost of infrastructure, but support their governance. Particularly in the case of green and social bonds, issuers must implement reporting capabilities to obtain international certification of compliance with green or social bond standards. High-quality market reporting on performance must be in place to build investor confidence and increase appetite for investment in future projects.

4.4 How the 2050 vision for financing of network infrastructure will be achieved

Strategic element	2050 Vision – How it will be done
A full-lifecycle planning approach is adopted	The full lifecycle of infrastructure projects, which can span decades, will be budgeted for upfront, covering construction, maintenance through to decommissioning. This will show the "real" cost which is weighed against the multi-decade benefits of a potential project.
Value for money is optimised	Multiple policy objectives will be effectively balanced to determine optimal procurement strategy. Explicit upfront decisions will be taken on how to balance cost, time, quality and other public policy objectives like employment, local content and BEE. Once priorities are determined, focus will be trained on maximising returns to each priority through procurement design.

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Strategic element	2050 Vision – How it will be done
Projects are designed to meet the risk and return needs of investors	Infrastructure projects will be designed in a way that facilitates ready access by both domestic and international investors. Different risk appetites and liquidity needs will be accommodated. Funding (tax or user payments) will be clearly determined to make projects bankable.
Projects are designed to minimise risk	Project partners will be allocated risks they are best able to manage. Project design considers which parties will incur the many risks that arise from demand (use) risk through to exchange rate risk. Some risks will be absorbed by government, others will more appropriately be absorbed by private sector partners.
Partnerships and alliances between public and private sector are embraced	Partnerships and alliances between public and private sectors will have tailored project designs that assign roles to multiple partners to maximise value and meet policy goals. The approach, rules and regulations related to enabling public and private sector partnerships and alliances will be reformed to reduce the cost and complexity. There will be investment in public sector capacity to engage in such partnerships with confidence.
Capital market development is supported	South Africa capital markets will have a growing sophistication and continuous development of innovative infrastructure financing instruments. This will be supported with in an infrastructure project environment that has clear project designs and predictable pipelines.
Monitoring and reporting build investor confidence	From construction to operation and maintenance, the performance of the asset will be monitored with regular reporting to investors (and public at large) to build confidence and trust
Three-year action steps	• The infrastructure procurement framework (FIDPM) will be revised to require public institutions to consider partnering with private sector partners as an optimal procurement option. • The PPP regulations (Regulation 16) will be revised to simplify approval processes, standardise models for certain types of infrastructure, and speed up the time from initiation to procurement of PPPs. • The approach, rules and regulations for partnerships and alliances between the private and public sectors will be widened aimed at substantially deepening and expanding this opportunity for finance, build and operation. • Lifecycle planning will be applied to all infrastructure, with full budgets determined upfront and measured against lifecycle benefits in ascertaining optimal infrastructure procurement. • The Infrastructure Fund will deliver a robust pipeline of projects through blended finance models with significant participation from the private sector. • The capacity at all levels of the public sector will be developed to design bankable projects and manage them through to completion. • Capacity will be built at national and local government level to issue specialist green finance instruments such as green bonds.

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5 STRENGTHENING INSTITUTIONS FOR DELIVERY

HIGHLIGHTS

Features of the institutional framework and capacity by 2050

There will be a step change in the institutional capability that drives material progress in South Africa's infrastructure ambition. Planning, procurement and execution systems and capabilities will be operating at the highest global standard, commensurate with South Africa's significant infrastructure transformation agenda. Robust and ever-developing partnerships and alliances between public and private sectors will be a significant feature in planning and implementation, whether think tanks, financial institutions, business or communities. There will be confidence to drive an increasingly dynamic, high-performance delivery machinery.

Public infrastructure will be delivered and maintained in an environment that is safe, secure and with a high ethical standard.

How it will be done

- There will be significant capacity development within infrastructure procurement and delivery management.
- The regulatory and institutional framework will enable network infrastructure procurement and delivery.
- A strategic approach will be taken to infrastructure procurement.
- Systems of accountability will be aligned with effective infrastructure delivery.
- The asset management function will become robust.
- Services and support for safety, security and ethics will be strengthened
- Knowledge services will be strengthened.

5.1 Vision for institutional capability to plan and deliver network infrastructure

There will be a step change in the institutional capability that drives material progress in South Africa's infrastructure ambition. Planning, procurement and execution systems and capabilities will be operating at the highest global standard, commensurate with South Africa's significant infrastructure transformation agenda. Robust and ever-developing partnerships and alliances between public and private sectors will be a significant feature in planning and implementation, whether think tanks, financial institutions, business or communities. There will be confidence to drive an increasingly dynamic, high-performance delivery machinery. This will align delivery with the Constitutional imperative (section 195) to promote the "efficient, economic and effective use of resources" and to ensure that public administration is "development-oriented".

The vision recognises that large-scale public network infrastructure projects have some characteristics that make them unique and require differentiated approaches to charting their delivery. More than anything else, they continuously experience risk events over the course of protracted delivery periods. Their scale and complexity mean that these risks can require high-impact evidence-based decision-making with very material implications for costs and outcomes. The buyer-supplier relationship therefore differs from most other government projects in that the buyer or "client" function requires significant professional capability throughout the process of conceptualisation to implementation and maintenance, that is, through the full life-cycle of the project.

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The vision also recognises that efficient and timeous delivery of public infrastructure requires an environment that is safe, secure and ethical.

5.2 Status of institutional planning and execution capability in 2021

There is considerable evidence of diminishing capability to plan, finance, procure and implement critical network infrastructure. While there is also evidence of success, overall, the aggregate numbers show diminishing outcomes that are not delivering to South Africa's long-term agenda for employment, equity and poverty eradication.

The NIP 2050 seeks to strengthen the capacity to deliver and address areas that are hindering progress. The National Planning Commission (NPC) (2020) revealed the following concerns:

- A dearth of properly prepared and bankable projects.
- Significant underspending against annual budgets, resulting in the five-year spending trajectory having been adjusted downwards every year since 2017.
- Significant cost and time overruns and, relatedly, significant delays in the implementation of identified projects.
- Infrastructure projects not resolving the issues they set out to achieve.
- Existing infrastructure not being effectively maintained to ensure it continues to effectively serve the purpose for which it exists.
- Opportunities being missed and suboptimal developmental outcomes in terms of BBBEE, employment, local production and content.
- Late payments to service providers.
- Unintended consequences of regulations and instructions that are not sufficiently and timeously reigned in (such as those related to 'mafia'-style tactics to forcibly secure participation in infrastructure), including removing unpredictable and harmful procurement practices.
- Poor project outcomes in terms of value for money.

The NPC cites gaps in human capacity and in the administrative and regulatory framework to procure and oversee major infrastructure projects as one of the key barriers to success in this domain. Other key barriers including the following:

- Ineffective interventions aimed at basic management practices, increasing the throughput of engineering undergraduates, and the deployment of technical assistance and semi-retired engineers. These interventions have failed to address the key challenges outlined by the Construction Industry Development Board (CIDB) in 2003, which include weak delivery management skills, inefficient or inappropriate systems and processes, and inconsistent procurement procedures.
- Public sector supply chain management (SCM) practices that have misplaced infrastructure procurement within financial processes and treated procurement as a general administrative (back-office) function requiring relatively low skills level rather than a professional strategic function linked to those responsible for delivering infrastructure.
- Differences in understanding and interpretation of regulation, policy and practice within an excessively rigid, fragmented and complex legislative regime that does not recognise or appropriately address the specificities of infrastructure delivery.

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- An administrative paradigm in the way in which SCM units focus on the "ticking of boxes", where compliance with rules is more important than project outcomes and procurement is centrally and remotely controlled through the office of the chief procurement officer.
- Failure to accommodate the way risks inherent to the procurement and delivery of infrastructure are commonly mitigated.
- Poor procurement practices and poor management of outsourced functions.
- Lack of appropriate capacity, appropriate skills and experience in the specifying, procuring and overseeing of the delivery of infrastructure and its regulation.
- Exclusion or marginalisation of built-environment professionals in key processes.
- Difficulties in obtaining licences and permits due to excessive bureaucracy and slow decision-making.

There have been efforts to strengthen delivery over this period. Examples are as follows:

- The Infrastructure Delivery Improvement Programme (IDIP) was in place between 2003 and 2017 and aimed to address communication and coordination amongst user departments and implementing agents.
- Infrastructure Delivery Management Toolkits (2004, 2006, and 2010) were developed through IDIP.
- The Cities IDMS (CIDMS) (2016) was developed by National Treasury through the Cities Support Programme to establish principles, methodologies, processes, techniques and case studies to assist infrastructure planners and decision-makers within cities.
- A National Infrastructure Plan with 18 identified Strategic Integrated Projects (SIPs) was developed and adopted by Cabinet in 2012. The Infrastructure Development Act, No 23 of 2014 was gazetted, which saw the establishment of the Presidential Infrastructure Coordinating Commission (PICC) Council, Management Committee and Secretariat. A PICC Technical Task Team was established to support the Commission Structures plus create technical capacity in infrastructure.
- There are some notable successes in changing the course of the quality of human settlements. Over the decade from 1995 to 2005, the City of Johannesburg drove a transformation programme in Soweto, from dormitory to decent living, with investment in tarred roads, parks, sidewalks, theatres, shopping precincts, churches, places of entertainment, transport nodes and community centres.
- An integrated strategy for the reconstruction, growth and development of the construction industry was implemented.
- A documented body of knowledge and a set of best practices in the delivery management of infrastructure were provided.
- External expertise from semi-retired personnel and their deployment to the most vulnerable and underperforming municipalities were leveraged.
- The throughput of tertiary institutions of higher learning was increased.
- Technical assistance to departments and municipalities on infrastructure project management and organisational development was provided.
- The South African public procurement system was modernised and overseen.

In the main, the model for delivering network infrastructure relies on state institutions to do all functions up to implementation. There is considerable reliance on state institutions for policy and regulation and on monopoly SOEs to raise finance and procure services. The delivery of digital infrastructure differs in the sense that there is significant private sector leadership.

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However, the government's model of delivering continues to rely on SOEs, with limited scope for partnerships. If performing well, this model can deliver big infrastructure when the context is well understood and not changing much. However, the conditions for delivery in all four sectors – energy, freight transport, water and telecommunications – are transforming faster than ever before. This context **requires** partnerships that take on board emerging ways of planning, financing and executing so that they are lower-cost and more efficient and adaptable.

Safety and security have been critical binding constraints to the progress of public infrastructure – in building and operations. Providing infrastructure services at the lowest possible cost to users depends on minimizing avoidable costs, especially those merely drain resources away from the provision of infrastructure through theft, extortion and corruption. Core challenges that have been identified by many stake-holders include:

- Corruption in tendering processes that raise the costs of delivering infrastructure and, at the extreme, result in the failure of infrastructure
- The extortion of firms and workers by the so-called "construction mafia", whose activities act as a tax on infrastructure development or even halt infrastructure projects.
- The violent extortion of firms and workers providing services using infrastructure such as the attacks on truck drivers
- The theft and destruction of infrastructure by those seeking to recycle stolen commodities through the scrap metals industry
- Unlawful consumption of infrastructure services through illegal connections and the non-payment of fees and charges
- Political and social unrest targeted at extraction

These challenges are regarded by industry role-players as significant risks to the viability and implementation of the NIP2050. Resolving them requires a combination of community-based mobilization and involvement, increased provision for security costs in the delivery of infrastructure, and much more effective policing and law enforcement.

The emergent partnership between PRASA, Transnet, SAPS, safer city projects in three metropolitan areas, commuter forums and community police forums in 2020/1 resulted in a substantial fall in reported rail theft and 341 arrests. The Justice Crime Prevention and Security Cluster has been tasked with fighting extortion at infrastructure sites increasingly applying pro-active approaches involving crime intelligence and coordinated dedicated task teams at national and provincial levels.

5.3 Conditions required to achieve the required institutional planning and execution to enable delivery of critical network infrastructure

Previous sections of the NIP 2050 identify approaches to sector reform and finance. Here, the conditions required for effective project execution in relation to project prioritisation, optimisation, planning, procurement and execution are further detailed.

Government must become a sophisticated "client" in its procurement of infrastructure, operating at a global standard commensurate with the significance and complexity required to deliver on South Africa's long-term economic imperatives. There must be continuous improvement in its Infrastructure Procurement and Delivery Management (IPDM).

The following conditions must be met to achieve the 2050 vision:

1. **Public sector competencies must operate at a high professional level.**

   Competence to procure and deliver must be high in respect of ability, knowledge and skill.

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2. **The regulatory framework must enable network infrastructure procurement and delivery.**
    - The regulation of SCM for infrastructure must enable integrated projects (to include demand, acquisition, logistics, disposal and risk management), with built-environment professionals playing a significant role. SCM for infrastructure must be handled as a strategic function, not simply a financial one.
    - The procurement of infrastructure must be differentiated from that of other goods and services.
3. **A strategic approach must be taken to infrastructure procurement.**
    - Value for money must be a focus and prioritised over lowest cost. This must include robust cost-benefit analysis.
    - There must be trust and understanding with suppliers.
    - Departments and entities with large infrastructure procurement budgets must have a chief procurement officer, with sufficient built-environment professional capacity leading the procurement process.
4. **Infrastructure delivery must be managed as an "enterprise" and not an ad hoc collection of projects.**
5. **The asset management function must be robust.**
6. **The environment for public infrastructure delivery must be safe, secure and ethical.**

5.4 How the 2050 vision for institutional capability will be achieved

Strategic element	2050 Vision – How it will be done
Significant capacity is developed in public sector infrastructure procurement and delivery management	• Professional procurement capacity will be developed. It will be recognised as a profession requiring high-level specialised capabilities in procurement, contracts, tender procedures, price determination documents and contract administration. • There will be a growing cohort of public sector professionals registered with built-environment bodies and councils, as relevant to the function such as in architecture, landscape architecture, quantity surveying, cost-benefit analysis, engineering, construction management or project construction management. Suitably experienced and registered built-environment specialists will be appointed to all technical and technical management posts, including procurement, where they perform work identified by the Council for the Built Environment. • Client delivery managers, individuals who lead infrastructure projects with a single point of accountability, will be in possession of certification of competence in terms of SANS ISO 21500 (of the South African National Standards). • The state will actively support the development of systems and institutions that deliver built-environment professionals.
The regulatory and institutional framework enables network infrastructure	• The regulatory framework will be designed specifically for infrastructure procurement and delivery.

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Strategic element	2050 Vision – How it will be done
procurement and delivery	• ISA will lead the process of preparing an approach to the Auditor General to guide audits in the development of state infrastructure procurement and delivery management. • A specialised section in National Treasury, staffed with suitably qualified and experienced built-environment professionals, will oversee the regulatory framework for IPDM.
A strategic approach is taken to infrastructure procurement	• The IPDM will be designed to focus on **value for money** rather than least cost. In infrastructure procurement and delivery, decisions in this regard will be taken throughout the project lifecycle in an accountable and development-oriented manner. • Infrastructure SCM will become a strategic function and not a back-office or purely financial function. • Specialised professional judgement will be incorporated into infrastructure procurement processes. • IPDM will be de-linked from centralised purchasing and led by a chief procurement officer and/or high-level office specifically mandated and capacitated with built-environment professionals to procure and deliver infrastructure.
Systems of accountability are aligned with effective infrastructure delivery	• Infrastructure delivery will be managed as an enterprise and not an ad hoc collection of projects. • Oversight and delivery will be led by top executive leadership with suitable professional qualifications and experience. • Delegations of authority will enable timeous decision-making and organisational accountability. • ISA will be empowered to initiate interventions and advise National Treasury to add conditionalities to budgets linked to the attainment of the IPDM system milestones to ensure organs of state deliver and to address persistent underperformance in infrastructure procurement and delivery.
The asset management function is robust	• A framework will be developed and implemented for infrastructure asset management in consultation with ISA. • National Treasury will require a prescribed percentage of all infrastructure budgets of all relevant organs of state be allocated to maintain existing infrastructure so that it remains fit for purpose, unless it can be demonstrated that this is unnecessary. • Statutory councils or SOEs with an infrastructure mandate will put in place certification schemes in accordance with the provisions of SANS ISO 55001 to certify the competence of individuals to perform specific jobs related to infrastructure asset management.
The environment for infrastructure delivery is safe, secure and ethical	• The economic and security clusters involved in overseeing infrastructure and safety, security and justice will work closely together to ensure that crime and violence do not hinder timeous delivery and efficient operations of critical infrastructure. • A plan to mitigate financial risks associated with crime and violence at infrastructure sites will be developed, with possible attention to Risk Insurance Instruments. • Relevant municipal, business, community and labour stakeholders will be engaged in strategies to stabilise the infrastructure delivery environment

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Strategic element	2050 Vision – How it will be done
	• There will be a commitment to driving an ethics culture in public infrastructure delivery, and demonstrable progress in consequence management.
Knowledge services support infrastructure delivery	Knowledge and innovation capabilities and services will be strengthened to support the evidence-based and dynamic approach required to deliver on the NIP 2050. The Department of Science and Innovation (DSI) will mobilise existing players, audit existing services and capabilities and, guided by the ISA, identify key gaps to be filled and how best these gaps can be filled. Underutilised or defunct capabilities within publicly funded institutions will be identified and consolidated.
Three-year action steps	• A plan to build critical capabilities (and ensure accreditation where relevant) in the procurement and delivery of infrastructure will be finalised in 2022/3. Budgets and partnerships required to implement the plan will be approved in 2022/3 for implementation in 2022/3. • The regulatory and institutional framework for procuring and delivering network infrastructure will be reviewed and modified to be more enabling, while ensuring good governance, by 2022/3. The accountabilities, mandates and powers across DPWI, ISA, National Treasury, DMRE, DCDT, DWS, DoT, Cogta and relevant national agencies will be clarified to ensure coherence, alignment and performance. • A framework will be developed and implemented for infrastructure asset management, including rules related to budgeting for infrastructure maintenance. • A plan for securing infrastructure delivery and operations from crime, violence, extortion and corruption will be finalised and budgeted for by 2022/3. Risk mitigation will form part of this plan. • A plan for knowledge services in support of the NIP 2050 will be developed and finalised by DSI in 2022/3.

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6 REBUILDING A VIBRANT AND EMPOWERED CIVIL CONSTRUCTION AND SUPPLIER SECTORS

HIGHLIGHTS

Features of the civil construction and supplier sector by 2050

The South African civil construction and supplier sector will be a vibrant and respected, world-class African full-service built-environment delivery provider that supports Southern African development. It will be cost-effective and offer safe and reliable service with an experienced and skilled workforce as well as world-class products relevant to the development context. It will be an industry that is inclusive in terms of representative ownership and business practices. The industry will have a wide range of continuously improving products and services delivered by companies that range from small domestic-oriented ones to large companies that can deliver regionally and globally.

How it will be done

- The state will oversee the procurement and delivery of infrastructure with a high level of capability.
- There will be a national infrastructure champion.
- There will be a pipeline of bankable projects that enables the construction sector to plan, invest and develop its people.
- Regulations and the process of issuing permits will be streamlined.
- There will be an explicit effort to build South African construction and supplier industries for deliver against national development objectives.

6.1 Vision for the civil construction sector by 2050

The South African civil construction and supplier sector will be a vibrant, respected and world-class African full-service built-environment delivery provider that supports Southern African development and beyond. It will be cost-effective and offer safe and reliable service with an experienced and skilled workforce as well as world-class products relevant to the development context. It will be an industry that is inclusive in terms of representative ownership and business practices. The industry will have a wide range of continuously improving products and services delivered by companies that range from small domestic-oriented ones to large companies that can deliver regionally and globally.

The sector will be known for:

- consistently delivering quality projects on time, within budget and to the right quality in a sustainably responsible manner that satisfies investors' expectations;
- being well served by qualified and experienced local professionals and locally manufactured and produced goods;
- having a reliable, experienced and skilled workforce trained through study and work experience;
- sustainably generating a high number of jobs per unit of expenditure while being able to absorb low-skilled labour workers; and
- embracing and contributing to government's transformational agenda.

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6.2 Status of the construction sector in 2021

The construction industry plays an indispensable role by providing physical infrastructure. It is an important employer, especially for low- and semi-skill workers, and has important linkage effects into related goods and services.

The construction industry operates in a uniquely project-specific and complex environment, combining different investors, clients, contractual arrangements and consulting professions; different site conditions, design, materials and technologies; and different contractors, specialist subcontractors and the workforce assembled for each project.

The sector is almost entirely based on a competitive market environment in terms of project cost, schedule and performance delivery and is reliant on fair competition, predictability in procurement outcomes, appropriate risk allocations and prompt payment.

Government's relationship with the construction industry was damaged by proven anti-competitive and collusive behaviour. The industry faced substantial fines (R1,46 billion) and a contribution to the voluntary rebuilding programmes (R1,5 billion)

The construction sector is highly regulated by many acts, many of which require permits in advance of construction in terms of slow and cumbersome processes. The Infrastructure Development Act, No 23 of 2014 (IDA), recognises the considerable statutory planning and implementation obstacles facing infrastructure delivery. This act provides a statutory instrument by which obstacles to the expeditious implementation of the national infrastructure plan can be removed via facilitated and expedited approvals, authorisations, licences, permissions or exemptions that may be required in terms of legislation. Yet, the World Bank's 2020 Ease of Doing Business ranking placed South Africa 98th out of 190 countries on regulations relating to construction permits and 108 regarding the registering of property.

There are several organs of state tasked with supporting, regulating or developing the industry but no single national champion within the public sector to address the complex and often cross-cutting challenges facing the industry or the harmful unintended consequences of the regulatory environment that arise from time to time. Regulators have been slow to address issues, some of which are long standing and well understood, which has a negative impact on industry, creates inefficiencies or retards growth.

Government accounts for over two-thirds of civil works revenue and about 40% of non-residential construction revenue. The fall and uncertainty in government construction spending after 2014 has therefore had a material effect on the health of the South Africa construction sector, and especially the sector involved in civil works.

Construction is a low-margin business and therefore requires constant cash inflow to maintain employment, improve on business processes, build up a balance sheet and train and develop staff. Weakening project flow and spending by the public sector have led many large civil construction companies to turn their attention to foreign contracts and/or to survive in South Africa by shifting their commercial activity away from construction. There is evidence of an unprecedented number of large contractors having filed for business rescue or liquidation, largely attributed to a combination of a lack of large government infrastructure contracts, late payment, and the taking on of problematic and loss-making contracts. The value of public listed construction companies fell by 60% to 70% between 2008 and 2018, although some part of this may have been caused by the sale of companies to black-empowered entities that are not listed. There has also been some business failure and significant skills emigration overseas. Construction employment fell by about 35% between 2014 and 2019[28].

[28] See IMESA (2019). The Challenges of Construction in 2019: Picking up the pieces. Presentation to IMESA (Western Cape) Branch Meeting, 29 May 2019.

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The state infrastructure investment drive will be calling on a severely depleted delivery sector, which may result in increased introduction of foreign businesses to assist in the delivery of major projects.

Government's infrastructure investment drive will act as an economic stimulus if delivered by South Africa construction companies and domestic supplier industries. The pace at which this can happen depends substantially on the ability of the state to create confidence in the sector. This in turn will require a transparent and credible pipeline of projects and reformed procurement processes as outlined in sections 4 and 5 above.

6.3 Conditions required to ensure the civil construction sector can deliver on South Africa's 2050 vision

The following conditions must be met to achieve the 2050 vision:

1 **The state must operate its IPDM processes in a way that creates certainty and confidence.**

2 **Workflow must be consistent.**

Low-margin business require constant cash inflow to maintain employment, improve on business processes and build up a balance sheet. A project pipeline must enable civil construction companies to plan and structure their work as well as make decisions around capital and human resource investments.

3 **Regulations and the process of issuing permits must be streamlined.**

4 **Professional capacity must be available, skilled, experienced and competent.**

Consulting engineering and construction are a knowledge-based service industry that needs to invest in developing future skills while ensuring business sustainability. Experienced staff are essential to the success of a construction and consulting engineering business. Skilled and competent people must manage very expensive resources and provide the most cost-effective innovative solutions as small errors can lead to large losses.

5 **There must be an explicit commitment to building "South Africa Inc" civil construction and supplier firms**

6.4 How the 2050 vision for a thriving construction sector will be achieved

Strategic element	2050 Vision – How it will be done
The state oversees the procurement and delivery of infrastructure with a high level of capability	The approach to developing institutional IPDM capacity stated in the NIP 2050, section 5, will be implemented.
There is a national infrastructure champion	ISA will be designated as the national infrastructure champion, with the authority and leadership capabilities to resolve blockages as they arise.
There is a pipeline of bankable projects that enables the construction sector to plan, invest and develop its people	ISA will enable the development of a pipeline of bankable projects. It will also publicise the projects and report on their progress at regular intervals. ISA will further be responsible for project assurance processes, as determined in the SIDS Methodology.

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Strategic element	2050 Vision – How it will be done
	Infrastructure delivery processes will be digitised to drive efficiency, speed, transparency, adjudication assistance and implementation monitoring.
Regulations and the issuing of permits are streamlined	• ISA will champion the removal of red tape and work closely with legislative initiatives aimed at easing or reducing the cost of doing business, eg the Ease of Doing Business Bill (B6-2021), which seeks to provide for the assessment of regulatory measures developed by the Executive, members and committees of Parliament and self-regulatory bodies to detect and reduce red tape and the cost of red tape on businesses. • South Africa will fall into the top quartile of the World Bank's Ease of Doing Business ranking in respect of regulations relating to construction permits and the registering of property.
There is an explicit effort to build South Africa construction and supplier industries to deliver on national development objectives	• A civil construction and supplier master plan will be developed and implemented. • Support mechanisms will be investigated and implemented. • There will be an explicit commitment to providing training, education and work experience opportunities. • Public and private cooperation and partnership will be strengthened. • There will be active and explicit support to strengthening emerging construction and supplier businesses and empowerment of historically disadvantaged entrepreneurs. Action will be taken to ensure that the Preferential Procurement Policy Framework enables access to opportunity for historically disadvantaged business and black industrialists and that misuse of these provisions is stopped. • Strategies will be identified and implemented to drive reduced carbon emissions in supplier industries. This will include innovation in existing materials such as steel and cement as well as innovation in materials usage.
Three-year action steps	The steps will all be implemented within one to three years.

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7 MONITORING AND REPORTING ON PROGRESS

HIGHLIGHTS

Features of how progress is monitored and reported

This NIP 2050 is a 30-year plan for critical network infrastructure, with a focus on energy, freight transport, water and digital infrastructure. The development of capacity and systems to drive its implementation will be an ongoing process. Working with project owners, the PICC and ISA will monitor the implementation of the NIP 2050. Monitoring and reporting to ISA and the PICC will focus on progress in implementing critical institutional reforms, the required capacity development and high-level information on progress of the most important infrastructure projects.

How it will be done

- There will be a transparent and up-to-date database of significant network infrastructure projects
- ISA will do the following:
    - Establish a database that is transparent and open to government and stakeholders. This database will house the most important information in respect of critical areas required for a successful implementation of the NIP 2050 related to institutional strengthening and project development and delivery.
    - Set the data standards for proactive reporting.
    - Ensure that a publicly accessible portal is in place.
    - Engage with any independent assurance teams who identify key issues of concern, gaps in the data, etc, and address the shortcomings with the relevant organ of state.
    - Monitor the reporting of data and engage with organs of state that fail to do so.
    - Promote the use of apps that analyse the data that enables more effective infrastructure delivery.
- It will be a requirement by relevant organs of state that they report into this database. The reporting requirements will be kept to a minimum and, as far as possible, be limited to information that organs of state are already producing as part of their existing performance reporting requirements. Where possible, ISA will use existing performance reporting reports of organs of state to collect information rather than request organs of state to do additional reporting.
- ISA will be empowered and required to report on NIP 2050 progress, and to act on major areas that need course correction.

7.1 Vision for the monitoring and evaluation of critical network infrastructure planning and execution

This NIP 2050 is a 25-year plan for critical network infrastructure, with a focus on energy, freight transport, water and digital infrastructure. The development of capacity and systems to drive its implementation will be an ongoing process. Working with project owners, the PICC and ISA will monitor the implementation of the NIP 2050. Monitoring and reporting to ISA and the PICC will focus on progress in implementing critical institutional reforms, the required capacity development and high-level information on important Strategic Integrated Projects and other identified infrastructure projects in the NIP2050. ISA will then report to the PICC Council, which is chaired by the President of South Africa, on a regular basis on progress in implementing NIP 2050 and on achieving the outcomes of the strategic agenda of South Africa.

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7.2 Status of monitoring and evaluation capability in 2021

South Africa does not have a culture of making infrastructure-related information publicly accessible. For example, the CIDB established a register of projects in 2004, which according to its founding act it is, amongst other things, required to gather information on the nature, value and distribution of construction works projects. No data from this register is made publicly available for analysis. Likewise, no publicly accessible information is available on progress or the attainment of milestones on the pipeline of 18 strategic integrated projects (SIPs), as gazetted in Schedule 3 of the Infrastructure Development Act, 2014. A lack of access to information makes it difficult to hold organs of state to account and provide much-needed information to the construction industry to enable this industry to make informed decisions around capital and human resource development investments in order to ensure that local capacity exists to plan, design and deliver the envisaged pipeline of public infrastructure projects.

The information provided by organs of state is frequently insufficient for informed decision-making and the exercising of governance functions when projects are failing to achieve what was planned and corrective action is necessary. Such corrective action needs to happen early enough in the project development and implementation process to ensure projects are delivered. As indicated in section 5, large infrastructure projects, or SIPs, of this nature are highly complex and challenges are expected as a norm in their development and implementation. There is a large number of public infrastructure projects that for various reasons fail to be delivered on time or within budget or fail to solve the problem that they were meant to solve. Early-warning systems are essential to their success.

7.3 Conditions required to achieve the 2050 vision for monitoring and evaluation

The following conditions must be met to ensure effective monitoring and evaluation that ensures quality and accountability:

1 **There must be a central high-priority infrastructure projects database that is open to government and other stakeholders.** This should contain information on progress in relation to the most important milestones for institutional reform, capacity development and major NIP 2050 infrastructure projects (SIPs).

2 **There must be a requirement for information to be provided to this central database** by relevant organs of state. This requirement should be aligned to current reporting and not add additional reporting obligations, but it should not be voluntary.

3 **There must be open reporting on infrastructure projects** at various stages of development and implementation, in line with the Open Contracting Partnership and CoST Infrastructure Transparency Initiative. Open-data portal dashboards provide key information, including who is winning contracts, time and cost overruns, and variations in infrastructure investment. This means the data can be used by the private sector, civil society, the media and public to identify red flags relating to competition, efficiency and corruption, thereby bolstering efforts to reform infrastructure development. The open reporting should also provide useful market intelligence to the private sector. The Ukraine is currently using this approach to reform the delivery of highways, with great effect.

7.4 How the 2050 vision for monitoring and evaluation will be achieved

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Strategic element	2050 Vision – How it will be done
There is a transparent and up-to-date database of significant network infrastructure projects	ISA will establish and manage a publicly accessible, single database. It will contain high-level, mission-critical information on progress of the development and implementation of the NIP 2050. This will include critical institutional reforms, capacity development and major infrastructure projects in particular strategic infrastructure projects (SIPs). This will be high-level information that will be focused on the most important milestones in development and delivery.
It is a requirement that relevant organs of state must report into this database	ISA will develop guidelines relating to the information required by the central database that will assist in the monitoring and reporting on NIP 2050 progress. The central database will be aligned with current reporting and not add additional reporting requirements, other than those required by legislation. The submission of information will not be voluntary. ISA will: • set the data standards for proactive reporting, ie identify the data points in the project cycle and describe the data that needs to be uploaded on the open portal; • ensure that a publicly accessible portal is in place where organs of state can upload their data; • engage with any independent assurance teams who identify key issues of concern, gaps in the data, etc, and address the shortcomings with the relevant organ of state; • monitor the reporting of data by organs of state and engage with organs of state who fail to do so; and • promote the use of software apps that analyse the data that enables more effective infrastructure delivery.
ISA will be empowered and required to report on NIP 2050 progress	ISA will provide quarterly and annual reports on NIP 2050 development and implementation. ISA will be empowered to act on major areas that require course correction.
Three-year action steps	The steps must all be implemented within one to three years.

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