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The R200-Billion Factory

What physical industrial system could approximately R200-R250 billion actually build?

R225bn	34	11,100
modelled capital envelope	plant modules	direct operating jobs

South Africa | Industrial systems | Capital allocation

Inside the note

A map of the argument, model, evidence, and qualifications.

PART I

The answer

PART I: The answer

It builds an industrial programme, not one factory

R225 billion is large enough to alter South Africa's industrial structure, but too small to repair every constraint and too large to spend intelligently as one project. The useful mental picture is not a giant factory behind one fence. It is a ten-year programme containing prepared sites, reliable utilities, about three dozen production modules, laboratories, colleges, supplier finance, logistics connections and customers.

The model allocates R225 billion in constant 2026 rand. Only R96 billion, or 43 per cent, goes directly into production plants. R35 billion provides power and grid connections; R14 billion water and effluent systems; R18 billion rail, port and logistics upgrades; R12 billion industrial parks and common services; R20 billion supplier and working capital; R8 billion skills, research and testing; R7 billion worker transport and housing; and R15 billion contingency.

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Most of the factory is not a factory

Illustrative R225bn programme; constant 2026 rand

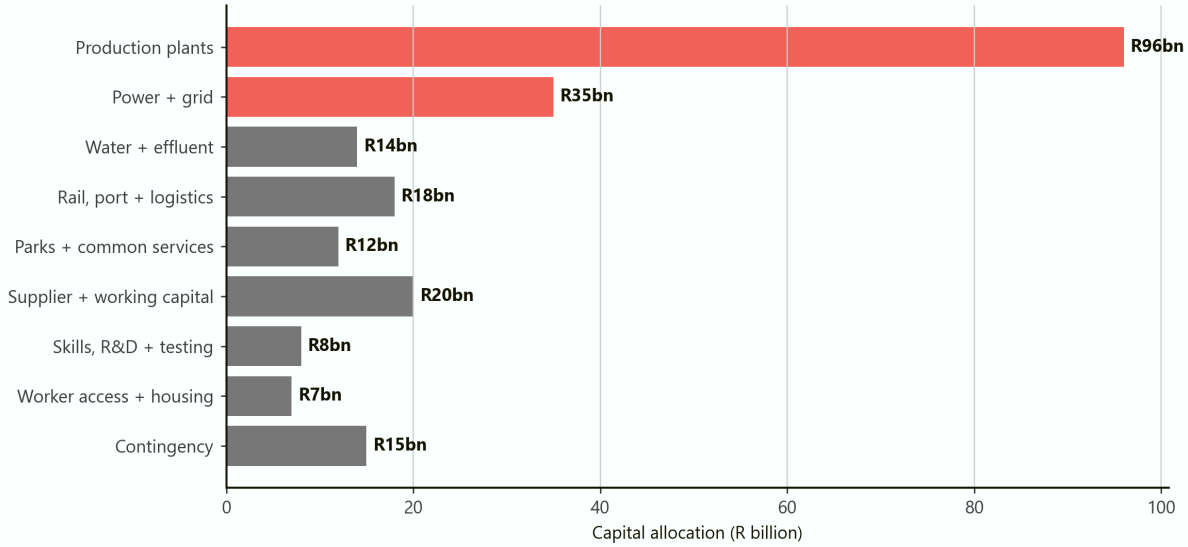

Figure 1. More than half of the illustrative envelope enables production rather than buying production equipment. The distinction is essential: a plant without power, water, logistics, skills, working capital or customers is not productive capital.

The central conclusion: A credible R225 billion programme could establish 34 industrial modules across manganese-battery materials, PGM-hydrogen components, vanadium storage and shared machinery or recycling. In the central case it supports about 11,100 direct operating jobs, roughly 10,000 supplier jobs, R108 billion of annual sales, 700 MW of reliable power demand and twelve million cubic metres of

annual industrial water demand. It takes close to a decade, not one budget year, and its success depends more on utilisation and execution than on the number of ribbon cuttings.

The numbers are scenarios, not quotations or forecasts. Plant sizes inherit the transparent stylised assumptions developed in GreyScienx Papers 5, 6 and 7. Their purpose is physical discipline. They force a large monetary promise to answer mundane questions: how many lines, where, connected to what, staffed by whom, producing how much, and sold to which customer?

Seven findings

First, R225 billion is a portfolio, not a blank cheque. South Africa's 2026 Budget projects R1.07 trillion of public-sector infrastructure spending over three years. The paper's hypothetical programme is therefore material but not unprecedented in relation to the national capital plan. It would equal about one fifth of that three-year total and would compete with roads, water, energy and social infrastructure for scarce engineering and fiscal capacity. National Treasury, *Budget Review 2026*.

Second, enabling infrastructure consumes 35 per cent before supplier finance, skills or contingency. Industrial machinery is useless when grid connections arrive late, effluent permits fail or freight cannot move.

Third, the production core is deliberately modular. Thirty-four modules are easier to stage, benchmark and close than one integrated conglomerate. Failure in a cathode line should not automatically take down an electrolyte plant or a catalyst facility.

Fourth, construction jobs are temporary. The programme peaks near 40,000 direct construction jobs in the model but settles near 11,100 direct operating jobs. Presenting the peak as permanent employment would be misleading.

Fifth, capacity utilisation is the economic hinge. At 40 per cent average use, the production portfolio creates almost no local value after its fixed burden in the model. Above 70 per cent, the case becomes materially stronger.

Sixth, geography should follow economic function. The plan uses five connected nodes rather than one national megasite: Northern Cape mineral processing; Gauteng components, research and finance; Limpopo and North West PGM systems; Gqeberha/Coega battery and export production; and an East London/Durban storage and automotive corridor.

Seventh, the reserve is a governance instrument. The R15 billion contingency is released only at stage gates. If it is allocated politically on day one, it is not a reserve.

PART II

What R225 billion means in context

PART II: What R225 billion means in context

Large enough to matter, not large enough to ignore choices

The 2026 Budget estimates public-sector infrastructure expenditure of R1.066 trillion over 2026/27-2028/29. Transport and logistics account for R417.6 billion, energy R213.6 billion and water and sanitation R185.2 billion. State-owned companies are expected to execute R445.5 billion, provinces R217.8 billion and municipalities R205.7 billion. National Treasury, *Budget Review 2026*, Annexure D.

This comparison prevents two opposite errors. The first is to describe R225 billion as impossibly large. Government and public entities already manage capital programmes several times that size. The second is to describe it as enough to rebuild the whole industrial economy. National infrastructure requirements are much larger, and the existing pipeline already claims construction firms, engineers, transformers, municipal approvals and fiscal space.

The programme must therefore be additional in capability, not merely additional in invoices. It should concentrate on gaps that allow private factories and existing assets to work: dedicated connections, common treatment facilities, testing, logistics interfaces, supplier credit and skills.

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A programme is a system, not a shopping list

Delivery moves from prepared sites to utilities, plants, suppliers and customers

A late grid connection can strand an early factory; an absent customer can strand the entire chain.

Figure 2. The physical sequence matters. Land and permits precede utilities; utilities precede plant commissioning; operations require people and inputs; and the whole chain depends on customers.

Capital budget is not total economic cost

The R225 billion envelope does not include every lifetime cost. Plants need feedstock, wages, electricity, maintenance, inventory and replacements. A battery-material facility may require months of expensive chemical stock before receiving customer payment. A hydrogen-component producer may spend years qualifying a product. A public capital allocation can build the asset while leaving the operating company insolvent.

The model therefore includes R20 billion for supplier development and working capital. This is not a grant to keep weak businesses alive. It is a revolving facility for qualifying suppliers, financing inventory and bridging verified orders. Loans should be priced, secured where possible and withdrawn when the customer disappears.

PART III

The production core

PART III: The production core

Thirty-four modules in four families

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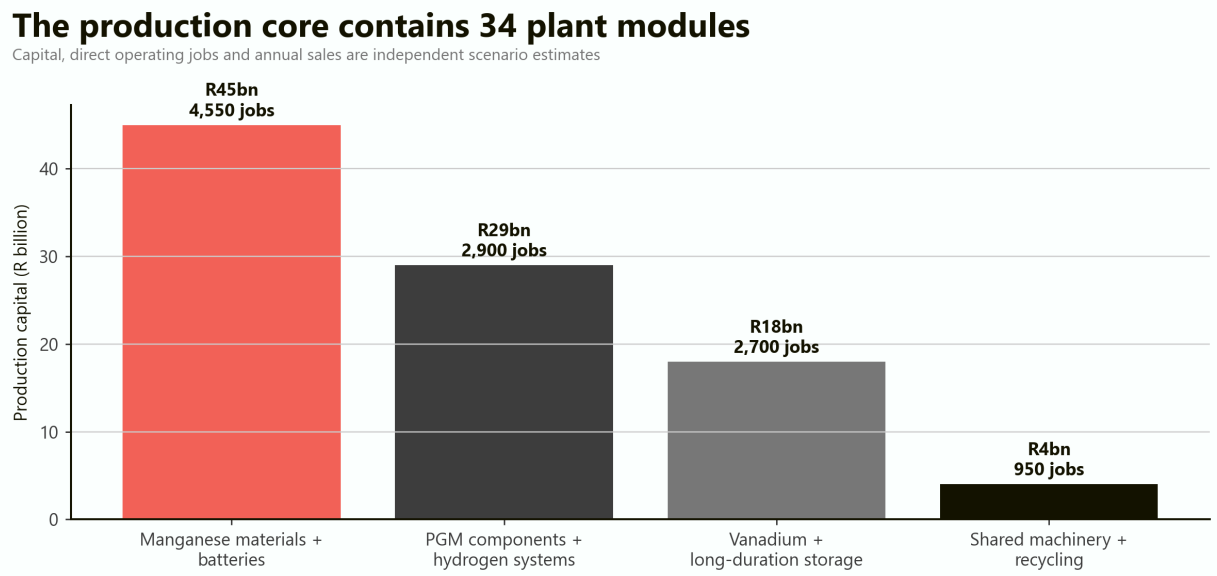

Figure 3. The R96 billion production core is divided among four families. Jobs are direct operating positions at modelled utilisation, not construction or economy-wide multiplier claims.

The **manganese-materials and battery family** receives R45 billion across nine modules. It includes high-purity manganese, sulphate, precursor or cathode materials, cell production, pack assembly and recycling. It is the largest allocation because chemical processing and cell manufacture are capital intensive. It does not attempt to turn all South African manganese into batteries; export markets and qualified customers remain limiting.

The **PGM-component and hydrogen-system family** receives R29 billion across ten modules. It prioritises catalysts, inks, coated membranes, membrane-electrode assemblies, selected stacks, system integration and recycling. It treats green-hydrogen production as a customer project with separate electricity economics rather than a compulsory sink for factory output.

The **vanadium and long-duration-storage family** receives R18 billion across ten modules. It combines refining and electrolyte with pumps, tanks, power electronics, containerisation, project integration and recovery. Stack and membrane localisation deepen only after a fleet proves demand.

The **shared machinery and recycling family** receives R4 billion across five smaller modules. It provides process skids, fluid handling, enclosures, industrial controls, testing and recovery services usable across multiple technologies. This is the smallest allocation but one of the best protections against technological substitution.

Family	Production capital	Modules	Direct operating jobs	Annual sales	Reliable power
Manganese materials and batteries	R45bn	9	4,550	R42bn	380 MW
PGM components and hydrogen systems	R29bn	10	2,900	R34bn	155 MW
Vanadium and long-duration storage	R18bn	10	2,700	R25bn	120 MW
Shared machinery and recycling	R4bn	5	950	R7bn	45 MW

The table is not a tender schedule. Module scales are independent, and downstream sales contain imported inputs. Annual sales are not GDP, local value added or profit. The plan must audit each measure separately.

Why not spend all R225 billion on plants?

Because the additional plant would compete for missing connections, skills and customers. The marginal rand eventually buys less productive capacity. A second cell factory may look impressive but destroy value if both factories operate at 45 per cent. A shared testing laboratory or rail siding can raise utilisation across several plants.

Industrial policy should optimise the system, not maximise factory count.

PART IV

Power, water, logistics and land

PART IV: Power, water, logistics and land

The production core behaves like a new industrial town

The central portfolio requires about 700 MW of reliable connected power. That is demand, not necessarily continuous consumption at nameplate. Energy-intensive manganese refining dominates, while component assembly uses less energy but requires exceptional power quality. On-site renewables and storage can reduce cost and interruption, but they do not eliminate grid, land or backup requirements.

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Utilities must arrive before production ramps

Illustrative connected demand from the production core

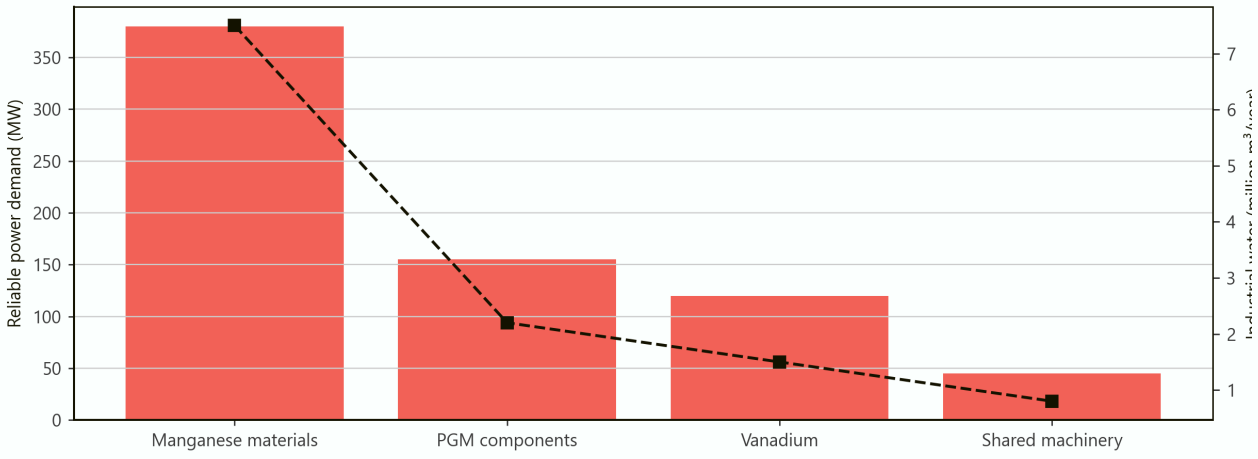

Figure 4. Manganese materials dominate the modelled utility burden. The right-hand line reports industrial water; both measures are illustrative engineering envelopes rather than site designs.

Annual industrial water demand reaches about twelve million cubic metres. The total is modest relative to national consumption but can be decisive in a water-constrained district. High-quality process water, wastewater treatment, chemical recovery and reliable municipal bulk supply matter more than the national average.

The plan sets aside R14 billion for water and effluent systems. Common treatment at an industrial park can lower unit cost and improve compliance, but it concentrates risk. A treatment failure can stop every tenant. Facilities need redundancy, clear ownership and tariffs that fund maintenance.

The R18 billion logistics allocation is targeted rather than national. It finances sidings, loading equipment, port interfaces, hazardous-material handling, storage and digital scheduling associated with selected nodes. It cannot repair the entire freight network. National reforms remain necessary.

Land must be ready, not merely designated

An industrial development zone is not prepared because a map has been approved. A ready site has title, zoning, environmental authorisation, bulk services, geotechnical work, road and rail access, grid capacity, water allocation, waste routes, security and a delivery authority able to contract.

The programme should fund sites in phases. A site receives production equipment only when the utility and permitting package is bankable. This reverses the common sequence in which machinery is ordered first and public agencies spend years solving access afterward.

PART V

Geography

PART V: Geography

Five nodes, one connected portfolio

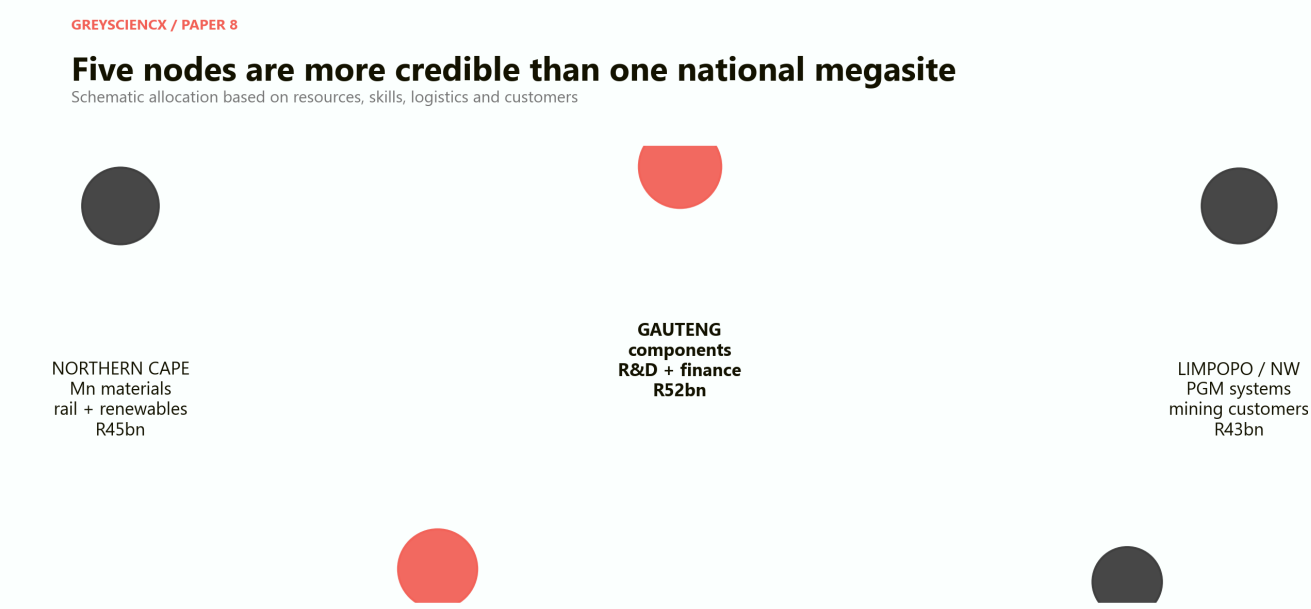

Figure 5. The map is schematic, not geographic. Allocation follows combinations of resource access, existing industry, skills, ports and customers rather than provincial equality.

Northern Cape hosts manganese processing and renewable-linked utilities near ore and rail. The node requires water discipline and reliable export logistics. It should not host downstream production that gains more from engineering labour or automotive customers elsewhere.

Gauteng concentrates laboratories, component companies, universities, finance, software, certification and headquarters. Its value is coordination and skill depth, not ore proximity.

Limpopo and North West connect PGM components and mining-equipment systems to mines, refineries and early customers. Some precision manufacturing can remain in Gauteng while field integration occurs near users.

Gqeberha and Coega combine port infrastructure, automotive capability, industrial land and export orientation. Battery materials, packs and related systems can share logistics and quality disciplines with automotive suppliers.

East London and Durban provide electrolyte, storage-system and automotive opportunities linked to ports and existing industrial bases. The paper groups them as a corridor for modelling; they remain separate cities with different utilities and institutions.

PART VI

Construction and employment

PART VI: Construction and employment

The jobs arrive in two waves

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Construction is the employment peak; operation is the test

Direct jobs only; supplier and induced employment shown separately

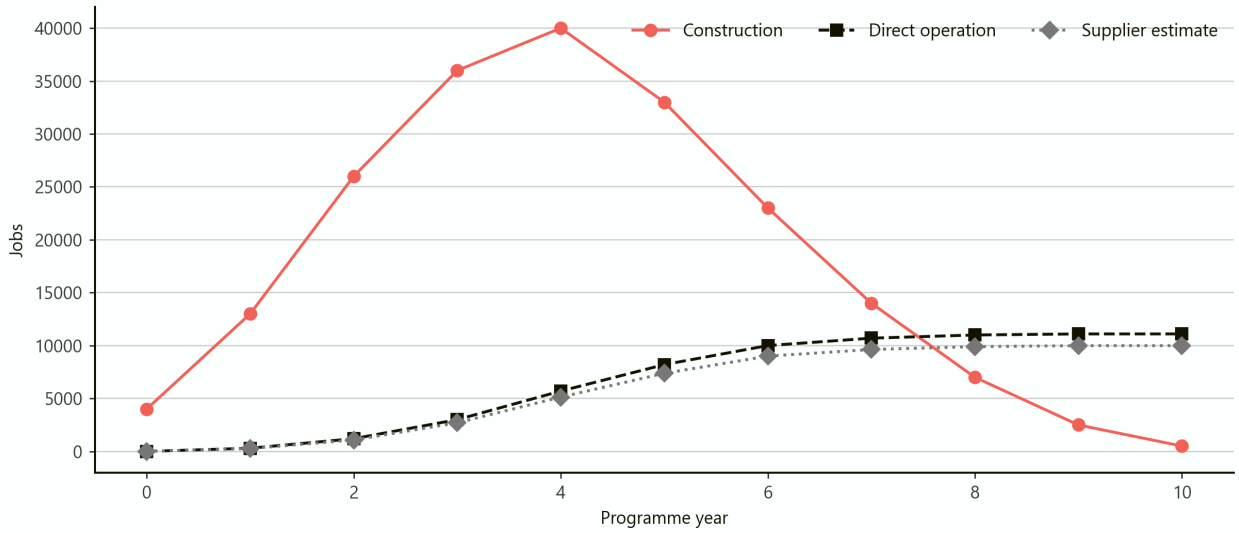

Figure 6. Construction peaks around year four and then falls. Permanent operating and supplier employment rises more slowly. The distinction should be built into every public announcement.

The model peaks near 40,000 construction jobs. These positions are real and valuable, but temporary. By year ten, direct operation stabilises around 11,100 positions. An illustrative supplier ratio adds roughly 10,000 jobs. Induced service employment is not quantified because it depends on wages, imports, location and household spending.

Modern mineral processing is capital intensive. R225 billion will not directly absorb millions of unemployed people. Its employment case is that productive, exporting firms create durable skilled and semi-skilled work, demand local services and relieve foreign-exchange constraints. It must be paired with labour-intensive sectors, urban services and broad employment policy.

The programme also changes the type of work. Construction needs civil trades and project supervision. Commissioning needs instrumentation, process control and vendor engineers. Operation needs technicians, chemists, maintenance teams, quality managers, logistics specialists and sales engineers. Training people only for the final plant leaves the construction and commissioning bottlenecks untouched.

R8 billion for skills is operating infrastructure

The skills allocation funds industry-linked TVET programmes, apprenticeships, university laboratories, conversion courses, vendor training and production-management capacity. Support follows verified placements and competency, not enrolment alone.

Plants should sign training contracts before financial close. Imported specialists may be necessary in the first years, but every work permit for a scarce role should carry a counterpart and transfer plan. The objective is not to ban foreign expertise; it is to prevent permanent dependence.

PART VII
Time

PART VII: Time

Ten years, three investment decisions

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R225 billion takes a decade to become an operating system

Illustrative spend waves; reserve is released only through stage gates

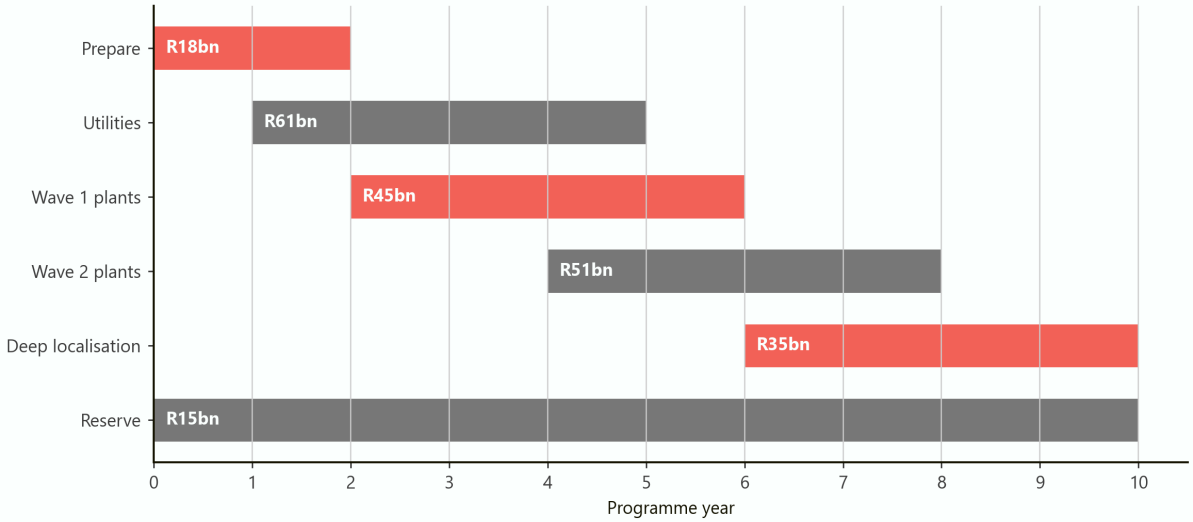

Figure 7. Spending overlaps, but commitment is staged. The reserve remains available across the decade and is not treated as an ordinary programme line.

Years 0-2: prepare. Select nodes, complete bankable feasibility, obtain permits, negotiate offtake, establish technical standards and commission shared laboratories. Small pilots may proceed. Large process equipment should not be ordered on the basis of a concept note.

Years 1-5: enable. Build grid connections, generation, water, effluent, roads, rail interfaces and common services. Utility schedules must be contractual and visible to plant lenders.

Years 2-6: Wave 1 plants. Build modules with proven feedstock, technology partners and customers: high-purity materials, catalysts, electrolyte, pack and storage integration, machinery and recycling.

Years 4-8: Wave 2 plants. Add cathode, cell, stack or electrolyser capacity only when Wave 1 provides qualification, supplier and customer evidence.

Years 6-10: deepen. Localise harder components, expand successful lines, acquire technology and export systems. Close or sell modules that fail rather than preserving them as monuments.

National Treasury reported that the Budget Facility for Infrastructure approved nine projects worth R55.5 billion in the 2025 cycle, with R15.3 billion funded by the facility. The scale demonstrates why project preparation and co-financing must be institutional rather than improvised. National Treasury, *2025 Budget presentation*.

PART VIII

Utilisation, working capital and customers

PART VIII: Utilisation, working capital and customers

The plant is valuable only when it runs

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A half-used plant can destroy an apparently good plan

Stylised annual local value from R96bn production capital

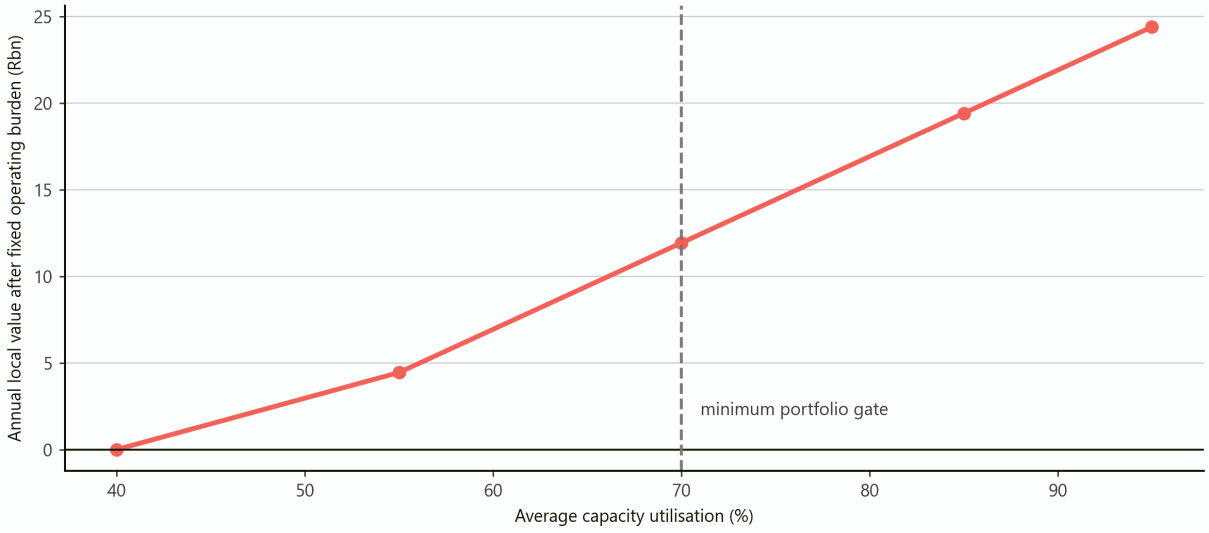

Figure 8. The stylised portfolio barely covers its fixed operating burden at low utilisation. Seventy per cent is a programme gate, not a universal plant break-even point.

At 40 per cent average utilisation, the production portfolio's local value after its stylised fixed burden is near zero. At 55 per cent it reaches roughly R4.5 billion annually; at 70 per cent about R12 billion; at 85 per cent roughly R19 billion; and at 95 per cent about R24 billion.

The precise curve is assumed. The lesson is robust. A project can be technically complete and economically unfinished. Underuse raises unit cost, slows learning, weakens suppliers and turns debt into a burden.

Every module therefore needs a utilisation plan containing customer concentration, minimum order volume, price corridor, qualification period, export logistics and downside response. Government procurement can anchor demand where the state genuinely needs the product. It should not create permanent artificial consumption.

Working capital deserves equal attention. A profitable exporter can fail while carrying inventory and waiting for payment. The R20 billion facility should finance verified orders and receivables, with risk-sharing from commercial banks. It should report arrears, restructurings and losses like a bank, not hide them as industrial support.

PART IX

Overruns and the reserve

PART IX: Overruns and the reserve

A contingency is not enough to cure weak execution

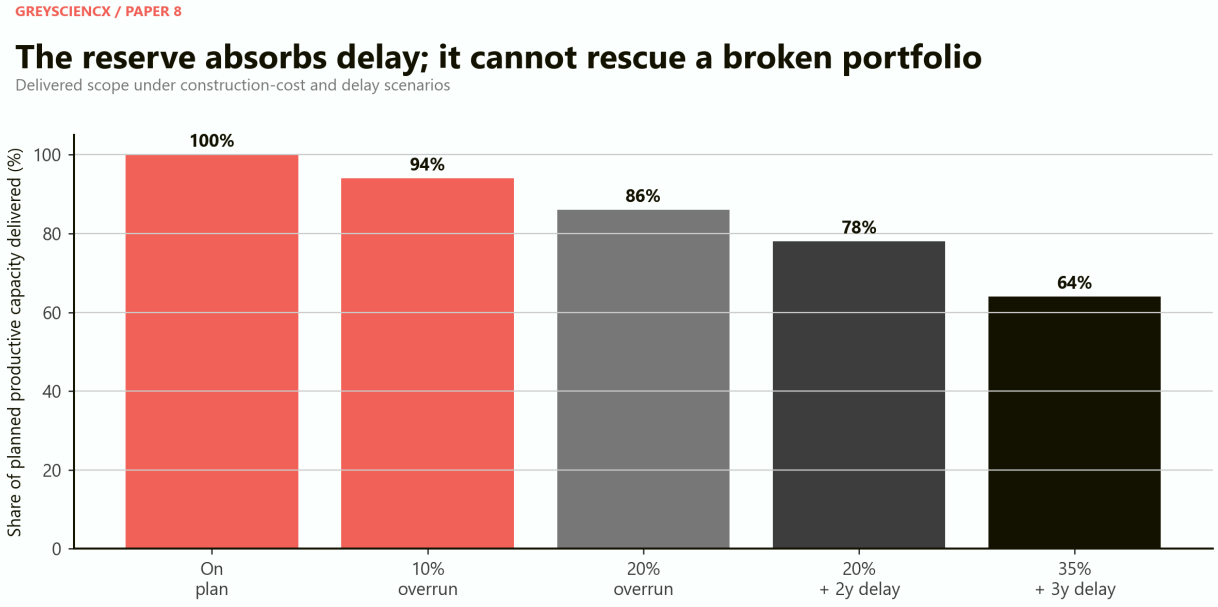

Figure 9. A moderate overrun can be absorbed by scope and reserve management. Combined cost escalation and delay can leave barely two-thirds of planned productive capacity operating.

The on-plan case delivers the full productive system. A 10 per cent overrun reduces effective scope to 94 per cent after using part of the reserve. At 20 per cent, delivered scope falls to 86 per cent. Combining a 20 per cent overrun with a two-year delay reduces it to 78 per cent; a 35 per cent overrun and three-year delay to 64 per cent.

Delay is expensive even when the construction invoice does not rise. Management and interest continue, technology ages, customers find other suppliers and trained workers leave. The correct response is not always to inject more money. Some modules should be cancelled so the remaining system can operate.

The R15 billion reserve is held centrally. Release requires an independent explanation of cause, remaining economics and alternatives. It cannot cover ordinary operating losses or replace missing customer revenue.

PART X

Three outcomes

PART X: Three outcomes

The budget does not determine the result

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The same budget can produce very different industrial estates

Illustrative programme outcomes after ten years

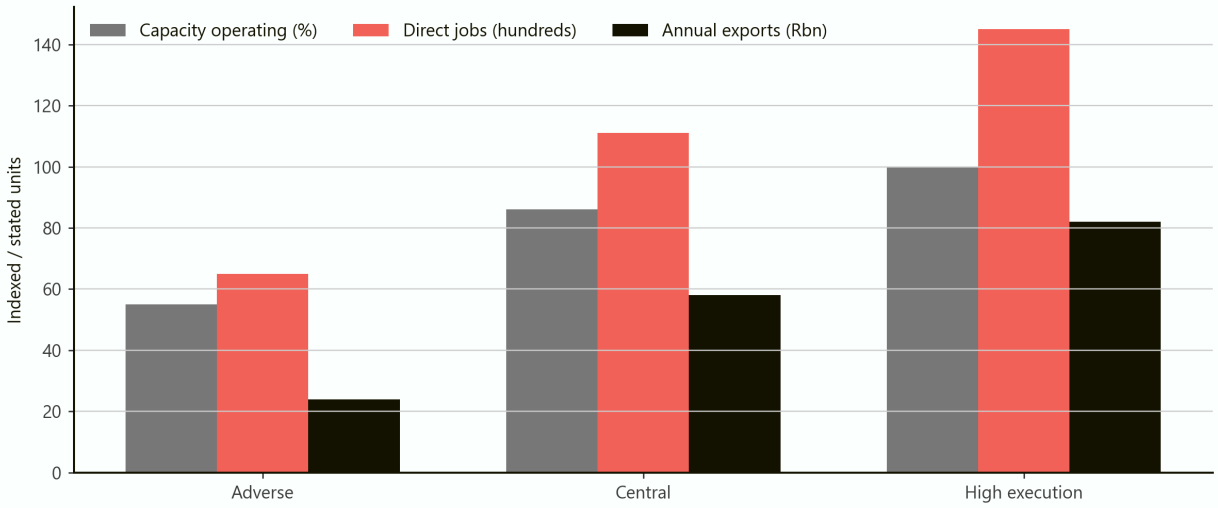

Figure 10. The central case reaches 86 per cent of planned operating capacity, 11,100 direct jobs and R58 billion of annual exports. The axes use stated units, with direct jobs expressed in hundreds.

In the **high-execution case**, utilities arrive on time, commercial partners transfer usable know-how, average utilisation approaches 90 per cent and successful modules expand. Roughly 14,500 direct operating jobs and R82 billion of annual exports become possible.

In the **central case**, several modules are delayed or downsized. The programme delivers 86 per cent of planned capacity, 11,100 direct jobs and R58 billion of exports. It creates a material industrial platform without transforming the labour market by itself.

In the **adverse case**, projects are selected politically, infrastructure is late and factories operate around half capacity. Only 55 per cent of planned productive capacity functions, direct jobs settle near 6,500 and exports near R24 billion. Capital exists physically but much of it is economically stranded.

PART XI

Governance

PART XI: Governance

Treat each module as a falsifiable proposition

Every project passes six gates: prepared site, utility contract, technology and operator, customer or credible market, complete financing, and measurable local value. Approval is conditional. A project that loses its offtake returns to appraisal.

The programme publishes a quarterly physical account: land prepared, megawatts connected, water commissioned, equipment installed, qualification achieved, capacity used, output sold, local value, employment, accidents and cash exposure. Monetary expenditure without physical progress is an alarm.

Governance should separate portfolio owner, project appraiser and plant operator. Political leaders define objectives and risk appetite. Independent specialists test projects. Competitive firms operate plants. The state can hold equity without appointing every manager.

South Africa's Infrastructure Fund already uses blended structures and project preparation. The DBSA reported R37.6 billion of Budget Facility for Infrastructure approvals since inception and a mandate to crowd in investment. The industrial programme should build on those institutions while keeping commercial manufacturing risk distinct from public utility obligations. DBSA, *Integrated Annual Report 2025*.

PART XII
Verdict

PART XII: Verdict

What R225 billion can honestly buy

It can buy a serious industrial option: 34 production modules, five connected nodes, the utility systems to run them, laboratories to qualify them, colleges to staff them, working capital to fulfil orders and a reserve to stop one failure consuming the programme.

It cannot buy automatic competitiveness, millions of permanent jobs, guaranteed exports or immunity from commodity and technology cycles. Those outcomes depend on customers, management, prices and repeated operational performance.

The best plan is therefore selective and sequential. It builds the parts South Africa is ready to operate; imports or partners for what it is not; deepens only after utilisation; and closes projects that fail. R225 billion should not be judged by how completely it is spent. It should be judged by how much competitive production remains ten and twenty years later.

SECTION

Model assumptions and interpretation

Model assumptions and interpretation

All amounts are constant 2026 rand. The R225 billion envelope is the midpoint of the requested R200-R250 billion range. Allocations and module outcomes are scenarios, not forecasts, engineering designs or procurement estimates.

Production-module costs and operating characteristics draw on the transparent illustrative modules in GreyScienx Papers 5-7. The portfolio is not mass-balanced. A downstream plant's full output is not assumed to use only domestic upstream production.

Jobs are direct unless labelled supplier estimates. Construction employment is a time profile, not permanent. Annual sales are not GDP, value added, exports, tax revenue or profit. The utilisation curve uses a stylised fixed burden to demonstrate sensitivity.

Geographic nodes are schematic. Site selection requires detailed land, grid, water, logistics, environmental, labour and customer analysis. The paper does not recommend a specific parcel or procurement.

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