

SOUTH AFRICA CAPABILITY ATLAS: An adaptive map of work, professional expertise, research and civic capability

Evidence-led companion to Inflexion Point — revised working paper, 12 August 2026

Status and use

This is a national planning hypothesis for consultation, not an official workforce forecast, a list of guaranteed jobs or an allocation of subjects to particular institutions. It asks what South Africa should be able to retain, repair, develop or stop doing within an indicative five-to-eight-year decision window, then identifies the work, professional, research and civic capabilities that would make those choices possible. Provincial entries indicate stronger concentrations and transition opportunities, not exclusive mandates. The window is deliberately approximate: every forward-looking claim remains a proposition to be tested, revised or abandoned as conditions change.

The map in one proposition

South Africa should prepare for several plausible versions of the coming five to eight years rather than one official future. Across those versions, it will need linked capability systems able to teach students, care for a younger and gradually ageing population, keep water and energy flowing, repair and operate infrastructure, move goods through ports and corridors, produce food under climatic pressure, govern digital systems, renew industry, administer the state competently, sustain public reasoning and create knowledge in fields where dependence carries strategic risk. The balance among these requirements will change. Some of the work is highly professionalised; some is technical, artisanal, entrepreneurial or community-based. Much of it succeeds only when these forms of work meet.

The atlas therefore maps capability rather than merely credentials. A water system, for example, requires hydrologists and engineers, but also process controllers, artisans, asset managers, procurement and finance specialists, laboratory staff, municipal managers, catchment researchers and citizens able to participate in water governance.

The institutional question behind the map

The Atlas is not an instruction to chase whichever capabilities currently attract the strongest market signal. It asks each institution to state what kind of knowledge institution it is: which fields it will teach with depth, which forms of inquiry and scholarship it will sustain, which professions or communities it will help form, what knowledge it will preserve or create, and how its mission relates to place and public life. Identity is not branding. It is a public promise about what an institution will know, teach, question and contribute.

The intellectual function of higher education includes teaching, research, scholarship, critical inquiry, professional judgement, cultural and linguistic stewardship, and the creation of spaces in which evidence and inherited assumptions can be contested. Public and private institutions may

carry these functions in different combinations. The point is not to force every institution to imitate a research-intensive public university, nor to allow any institution to reduce higher education to credential delivery. The companion conference paper uses this map to ask which responsibilities belong to particular institutional identities and which require collaboration across the system.

How to read the atlas

The unit of analysis is a capability system: a body of socially necessary work, the professional and technical expertise required to perform and govern it, the research needed to improve or adapt it, and the civic capacity that gives it legitimacy and reach. Job titles are included as illustrations but are not treated as fixed. Generative artificial intelligence and other technologies change tasks unevenly; exposure to a technology is not the same as the disappearance of an occupation (Gmyrek et al., 2025).

Evidence class	Meaning	Adaptive response
A — present and persistent	Visible in current employment, public-service need, occupational demand, demographic pressure or infrastructure failure. The scale may change, but the capability is unlikely to become unnecessary.	Build and repair now; improve retention, distribution and quality.
B — committed transition	Strongly signalled by approved policy, an investment plan, regulation, industrial change or a funded infrastructure pipeline. Timing and scale remain uncertain.	Create pathways and regional capacity; expand, pause or redirect against verified milestones.
C — scenario-dependent option	Plausible under particular combinations of technology, investment, climate, trade or regulation. It should not be sold as a guaranteed graduate destination.	Maintain research and bounded pilot capability; expand, redesign or stop when trigger evidence appears.

The atlas uses three concurrent decision modes rather than a single sequence. Present obligations require repair or protection wherever capability failure is already constraining learning, health, infrastructure, production or government. Committed transitions justify pathway-building, but expansion follows verified milestones rather than elapsed time. Strategic options retain research, teaching and experimental capacity until trigger evidence strengthens, weakens or changes direction. All three modes may operate at once, and a shock may accelerate, suspend or reverse a decision. The five-to-eight-year window provides enough distance for institutional choices to matter; it is not a projection or an endpoint. Time matters, but elapsed time is not evidence.

Method and evidence

The atlas triangulates six forms of evidence: official employment and population statistics; DHET's occupations-in-high-demand analysis; national sector and infrastructure plans; professional and public-service workforce strategies; task-level technology evidence; and evidence of unmet civic and public need. The 2024 occupations list is used as a current signal, not as a terminal forecast. Vacancy data record employers able and willing to recruit; they do not count every teacher, nurse, municipal engineer, social worker or community practitioner whom a society may need but has not budgeted to employ (DHET, 2024).

The map also treats informal and own-account work as part of the national economy. Statistics South Africa estimated that the informal sector accounted for 19.5% of total employment in the fourth quarter of 2024 (Statistics South Africa, 2025b). A map built only from formal advertisements would therefore overlook a substantial field of livelihoods, enterprise and service provision. The atlas identifies capabilities that can raise productivity, safety, bargaining power, market access and routes into formality where that is advantageous.

Population is treated as a demand signal. South Africa's 2025 population was estimated at 63.10 million; about 26.2% were younger than 15 and 10.5% were aged 60 or older. Provincial age structures and migration patterns differ (Statistics South Africa, 2025a). The system must therefore prepare for a continuing youth pipeline, recurrent adult learning, a larger care burden, urban concentration and difficult questions about sustaining capability in places losing skilled people.

South African Adaptive Capability Atlas

12 national priority capability systems · evidence-class view

A class describes the strength and maturity of the evidence — not the importance of the capability.

A Present and persistent

Build and repair now; improve retention, distribution and quality. 3 A-only systems.

1 Health, care and biosecurity

2 Education and lifelong learning

9 Capable government, justice and public safety

A/B Persistent capability + committed transition

Maintain the core; expand, pause or redirect transition components against verified milestones. 5 systems.

4 Water, climate, biodiversity and disaster resilience

5 Infrastructure, settlements, mobility and logistics

6 Food, agriculture and the bioeconomy

8 Advanced production, repair and circular industry

10 Enterprise, finance and inclusive livelihoods

A/B/C Mixed portfolio including scenario-dependent options

Protect established capability; test transitions; expand Class C components only when trigger evidence appears. 4 systems.

3 Energy, minerals and a just transition

7 Digital, AI, data and cybersecurity

11 Language, culture, media and the creative economy

12 Research, knowledge sovereignty and innovation

Evidence matrix

A = present and persistent · B = committed transition · C = scenario-dependent option

Mixed systems contain different components at different evidence levels; Class C does not mean lower public value.

Source: South African Adaptive Capability Atlas — evidence-class matrix and “National map at a glance”.

National map at a glance

Capability system	Work South Africa must be able to do	Class	Place logic
1. Health, care and biosecurity	Care, diagnose, prevent, rehabilitate, manage health systems and respond to outbreaks	A	Everywhere; rural and underserved districts require deliberate distribution
2. Education and lifelong learning	Build foundational learning; teach disciplines and vocations; support recurrent learning	A	Everywhere; language, rurality and school performance shape local need
3. Energy, minerals and a just transition	Operate and expand power systems; beneficiate minerals; rehabilitate sites; manage transition	A/B/C	Mpumalanga, Northern Cape, North West, Limpopo, Gauteng, Eastern Cape; national grid
4. Water, climate, biodiversity and disaster resilience	Secure water; maintain ecosystems; anticipate, prevent and recover from shocks	A/B	Everywhere; strongest place-specific pressures differ by catchment and coast
5. Infrastructure, settlements, mobility and logistics	Plan, finance, build, operate and maintain settlements, networks, ports and corridors	A/B	Metros, secondary cities, rural municipalities, ports and freight corridors
6. Food, agriculture and the bioeconomy	Produce, process, assure and distribute food; manage land, animals and biological resources	A/B	All provinces; distinctive commodity, water and biodiversity systems
7. Digital, AI, data and cybersecurity	Build trustworthy digital systems; secure data; automate judiciously; govern technology	A/B/C	National backbone with metropolitan and research-intensive concentrations
8. Advanced production, repair and circular industry	Make, maintain, remanufacture and decarbonise products and production systems	A/B	Gauteng, KwaZulu-Natal, Eastern Cape, Western Cape and mining-industrial corridors

Capability system	Work South Africa must be able to do	Class	Place logic
9. Capable government, justice and public safety	Plan, regulate, procure, adjudicate, account, deliver services and build public trust	A	Every sphere of government; acute need in municipalities
10. Enterprise, finance and inclusive livelihoods	Start and grow firms and cooperatives; finance investment; improve informal livelihoods	A/B	Everywhere; market access and sector opportunities differ by place
11. Language, culture, media and the creative economy	Create, interpret, communicate and preserve meaning across a multilingual democracy	A/B/C	National; strong urban, heritage, tourism and language-region concentrations
12. Research, knowledge sovereignty and innovation	Generate, validate, preserve and apply knowledge of strategic and public value	A/B/C	Distributed mission networks with selected national facilities and specialist centres

The national backbone: capabilities required in every province

Some capabilities should be geographically concentrated because equipment, specialist supervision or industrial ecosystems are expensive. The following should not. Every province requires a sufficient base, even where advanced specialisation is shared nationally.

Backbone	Work layer	Professional layer	Civic layer
Foundational teaching and learner support	Early learning; language and literacy; mathematics and science teaching; inclusive education; counselling; assessment; school leadership	Teacher educators; subject specialists; educational psychologists; data and curriculum specialists	Families and communities able to support learning and hold systems to account

Backbone	Work layer	Professional layer	Civic layer
Primary health, care and public health	Prevention; community and primary care; maternal and child health; mental health; rehabilitation; elder care	Nurses, doctors, allied health professionals, social workers, health managers and community health workers	Health literacy, care networks, trust and community participation
Water, sanitation and municipal operations	Operate plants and networks; test water; maintain assets; manage revenue, projects and contractors	Engineers, process controllers, artisans, laboratory staff, asset and financial managers	Water stewardship, reporting of failures and participation in catchment and municipal governance
Digital, data and cyber competence	Use and secure digital systems; manage records and data; deliver accessible hybrid services	Software, data, cyber, information and service-design specialists plus digitally capable professionals	Privacy, media and AI literacy; safe access; resistance to fraud and manipulation
Public administration and implementation	Plan, budget, procure, contract, monitor, regulate and evaluate	Public managers, economists, accountants, planners, lawyers, statisticians and project professionals	Constitutional literacy, oversight and constructive participation
Climate and disaster readiness	Map risk; maintain early warning; adapt infrastructure and services; coordinate response and recovery	Climate, geospatial, engineering, health, logistics, communication and humanitarian specialists	Local preparedness, trusted communication and mutual-aid capability
Enterprise and livelihood support	Run compliant, productive small firms, farms, practices, cooperatives and informal enterprises	Accountants, business advisers, designers, technologists, extension practitioners and market specialists	Cooperative governance, consumer and worker rights, savings and financial capability

Twelve capability systems

The following cards state adaptive capability propositions and make visible the four layers that are too often planned separately. They are portfolio hypotheses, not destinations on a single road. Examples are selective. Each card should be validated and periodically re-tested by sector experts, workers, communities, professional bodies and provincial planners.

1. Health, care and biosecurity

Adaptive capability proposition: South Africa should be prepared to sustain and develop a distributed health-and-care workforce able to combine clinical depth, primary care, prevention, mental health, rehabilitation, social care, digital systems and outbreak readiness.

Map layer	Adaptive capability proposition
Work	Community and primary care; nursing and clinical practice; maternal, child and adolescent health; mental health; rehabilitation and disability support; elder and long-term care; laboratory and diagnostic services; health logistics; occupational health; veterinary and One Health surveillance.
Professional expertise	Medical, nursing, pharmacy, dental and allied-health professions; public-health and epidemiology; social work and psychology; health economics, informatics and management; biomedical technology; community health facilitation; veterinary and food-safety expertise.
Research	Disease burden and prevention; health-systems performance; vaccines and diagnostics; antimicrobial resistance; mental health; climate-health; ageing; disability and rehabilitation; indigenous and community health knowledge; ethical health data and AI.
Civic capability	Health and science literacy; care networks; informed consent; trust in public-health communication; patient rights; community participation; resistance to misinformation and stigma.
Place and pathway	A national backbone with stronger rural clinical platforms and district training networks. Degrees and professional qualifications must connect to community-based learning, technician routes, workplace development and recurrent professional education.
Evidence, triggers and review	Class A. Act wherever distribution, retention, supervision or management evidence shows failure. Expand care, mental-health, digital-health and ageing capability in response to demographic, service and access indicators; revisit direction at every atlas refresh. The 2030 Human Resources for Health Strategy frames workforce equity, planning and universal health coverage (National Department of Health, 2020).

2. Education and lifelong learning

Adaptive capability proposition: South Africa should protect and deepen a teaching profession with stronger subject depth, inclusive practice, professional learning and capacity to respond to changing patterns of youth and adult learning—and to work with, rather than be replaced by, digital tools.

Map layer	Adaptive capability proposition
Work	Early-childhood development; foundational literacy and numeracy; subject teaching; vocational and technical education; inclusive education; counselling; school and college leadership; curriculum, assessment and learning design; adult and workplace learning; library and information services.
Professional expertise	Teachers and teacher educators; subject and language specialists; educational psychologists; curriculum and assessment experts; learning designers; special-needs practitioners; institutional leaders; artisans and professionals prepared to teach; data-informed improvement specialists.
Research	Foundational learning; multilingual pedagogy; mathematics and science education; vocational learning; teacher development and retention; inclusive education; assessment validity; AI-supported learning; cost-effective models for rural and adult provision.
Civic capability	Family and community support for learning; reading cultures; language inclusion; learner safety; capacity to scrutinise school performance without reducing education to a league table.
Place and pathway	Required everywhere. Provincial language, rurality, migration and school-performance patterns should shape recruitment and placement. Initial degrees and diplomas need residency-like workplace support, modular professional learning and articulation with TVET and community education.
Evidence, triggers and review	Class A. A standing repair obligation rather than a dated stage. Intensify, redirect or maintain interventions as learner, teacher, language and population evidence changes. The DBE Action Plan to 2029 provides the current schooling improvement framework; the population age structure sustains long-term demand (DBE, 2025; Statistics South Africa, 2025a).

3. Energy, minerals and a just transition

Adaptive capability proposition: South Africa must simultaneously operate legacy systems, expand and stabilise the grid, build lower-carbon industries, add value to minerals and manage the social and environmental consequences of transition.

Map layer	Adaptive capability proposition
Work	Power generation, transmission, distribution, storage and maintenance; energy efficiency; mine operation, safety and closure; mineral processing and beneficiation; environmental rehabilitation; new-energy vehicles; battery and hydrogen value chains; transition planning and worker support.
Professional expertise	Electrical, mechanical, chemical, mining and metallurgical engineers; geoscientists; technicians and artisans; grid and systems operators; environmental and occupational-health professionals; energy economists, lawyers, financiers, industrial planners, labour-transition and community-development specialists.
Research	Grid stability; energy storage; solar, wind and demand management; low-carbon fuels; minerals and materials processing; mining safety; circular use of batteries and materials; rehabilitation; distributional and place-based effects of transition.
Civic capability	Energy literacy; meaningful participation in siting and benefit-sharing; worker voice; community monitoring; ability to negotiate land, livelihood and environmental trade-offs.
Place and pathway	Mpumalanga for coal transition, grid and rehabilitation; Northern Cape for renewables, minerals and possible green hydrogen; North West and Limpopo for mining and beneficiation; Eastern Cape for automotive transition; national transmission and municipal-distribution capability. University–TVET–industry pathways and transition hubs are essential.
Evidence, triggers and review	Classes A/B; selected hydrogen and scale assumptions remain C. Protect core power and mining capability; expand, redirect or pause pathways against verified investment, grid and transition milestones. The JET Investment Plan identifies place-based Skills Development Zones; the 2025 Critical Minerals and Metals Strategy emphasises value addition, industrialisation and sustainability (PCC, 2023; DMPR, 2025).

4. Water, climate, biodiversity and disaster resilience

Adaptive capability proposition: Water security and climate adaptation will be operating disciplines, not environmental electives, while biodiversity must be treated as living infrastructure and a basis for legitimate livelihoods.

Map layer	Adaptive capability proposition
Work	Catchment and groundwater management; water and wastewater treatment; network maintenance; flood, fire, drought and coastal-risk management; weather and Earth observation; ecological restoration; conservation, fisheries and biodiversity enterprises; disaster logistics and recovery.
Professional expertise	Hydrologists, engineers, process controllers and artisans; environmental scientists; ecologists, ocean and fisheries specialists; climate scientists; meteorologists; geospatial analysts; planners; risk, insurance and disaster professionals; community facilitators and environmental-law specialists.
Research	Catchment dynamics and water reuse; drought-resilient systems; climate attribution and local forecasts; fire and flood regimes; ecosystem restoration; biodiversity finance; sustainable use; climate-health and climate-migration; adaptation effectiveness.
Civic capability	Water stewardship; local risk mapping; early-warning response; community monitoring; environmental rights; indigenous ecological knowledge; negotiated conservation and benefit-sharing.
Place and pathway	National capability organised by catchments, coasts, biomes and risk zones rather than provincial borders alone. Strong water and drought capability in arid provinces; flood and coastal resilience in KwaZulu-Natal, Eastern Cape and Western Cape; biodiversity systems across rural landscapes.
Evidence, triggers and review	Classes A/B. Municipal and operational repair is a standing obligation; adaptation priorities should be revised whenever risk, service, catchment or ecological evidence changes. The National Water and Sanitation Master Plan and NWRS-3 require capable institutions and water management; the biodiversity-economy strategy offers an opportunity but should be tested against ecological limits and community benefit (DWS, 2019, 2023; DFFE, 2024).

5. Infrastructure, settlements, mobility and logistics

Adaptive capability proposition: The scarce national capability will not be to announce infrastructure but to plan, finance, procure, build, operate, maintain and adapt it over its full life.

Map layer	Adaptive capability proposition
Work	Infrastructure planning and finance; engineering design; construction and inspection; asset and facilities management; municipal services; housing and settlement upgrading; public transport; road, rail, port, aviation and supply-chain operations; maintenance, repair and logistics analytics.

Map layer	Adaptive capability proposition
Professional expertise	Civil, transport, electrical and mechanical engineers; architects and urban planners; quantity surveyors; construction and project managers; artisans and technicians; procurement, contract, commercial and infrastructure-finance specialists; port, rail and supply-chain professionals.
Research	Low-cost and climate-resilient materials; asset-condition monitoring; human settlements; mobility and freight modelling; port and rail performance; infrastructure finance and procurement; spatial inequality; maintenance institutions and technology.
Civic capability	Participatory planning; commuter and user knowledge; community contracting oversight; road and workplace safety; ability to evaluate life-cycle trade-offs rather than only new construction.
Place and pathway	Metropolitan systems; Durban/Richards Bay, Cape Town/Ngqura/Gqeberha and other port corridors; mining and agricultural rail routes; secondary cities and rural municipalities. Degrees must articulate with technician, artisan, apprenticeship and work-integrated routes.
Evidence, triggers and review	Classes A/B. Maintenance and operational competence are standing priorities. Treat the National Infrastructure Plan 2050 and the Freight Logistics Roadmap as directional signals; activate expansion when projects reach credible financial, procurement and operational milestones (Infrastructure South Africa, 2022; Department of Transport, 2023).

6. Food, agriculture and the bioeconomy

Adaptive capability proposition: Food security will depend on productive and inclusive value chains able to manage water, climate, animal and plant health, technology, processing, logistics and contested land relations.

Map layer	Adaptive capability proposition
Work	Crop and livestock production; veterinary and extension services; aquaculture and fisheries; food processing, safety and quality; cold chains and logistics; agricultural finance and insurance; agri-enterprise; land and water management; biotechnology and biological-resource enterprises.
Professional expertise	Agronomists, veterinarians, animal and plant scientists, soil and water specialists; food scientists and technologists; extension practitioners; engineers, technicians and artisans; economists, trade, logistics and cooperative-development specialists; biosafety and intellectual-property expertise.

Map layer	Adaptive capability proposition
Research	Climate-resilient crops and livestock; soil and water efficiency; plant and animal disease; nutrition; food safety; indigenous crops and knowledge; agricultural robotics and data; smallholder and land-reform models; sustainable fisheries and bio-based materials.
Civic capability	Food and nutrition literacy; cooperative governance; land and water negotiation; farmer organisations; biosecurity reporting; ethical stewardship of indigenous knowledge and genetic resources.
Place and pathway	All provinces, differentiated by commodities, climate and market access: intensive horticulture and wine systems; grain and livestock regions; subtropical and smallholder systems; coastal fisheries and aquaculture. Rural learning networks, demonstration sites and extension platforms are needed.
Evidence, triggers and review	Classes A/B. Protect extension, veterinary, water, processing and market capability; expand or redirect new biotechnology pathways only when ecological, market and production evidence warrants it. The Agriculture and Agro-processing Master Plan links inclusion, food security, technology, climate resilience, R&D, extension and value addition (DALRRD, 2022).

7. Digital, AI, data and cybersecurity

Adaptive capability proposition: Digital competence will be distributed across professions, while a smaller advanced workforce builds and assures systems, secures infrastructure and governs data and algorithms in the public interest.

Map layer	Adaptive capability proposition
Work	Software and platform engineering; data stewardship and analytics; cyber defence and incident response; cloud and network operations; automation and human-centred design; AI development, evaluation, audit and procurement; digital public services; language technologies and accessible systems.
Professional expertise	Software, data, AI, network and cybersecurity specialists; statisticians; information and records professionals; service and interaction designers; technology lawyers, ethicists, auditors and regulators; domain professionals able to specify, test and supervise technology.
Research	Low-resource and African-language AI; trustworthy and explainable systems; cybersecurity; public-interest data infrastructures; digital identity; human–AI work design; computational science; algorithmic bias, privacy, competition and environmental cost.

Map layer	Adaptive capability proposition
Civic capability	AI, media, data and privacy literacy; cyber hygiene; ability to recognise fraud and synthetic media; informed participation in digital-government and surveillance decisions; accessible digital citizenship.
Place and pathway	A national backbone with advanced clusters in metropolitan and research-intensive centres, shared cyber and compute infrastructure, and deliberate inclusion of rural providers. Specialist degrees sit beside conversion programmes, modular professional learning and cross-disciplinary requirements.
Evidence, triggers and review	Classes A/B/C. Cyber, data and baseline digital capability are A; sector-wide AI redesign is B; particular job and productivity claims remain C. Reclassify these propositions as technology, adoption and regulation change. South Africa's 2024 AI Policy Framework is a policy signal; the 2026 draft policy was withdrawn for revision and is not treated here as adopted policy (DCDT, 2024; GCIS, 2026).

8. Advanced production, repair and circular industry

Adaptive capability proposition: Industrial capability will depend as much on technicians, maintenance and production learning as on frontier invention, and on the ability to decarbonise without abandoning productive depth.

Map layer	Adaptive capability proposition
Work	Advanced and precision manufacturing; automotive and new-energy vehicles; chemicals, pharmaceuticals and medical devices; electronics; automation and robotics; industrial maintenance; quality and metrology; remanufacture, recycling and materials recovery; production and supply-chain management.
Professional expertise	Mechanical, industrial, chemical, mechatronic, materials and electrical engineers; technologists, technicians and artisans; production, quality, safety and supply-chain specialists; industrial designers; commercialisation, standards and intellectual-property professionals.
Research	Advanced materials and manufacturing processes; industrial AI and robotics; batteries and components; biomanufacturing; low-carbon process heat; additive manufacturing; recycling and product life extension; firm learning, technology diffusion and industrial policy.
Civic capability	Worker participation in technology adoption; occupational safety; community understanding of industrial risk; consumer right-to-repair; cooperative and local-supplier capability.

Map layer	Adaptive capability proposition
Place and pathway	Gauteng manufacturing and services; Eastern Cape and KwaZulu-Natal automotive and industrial systems; Western Cape technology and design; mining-linked production corridors. Shared factories, laboratories and work-integrated university–TVET–industry routes should be normal infrastructure.
Evidence, triggers and review	Classes A/B. Protect maintenance, quality and production competence; expand, redirect or pause new-energy and circular systems against industrial investment and production evidence. The STI Decadal Plan and critical-minerals strategy support innovation, value addition and technology diffusion (DSI, 2022; DMPR, 2025).

9. Capable government, justice and public safety

Adaptive capability proposition: South Africa requires a professional state able to turn policy into lawful, ethical and competently managed services, particularly at local level, while protecting rights and public trust.

Map layer	Adaptive capability proposition
Work	Policy and programme design; budgeting and revenue; procurement and contract management; project delivery; regulation and inspection; statistics, monitoring and evaluation; records and archives; courts and legal services; policing, forensics, corrections and violence prevention; diplomacy.
Professional expertise	Public managers, planners and development economists; accountants, auditors and statisticians; lawyers, prosecutors and judicial officers; procurement and project professionals; engineers and municipal managers; archivists and information professionals; criminologists, forensic and safety specialists.
Research	State capability and implementation; local-government finance and service models; corruption prevention; regulatory design; justice access and court administration; violence and crime prevention; public trust; digital government, administrative data and institutional memory.
Civic capability	Constitutional and legal literacy; public reasoning; community safety partnerships; budget and procurement oversight; whistle-blower protection; ability to participate constructively without surrendering scrutiny.
Place and pathway	Required in all spheres, with particular emphasis on municipalities and frontline institutions. Professional formation should combine disciplinary education, supervised practice, public ethics, data competence and recurrent learning tied to actual service systems.

Map layer	Adaptive capability proposition
Evidence, triggers and review	Class A. This is a continuous obligation, but priorities should be reset as service, audit, staffing and public-trust evidence changes. The Medium Term Development Plan prioritises a capable, ethical developmental state; the Auditor-General has called for professionalisation and attention to skills and capacity gaps in local government (DPME, 2025; AGSA, 2025).

10. Enterprise, finance and inclusive livelihoods

Adaptive capability proposition: South Africa needs capability to finance productive investment, grow and govern firms and cooperatives, and improve the security and productivity of livelihoods that do not begin inside large employers.

Map layer	Adaptive capability proposition
Work	Enterprise formation and growth; accounting, tax and compliance; development and infrastructure finance; risk and insurance; export and market development; cooperative and social enterprise; digital commerce; business turnaround; productivity, design and technology extension; livelihood support.
Professional expertise	Accountants, economists, actuaries, financiers and risk specialists; business, marketing, logistics and trade professionals; designers and technologists; cooperative-development and labour specialists; business rescue and insolvency practitioners; extension and incubation professionals.
Research	Firm dynamics and productivity; access to finance and markets; township and rural economies; informal livelihoods; competition and platform power; cooperative governance; industrial and trade policy; inclusive financial technology and social protection.
Civic capability	Financial, tax and consumer literacy; worker and enterprise rights; cooperative decision-making; savings and risk management; networks of trust; ability to use digital markets without being captured by them.
Place and pathway	Every province, linked to local value chains rather than generic entrepreneurship courses. Full qualifications should sit beside clinics, modular learning, mentoring, procurement access, technology extension and reliable business services.
Evidence, triggers and review	Classes A/B. Maintain support for productivity and livelihood resilience; activate or redirect transition pathways as sector investment, market access and worker evidence changes. Informal-sector scale requires the map to extend beyond formal employer demand (Statistics South Africa, 2025b).

11. Language, culture, media and the creative economy

Adaptive capability proposition: In a multilingual democracy, interpretation, cultural production and trustworthy communication are infrastructure; they are also fields of work and enterprise being reshaped by digital platforms and AI.

Map layer	Adaptive capability proposition
Work	Language teaching, translation and interpreting; journalism and public-interest communication; film, music, games, publishing, performance and design; heritage, museums and archives; tourism interpretation; content moderation and verification; community and science communication.
Professional expertise	Language practitioners, writers, journalists and editors; artists, designers, producers and technical crews; historians, archaeologists, curators, archivists and conservators; intellectual-property, media law and cultural-enterprise specialists; digital and audience analysts.
Research	African languages and terminology; language technology; histories and archives; creative industries and platform economics; misinformation and media trust; heritage conservation; cultural policy, memory and social cohesion.
Civic capability	Multilingual participation; media and historical literacy; dialogue across difference; ethical memory; capacity to create and interpret culture rather than consume an algorithmic feed as though it were inevitable.
Place and pathway	National capability with local language, heritage, tourism and creative clusters. Studio, workplace and portfolio routes; full humanities and arts qualifications; technical programmes; community media; and shared cultural infrastructure all have roles.
Evidence, triggers and review	Classes A/B/C. Communication and language access are A; particular creative markets and technologies are B/C. Review the balance as platforms, audiences and cultural practices change. These capabilities carry civic and knowledge value even where vacancy data are weak; they should not be judged solely by immediate wages.

12. Research, knowledge sovereignty and innovation

Adaptive capability proposition: South Africa must retain the capacity to identify its own questions, generate and test knowledge, preserve evidence and collaborate internationally without becoming merely a data source or downstream user.

Map layer	Adaptive capability proposition
Work	Basic and applied research; research infrastructure and laboratories; postgraduate supervision; biostatistics and data stewardship; technology transfer and standards; policy research; libraries, archives and collections; research management, ethics, communication and public engagement.
Professional expertise	Researchers across sciences, engineering, health, social sciences, humanities and arts; laboratory and research technicians; data stewards and software engineers; librarians and archivists; research managers, ethics and integrity officers; intellectual-property, innovation and science-communication professionals.
Research missions	Health and One Health; foundational learning; water and climate adaptation; energy, minerals and materials; food systems; AI, cyber and African-language technology; infrastructure and cities; democracy and inequality; space, astronomy and Earth observation; biodiversity, oceans, culture and historical memory.
Civic capability	Scientific and statistical literacy; public participation in research agendas; community data stewardship; understanding of uncertainty; research ethics, benefit sharing and respect for indigenous knowledge.
Place and pathway	Distributed national mission networks, shared equipment and data, selected specialist centres and national facilities, and deliberate pipelines from undergraduate research to doctoral and technical careers. Northern Cape astronomy and space-linked capability is one distinctive concentration, not the whole map.
Evidence, triggers and review	Classes A/B/C. Protect foundational and strategic capability irrespective of short-term market signals; expand, combine, redirect or pause missions through transparent review. The STI Decadal Plan supports a coordinated national system of innovation; SANSA's 2025–2030 strategy illustrates the link between research, services, industrial development and human capability (DSI, 2022; SANSA, 2025).

Provincial capability concentrations

The provincial map is a portfolio view, not nine small economic plans. It combines existing economic and knowledge bases, major public needs and plausible transition opportunities. Concentration can create depth, but every entry depends on national backbones and interprovincial mobility. No province should be told to produce only what its current economy already does; that would convert inequality into a curriculum.

Province	Priority concentrations	Professional and research depth	Civic and place capability
Eastern Cape	Automotive and new-energy vehicle transition; renewable-energy operations; rural teacher education and health; agriculture and agro-processing; coastal and ocean capability; logistics and port-linked production	Mechatronics and production engineering; battery and component systems; artisans and maintenance; rural clinical and teacher supervision; agricultural extension; coastal science; municipal and logistics management	Community benefit and land negotiation; worker transition; rural service oversight; multilingual learning; coastal stewardship
Free State	Grain, livestock, food processing and agricultural logistics; water and catchment management; health and teacher education; veterinary and One Health; secondary-city and rural municipal capability	Agronomy, veterinary and food science; irrigation and water engineering; storage and logistics; health workforce; teacher development; municipal finance, engineering and asset management	Food and water literacy; cooperative governance; rural safety; municipal participation; links between research farms and producers
Gauteng	Advanced services and finance; AI, data and cyber; biotechnology and health; public administration; manufacturing and repair; logistics; dense urban infrastructure and creative industries	Advanced digital, finance, biomedical and professional expertise; industrial technology; infrastructure finance; urban planning; public management; migration, housing and transport research	Metropolitan participation; digital rights; social cohesion and migrant inclusion; public transport and settlement oversight; media literacy

Province	Priority concentrations	Professional and research depth	Civic and place capability
KwaZulu-Natal	Ports, maritime, freight and logistics; manufacturing and chemicals; agriculture and food; health; tourism and culture; flood, coastal and disaster resilience	Port, rail and supply-chain professionals; chemical and industrial safety; engineers and artisans; health systems; coastal science; disaster management; agricultural and tourism enterprise	Flood preparedness; coastal stewardship; port-community relations; worker and industrial safety; multilingual public communication
Limpopo	Mining and mineral processing; agriculture and food; biodiversity and tourism; water; rural health and teacher education; cross-border trade and logistics	Mining, geology and beneficiation; water and environmental management; agricultural and veterinary extension; rural health; teacher development; border, logistics and trade capability	Land, water and mining-benefit negotiation; conservation benefit-sharing; cross-border and multilingual communication; community monitoring

Province	Priority concentrations	Professional and research depth	Civic and place capability
Mpumalanga	Coal-region transition; power generation, transmission and renewables; mine closure and environmental rehabilitation; agriculture; freight; biodiversity and tourism; municipal transition planning	Grid, energy and mining engineering; artisans; rehabilitation science; labour-market and regional planning; agriculture; municipal finance and asset management; community-development expertise	Worker and community transition institutions; benefit-sharing; environmental monitoring; land-use negotiation; social dialogue
Northern Cape	Solar and wind systems; possible green-hydrogen value chains; mining and critical minerals; astronomy, space science and Earth observation; drought and water management; agriculture; remote service delivery	Renewable-energy technicians and engineers; electrochemistry and process expertise where investment warrants; geology and mining; astronomy, data and instrumentation; water and remote-health/learning systems	Land and benefit negotiation; water stewardship; science engagement; local procurement oversight; digital inclusion across distance

Province	Priority concentrations	Professional and research depth	Civic and place capability
North West	Platinum-group metals, mining services and possible hydrogen applications; mineral beneficiation; mine safety and rehabilitation; agriculture; water; manufacturing and maintenance	Mining, metallurgy and materials; occupational health and safety; environmental rehabilitation; process and maintenance technicians; agricultural and water expertise; mining-community development	Mine-community agreements; worker safety; water monitoring; land rehabilitation; transparent local benefit and procurement governance
Western Cape	Digital, AI and creative industries; biotechnology and health; agri-food and water; ocean and marine systems; renewable energy; tourism; climate-resilient urban and rural systems	Advanced software, biomedical and design capability; food, agricultural and water science; ocean and climate research; energy systems; urban planning; tourism and cultural-enterprise expertise	Water and fire preparedness; digital and media literacy; coastal stewardship; migrant inclusion; ethical innovation and public participation

Interprovincial and national corridors

System	Geography	Capabilities that must travel across borders
Electricity and transition	Generation regions, national transmission, municipal distribution, industrial users and households	Grid planning; power-system engineering; technicians and artisans; municipal finance; demand management; worker and community transition; energy regulation
Freight and trade	Ports, rail corridors, roads, border posts, agricultural and mining regions, manufacturing centres	Port and rail operations; logistics data; engineering and maintenance; customs and trade; safety; corridor governance and community effects
Water and catchments	Catchments and transfer schemes crossing administrative boundaries	Hydrology, ecology, engineering, treatment, agriculture, municipal operations, data and negotiated water governance
Health and learning	Referral hospitals, clinical platforms, teacher-development networks, rural districts and metros	Shared supervision, specialist rotations, tele-services, transport, language capability and distributed training
Knowledge and digital infrastructure	National research facilities, high-performance computing, data networks, laboratories, libraries and archives	Shared technical staff, cyber and data governance, research software, equipment access, preservation and open science

The professional backbone between sectors

Sector maps routinely rediscover the same missing occupations in separate rooms. The following professional and technical backbone should be planned across missions rather than left to each sector to bid for after failure.

Backbone	Illustrative expertise	Function
Implementation and delivery	Programme, project, portfolio and operations managers; systems engineers; change and service-design specialists	Convert plans into sequenced, measurable work; manage interfaces and operational handover
Commercial and public value	Procurement, contract, quantity-surveying, cost, infrastructure-finance and business-case specialists	Buy and finance well; manage suppliers and life-cycle cost; protect public value

Backbone	Illustrative expertise	Function
Evidence and assurance	Statisticians, data stewards, geospatial specialists, evaluators, auditors, quality and regulatory professionals	Create trustworthy evidence; test performance, safety, fairness and compliance
Technical continuity	Technicians, technologists, artisans, laboratory and equipment specialists, maintenance planners	Operate, calibrate, repair and preserve systems that professional design alone cannot sustain
Learning and workforce formation	Teacher educators, workplace mentors, clinical and technical supervisors, curriculum and assessment specialists	Turn expertise into new practitioners; recognise learning across institutions and workplaces
Public legitimacy	Community-engagement practitioners, mediators, communicators, language professionals, social and behavioural researchers	Make decisions intelligible; negotiate conflict; include affected knowledge; build trust without manufacturing consent
Ethics, law and risk	Lawyers, ethicists, safety, environmental, cyber, privacy and integrity professionals	Identify harm, allocate responsibility, protect rights and govern uncertainty

National research missions as an adaptive portfolio

The research map is mission-oriented without abolishing disciplines. Missions are problems around which disciplines, institutions and users collaborate; they are not substitutes for the deep disciplinary capability from which good interdisciplinary work is built.

Mission	Core questions	Adaptive test
Health, care and One Health	Disease burden, prevention, diagnostics, mental health, ageing, health-system performance, animal–human–environment links	Better outcomes and distribution; scalable district models; local diagnostic, data and production capability
Learning and human development	Foundational literacy and numeracy, multilingualism, teachers, vocational learning, inclusion and assessment	Verified improvement in learning; stronger teacher practice; credible adult and vocational pathways

Mission	Core questions	Adaptive test
Water security and climate adaptation	Catchments, groundwater, treatment, reuse, drought, flood, fire, coastal risk and adaptation effectiveness	Operational decision tools; lower losses and risk; functioning community and institutional arrangements
Energy, minerals and materials	Grid, storage, renewables, mineral processing, batteries, hydrogen options, mining safety and rehabilitation	Reliable systems, value addition and just transition; scale contingent on technology and investment evidence
Food systems and bioeconomy	Climate-resilient production, nutrition, biosecurity, veterinary science, processing, logistics and biodiversity use	Food and nutrition security; inclusive productivity; ecological integrity; stronger rural value chains
Digital public interest	Cybersecurity, public data, low-resource language AI, digital identity, algorithmic assurance and human–AI work	Secure and accessible services; local technical depth; accountable technology; African-language inclusion
Infrastructure, cities and mobility	Maintenance, settlements, transport, freight, construction methods, finance and spatial inequality	Longer asset life, reliable networks, safer mobility and more inclusive settlements
Production and circularity	Advanced manufacturing, industrial diffusion, repair, remanufacture, recycling and low-carbon processes	Productive firms, technical jobs, lower material intensity and resilient value chains
Democracy, justice and social repair	State capability, inequality, violence, migration, trust, law, language, memory, media and public institutions	More legitimate and effective institutions; evidence for prevention and reform; protected public reasoning
Space, astronomy and Earth observation	Astronomy, space weather, remote sensing, communications, instrumentation and data science	Scientific depth, useful public services, industrial spillovers and continental collaboration

Mission	Core questions	Adaptive test
Oceans, biodiversity and cultural landscapes	Marine systems, fisheries, conservation, biodiversity economy, heritage and indigenous knowledge	Ecological resilience, legitimate livelihoods, preserved knowledge and fair benefit-sharing

Civic capabilities South Africa cannot outsource

Civic capability is not an ornamental graduate attribute added after the technical curriculum has been completed. It is the social capacity without which technical systems are captured, rejected, misused or simply fail to reach people.

Civic capability	What people should be able to do	Formation sites
Public reasoning and media literacy	Evaluate evidence and competing claims; identify manipulation, synthetic media and conflicts of interest	Curricula across fields; public-interest media; libraries; schools; community learning
Constitutional, legal and institutional literacy	Understand rights, responsibilities, public institutions and lawful routes for action and redress	Schools, colleges and universities; legal and public-service clinics; civic organisations
Multilingual participation	Participate, learn and access services across languages; interpret specialised knowledge for public use	Language departments, professional programmes, public services, media and language technologies
Dialogue, mediation and social cohesion	Work through conflict, migration, inequality, xenophobia, land and resource disputes without erasing disagreement	Humanities and social sciences; community organisations; labour; faith and cultural institutions
Digital citizenship and data stewardship	Protect privacy and security; understand automated decisions; govern community and personal data	All education routes; public digital services; professional bodies; libraries and civil society
Climate, water and disaster preparedness	Interpret warnings, reduce local risk, coordinate response and scrutinise environmental decisions	Municipalities, schools, health and emergency services, research and community networks

Civic capability	What people should be able to do	Formation sites
Health and care literacy	Prevent illness, navigate care, support disability and ageing, and respond to public-health evidence	Health and social services, schools, workplaces, media and community organisations
Economic and cooperative capability	Manage household and enterprise finance; exercise worker and consumer rights; govern cooperatives	TVET, CET and higher education; unions; business services; community and financial institutions
Citizen oversight and co-production	Read budgets and service information, monitor delivery, contribute local knowledge and demand accountability	Municipal and provincial forums; universities and colleges; civil society; open-data systems

Implications for higher education and the wider PSET system

System implication	Adaptive design requirement
Plan by capability system	Use enrolment and programme planning to assemble complete capability systems, not isolated lists of qualifications.
Differentiate without freezing hierarchy	Allow institutions to develop distinctive depth while guaranteeing articulation, shared infrastructure and regional access.
Join professional and technical routes	Design degrees, diplomas, occupational qualifications, apprenticeships and workplace learning as connected pathways.
Fund recurrent learning	Create finance and quality arrangements for modular professional renewal, conversion and adult return, not only first qualifications.
Reward teaching and supervision capacity	Protect teacher educators, clinical supervisors, workplace mentors, technicians and laboratory staff who reproduce capability.
Build mission networks	Share expensive equipment, data and specialist staff; fund multi-institutional missions with clear public outcomes and disciplinary depth.
Use place as a design variable	Connect provision to catchments, districts, corridors, industries and communities without confining students to provincial labour markets.
Treat public value as evidence	Assess civic, cultural, language, research and service functions alongside wages, vacancies and private returns.

System implication	Adaptive design requirement
Create teach-out and protection tests	Before closing weakly enrolled fields, test national scarcity, replacement time, regional access, research dependence and public value.

An adaptive programme: recurring decisions, not fixed stages

Decision mode	National action	Evidence discipline
Observe and reinterpret	Maintain a national capability observatory; link labour, qualification, professional-registration, graduate, public-service and regional evidence; convene provincial and sector panels; refresh the atlas when new evidence, policy shifts or shocks materially alter an assumption.	Published methods, source ledger and visible uncertainty. No claim of precision unsupported by the evidence; no assumption survives merely because it appeared in the previous map.
Repair, protect and redistribute	Act whenever persistent service failure, geographic absence, fragile teaching or research pipelines, or strategic dependence threatens essential capability. Priorities may begin, continue or intensify at any point in the decision window.	Baseline and outcome evidence for distribution, retention, learning, service performance, cost, quality and public value. Protection decisions must state what would be difficult or impossible to rebuild.
Pilot and test options	Use bounded pilots, regional capability compacts, shared laboratories and flexible learner routes where need is plausible but scale, technology or institutional form remains uncertain. Preserve comparison groups and alternative options where feasible.	Explicit hypotheses, costs, safeguards and stopping rules. A successful announcement is not a successful pilot; evidence must show capability, access and public value.

Decision mode	National action	Evidence discipline
Expand, redesign, share or stop	At scheduled and event-triggered reviews, decide which pathways should grow, be redesigned, be shared across institutions or regions, remain protected at small scale, or be taught out. Revisit portfolios after major demographic, climate, technological, fiscal or investment shifts.	Decisions tied to trigger evidence and operational milestones rather than elapsed years. Publish what changed, why it changed, who bears the transition cost and which assumption was retired.

Indicators and trigger evidence

Evidence family	Illustrative indicators	Rule
Demand	Employment and task change; vacancies and wages; professional retirements; public-service and community need; informal-livelihood patterns	Never inferred from one source or one exceptional year
Pipeline	Applicants, enrolment, progression, completion, licensing, workplace placement, postgraduate and supervisor capacity	Disaggregated by province, institution type, field, sex, race, disability and socioeconomic position where lawful and useful
Distribution	Geographic deployment, retention, service access, rural and township availability, migration and vacancy duration	A national surplus can coexist with a local absence
Performance	Learning, professional competence, service reliability, project delivery, research use, safety, productivity and public trust	Qualifications and headcounts are inputs, not final outcomes
Transition	Approved investment, financial close, procurement, grid connection, regulatory change, technology adoption and employer co-investment	Scale scenario-dependent programmes only when milestones are real

Evidence family	Illustrative indicators	Rule
Resilience and public value	Capability replacement time, strategic dependence, civic and language function, infrastructure criticality and shock response	Protect high-value capacity even where immediate market returns are weak

Limits and cautions

- This atlas does not estimate the number of jobs at a fixed future date, nor does it assume that one transition path will prevail. Credible numerical scenarios would require sector-specific models, explicit assumptions and repeated revision.
- A policy plan is evidence of direction, not proof that investment or employment will materialise. Class B and C capabilities require trigger evidence.
- Provincial concentrations are interpretive and should be validated against district and corridor evidence. Provincial borders do not contain labour markets, catchments or value chains.
- Occupational categories can conceal changing tasks and hybrid roles. The map should be refreshed from task-level evidence as well as job titles.
- Professional registration counts do not necessarily measure active practice, geographic availability or quality.
- Civic and public-good capabilities are difficult to quantify. Difficulty is not a reason to omit them; it is a reason to state the judgement and invite scrutiny.
- The atlas could be captured by provider interests, sector lobbying or fashionable technologies. Independent methods, published sources and visible uncertainty are safeguards.

Questions for national validation

- Which capabilities are missing because they are not represented by a powerful sector or profession?
- Where does South Africa already possess deep capability that should be protected, shared or redirected rather than recreated?
- Which national needs are systematically hidden by vacancies, budgets or professional registers?
- Which capability systems require national concentration, and which require a minimum base in every province or district?
- What evidence should trigger the expansion of scenario-dependent fields—and what evidence should stop it?

- Which functions require full qualifications, which require shorter or recurrent learning, and which are best formed through supervised work?
- How should public, private, university, TVET, CET, employer, professional-body and community provision be combined without producing a hierarchy of quality and access?
- Which knowledge, language, research and civic capacities must be protected even if their immediate market signal is weak?

Closing note

The central claim of this atlas is modest but demanding: South Africa should decide what it must be capable of doing before it decides how many versions of the present institution it can support. The map will be wrong in places. That is why it is published as a testable proposition with evidence classes, trigger conditions and review points. Its usefulness lies not in predicting one future correctly, but in making choices reversible where possible and protective where necessary. The greater error would be to leave the map implicit, allow current institutional supply to stand in for national need, and notice only after conditions have shifted that the country has credentials in abundance and capability in rather shorter supply.

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