

THE SEVENTEEN-COMMUNITY MODEL

A federated architecture for near full productive participation and circular
economic development in South Africa

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Abstract

South Africa has an employment problem that cannot be reduced to a shortage of vacancies. National growth, labour market, skills and enterprise programmes remain essential, yet the local production system in which a particular person must earn, spend, learn, save and progress is often left unspecified. The purpose of this paper is to develop the 10,000 People Economy as an integrated design for near full productive participation and circular economic development. The method combines design science, supply and use accounting, regional input output and social accounting logic, consistent stock flow finance, physical resource balances and comparative institutional analysis.

The community kernel contains 10,000 residents. Its productive population is derived from the resident profile rather than imposed as a fixed ratio. The current planning account produces 6,000 productive people, assigns 5,400 unique people to local production and retains 600 people in existing external or remote paid work. Local production is organised through 204 operating units in eleven connected business systems. Federation supplies the specialist industries, market access, financial pooling and recovery capacity that one kernel cannot carry. Within the model, seventeen communities form the structural lower bound because this is the first whole number that satisfies the industry family, self-financing state and decline/disaster state representation conditions.

The model follows household income, enterprise sales, imported inputs, tax, public expenditure, savings, credit, capital formation and seven physical resource classes through a four-state system. It distinguishes monetary recirculation from physical circularity and separates external revenue from cash that remains after collection loss, operating cost, tax, maintenance, replacement, debt service, working capital and reserves. The current baseline achieves 46.36 per cent cost weighted local provision against a maximum feasible benchmark of 76.41 per cent. Avoidable external dependence remains R115.710 million per community each year, and the modeled closure programme requires about R2.430 billion of capex per community. A seventeen-community federation also requires R1.9095 billion of internally held recovery capacity for a severe case under the current risk assumptions.

The contribution of the paper is a single operating architecture that connects people, businesses, skills, finance, public value, exports, assets and material flows. It shows that the primary constraint is not population size alone, but the joint composition of industries, customers, retained external cash, institutional forms and risk sharing capacity. The paper also states the limits of the current result. Three of six model criteria pass, none of the thirty nine implementation evidence items is verified, and the fifty-community reference replay retains seven liquidity failures and a R522.104 billion terminal capital backlog. The seventeen-community model is therefore a defined development architecture with a practical implementation pathway, not a record of outcomes already achieved.

Keywords: *full employment; circular economy; policy manifesto; regional input output; social accounting matrix; stock flow consistency; development finance; industrial policy; cooperative governance; municipal finance; South Africa*

Policy preamble

THE HUMAN PURPOSE

An unemployment rate counts people, but it does not show what is being lost. A person without a route into productive work loses income and experience. The community loses demand, care, maintenance, enterprise and knowledge. A serious development policy must show, person by person, how willing participants can enter paid work, learn and progress.

Economic rights become real through institutions. Income support can protect a household, but it cannot by itself create a local productive base. People also need a path into work, learning, capital, services and ownership. The institutions that provide those paths must maintain the assets they inherit and build the capacity that the next generation will need.

The proposed communities remain part of South Africa and continue to trade with the rest of the country and the world. The local boundary has a practical purpose: it is small enough to count residents, roles, needs and assets. Federation adds the scale required for specialist production, shared finance and risk pooling. The model prefers local capability where it is feasible, but it does not prohibit imports. Its measure of autonomy is simpler and more demanding: whether the productive system can pay for essential imports, maintain its assets and recover from shocks without permanent emergency finance.

The paper keeps this preamble beside the analysis because the proposal has both a public purpose and a burden of proof. The public purpose is to make paid participation, useful production and stewardship practical at a human scale. The burden of proof is to show, transaction by transaction and asset by asset, that the proposed institutions can carry that promise without hiding costs, dependence, exclusion or failure.

1. The national problem and the missing scale of action

Statistics South Africa reported an official unemployment rate of 33.6 per cent in the second quarter of 2026. It counted 16.7 million employed people and 8.5 million unemployed people. Vacancies are scarce, but the model addresses a wider coordination problem. Demand, production, infrastructure, skills and capital do not meet at a scale where particular people and firms can be organised (Statistics South Africa, 2026).

The National Development Plan already identifies the required macroeconomic directions: higher employment, rising productivity, stronger exports, improved skills, competitive infrastructure, lower living costs and a capable developmental state. It also recognises that rising export earnings and investment are prerequisites for many domestic service jobs (National Planning Commission, 2012). The unresolved

question is institutional: the repeatable local unit through which these objectives become an integrated production system has yet to be defined.

Conventional local development interventions often treat employment, enterprise support, infrastructure, waste, finance and public services as separate programmes. The 10,000 People Economy model treats them as interacting stocks and flows. A wage becomes household demand. Demand becomes enterprise revenue only to the extent that it is locally captured. Enterprise output requires imported inputs until local capability is built. Tax leaves the private local circuit when collected; any later public expenditure has a separate jurisdiction, appropriation, timing and delivery pathway. Savings may leave the boundary, become paid in capital in the selected non-bank fund, or become a withdrawable funding claim only under a legally permitted alternative form. Waste can remain a disposal cost or become a secondary input. Every policy choice therefore changes the economic metabolism.

The missing unit of development lies between the household and the nation. A settlement acting alone may be too small to sustain specialist industries, risk reserves and a diversified export portfolio, while a national plan is too aggregate to assign productive roles and verify local physical balances. The model therefore proposes a nested architecture: 10,000-person kernels for operational visibility, a seventeen-community structural lower bound, and a comparative scale programme extending to the current fifty-community reference replay.

2. Central thesis, method and boundaries

2.1 Central thesis

The central thesis of this paper is that seventeen federated communities of 10,000 residents provide a coherent architecture for near full productive participation and circular economic development when six constraints are governed as one system: an adequate industry mix, demonstrated customer demand, recurring unrestricted export cash, internally originated finance, governance capable of moving communities through changing states, and the capacity to absorb correlated losses without importing emergency capital. The structural calculation establishes seventeen as the lower bound within the model. Economic sufficiency still depends on satisfying the complete viability rule in the South African setting in which the model is applied.

The number seventeen solves a representation count. It does not by itself create diversification, liquidity or recovery capacity. Under the present planning assumptions, a seventeen-community federation requires a severe reserve of R1.9095 billion held within the network. The practical implication is that resilience must be capitalised as part of the economic design. E18 must replace the provisional risk inputs with observed histories and must establish that the reserve exists, is available and is not committed elsewhere.

The result is governed by joint constraints. Ten thousand people are not intrinsically sufficient, and one successful industry cannot carry the whole economy. A larger population does not automatically create sustainability. Under proportional expansion, employment coverage and capital per resident remain largely unchanged. Scale creates value when shared capacity lowers fixed costs, reduces specialist import dependence and raises network utilisation. Population, industry composition and institutional coordination must therefore be analysed and governed together.

2.2 Method

The blueprint synthesises five linked workbooks: the employment kernel, internal flows, capitalisation, external revenue and state dynamics, and the autonomy achievement register. The method is design science rather than econometric estimation. It first derives the productive population from a resident cohort account. It then separates unique people, position contracts, paid hours and FTE before allocating local people to sectors. The remaining layers model transactions and stocks, impose financial and physical constraints, compare scale scenarios, and define the evidence needed to replace assumptions with observed values.

Layer	Question answered	Primary output
Employment kernel	Who is in the productive population, how many are unique people, and how do contracts, hours, FTE and progression differ?	6,000 derived people: 5,400 local and 600 external or remote
Internal flows	What is produced, imported, bought, consumed, invested and exported, and what customer sales can support each role?	Supply and use, interindustry and demand to employment accounts
Capitalisation	What assets are required, how can the backlog close, and what productive capex is eligible under accepted demand?	R3.984bn risk adjusted requirement; R0 source eligible productive capex
External revenue	How do modeled sales become recurring cash that can fund unavoidable imports and productive upgrading?	Anchor portfolio, buyer schedule, cash waterfall and 1.084x recurring import cover
State dynamics	How do communities evolve, stagnate, self-finance or recover?	Five conditional transition matrices, expected durations, shared shock counts and reserve targets
Achievement register	What proof is required before model feasibility becomes an achieved claim?	39 evidence items, six criteria and the E18 risk gate

Source: synthesis of the five linked 10,000 People Economy model layers (2026).

2.3 Boundary conditions

The resident population is fixed at 10,000 for the base kernel, but the productive population is not fixed as a percentage. It is derived by cohort after subtracting people outside the paid work pathway, full time learners not seeking paid work, care constraints that remain after support, health or disability constraints that remain after reasonable accommodation, and other non-participation, then adding net migration. Productive status includes paid enterprise work, paid apprenticeships, structured public service and

people available for paid transition. Informal activity without sufficient income, security, supervision, output or progression remains a transition category rather than achieved employment.

Local provision and circularity are different questions. The local provision boundary is the cost weighted share of seven essential requirements that can be supplied inside the community or federation. It is not a measure of monetary recirculation, material recovery, service quality or local value added. Specialist medicines, equipment, advanced machinery, some digital services, strategic energy inputs and other low volume or high complexity goods remain outside the feasible local provision benchmark. The model therefore distinguishes dependence that can feasibly be reduced from an unavoidable import floor that must be funded by exports or institutional revenue.

2.4 Assumptions that carry the result

The model is useful only if its influential assumptions are visible. The following values do much of the work. Each one must be treated as a question for field research, not as a fact that implementation may inherit.

Assumption	Why it matters	Validation requirement
Derived 6,000-person planning pool	Sets the person ceiling before sector allocation; 60.0% is an output of the current cohort inputs, not a fixed rule	Resident register; age; education; care; health or disability; accommodations; participation; migration; existing employment
12 industry families	Sets the diversification floor	Site demand, supplier feasibility, skills and infrastructure study
10% self-financing and 6% decline/disaster shares	Produces the integer representation conditions and lower bound of 17	Observed transitions, correlated shock tests and sensitivity analysis
46.36% current and 76.41% feasible cost weighted local provision	Set the present provision baseline and configured import floor benchmark; neither is circularity	Measured requirements, current supply, replacement costs, technical limits and commissioned capacity
R94.98m recurring export cash per community	Provides only 1.084x modeled cover of the import floor before launch working capital	Named buyers, executed contracts, delivered volumes and prices, collections, all operating costs, tax, funded reserves, debt service and working capital custody
R1.334bn annual B01-B11 sales	Funds the planning allocation of 5,400 local people, 5,565.74 contracts and 4,958.02 FTE	Sector product schedules, buyers, units, prices, collections, unique person IDs, contracts, paid hours, payroll/FTE and working capital cycles
R0 external commercial finance	Defines the autonomy claim	Legal structure, deposit and capital custody, liquidity and complete facility replay

Source: peer review sensitivity assessment of the current model assumptions.

2.5 Analytical architecture and reproduced equations

The model requires several analytical frameworks because no single multiplier can represent production, income, finance, materials, institutions and change through time. The frameworks below are nested. supply and use accounting closes products; input output analysis traces interindustry requirements; a social accounting matrix extends the circular flow to factors and households; stock flow consistency closes

financial positions; environmental economic accounts close physical resources; and the four-state system represents changing operating conditions. An accounting identity proves consistency only. It does not prove causation, spare capacity, feasible substitution, viable prices or institutional authority (United Nations et al., 2009; Miller and Blair, 2009; Nikiforos and Zezza, 2017; United Nations et al., 2014).

Framework	Question	Model use	Principal limitation
Supply and use table	Does every product supplied have a recorded use?	Reconciles output, imports, intermediate use, final use, investment, inventories and exports	Closure can coexist with implausible coefficients or prices
Regional input output	How does final demand propagate through suppliers?	Tests sector requirements, import leakages and demand supported employment	Fixed coefficients and no automatic capacity, price or finance response
Social accounting matrix	How do production incomes reach institutions and return as expenditure?	Adds factors, households, enterprises, government and transfers	Multiplier results depend on the chosen endogenous accounts and fixed price assumptions
Stock flow consistency	Do transactions reconcile with every balance sheet through time?	Closes cash, loans, equity, tax, public expenditure, assets and rest-of-world positions	Accounting closure does not make a behavioural assumption true
Environmental economic account	Do materials, water, energy, residuals and stocks close in native units?	Prevents money from concealing physical scarcity or waste	Requires measured quantities, boundaries and conversion factors
Institutional and state model	Who may act, under what rules, and how does the system change?	Connects authority, evidence gates, transitions, shocks and recovery	Transition inputs remain provisional until observed histories exist

2.5.1 Supply and use and input output identities

For a product account valued consistently, total supply equals total use. Let q denote domestic output, m imports, τ net product taxes and applicable margins, z intermediate use, c_h household consumption, c_g government consumption, i_f gross fixed capital formation, δ_{inv} inventory change and x exports. The canonical supply use identity is (United Nations et al., 2009; Eurostat, 2008):

$$q + m + \tau = z + c_h + c_g + i_f + \delta_{inv} + x$$

The identity must hold by product as well as in aggregate. It is the formal basis for E14, but it does not show whether a local supplier can replace an import. That substitution needs product specifications, capacity, quality, price, delivery and input evidence. Statistics South Africa's supply and use tables provide the national classification and balancing precedent; the community account must regionalise and

disaggregate it with field data rather than divide national totals by population (Statistics South Africa, 2010).

In a fixed coefficient input output model, gross sector output g is the sum of intermediate requirements $A g$ and final demand f . If the Leontief inverse exists, the production and employment responses are:

$$\begin{aligned} g &= A g + f \\ g &= (I - A)^{-1} f \\ \Delta E &= l' (I - A)^{-1} \Delta f \end{aligned}$$

A is the matrix of direct input coefficients and l is sector employment per unit of output. The final equation is a scenario result, not a job count that can be claimed in advance. It assumes fixed technology, viable production, available labour and capital, and no binding supply or price constraint. The present workbook has a balanced supply and use structure, but it does not yet contain a field estimated regional A matrix. Its employment numbers therefore remain engineering requirements governed by E15-E17, not Leontief estimates (Miller and Blair, 2009).

2.5.2 Regionalisation, local multipliers and the SAM

A national coefficient cannot be treated as local merely because the population boundary is small. A simple location quotient can identify relative specialisation, where e_{ir} is employment in industry i and region r , e_r is total regional employment, and e_{in} and e_n are the corresponding national values:

$$LQ_i = \frac{e_{ir} \cdot e_n}{e_r \cdot e_{in}}$$

LQ_i greater than one indicates relative concentration. It does not prove that the region supplies its own requirements or justify setting an import coefficient to zero. Regional technical coefficients should be estimated from invoices, supplier surveys and trade flows, with location quotient methods used only as transparent non-survey estimates and sensitivity tested against alternatives (Flegg, Webber and Elliott, 1995).

A social accounting matrix extends production accounts to factor incomes, households and institutions. Partitioning endogenous accounts into y , average expenditure propensities into M and exogenous injections into z gives the fixed price multiplier system (Pyatt and Round, 1979; Round, 2003):

$$\begin{aligned} y &= M y + z \\ \Delta y &= (I - M)^{-1} \Delta z \end{aligned}$$

This is the appropriate framework for asking how wages become household spending, enterprise receipts, factor income and another round of spending. South African SAMs supply a national empirical base, and

Kim's hypothetical integration of a targeted employment programme shows how a new labour intensive activity can be introduced without pretending that it has the input structure of an existing sector (van Seventer et al., 2016; Kim, 2011). The project must still construct a regional SAM for the selected sites.

The local multiplier should be reported as an observed ratio, not a universal constant:

$$m_{\text{local}} = \frac{\Delta Y_{\text{local}}}{\Delta J_{\text{external}}}$$

$$\text{Special case only: } m_{\text{local}} = \frac{1}{(1 - c_{\text{local}})}$$

Here $\Delta J_{\text{external}}$ is a genuinely exogenous retained income injection and c_{local} is the constant marginal share re-spent locally. The geometric special case requires unlimited supply at fixed prices, an unchanged spending share and no capacity, saving, import, tax or debt service feedback. Empirical local employment multipliers vary by industry and place; an estimate from another labour market cannot be copied into this model (Moretti, 2010). The workbook should instead derive each round from counterparty coded transactions and report leakage to imports, external savings, taxes not yet reappropriated locally and external debt service.

2.5.3 Stock flow consistency and financial closure

The stock flow consistent stock flow discipline is that every payment is another sector's receipt and every financial asset is another sector's liability. For the community, households, enterprises, the member fund, government and the rest of the world must therefore satisfy:

$$\sum_s NB_{s,t} = 0$$

$$\text{Assets}_{s,t} = \text{Liabilities}_{s,t} + \text{Net Worth}_{s,t}$$

Closing stock = opening stock + transactions + revaluations + other volume changes

NB is net borrowing or lending by sector. These identities prevent a tax outflow, import payment, loan, repayment or capital contribution from appearing on only one side of the model. They also expose the difference between a balance sheet position and spendable cash. stock flow consistency does not select the behavioural equations: repayment rates, saving choices, pricing, default and investment still require evidence and sensitivity analysis (Godley and Lavoie, 2007; Nikiforos and Zezza, 2017).

The selected community vehicle is currently a cash funded non-bank fund. Its accounting perimeter is therefore different from a deposit taking bank:

Non-bank: cash + gross loans – allowance = member equity + retained earnings + other liabilities

Deposit bank: loans + reserves + securities = deposits + other liabilities + equity

Only the second form can carry deposit liabilities, and its lending, withdrawals and external payments require the associated prudential and settlement architecture. The model may compare forms, but it may not reuse the non-bank cash result after changing the institution's legal and monetary identity (Bank of England, 2021; South African Reserve Bank, 2026a-d).

2.5.4 Physical balances, capital and circularity

Circularity must close in physical units as well as money. The System of environmental economic Accounting distinguishes natural inputs, products and residuals and links their flows to changes in environmental and produced assets (United Nations et al., 2014). Statistics South Africa's physical energy flow accounts demonstrate the national application of this accounting family, although the project still needs site level meters and balances (Statistics South Africa, 2025). The project's operational boundary applies the following balance separately to mass, water, energy and service capacity units:

Opening stock + local extraction + imports + recovered inflows = intermediate use + final use + exports + emissions + residual waste + closing stock

Recovered material is an input only when its quantity and quality are measured and its source residual is removed from the waste side, preventing double counting. A monetary recycling sale cannot stand in for tonnes recovered, potable water delivered, energy reliability or asset condition. The relevant circularity indicators are therefore resource specific recovery yield, virgin input displacement, residual intensity, service sufficiency and lifecycle condition, not one composite percentage.

Produced capital evolves through investment, depreciation and abnormal loss. For asset class k:

$$K_{k,t} = (1 - \delta_k) K_{k,t-1} + I_{k,t} - D_{k,t}$$

D captures disposals or disaster losses outside normal depreciation. This identity is what connects maintenance, replacement, resilience and capex. A community is not self-sustaining if current output is achieved by consuming its capital stock or natural assets faster than they are renewed.

2.5.5 Employment guarantee as an endogenous stabiliser

A job guarantee is not an assumption that labour demand will always equal labour supply. It is a standing institutional capacity to fund useful work when qualifying paid employment falls short. For unique people who are ready and seeking paid work, the project rule is:

$$J_{\text{gap},t} = \max[0, P_{\text{ready},t} - E_{\text{qualifying},t}]$$

$$JG_{\text{FTE},t} \leq \min(\text{service demand FTE}, \text{authorised budget FTE}, \text{supervised capacity FTE})$$

The first equation measures a person gap; the second prevents unsupported role creation. Qualifying employment must satisfy the wage, hours, safety, stability and progression rules, while guarantee work

must have an authorised customer or public purpose budget, inputs, supervision and measurable output. Tcherneva's design work treats the guarantee as a permanent employment buffer rather than a temporary project, while Kim demonstrates that a South African targeted programme should enter a SAM with its own labour intensive production structure (Tcherneva, 2018; Kim, 2011). The model must report gross cost, non-labour inputs, attributable revenue, tax feedback and displacement separately.

2.5.6 Development finance and industrial policy discipline

Development finance is justified here by patient capital, coordination and learning problems, not by a presumption that community ownership makes every project bankable. Development banks can shape markets and support structural transformation, but their mandates, instruments and governance determine whether they create capability or socialise losses (Mazzucato and Penna, 2016; Griffith-Jones and Ocampo, 2018). Industrial policy should be organised as disciplined discovery between public and productive actors, with clear performance tests and withdrawal rules rather than unconditional protection (Rodrik, 2004).

Finance and policy gate	Required question	Project control
Mission and additionality	What capability or coordination failure is being solved?	Name the product, customer, capability and counterfactual
Demand	Who will pay, how much and on what collection terms?	E15 and N11 accepted before productive capex
Technical delivery	Can the asset produce at required quality and utilisation?	Commissioning, maintenance and operator evidence
Repayment and loss	What cash repays the facility and who bears downside loss?	Cash waterfall, affordability, impairment and concentration limits
Learning	What information will change the next allocation?	Milestones, productivity, supplier depth and published variance
Exit or renewal	When is support withdrawn, restructured or extended?	Time limit, review authority and worker transition plan
Governance	Who decides, benefits, verifies and can challenge?	Related party disclosure, independent verification and appeal

$$\text{Eligible capex}_{s,t} = \min(\text{demand ceiling}_{s,t}, \text{internal cash ceiling}_t, \text{risk ceiling}_{s,t}, \text{delivery ceiling}_{s,t})$$

$$\text{Internal finance}_t = \text{paid in capital} + \text{retained surplus} + \text{principal collections} + \text{unrestricted export allocation} + \text{lawfully recognised public capital}$$

These are project control equations, not results from the cited literature. They operationalise the internal funding rule while exposing timing and maturity mismatch. Even if cumulative internal sources eventually exceed cumulative investment, the programme can still fail in an earlier year because cash arrives after payroll, imports or capex fall due.

2.6 South African spatial and municipal application

The 10,000-person kernel cannot be evaluated as an aspatial average. South African employment is strongly concentrated, and the legacy of spatial separation changes access to customers, infrastructure, skills and transport. place based intervention can be justified, but it requires coordination across levels of government and must be adapted to uneven institutional capability (Turok, 2010; Todes and Turok, 2018; Turok and Visagie, 2025). Site selection must therefore record travel time and cost, land and tenure, water and energy capacity, logistics, digital connectivity, current firms, household demand, municipal service condition, market access and exposure to correlated hazards.

Municipal finance is also a binding production condition. South African municipalities combine own revenue, intergovernmental transfers and conditional funding within constitutional and MFMA controls; fiscal stress can undermine both infrastructure investment and operations (South African Cities Network, 2022; Fuo, 2023). The model must not convert locally generated tax into an assumed local entitlement. It recognises public value only through the following project control rule:

$$\text{Recognised public value}_t = \text{lawful executed expenditure}_t \times \text{boundary share}_t \times \text{accepted delivery share}_t$$

Both shares lie between zero and one and require auditable attribution. The equation does not confer legal authority or determine a budget. It records value only after the competent institution has lawfully budgeted and spent funds, the expenditure is attributable to the community boundary, and the specified service or asset has been delivered and accepted. This keeps the political compact connected to South Africa's actual fiscal constitution rather than an invented tax return loop.

3. The 10,000-person productive kernel

3.1 Why 10,000 is the operational unit

Ten thousand residents define a planning kernel rather than a universal demographic optimum. The unit is large enough to contain a diversified everyday economy and small enough to make people, roles, firms, service obligations, assets and material flows visible. Its value lies in governance and measurement. The model can therefore compare this unit with communities of 12,000, 15,000 and 20,000 residents without confusing a practical boundary with a natural law.

The model separates residents from the labour account. Children, older people and people who cannot currently participate remain consumers, citizens and rights bearers. Disability is not an automatic exclusion. A person who can participate with reasonable accommodation remains in the productive population, and the accommodation becomes a costed requirement of the work system.

3.2 Deriving the productive population

The productive population is calculated before the production portfolio is staffed. The current figures below are a planning cohort, not a claim about a selected place. They show how the logic works and make each exclusion visible enough to challenge.

Productive people = residents – outside pathway – full time education not seeking paid work – unresolved care constraints – unresolved health or disability constraints – other non-participation + net migration

Age	Pop.	Outside	FT study	Care	Health / disability	Other	Net migration	Accom.	Result
0-14	2,100	2,100	0	0	0	0	0	0	0
15-24	1,700	0	400	30	15	100	-20	60	1,135
25-34	1,600	0	50	70	25	100	+25	80	1,380
35-54	2,600	0	0	100	50	140	+20	150	2,330
55-64	1,100	0	0	40	60	100	-5	80	895
65+	900	550	0	10	30	30	-20	30	260
TOTAL	10,000	2,650	450	250	180	470	0	400	6,000

Source: Internal Flows risk model workbook v10, Labour Force Account. Values are planning inputs pending E17; continuity is pending E18.

The calculation produces 6,000 productive people. The resulting 60.0 per cent is not carried forward as a permanent ratio. It must change when the community's age profile, education participation, care system, health, disability accommodations or migration changes. The account separately identifies 400 people who require accommodation but remain included. This prevents support needs from being misread as economic inactivity.

3.3 Starting employment status

The derived pool is not the same as the number of people who need a new job. At the planning start, 2,700 people already meet the model's paid work rule. Another 400 people earn income informally but need a transition in pay, security, supervision or progression. The remaining 2,900 people are available for placement. Existing external or remote workers remain in the community labour account, but they are not assigned again to B01-B11.

Starting status	Unique people	Average paid hours	FTE	Treatment
Existing local paid employment	1,900	38.0	1,805	Meets rule at start
Existing external or remote paid employment	600	40.0	600	Separate from B01-B11
Paid apprenticeship or structured public service	200	30.0	150	Meets rule at start
Informal income activity requiring transition	400	32.0	320	Transition required
Unplaced but available for paid work	2,900	38.0	2,755	Placement required
TOTAL	6,000	37.5	5,630	2,700 initially meet the rule

Source: Internal Flows risk model workbook v10. starting status values require person level verification under E17 and continuity evidence under E18.

3.4 People, positions, hours and FTE are different

A unique person is counted once. A position contract is a paid relationship and one person may hold more than one. Paid hours describe the actual workload. FTE converts those hours into a forty-hour equivalent for capacity and cost analysis. Keeping these measures separate prevents part time work or multiple contracts from inflating the employment claim.

ID	Business system	Unique people	Position contracts	FTE	Avg hours	Legacy slots
B01	Food and agro processing	635	654.05	584.20	36.8	760
B02	Built environment and maintenance	602	611.03	577.92	38.4	720
B03	Care, health and social services	602	633.61	517.72	34.4	720
B04	Education and skills pipeline	518	541.31	455.84	35.2	620
B05	Local services, trade and logistics	568	593.56	499.84	35.2	680
B06	Manufacturing, repair and circular economy	585	593.77	561.60	38.4	700
B07	Digital, admin and professional services	510	521.48	479.40	37.6	610
B08	Energy, water, utilities and environment	393	398.89	377.28	38.4	470
B09	Governance, security, finance and cooperatives	359	367.08	337.46	37.6	430
B10	Creative, tourism, sports and culture	301	319.06	252.84	33.6	360
B11	Research, productivity and export upgrading	327	331.90	313.92	38.4	390
	TOTAL B01-B11 local portfolio	5,400	5,565.74	4,958.02	37.05	6,460

NO DOUBLE COUNTING

The 5,400 local people and 600 external or remote workers reconcile to 6,000 unique productive people. The 6,165.74 total position contracts and 5,558.02 FTE describe those same people. The legacy 6,460 role slots describe the earlier portfolio's design capacity and are not added to any labour total.

Source: Internal Flows risk model workbook v10 and Employment Kernel labour account workbook v3.

3.5 Employment as capability formation

The model does not treat employment as a static assignment. Each pathway requires a stage, training period, core skills, credential route, mentor, productive asset and progression route. The planning distribution assigns 720 people to paid apprenticeships, equal to twelve per cent of the derived productive

population. This turns the skills system into part of production rather than a preparatory institution waiting for jobs to appear. It remains a plan until payroll, supervision, assessment and progression records are accepted under E17.

International comparisons are used as mechanisms, not templates. Policy transfer fails when a visible programme is copied without the institutions, incentives and constraints that make it work. The comparison therefore asks the same five questions of every case: what mechanism is evidenced, which institutions enable it, what exactly may be transferred, what inference is prohibited, and what South African result would establish that the adaptation works (Dolowitz and Marsh, 2000).

3.6 Comparative institutional evidence

Case	Evidence backed mechanism	Transfer object	Prohibited inference	South African validation requirement
Germany	Paid company and vocational school learning, recognised occupations, contracts, qualified trainers and independent chamber assessment	Work linked pathway, occupational standard, mentor and external assessment	That German chambers, employer coordination or training finance already exist locally	Executed contracts, qualified mentors, recognised assessment, completion, placement and wage progression
Singapore	Industry government skills maps connect jobs, career paths, emerging competencies and training	Common jobs skills language, modular updating and employer feedback	That training credits or course completion guarantee employability	Employer validated maps, participation, completion, placement, retention and earnings
Italian districts	Specialised small firms combine rivalry, cooperation, supplier depth and collective learning	Supplier networks, shared services and specialised capability	That geographic proximity automatically creates trust, innovation or competitiveness	Local input share, productivity, quality, firm survival, innovation diffusion and buyer diversity
Mondragon	Federated cooperation, education and member governance coexist with tensions over managerial control and non-member subsidiaries	Explicit membership rights, mutual funds, inter-enterprise support and governance education	That a cooperative label guarantees participation, equality or international transfer	Voting, capital rights, member coverage, transfer rules, worker mobility and subsidiary participation
Vietnam	Export learning and functional upgrading can improve performance, but buyer power governs value capture	Buyer intelligence, negotiation, product development, certification and distribution capability	That gross exports equal retained cash, autonomy or upgrading	Contracts, concentration, collected margin, imported content, product upgrading and bargaining outcomes

3.6.1 Germany: collective skill formation

Germany's dual system links two learning sites: the enterprise and the vocational school. Apprentices hold company training contracts, receive an allowance, train in recognised occupations and complete

independently administered examinations; qualified trainers, employer organisations, social partners, chambers and the state share responsibility for standards and quality (Federal Institute for Vocational Education and Training, 2017, 2020). The academic literature describes this as collective skill formation because firms, intermediary associations and the state jointly solve investment and coordination problems that an individual training provider cannot solve alone (Busemeyer and Trampusch, 2012).

The transferable mechanism is therefore not the word dual. It is a governed contract connecting paid work, a published occupational standard, a competent workplace mentor, protected learning time, an external assessment and a portable result. In South Africa those functions must be mapped to the NQF, QCTO, SETA, TVET and professional routes that lawfully apply. The mechanism is admissible only if learners complete, gain recognised capability, enter qualifying paid work and progress in wages and responsibility.

3.6.2 Singapore: a common jobs skills language

Singapore's Skills Framework is co-created by government, employers, industry associations, unions, professional bodies and education providers. It maps sector information, occupations, job roles, career pathways, existing and emerging competencies and relevant training (SkillsFuture Singapore, 2025). This supports the model's proposal that each business unit publish a role capability map and update it with employers rather than offer disconnected courses.

The limits are equally important. Research on SkillsFuture identifies tensions between vocational and academic status, individual aspirations and state pragmatism, while a case study of the credit scheme reports barriers of time and cost, low participation and implementation risks (Tan, 2017; Kim et al., 2021). The transferable element is a living jobs skills information system with employer feedback and work based routes, not a training voucher. The South African validation requirement must connect participation to recognised competence, placement, retention, productivity and earnings.

3.6.3 Italian industrial districts: organised specialisation

The industrial district literature describes territorially concentrated systems of specialised small firms embedded in a local labour market and institutional setting. Their performance can arise through inter-firm division of labour, collective learning and shared services, but the balance between cooperation and competitive replacement differs across districts (Becattini, 1991; Staber, 1998). Proximity is therefore not the causal mechanism on its own.

The model may transfer supplier development, shared testing and logistics, joint purchasing, specialised training and forums for technical learning. It may not assume that declaring a cluster creates trust or demand. The required evidence is actual local procurement, lower unit cost, improved quality and delivery, enterprise entry and survival, innovation diffusion and buyer diversification, compared with a baseline and credible counterfactual.

3.6.4 Mondragon: federation with governance risk

Mondragon is relevant because it joins firms, education and federated institutions, but the evidence does not support a romantic transfer. Studies of its managerial discourse and multinational cooperatives show tensions between commercial standardisation and cooperative identity, between managerial control and member participation, and between owner members and workers in non-cooperative subsidiaries (Heras-Saizarbitoria and Basterretxea, 2016; Bretos, Errasti and Marcuello, 2018; Bretos and Errasti, 2018).

The transferable mechanism is explicit inter-cooperation: enforceable membership and voting rights, transparent internal capital, mutual support rules, governance education, worker mobility and a defined relationship between local enterprises and federation institutions. Every participating entity must report who owns, who votes, who holds residual claims, how losses and transfers are allocated, and which workers remain outside membership. Cooperative form is an institutional choice that must be audited; it is not evidence of democratic performance by itself.

3.6.5 Vietnam: export learning and value capture

Global value chain research distinguishes market, modular, relational, captive and hierarchical forms according to transaction complexity, codifiability and supplier capability. These structures distribute power and shape upgrading possibilities (Gereffi, Humphrey and Sturgeon, 2005). The broader development evidence likewise treats global value chains as possible channels for productivity and jobs whose gains depend on domestic capability, connectivity and policy (World Bank, 2020). Evidence from Vietnamese manufacturers shows both learning opportunities and exposure to buyer power. Exporting can support capability development, while market intelligence, negotiation and functional upgrading can strengthen bargaining power and export performance (de Oliveira et al., 2021; Pham and Petersen, 2021).

The model should therefore treat exports as a capability ladder and a cash waterfall. Candidate anchors must show product development, certification, market intelligence, distribution capability and negotiation capacity, alongside buyer concentration, imported content, collection terms and retained unrestricted cash. Gross export revenue is not evidence of local value capture, and insertion into a global chain is not autonomy if a dominant buyer appropriates the gain.

3.6.6 The transfer admissibility rule

Transfer admissible = evidenced mechanism AND institutional fit AND lawful authority
AND local demand AND measurable outcome

This is a project governance rule. Failure of any term keeps the mechanism at provisional implementation status. The five cases inform the design, but none supplies a coefficient for the seventeen-community model or determines the required federation size. Their proper role is to clarify mechanisms, specify institutions and define the evidence required before transfer into the South African setting.

4. Establishing the federation boundary

4.1 The structural lower bound calculation

The current model first calculates a structural lower bound, denoted N_L . Let N_F be the number of communities needed to carry the industry family requirement under the current rule of at least one differentiated anchor family per community. Let p_D be the assumed share of communities in decline/disaster, p_S the assumed share in self-financing, and k_D and k_S the minimum whole community representation required for those states. Then:

$$N_L = \max\left(N_F, \left\lceil \frac{k_D}{p_D} \right\rceil, \left\lceil \frac{k_S}{p_S} \right\rceil\right)$$

$$N_L = \max\left(12, \left\lceil \frac{1}{0.06} \right\rceil, \left\lceil \frac{1}{0.10} \right\rceil\right) = \max(12, 17, 10) = 17$$

Seventeen is therefore the smallest whole number candidate that satisfies all three representation conditions under the current assumptions. The value $N_F = 12$ depends on assigning at least one differentiated anchor family to each community. A different rule for how many families one community can carry would change that term. The result also depends on treating six per cent and ten per cent as the relevant state shares. These choices define representation. They do not establish sufficient production, cash, liquidity, credit performance, infrastructure or resilience.

$$N_{MV} = \text{smallest } N \text{ for which every viability gate passes}$$

Current result: $N_{MV} = \text{NOT ESTABLISHED}$; candidate search range: $17 \leq N \leq 50$

The integer rule is a planning device, not a probability theorem. An expected count of one does not guarantee that exactly one community will be in decline, nor does it measure the covariance of shocks. A drought, market failure or institutional breakdown may affect several communities at once. The lower bound calculation must therefore be followed by federation specific facility and stress assessments.

COUNTING IS NOT POOLING

The six per cent share remains only in the historical representation calculation. It no longer sizes the risk pool. Under the event conditioned model, a severe case affects between nine and thirteen of the seventeen communities, depending on the event. The candidate therefore needs R1.9095 billion of internal recovery capacity for a severe case, not merely enough liquidity for one declining community.

17 x 10,000: the structural lower-bound topology

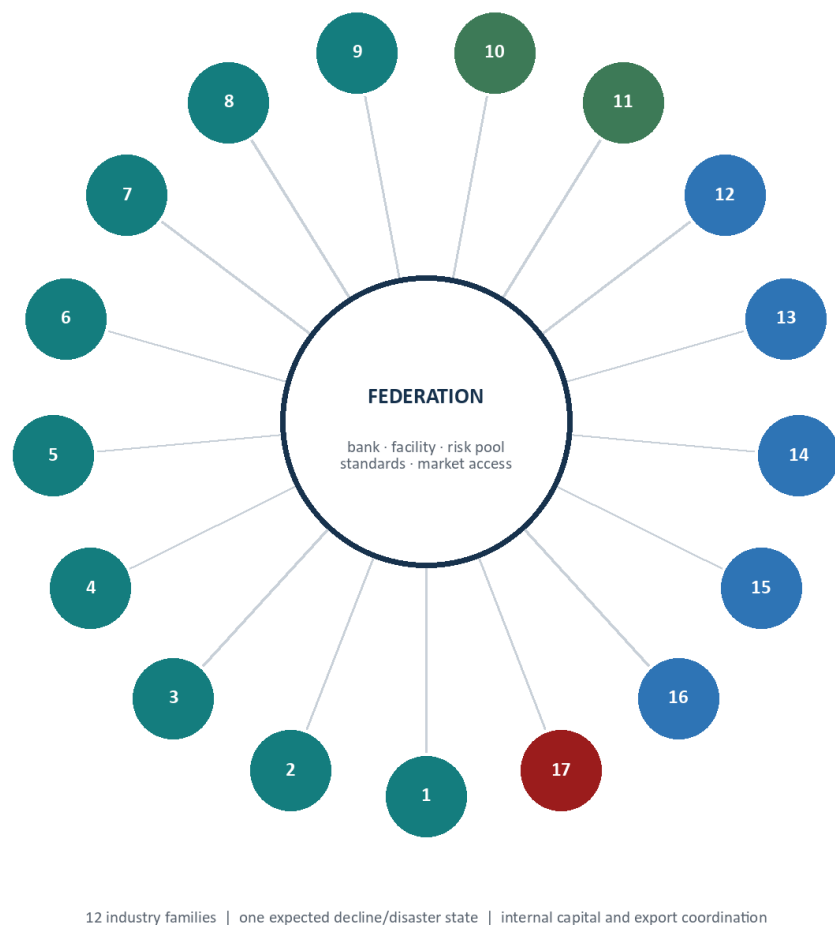


Figure 1. Structural lower bound topology: seventeen operating kernels linked by finance, risk, standards and external market access. This is a candidate configuration, not a viability finding.

Structural condition	Current assumption	Lower bound implication
Industry family representation	12 family equivalents; at least one differentiated family per community	$N_f = 12$ communities under the current allocation rule
Self-financing state representation	10% share; at least 1 whole community	$\text{ceil}(1 / 0.10) = 10$
Decline/disaster state representation	6% share; at least 1 whole community	$\text{ceil}(1 / 0.06) = 17$
Structural lower bound candidate	Maximum of the three conditions	17 communities
Lower bound scenario population	$17 \times 10,000$ residents	170,000 residents
Lower bound productive people	$17 \times 6,000$ derived people	102,000 unique people
Local / external pathways	$17 \times 5,400$ local; 17×600 external or remote	91,800 local; 10,200 external or remote
Position contracts / FTE	Scaled from the reconciled labour account	104,817.62 contracts; 94,486.34 FTE

Source: External Revenue Anchor risk model workbook v10, Scale Solver, Correlated Shock Risk and Viability Boundary (2026).

4.2 The viability decision rule

CRITICAL CLAIM BOUNDARY

Seventeen is the structural lower bound candidate. Fifty is the only fully replayed selected scenario reference, and its export cash replay leaves a R522.104 billion capital backlog in year thirty-five. Neither is established as the minimum viable federation. The minimum viable federation remains NOT ESTABLISHED.

A candidate can be promoted to the minimum viable federation only if it is the smallest network size that completes the full 35-year transition and facility replay with adequate liquidity, zero external funding and zero terminal backlog; keeps the source and application of capital inside the federation; services its modeled loan obligations; passes Base and all four event conditioned cases at that same size; fully funds the severe reserve from within the candidate; and supplies independently accepted E18, trade, capital custody, operating and governance evidence.

Candidate	What is currently demonstrated	Missing validation	Permitted claim
17	Structural representation gate passes	35-year replay, Base plus four event conditions, R1.9095bn internal reserve and E18	Structural lower bound candidate only
18-49	Structural representation gate passes	35-year replay, candidate specific reserve and E18	Candidate status not established
50	35-year replay completed; R522.104bn terminal network backlog remains	Capital closure, seven liquidity failures, R5.455bn internal reserve and E18	Replayed reference that currently fails the capital gate

Source: External Revenue Anchor risk model workbook v10, Recovery Reserve and Viability Boundary (2026).

The interval from seventeen through fifty is a current comparison range, not a proven viability interval. The next model release must replay every candidate on identical assumptions and apply the full decision rule without choosing the answer in advance.

4.3 Community size and sustainability

Residents per community	Cost weighted local provision, shared capacity	Capital per resident before E18 reserve	Lower bound network population
10,000	76.4%	R387,148	170,000
12,000	77.2%	R362,797	204,000
15,000	78.0%	R338,446	255,000
20,000	78.8%	R314,095	340,000

Source: Scale Solver, shared capacity scenario. These improvements are conditional assumptions, not observed economies of scale.

Population does not determine sustainability on its own. Adding residents while holding productive capacity fixed lowers employment coverage and local provision, while scaling every input in proportion leaves most per person ratios unchanged. Larger communities improve the provision result only under the explicit shared capacity assumption. The decisive variable is the productive arrangement that population makes possible, not headcount alone.

5. The economic constitution: seventeen governing rules

The following rules convert the model from a spreadsheet scenario into an institutional framework. They are intended to function like an economic constitution: stable enough to discipline implementation and amendable through evidence and transparent collective decision.

Rule	Binding policy meaning
1. Population boundary	Every operating kernel shall maintain a current register of residents, productive status, needs and capabilities. Planning begins with people, not projects.
2. Derived paid work guarantee	Every person in a locally verified productive population shall have access to paid work, paid learning or structured productive public service with progression. The productive population must be rebuilt from the resident profile, not fixed as a ratio.
3. Work must be demand backed, decent and countable	No employment result is achieved unless a unique person, paid contract, hours, wage, safety class, stability, progression route and accepted source of demand are recorded without double counting.
4. Local first, never local only	Local production shall be preferred where it is feasible, competitive and resource responsible. Specialist imports remain legitimate and must be explicitly funded.
5. Exports fund the import floor	Every federation shall maintain sufficient recurring unrestricted export cash, after collections and all operating, tax, lifecycle, debt service and reserve claims, to pay for unavoidable imports under credible downside stress.
6. Circularity precedes throughput	Repair, maintenance, reuse, remanufacture, nutrient recovery, water cycling and secondary inputs shall be evaluated before new extraction or replacement.
7. Assets carry lifecycle obligations	No capital asset is commissioned without a condition register, maintenance plan, replacement provision, operator capability and decommissioning route.
8. Capital originates within the federation	Primary and secondary financial markets shall be funded by member deposits, shares, retained surplus and federation reserves, not permanent external wholesale finance. Fiscal capital counts only after lawful appropriation, expenditure and boundary recognition.
9. Credit must be causal and bounded	Loans must name the productive, mercantile, infrastructure or household use outcome, repayment source, affordability limit, security, loss provision and community application.
10. Fiscal value is recognised, not presumed	Tax collection, appropriation, expenditure and accepted local value shall be reported as separate events. No generated tax share counts as a local inflow without a lawful route, a budget, delivery and evidence.
11. Procurement develops capability	Community and public purchasing shall build qualified local suppliers while preserving cost, quality, safety and anti-capture controls.
12. Industry diversity is a network duty	The federation shall maintain at least twelve differentiated industry families and avoid dependence on a single anchor, customer, technology or commodity.
13. Every community has a state	Catalysis, evolution, self-financing and decline/disaster are operating conditions of the same system. The decline rule shall be evaluated first, and budgets, employment protections and credit rules shall respond to the evidenced state.
14. Disaster is mutualised	The federation shall hold liquidity, essential inventories, recovery capacity and loss sharing rules sufficient for the published correlated event count, not only one declining community. The reserve shall be funded inside the exact federation and verified under E18.

Rule	Binding policy meaning
15. Surplus renews the productive base	Recurring unrestricted export cash and net resource loop savings shall first protect working capital, maintenance, skills, reserves and the capital queue before discretionary distribution. Local value captured is a diagnostic and may not be spent twice. Separately recognised fiscal expenditure may support these uses but is never presumed.
16. Evidence precedes achievement claims	Modeled feasibility, submitted evidence, independent acceptance and realised outcomes shall remain separate. Every period shall reconcile production, use, capital, trade and native unit resources, and E18 shall verify transitions, shared shocks, recovery costs and reserve custody before a resilience claim.
17. The system must evolve or be replaced	Rules, industry mix, technologies and placement allocations shall be reviewed against outcomes. Structures that preserve employment by suppressing productivity or innovation shall not be protected.

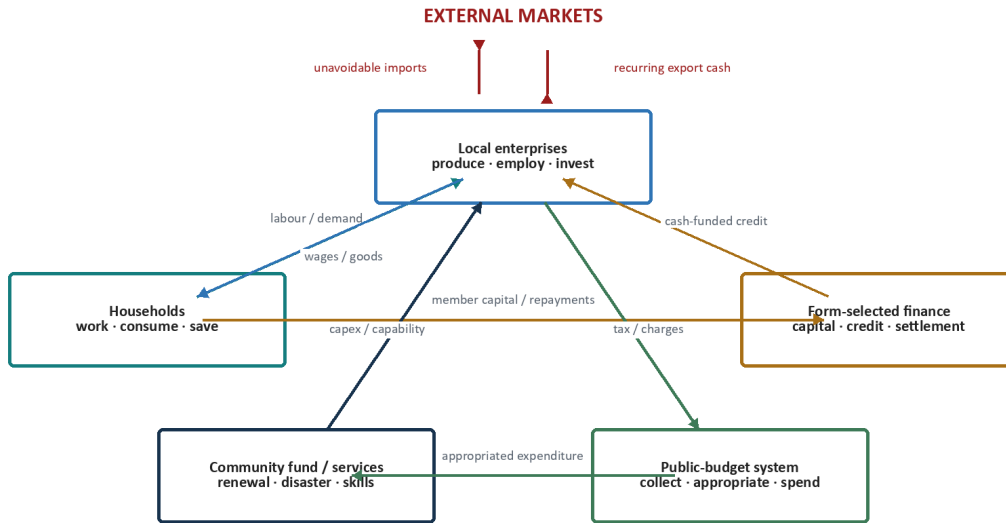
Source: author synthesis of the integrated model. These rules are proposed governance provisions, not existing law.

6. Internal flows and the circular operating system

6.1 The economy as a balanced transaction system

A circular economy is not defined by recycling alone, and it cannot be demonstrated by one percentage. The model begins with stock flow consistency: every transaction has an equal counterpart across households, enterprises, the form selected community financial institution, government, the community fund and the external sector. This prevents wages, credit, tax or exports from appearing as benefits without showing who pays, who receives, what obligation remains and whether value leaves the boundary. The finance ledger also distinguishes capital, funding liabilities, custody cash, loans, loss allowances and equity. Balanced money flows are necessary, but they do not prove that materials are recovered, services are sufficient or imports are falling.

This multidimensional treatment follows the circular economy literature's warning that the concept is broader than waste management and remains contested when system boundaries and social outcomes are left vague (Geissdoerfer et al., 2017; Kirchherr, Reike and Hekkert, 2017). Industrial symbiosis is a narrower mechanism in which one organisation's residual becomes another's input; it requires identifiable exchanges and cannot be inferred from geographic co-location (Chertow, 2000). South Africa's waste sector circular economy guideline supplies a policy bridge, but does not replace the wider production, service and asset accounts used here (Department of Environment, Forestry and Fisheries, 2020). The paper therefore reports monetary, production, service, import and physical loop results separately.



External flows remain explicit. Fiscal value counts only after lawful appropriation, expenditure inside the boundary and acceptance of the service or asset.

Figure 2. The internal economic flow architecture. External trade is part of the system, but its role is bounded and financed.

6.2 The quantified community supply and use account

The interaction model assigns a value to every major flow for each of the first five years. It follows the South African and international supply and use convention: domestic output and imports form supply; intermediate consumption, household and public consumption, capital formation, inventories and sales outside the boundary form use. The account is stated at basic price planning values. Tax remains in the separate fiscal ledger, so generated tax is not added to product output or treated as an automatic local inflow.

$$Q + M = Z_d + Z_m + C_h + C_g + I_p + I_c + \Delta \text{Inv} + X$$

$$Q_i = Z_{i,d} + Z_{i,m} + GVA_i$$

In the first identity, Q is domestic output, M is imports, Z_d and Z_m are locally supplied and imported intermediate uses, C_h and C_g are household and recognised public final use, I_p is permanent infrastructure formation, I_c is capability investment, ΔInv is inventory change and X is sales to the rest of South Africa or external markets. The second identity applies to each industry: its output equals local and imported intermediate inputs plus gross value added. For A01, retained local value is disclosed as a planning proxy rather than represented as verified national accounts gross value added.

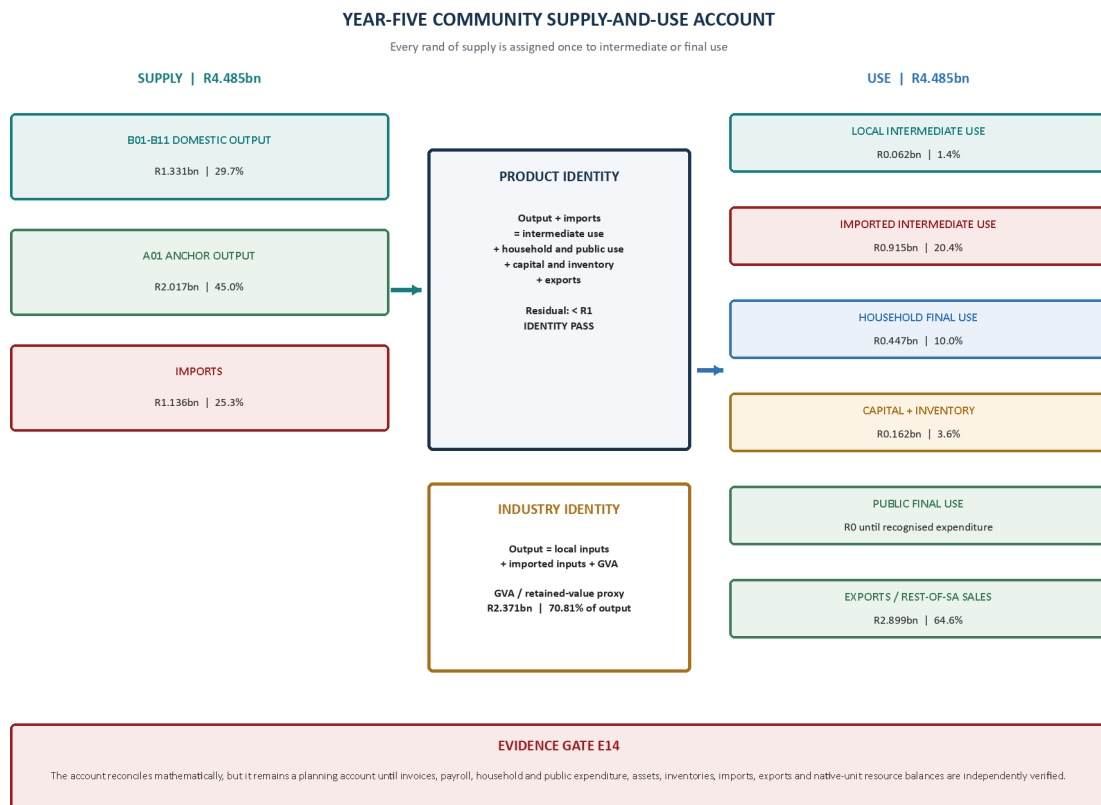


Figure 3. The year-five community supply and use account. The monetary identities reconcile to less than R1, while E14 remains required before the planning values may be treated as observed accounts.

Account side	Year-five category	R million	Share of total supply or use
Supply	B01-B11 domestic output	1,330.842	29.7%
Supply	Selected A01 anchor output	2,017.200	45.0%
Supply	Imports: household and intermediate	1,136.441	25.3%
Supply	TOTAL SUPPLY	4,484.483	100.0%
Use	Local intermediate use	62.384	1.4%
Use	Imported intermediate use	915.044	20.4%
Use	Household final use, including imports	446.783	10.0%
Use	Recognised public final use	0.000	0.0%
Use	Permanent infrastructure formation	138.077	3.1%
Use	Capability investment	10.192	0.2%
Use	Inventory change	13.308	0.3%
Use	Exports and rest-of-SA sales	2,898.696	64.6%
Use	TOTAL USE	4,484.483	100.0%

Source: Internal Flows risk model workbook v10, year-five supply and use account. Rounded values may not sum visually; the workbook identities reconcile within R1.

INTERPRETATION BOUNDARY

The account is complete as an accounting structure, not as evidence. Public final use is R0 because no lawful and attributable public expenditure has yet been recognised, not because public services are assumed absent. Exports are the balancing use after internal uses are allocated; they remain a sales requirement until customer contracts, invoices and cash receipts verify them. A balanced model can still be commercially wrong.

6.3 What each business buys and where its output goes

The B01-B11 interindustry matrix converts the qualitative arrows into buyer supplier amounts. For each year, every buying sector's local intermediate purchases are allocated across the eleven supplying sectors. The current planning rule gives seventy-five per cent weight to supplier output capacity and twenty-five per cent to a documented affinity pattern. This produces a complete matrix, but it is not an observed input output table. Supplier invoices, bills of materials and counterparty locations must replace the allocation rule under E14.

Year-five industry account	Output	Local inputs	Imported inputs	GVA / retained value proxy
B01 Food and agro processing	120.0	6.2	31.1	82.7
B02 Built environment and maintenance	133.8	7.6	38.0	88.2
B03 Care, health and social services	103.7	3.7	18.5	81.5
B04 Education and skills pipeline	109.4	3.5	17.7	88.1
B05 Local services, trade and logistics	120.0	8.7	43.8	67.5
B06 Manufacturing, repair and circular economy	175.6	11.9	59.8	103.8
B07 Digital, admin and professional services	164.3	4.8	24.0	135.5
B08 Energy, water, utilities and environment	117.9	5.7	28.7	83.5
B09 Governance, security, finance and cooperatives	73.9	1.8	9.0	63.1
B10 Creative, tourism, sports and culture	60.2	3.4	17.1	39.7
B11 Research, productivity and export upgrading	152.1	4.9	24.7	122.5
A01 Selected external revenue anchor	2,017.2	0.0	602.7	1,414.5
TOTAL COMMUNITY	3,348.0	62.4	915.0	2,370.6

Values in R million. A01 is the selected anchor and its retained value amount remains a proxy pending verified cost accounts.

Disposition of locally produced output	Household final	Local intermediate sales	Capital + inventory	External sales
B01 Food and agro processing	49.6	5.4	4.2	60.8
B02 Built environment and maintenance	9.0	5.9	54.1	64.8
B03 Care, health and social services	27.0	3.8	6.0	66.8
B04 Education and skills pipeline	24.8	5.0	10.5	69.1
B05 Local services, trade and logistics	51.8	6.1	7.1	55.0

Disposition of locally produced output	Household final	Local intermediate sales	Capital + inventory	External sales
B06 Manufacturing, repair and circular economy	18.0	8.3	27.6	121.6
B07 Digital, admin and professional services	11.3	7.9	9.2	135.9
B08 Energy, water, utilities and environment	13.5	6.4	29.3	68.7
B09 Governance, security, finance and cooperatives	6.8	4.1	4.3	58.8
B10 Creative, tourism, sports and culture	9.0	2.6	3.9	44.7
B11 Research, productivity and export upgrading	4.5	7.0	5.3	135.3
A01 Selected external revenue anchor	0.0	0.0	0.0	2,017.2
TOTAL COMMUNITY	225.4	62.4	161.6	2,898.7

Values in R million. Household final use in this table is locally produced output; R221.398m of household imports raises total household final use to R446.783m.

The two tables reveal the revised production structure. B06 manufacturing, repair and circular activity is the largest base sector output at R175.6 million and the largest base sector intermediate buyer at R71.7 million when local and imported inputs are combined. B07 digital and professional services and B11 productivity and export upgrading carry high value added assumptions and large external sales allocations. B02 directs R54.1 million to durable formation, capability and inventory, while B08 directs R29.3 million. These differences matter: the circular economy cannot be managed as eleven equal sectors, and a weak margin or import shock in one system changes demand, costs and output in several others.

6.4 How the interaction account changes over time

The account is recalculated annually rather than held as a static picture. At federation level, every community occupies one of four states: catalysis, evolution, self-financing or decline/disaster. Each state changes output capacity, import dependence, household demand, capital formation and retained value. Annual transition probabilities alter the distribution of communities, and the supply and use account is then weighted by that distribution. The financial balance is therefore both an outcome of the interaction system and one input into the next transition.

Account measure	Year 5: one community	Year 20: 50-community state distribution	Status
Domestic output	R3.348bn	R117.032bn	Identity component
Imports	R1.136bn	R49.173bn	State sensitive dependency
Household final use	R0.447bn	R19.329bn	State sensitive demand
Permanent infrastructure formation	R0.138bn	R6.363bn	State sensitive capital use

Account measure	Year 5: one community	Year 20: 50-community state distribution	Status
Exports / rest-of-network sales	R2.899bn	R99.831bn	Balancing external use
GVA / retained value proxy	R2.371bn	R77.168bn	Planning value added result

Source: Internal Flows and External Revenue Anchor risk model workbooks v10. All federation periods reconcile; E14-E18 remain required in every participating community.

The year-twenty federation account is not fifty copies of the mature year-five community. It reflects a simultaneous distribution across catalysis, evolution, self-financing and decline or disaster. The network reports about 188,035 state adjusted local productive people, with about 138,752 supported under the combined demand shock. This is why population size and industry composition cannot be analysed separately: state, production, demand, imports, capital and employment change together.

6.5 Financial autonomy is not circularity

At community level, the governing annual cash autonomy balance is represented as:

$$A_{\text{cash}} = C_e - N_a$$

C_e is recurring unrestricted export cash after collection loss, anchor imported inputs, logistics and compliance, local operating costs, cash tax, maintenance, replacement, internal debt service and the disaster reserve. N_a is the broader community autonomy funding need that has not already been deducted from C_e . Keeping those terms separate prevents the same local value margin or reserve from being spent twice. At the current fifty-community average, C_e is about R94.98 million per community and the resulting broader balance is negative R802.1 million per community per year. resource loop savings and recognised fiscal expenditure remain separately disclosed until their cash, legal route and non-duplication are verified. A reconciled cash balance is a financial test, not a circularity score, and cannot substitute for physical, service, production or import evidence.

6.6 Five dimensions that must remain separate

REPORTING RULE

Composite circularity score: NOT USED. Every dimension has its own denominator, unit, threshold and evidence test. circular economy achievement remains NOT ESTABLISHED until each named dimension is measured and independently accepted.

Dimension	Current model result	What the result means	Required achievement evidence
Monetary recirculation	56.28%	Locally captured household demand divided by the household spend pool	Observed household purchases and local supplier receipts
Local value added	71.85% base GVA; 70.81% including the anchor retained value proxy	B01-B11 output less complete local and imported intermediate use; A01 retained value remains separately disclosed	E14-verified sector production and input accounts
Local provision and import dependence	46.36% current; 76.41% feasible benchmark	Cost weighted local supply of seven essential requirements; neither percentage measures circularity	Requirements, quantities, replacement costs, technical limits and commissioned output
Essential service sufficiency	1 of 2 thresholds met	Housing/public realm maintenance is 56.64% against 80%; primary healthcare is 100% against 85%	Measured service volumes, quality, access and condition
Physical loops and recovery	Seven native unit resource balances; evidence required	Food, water, energy, maintenance, healthcare, recoverable materials and critical imports are reported separately	Measured resource balances with traceable residuals

Source: Internal Flows risk model workbook v10, Circularity Dashboard and Physical supply use Account (2026).

6.7 Reproducing the local provision results

The two percentages previously described as circularity are cost weighted local provision measures. Each of the seven essential requirements is converted to a common value denominator using its annual requirement and replacement cost. Current local provision subtracts the present external requirement from total costed demand. The feasible benchmark subtracts the configured unavoidable import floor. The calculation is:

$$P_{\text{current}} = \frac{V_{\text{total}} - V_{\text{current imports}}}{V_{\text{total}}}$$

$$P_{\text{current}} = \frac{\text{R}371.540\text{m} - \text{R}199.295\text{m}}{\text{R}371.540\text{m}} = 46.36\%$$

$$P_{\text{feasible}} = \frac{V_{\text{total}} - V_{\text{unavoidable imports}}}{V_{\text{total}}}$$

$$P_{\text{feasible}} = \frac{\text{R}371.540\text{m} - \text{R}87.637\text{m}}{\text{R}371.540\text{m}} = 76.41\%$$

The complementary current import dependence share is 53.64 per cent, while the configured unavoidable import floor share is 23.59 per cent. These are value weighted provision measures. They do not show how many times money circulates, how much material is recovered, whether a clinic meets its service obligation or how much value is added locally.

6.8 Physical supply and use in native units

Base local supply + credit enabled supply + circular or efficiency supply + external supply = household + productive + public + capital use

Resource	Native unit	Year-five total use	Total local supply	External supply	Circular / efficiency contribution
Food	million kcal/year	8,760	3,989.23	4,770.77	876.00
Potable and productive water	ML/year	438	295.23	142.77	52.56
Electricity and productive energy	MWh/year	30,000	12,047.23	17,952.77	4,500.00
Housing and public realm maintenance	units/year	300	167.83	132.17	30.00
Primary healthcare	visits/year	30,000	30,000.00	0.00	1,500.00
Recoverable materials	tonnes/year	5,000	2,518.89	2,481.11	1,500.00
Critical medicines and equipment	Availability index	100	10.12	89.88	5.00

Every resource also has an explicit use allocation across households, productive activity, public services and capital or maintenance. The units are never added together. These are planning values, not observed outcomes. Food combines an efficiency and biological loop contribution pending measured food waste recovery. Water combines reuse, treatment and loss reduction. Energy records renewable supply and efficiency rather than material recovery. Materials remain a planning proxy until site level characterisation and complete mass balances establish what is generated, recovered, treated, exported and finally disposed.

Source: Internal Flows risk model workbook v10, Physical Supply Use and Physical Loop Ledger (2026).

6.9 What is produced, consumed and retained

Consumption is divided into recurrent essentials, discretionary consumables and services, while production is divided into local final goods, intermediate inputs, public services, export outputs and asset forming activity. Permanent infrastructure includes housing systems, water and energy assets, roads and public realm, clinics, learning facilities, workshops, logistics and digital systems. Consumables include food, household goods, medicines, packaging, fuel and routine service inputs. Their treatment differs: infrastructure requires maintenance and replacement reserves; consumables require reliable throughput and inventory; recoverable materials require reverse logistics; specialist imports require export cover.

The community improves by advancing several results at once, not by suppressing consumption or maximising one ratio. Local provision should rise where quality and cost are acceptable. Material intensity and residual waste should fall. Water and energy productivity should improve. Essential services should clear their stated thresholds. Assets should last longer, and recurring unrestricted cash should grow faster

than unavoidable external requirements after all deductions and reserves. Each result remains visible so progress in one dimension cannot conceal deterioration in another.

7. Production portfolio: the businesses that constitute the economy

7.1 Two connected layers of production

The production portfolio has two layers that must be read together. The first is the everyday operating base inside each 10,000-person community. It contains 204 operating units across eleven business systems and assigns 5,400 unique local people through 5,565.74 position contracts equal to 4,958.02 FTE. The second is a differentiated external revenue anchor. The base supplies essential goods, services, maintenance, skills and enterprise support. The anchor brings income into the community and creates a demanding customer for selected base suppliers. The remaining 600 productive people are recorded as existing external or remote workers rather than assigned again to the local base.

The 204 units are not yet 204 named companies. They are operating cells: repeatable combinations of people, assets, responsibilities and shared services. A cell may ultimately be constituted as a cooperative division, company, social enterprise, franchise, contractor, utility operator or public service provider. Legal form follows the cash flow, risk, regulatory duty and ownership purpose of the activity. A site level business register must name every entity, owner, premise, licence, asset set, customer and contract before implementation.

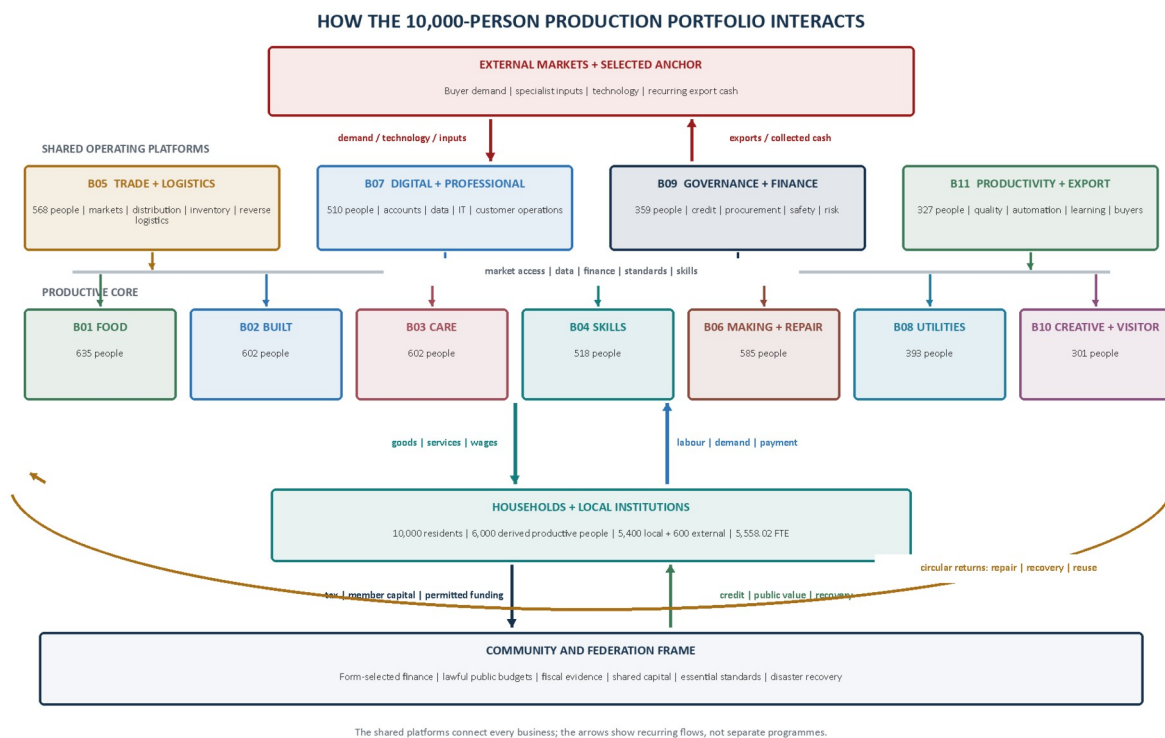


Figure 4. Overall production portfolio interaction model. Shared operating platforms connect the productive core to households, public and federation institutions, and external markets.

204	5,400	4,958.02
BASE OPERATING UNITS	UNIQUE LOCAL PEOPLE	LOCAL full time EQUIVALENTS
COUNTING RULE The 5,400 local people, 5,565.74 local position contracts and 4,958.02 local FTE describe the same workforce from different perspectives. The earlier 6,460 role slots remain only a design capacity comparator. The eleven base systems and the twelve-family diversification threshold are also different measures and must not be added together.		

7.2 The 204-unit base portfolio

Business system and operating form	Units	Unique people	Position contracts	FTE	Legacy slots
B01 Food and agro processing Farm block or food processing cell	24	635	654.05	584.20	760
B02 Built environment and maintenance Construction and maintenance contractor cell	24	602	611.03	577.92	720
B03 Care, health and social services Care hub	18	602	633.61	517.72	720

Business system and operating form	Units	Unique people	Position contracts	FTE	Legacy slots
B04 Education and skills pipeline Learning and trade centre	10	518	541.31	455.84	620
B05 Local services, trade and logistics Market, fleet or service micro franchise	34	568	593.56	499.84	680
B06 Manufacturing, repair and circular economy Workshop cluster cell	28	585	593.77	561.60	700
B07 Digital, admin and professional services Shared services pod	20	510	521.48	479.40	610
B08 Energy, water, utilities and environment Utility operating cell	14	393	398.89	377.28	470
B09 Governance, security, finance and cooperatives Cooperative operating office	10	359	367.08	337.46	430
B10 Creative, tourism, sports and culture Creative/tourism studio or venue cell	12	301	319.06	252.84	360
B11 Research, productivity and export upgrading Productivity and export lab	10	327	331.90	313.92	390
TOTAL BASE PORTFOLIO	204	5,400	5,565.74	4,958.02	6,460

Source: Employment Kernel labour account workbook v3 and Internal Flows risk model workbook v10. Counts are planning outputs pending E17 and continuity remains subject to E18.

At steady state, the original business archetypes carry R481.488 million of capital expenditure including contingency and R329.265 million of working capital, for total invested capital of R810.753 million. The revised local labour account carries R679.475 million of annual wages and R716.847 million of employer payroll cost. It requires R1.334 billion of annual customer sales and calculates R256.428 million of sales cycle working capital, R72.837 million below the original archetype allowance. The difference remains unresolved until enterprise product schedules, inventory days, receivable terms and collection evidence determine the final requirement. The planning portfolio produces R132.964 million of annual EBITDA, but this is not observed performance.

Operating form BOUNDARY

Essential activity is not the same as commercial viability. Food and agro processing and the shared manufacturing, repair and circular platform both fail the selected fifteen-year payback screen. They are therefore classified as explicitly supported productive infrastructure unless their economics improve. public service providers and the utility require executed authority and revenue instruments. No sector receives implied support merely because it belongs to the portfolio.

7.3 Operating forms and support flows

The model assigns every B01-B11 business system to one of four operating forms. The classification determines who may authorise the activity, what revenue instrument carries it, which obligations attach to it and whether a weak return is permitted to remain in the portfolio. A label does not create cash. Each route must be executed, costed and reconciled in the same economic boundary.

Sector	Operating form	Primary revenue instrument	Commercial screen
B01 Food and agro processing	Explicitly supported productive infrastructure	Market sales plus executed food security or institutional procurement contracts	55.85 years; support route required
B02 Built environment and maintenance	Commercial enterprise	Household, enterprise and competitively procured works contracts	Commercial screen pass
B03 Care, health and social services	Public service / contracted provider	Household fees plus executed health, care or social service contracts	Operating authority required
B04 Education and skills pipeline	Public service / contracted provider	Learner, employer and executed education or skills service contracts	Operating authority required
B05 Local services, trade and logistics	Commercial enterprise	Retail margin, logistics fees, hospitality receipts and service contracts	Commercial screen pass
B06 Manufacturing, repair and circular economy	Explicitly supported productive infrastructure	Enterprise orders, member service charges and executed repair or circularity contracts	53.34 years; support route required
B07 Digital, admin and professional services	Commercial enterprise	Subscriptions, retainers, transaction fees and external service sales	Commercial screen pass
B08 Energy, water, utilities and environment	Regulated utility	Approved tariffs, connection charges and executed utility or concession agreements	Operating authority required
B09 Governance, security, finance and cooperatives	Public service / contracted provider	Member dues, service fees, lawful appropriations and executed governance or safety contracts	Operating authority required
B10 Creative, tourism, sports and culture	Commercial enterprise	Visitor, event, venue, media, accommodation and creative sales	Commercial screen pass
B11 Research, productivity and export upgrading	Commercial enterprise	Enterprise retainers, productivity projects, research contracts and export service fees	Commercial screen pass

Source: *Internal Flows and Capitalization risk model workbooks v10 (2026)*. Classifications are policy controls; E16 and E18 acceptance remain required.

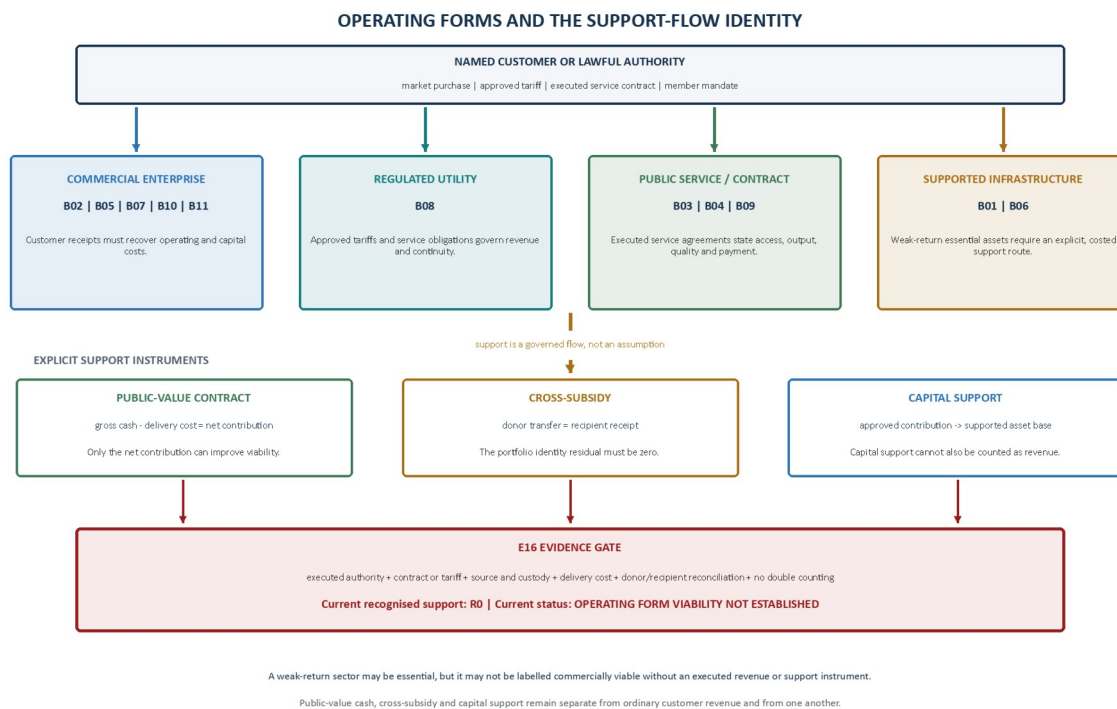


Figure 4A. Operating forms and support flow identity. Customer revenue remains distinct from public value contracts, cross-subsidy and capital support; E16 governs recognition.

The selected commercial screen is a fifteen-year simple payback test. Under the current archetype assumptions, B01 has a 55.85-year payback and B06 has a 53.34-year payback. Bringing both to the screen requires a combined R23.386 million of annual support or an equivalent improvement in price, demand, operating cost or invested capital. The portfolio contains R107.205 million of planning donor capacity in stronger sectors, but none is assigned or recognised. The R172.617 million demand envelope headroom is conditional on E15 and cannot be treated as transferable cash.

$$\text{Net public value contribution} = \text{gross contract cash} - \text{contract delivery cost}$$

$$\text{Cross-subsidy identity} = \text{donor transfer} - \text{recipient receipt} = 0$$

$$\text{Adjusted supported capital} = \text{legacy invested capital} - \text{recognised capital support}$$

These equations prevent double counting. public value gross cash first pays for the promised service; only its net contribution can improve operating viability. A cross-subsidy is the same portfolio cash at the donor and recipient ends, so the aggregate residual must be zero. Capital support reduces the asset base to be recovered and may not also be recorded as customer revenue. The current recognised value of every support route is R0 and the current status is OPERATING FORM VIABILITY NOT ESTABLISHED.

E16 RECOGNITION RULE

No public value contract, cross-subsidy or capital contribution enters the viability result until the operating authority, executed instrument, source and custody, delivery cost, donor recipient identity and no double count reconciliation are independently accepted. Until then, B01 and B06 remain support requirements, not commercially viable enterprises.

7.4 Business by business operating descriptions

The following descriptions state what each business system contains, what it produces, what it buys from the rest of the economy and what remains outside the local boundary. The workforce bars allocate the selected 5,400 unique local people across detailed roles. They also publish each sector's position contracts, FTE and average paid hours. The earlier role slot counts remain visible only as a design capacity comparator.

Each visual uses the same reading order. Inputs enter the operating cell, outputs move to named customer groups, and the return loop identifies the principal circular or learning feedback. The workforce bars reproduce the scaled person allocation and reconcile to the labour account.

B01 Food and agro processing

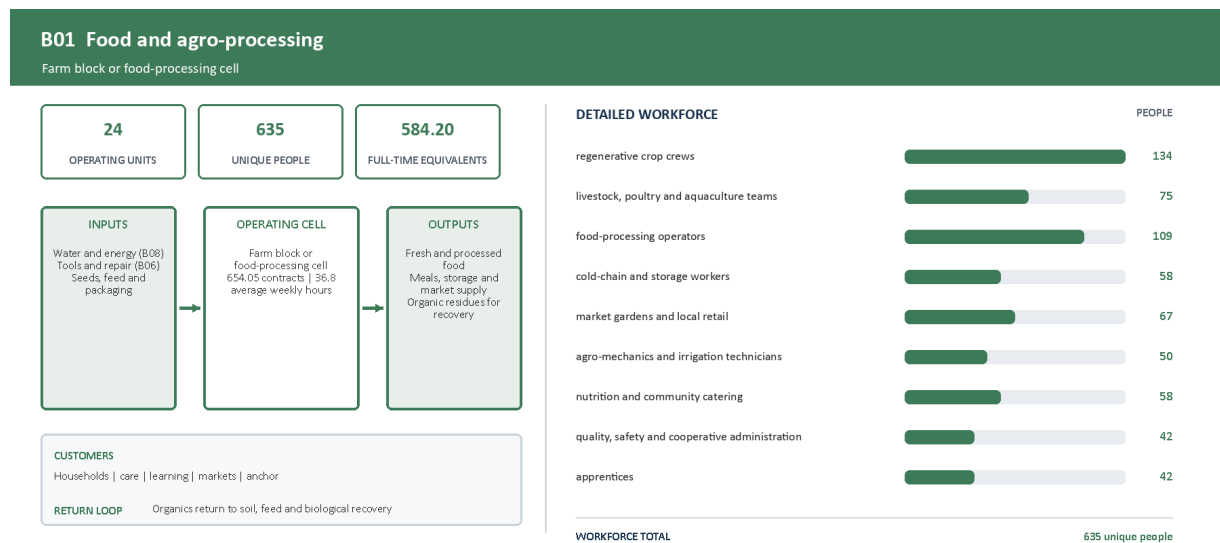


Figure 7.1. B01 operating model. The workforce bars reconcile to 635 selected unique people across 24 operating units. They hold 654.05 position contracts, equal to 584.20 FTE.

Operating form and scale. The model establishes 24 farm block or food processing cell units. The selected labour account assigns 635 unique people, 654.05 position contracts and 584.20 FTE at an average of 36.8 paid hours a week. The detailed person allocation is regenerative crop crews (134); livestock, poultry and aquaculture teams (75); food processing operators (109); cold chain and storage workers (58); market gardens and local retail (67); agro mechanics and irrigation technicians (50); nutrition and community catering (58); quality, safety and cooperative administration (42); apprentices (42). The earlier 760 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Produces fresh food, processed food, meals, storage and market services. It draws water and energy from B08, tools and repair from B06, distribution from B05, records and payments from B07 and B09, and institutional demand from care and learning facilities. Organic residues return to biological recovery. Seeds, genetics, selected feed and fertiliser, packaging and refrigeration components remain outside inputs until a site proves local substitutes.

B02 Built environment and maintenance

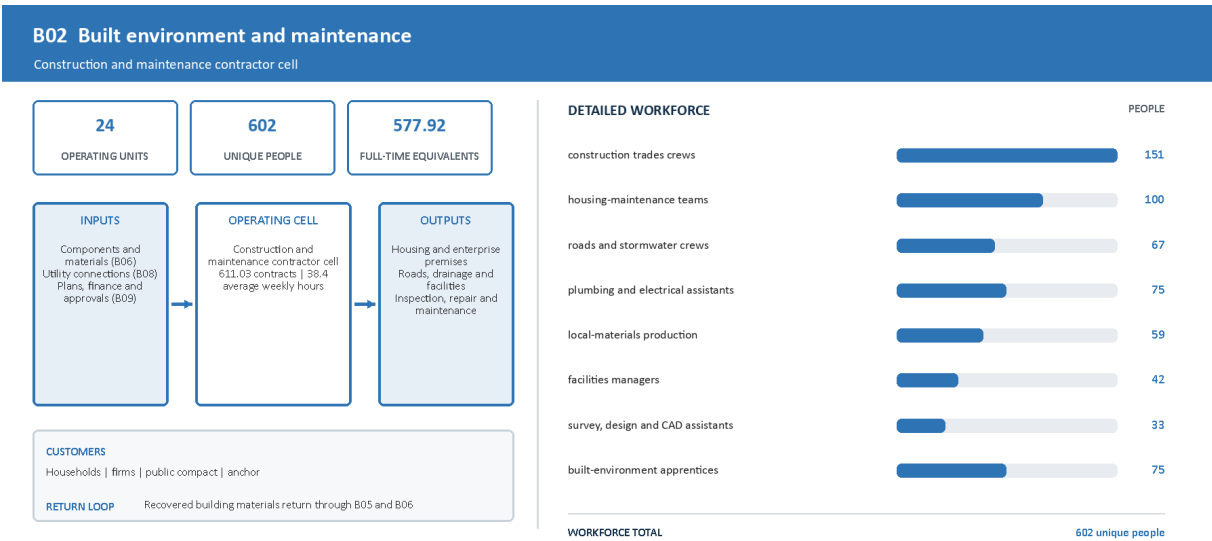


Figure 7.2. B02 operating model. The workforce bars reconcile to 602 selected unique people across 24 operating units. They hold 611.03 position contracts, equal to 577.92 FTE.

Operating form and scale. The model establishes 24 construction and maintenance contractor cell units. The selected labour account assigns 602 unique people, 611.03 position contracts and 577.92 FTE at an average of 38.4 paid hours a week. The detailed person allocation is construction trades crews (151); housing maintenance teams (100); roads and stormwater crews (67); plumbing and electrical assistants (75); local materials production (59); facilities managers (42); survey, design and CAD assistants (33); built environment apprentices (75). The earlier 720 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Builds and maintains housing, roads, drainage, public facilities and enterprise premises. The resulting assets are permanent infrastructure and therefore create continuing inspection, maintenance and replacement obligations. B06 supplies fabricated parts and repair capacity, B08 supplies utility connections, and B09 and the selected community financial institution finance approved works. Cement, structural steel, specialist plant, licensed professional services and some components may remain outside requirements depending on the site.

B03 Care, health and social services



Figure 7.3. B03 operating model. The workforce bars reconcile to 602 selected unique people across 18 operating units. They hold 633.61 position contracts, equal to 517.72 FTE.

Operating form and scale. The model establishes 18 care hub units. The selected labour account assigns 602 unique people, 633.61 position contracts and 517.72 FTE at an average of 34.4 paid hours a week. The detailed person allocation is community health workers (134); clinic assistants and administrators (67); nursing and care aides (84); early childhood carers (75); eldercare and disability support workers (59); social and youth support workers (50); mental health and substance use support workers (33); health data and referral coordinators (33); care apprentices (67). The earlier 720 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Delivers primary and home based care, early childhood support, disability and eldercare, referral, prevention and social support. Much of the service is consumed when delivered, but its durable output is health, participation and reduced household care burden. It purchases food, transport, facilities, digital records and utilities locally. Medicines, advanced diagnostics, regulated consumables and specialist clinical services remain part of the import and national system floor.

B04 Education and skills pipeline

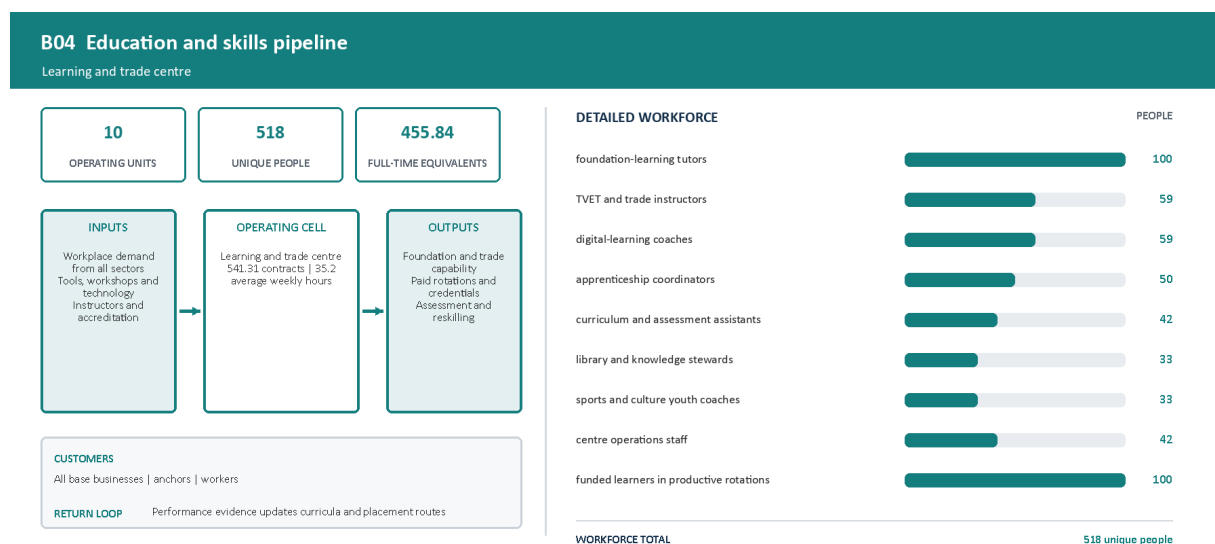


Figure 7.4. B04 operating model. The workforce bars reconcile to 518 selected unique people across 10 operating units. They hold 541.31 position contracts, equal to 455.84 FTE.

Operating form and scale. The model establishes 10 learning and trade centre units. The selected labour account assigns 518 unique people, 541.31 position contracts and 455.84 FTE at an average of 35.2 paid hours a week. The detailed person allocation is foundation learning tutors (100); TVET and trade instructors (59); digital learning coaches (59); apprenticeship coordinators (50); curriculum and assessment assistants (42); library and knowledge stewards (33); sports and culture youth coaches (33); centre operations staff (42); funded learners in productive rotations (100). The earlier 620 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Supplies foundational learning, trade instruction, digital capability, assessment and paid rotations to every other business system. Workshops, laboratories, libraries and learning platforms are productive infrastructure; skills and credentials are the recurring output. The centres buy tools from B06, technology from B07, facilities from B02 and placements from all employers. External accreditation, scarce instructors, specialist curricula and advanced training equipment remain necessary where local authority is insufficient.

B05 Local services, trade and logistics

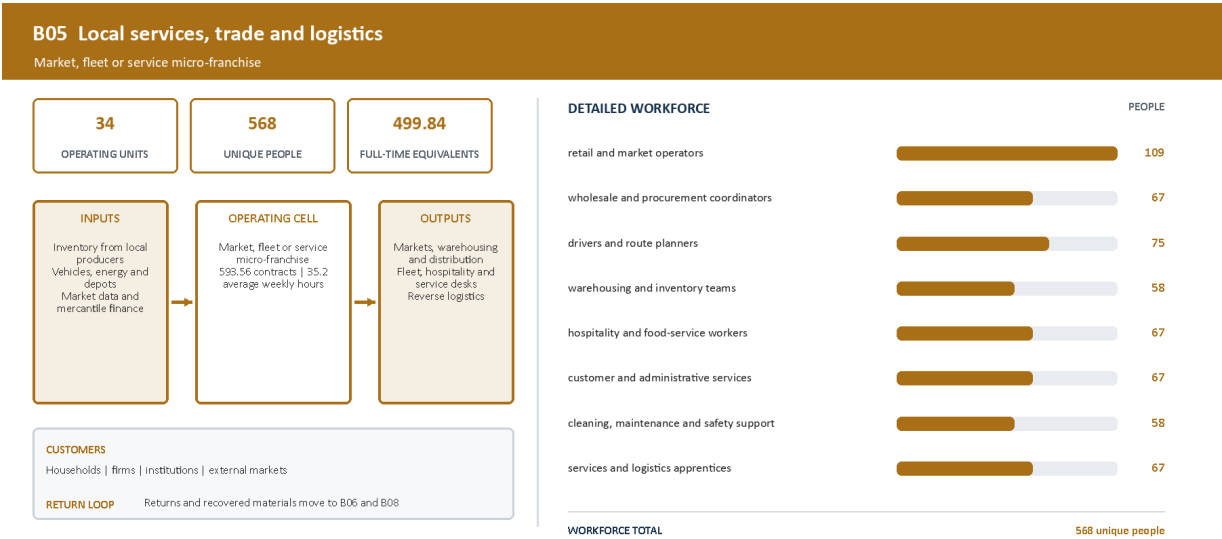


Figure 7.5. B05 operating model. The workforce bars reconcile to 568 selected unique people across 34 operating units. They hold 593.56 position contracts, equal to 499.84 FTE.

Operating form and scale. The model establishes 34 market, fleet or service micro franchise units. The selected labour account assigns 568 unique people, 593.56 position contracts and 499.84 FTE at an average of 35.2 paid hours a week. The detailed person allocation is retail and market operators (109); wholesale and procurement coordinators (67); drivers and route planners (75); warehousing and inventory teams (58); hospitality and food service workers (67); customer and administrative services (67); cleaning, maintenance and safety support (58); services and logistics apprentices (67). The earlier 680 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Moves goods between producers, households, institutions and external markets. It operates markets, procurement, inventory, warehousing, fleet, hospitality and service desks, and it carries the reverse logistics route for repair and recovery. Its vehicles, depots and cold chain equipment are durable assets; stock, fuel, packaging and food service inputs are consumables. External dependence remains in vehicles, fuel or energy carriers, imported inventory and long distance logistics that cannot yet be supplied inside the federation.

B06 Manufacturing, repair and circular economy



Figure 7.6. B06 operating model. The workforce bars reconcile to 585 selected unique people across 28 operating units. They hold 593.77 position contracts, equal to 561.60 FTE.

Operating form and scale. The model establishes 28 workshop cluster cell units. The selected labour account assigns 585 unique people, 593.77 position contracts and 561.60 FTE at an average of 38.4 paid hours a week. The detailed person allocation is metal fabrication workers (84); wood and furniture makers (67); textile and apparel workers (67); repair technicians (84); recycling and materials recovery teams (58); light electronics assemblers (50); production planning and quality staff (50); toolroom and machinist teams (58); manufacturing apprentices (67). The earlier 700 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Makes components, furniture, textiles and light electronics; repairs equipment; and converts recovered materials into usable inputs. It is the principal industrial symbiosis bridge between waste collection and productive reuse. B02, B01, B08 and the anchor portfolio are its major customers, while B05 supplies aggregation and distribution and B11 supplies quality and process improvement. Metals, polymers, electronic components, specialist machinery and precision tooling remain partly external until local bills of materials show otherwise.

B07 Digital, admin and professional services

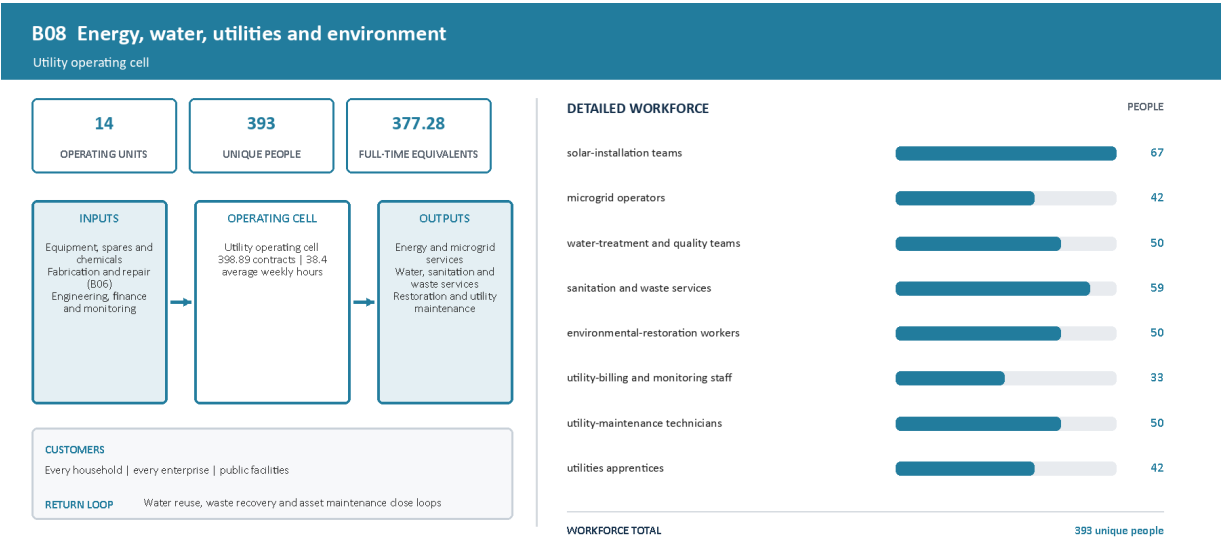


Figure 7.7. B07 operating model. The workforce bars reconcile to 510 selected unique people across 20 operating units. They hold 521.48 position contracts, equal to 479.40 FTE.

Operating form and scale. The model establishes 20 shared services pod units. The selected labour account assigns 510 unique people, 521.48 position contracts and 479.40 FTE at an average of 37.6 paid hours a week. The detailed person allocation is bookkeeping and payroll assistants (67); legal and compliance paralegals (33); software and data support workers (67); contact centre workers (75); design, marketing and content workers (50); business analysts and office administrators (59); it support and cyber hygiene technicians (42); shared services managers (42); digital and administration apprentices (75). The earlier 610 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Provides the common accounting, payroll, compliance, customer, data, marketing, information technology and office systems that small operating units could not efficiently duplicate. It lowers transaction costs across the entire kernel and can also sell low material services outside the federation. Laptops, network equipment, telecommunications, cloud services, specialist software and some legal expertise remain external inputs. Its high modelled margin must be supported by real service contracts and should not be presumed to subsidise other sectors automatically.

B08 Energy, water, utilities and environment



B09 Governance, security, finance and cooperatives



B10 Creative, tourism, sports and culture

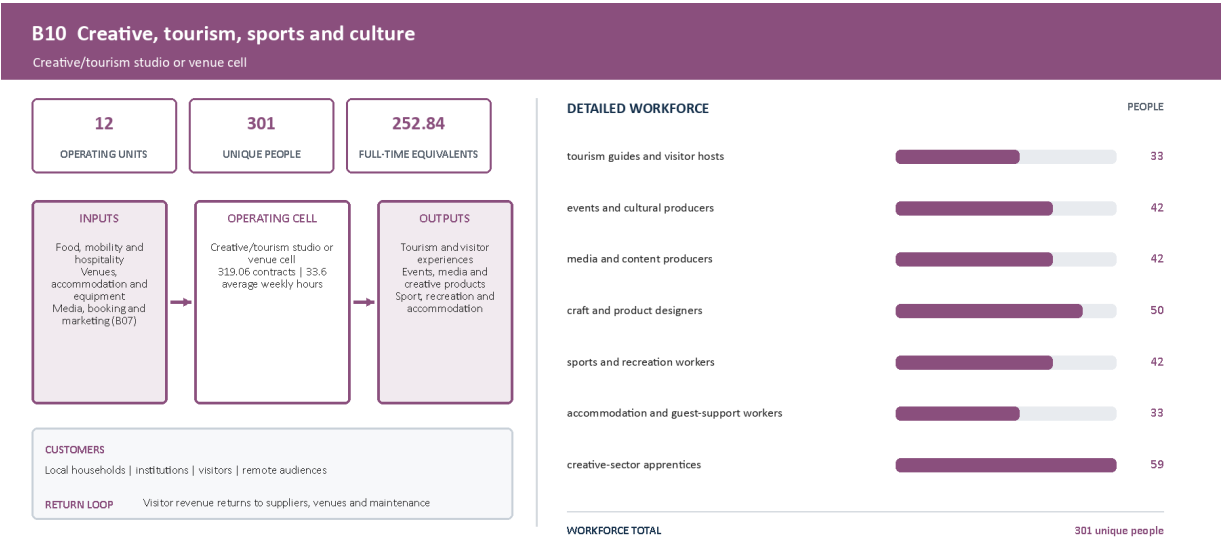


Figure 7.10. B10 operating model. The workforce bars reconcile to 301 selected unique people across 12 operating units. They hold 319.06 position contracts, equal to 252.84 FTE.

Operating form and scale. The model establishes 12 creative/tourism studio or venue cell units. The selected labour account assigns 301 unique people, 319.06 position contracts and 252.84 FTE at an average of 33.6 paid hours a week. The detailed person allocation is tourism guides and visitor hosts (33); events and cultural producers (42); media and content producers (42); craft and product designers (50); sports and recreation workers (42); accommodation and guest support workers (33); creative sector apprentices (59). The earlier 360 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Produces visitor experiences, events, media, craft products, recreation and accommodation. Local households and institutions consume part of this output; visitors and remote audiences turn it into external revenue. The cells buy food, transport, venues, maintenance, payments and marketing from the other systems. Venues and production equipment are durable assets, while food, materials and event inputs are consumables. long distance travel platforms, some media technology and external audience access remain outside dependencies.

B11 Research, productivity and export upgrading



Figure 7.11. B11 operating model. The workforce bars reconcile to 327 selected unique people across 10 operating units. They hold 331.90 position contracts, equal to 313.92 FTE.

Operating form and scale. The model establishes 10 productivity and export lab units. The selected labour account assigns 327 unique people, 331.90 position contracts and 313.92 FTE at an average of 38.4 paid hours a week. The detailed person allocation is productivity and process engineers (34); research assistants (42); export sales and market access staff (42); quality and certification officers (42); automation and machine technicians (42); enterprise coaches (50); data and evaluation staff (33); productivity apprentices (42). The earlier 390 role slots remain a design capacity comparator and are not added to the person count.

Production and flows. Runs the learning loop for the whole economy. It measures demand and performance, redesigns processes, supports certification and automation, develops external buyers and coaches enterprises through upgrading or transition. Its customers are all base businesses and each selected anchor. Specialist laboratories, certification bodies, advanced software, automation equipment and international market access remain partly external. The modelled margin is an assumption that requires signed demand and realised fee income.

Source: Employment Kernel labour account workbook v3, reconciled to Internal Flows and Capitalization risk model workbooks v10.

7.5 How the businesses trade with one another

The business list becomes an economy only when the units exchange useful output. The principal chains below show the intended links between production, consumption, durable assets, recurrent inputs and unavoidable external requirements. They are a design map. Site bills of materials, customer volumes and actual contracts must replace the present qualitative links.

Production chain	Internal flow	Durable stock or recurrent use	Outside floor and return loop
Food and nutrition	B08 water and energy + B06 tools -> B01 production -> B05 storage and distribution -> households, B03 care and B04 learning	Farms, irrigation, kitchens and cold rooms are assets; food, feed, packaging and hygiene inputs recur	Selected genetics, fertiliser, equipment and packaging remain outside; organics return to soil, feed or recovery
Shelter and public works	B06 components + B02 design, building and maintenance + B08 utility connections -> homes, firms and public facilities	Buildings, roads, drainage and networks are long lived stocks with funded maintenance	Cement, structural materials, plant and professional services may remain outside; recovered materials return through B05 and B06
Care and capability	B01 food + B02 facilities + B05 mobility + B07 records -> B03 care and B04 learning -> healthier and more capable workers for all systems	Clinics, centres and workshops are assets; care and instruction are recurrent services with cumulative human value	Medicines, diagnostics, accreditation and scarce specialists remain linked to national systems
Circular manufacturing	B05 collection and reverse logistics -> B06 sorting, repair, remanufacture and fabrication -> B01, B02, B08 and anchor users -> B11 quality improvement	Workshops, toolrooms and recovery equipment are assets; parts and materials circulate as inventory	Virgin materials, precision components and machinery remain outside where recovery or local manufacture is infeasible
Enterprise operating system	Household and firm deposits -> bank and B09 finance -> approved local credit; B07 accounting, payroll, data and customer systems -> every operating unit	Financial, data and governance systems are institutional infrastructure; fees, repayments and administration recur	Licences, payment rails, cloud systems, insurance capacity and specialist legal services remain externally connected
Visitor, cultural and digital demand	B01, B05 and B10 combine food, mobility, accommodation, events and media; B07 markets and sells the output to local and external customers	Venues, studios and visitor infrastructure are assets; hospitality, event and media inputs recur	External audiences and visitors provide export equivalent income; travel platforms and some production technology remain outside
Export upgrading	All base systems -> B11 standards, process improvement and market development -> selected anchor -> external buyer -> wages, supplier revenue, tax, deposits and reinvestment	Certification systems, laboratories, data and anchor plant deepen productive capacity	Buyer demand, export logistics, specialist equipment and unavoidable imports remain external; only recurring unrestricted cash may fund further production and renewal

Source: author synthesis of the linked employment, internal flow, capitalisation and external revenue model structures.

7.6 The federation anchor portfolio

Internal spending cannot finance the import floor when all income originates inside the same boundary and part of every production cycle leaves through imported inputs, gross tax outflows net of separately appropriated public expenditure, or external services. Each community therefore requires at least one tradable anchor system. An anchor is not necessarily one company. It may combine a lead producer, supplier network, training route, logistics capability, quality system and external customer channel.

For the seventeen-community lower bound case, the portfolio allocation assigns seventeen anchor systems across at least twelve distinct industry families. The remaining five selections should reduce market, geographic, resource and technology concentration. This is a candidate composition, not a viable minimum finding. The current workbook has not selected and replayed that seventeen-anchor set; fifty communities remains the only selected scenario state dynamics and facility reference.

Candidate anchor family	Representative anchor system	Primary base business linkages
Agro processing and export food	Citrus and subtropical fruit export packhouse	B01 food; B05 logistics; B08 utilities; B11 quality and export sales
Renewable energy and storage	Solar mounting, tracker and field services cluster	B06 fabrication; B08 utilities; B04 trades; B11 certification
Critical minerals beneficiation	Vanadium electrolyte and battery services hub	B06 manufacturing; B08 energy; B11 process and quality
Automotive and mobility components	Automotive wiring harness and electronics supplier	B06 assembly; B04 skills; B05 logistics; B11 quality
Capital equipment and metal fabrication	Mining pumps, valves and rotating equipment repair	B06 toolroom and repair; B05 logistics; B11 certification
Global business and digital services	Global finance, administration and customer operations centre	B07 shared services; B04 skills; B09 compliance
Health, medtech and care exports	Health administration and insurance process outsourcing	B03 care; B07 data; B09 risk and compliance
Circular economy and repair manufacturing	Electronics refurbishment and e-waste metals recovery	B05 reverse logistics; B06 repair and recovery; B11 quality
Forestry, wood and furniture	Federated timber, furniture and engineered wood platform	B06 woodwork; B02 construction; B05 distribution
Textiles, clothing, footwear and leather	Workwear, uniforms and technical textile platform	B06 textiles; B05 procurement; B11 quality and sales
Water, sanitation and environmental services	Modular water treatment and sanitation systems	B08 utilities; B06 fabrication; B02 installation
Creative, tourism, sport and culture	Regenerative tourism, events and destination services	B10 visitor economy; B01 food; B05 logistics; B07 marketing
Education and skills export services	Regional trade academy and apprenticeship export hub	B04 learning; all employers as placement sites; B11 evaluation
Construction materials and modular buildings	Modular housing, school and clinic manufacturing cell	B02 building; B06 components; B08 utility systems
Chemicals, fertilisers and industrial inputs	Fertiliser blending and soil input services	B01 agriculture; B06 process support; B11 testing
Security, governance and financial infrastructure	Cooperative finance, procurement and insurance platform	B09 finance and governance; B07 systems; all firms as members

Source: External Revenue and 50-Community Industrial Anchor Model v1. These are candidate archetypes, not site selections, funded projects or executed offtake.

The fifty-community workbook reports an average mature anchor of R2.017 billion in annual external revenue, R1.415 billion in local value captured, about R94.98 million in recurring unrestricted cash, R768.2 million in capital and 1,437 direct job slots. Local value captured is an economic retention diagnostic, not cash available to the federation. The anchor slots may not be added to the 6,000 productive people. E17 must identify which slots are held by the 5,400 local people, which relate to the 600 external or remote workers, which are genuinely additional positions, and which replace or upgrade existing work.

TRADE DOCTRINE

The federation shall export differentiated value, not raw dependence. External sales must deepen local supplier capability. Only recurring unrestricted cash after the full export cash waterfall may fund unavoidable imports, replenish assets and diversify the productive base. An anchor that extracts value without building these linkages does not satisfy the model.

7.7 What a complete business register must add

The portfolio states the complete modelled composition, but it is not yet an investable or implementable register. The next stage is to convert every cell and selected anchor into a named operating case.

Register requirement	Present model position	Evidence required before launch
Legal entity and ownership	Operating form is an archetype	Name, legal form, members or shareholders, board authority and beneficial ownership
Site and productive assets	Shared asset set is described	Premise, land or lease, asset register, capacity, condition, licences and maintenance plan
Products and customers	Outputs and internal links are defined	Product specification, volume, price, customer contract, service compact or offtake
Inputs and circular return	Likely local and outside inputs are mapped	Bill of materials, supplier quotes, import content, waste characterisation and verified recovery route
Workforce and skills	Unique people, position contracts, paid hours, FTE and planning work quality distributions are allocated	Person identifier, contract, wage, paid hours, safety, stability, mentor, credential, progression and anchor overlap reconciliation under E17
Finance and viability	Planning capital, revenue and margins are modelled	Opening balance sheet, working capital cycle, funding custody, repayment source and downside case
Public and regulatory duties	Governance functions are described	Permits, regulated accountability map, tax treatment, service standards and independent assurance

Source: proposed implementation control derived from the portfolio's current evidence gaps.

7.8 From a derived labour pool to demand backed employment

The labour account answers an important but limited question: how many unique people are in the productive population, and how 5,400 of them could be allocated across the local business portfolio. It

does not answer the commercial question of who will buy enough output, at what price and on what payment terms, to carry those people and their paid hours. Demand therefore sets a separate ceiling. Employment is achieved only where the demographic, person, contract, work quality and customer accounts all agree.

For each sector s , the demand account first reconciles required output to five customer classes. Household demand, local business demand, recognised public service demand, capital or institutional demand and external demand must add to sector revenue. Public demand is currently R0 because no lawful and evidenced local public expenditure has been recognised. The model then tests whether collected revenue covers non-labour inputs, fixed overhead and the loaded annual wage of the supported workforce.

$$\text{Required sales}_s = \text{household}_s + \text{local business}_s + \text{recognised public}_s + \text{capital or institutional}_s + \text{external}_s$$

$$\text{break even sales}_s = \frac{\text{target FTE}_s \times \text{loaded annual wage}_s + \text{fixed overhead}_s}{1 - \text{non-labour cost share}_s}$$

$$\text{Supported FTE}_s = \min(\text{target FTE}_s, \max(0, (\text{collected revenue}_s \times (1 - \text{non-labour share}_s) - \text{fixed overhead}_s) / \text{loaded annual wage}_s))$$

$$\text{Working capital}_s = \frac{\text{required annual sales}_s}{12} \times \text{working capital months}_s$$

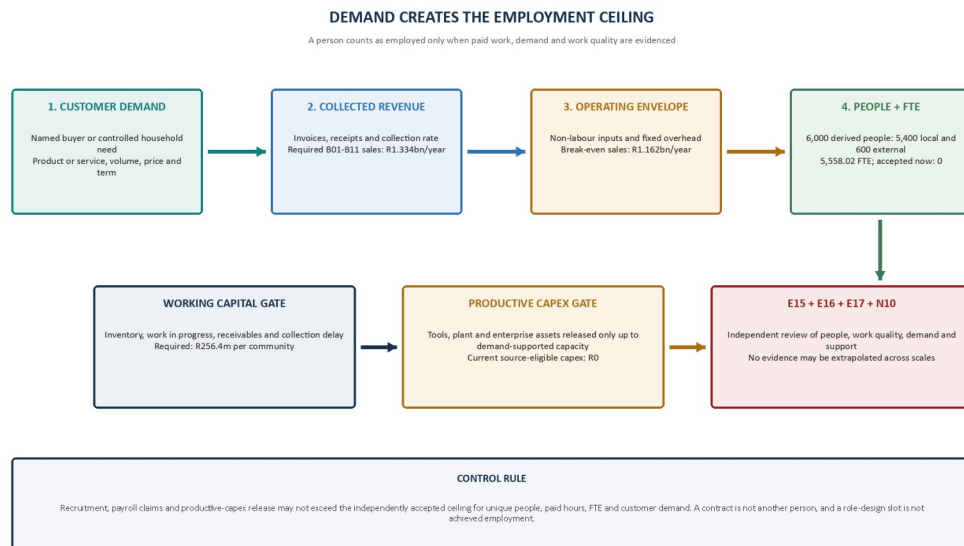


Figure 16. demand to employment control. Customer evidence, cash conversion and sales cycle finance determine the supported employment ceiling; allocation alone does not.

CURRENT RESULT

Per community, the planning account derives 6,000 productive people. It assigns 5,400 to local production and 600 to existing external or remote paid work. Submitted and independently accepted E15-E17 results remain zero. Required annual B01-B11 sales are R1.334 billion; break even sales are R1.162 billion; commercial headroom is R172.617 million before tax, finance, renewal and stress; and required working capital is R256.428 million. The permitted claim is **PLANNING LABOUR ENVELOPE - E15/E16/E17 NOT DEMONSTRATED.**

7.9 The sector by sector commercial envelope

The table below converts each workforce allocation into the minimum commercial envelope that must be investigated. Required sales are not forecasts. break even values apply the modelled non-labour cost share, loaded wage and fixed overhead. Working capital applies each sector's assumed sales cycle duration. These quantities are explicit so that field research can reject, resize or resequence a sector before people and capital are committed.

Sector	Unique local people	Required annual sales	Break even sales	Working capital
B01	635	R121.114m	R121.114m	R25.232m
B02	602	R138.701m	R135.026m	R23.117m
B03	602	R96.296m	R82.827m	R16.049m
B04	518	R103.932m	R89.100m	R25.983m
B05	568	R113.964m	R111.149m	R14.245m
B06	585	R183.354m	R183.354m	R45.838m
B07	510	R166.831m	R120.492m	R20.854m
B08	393	R122.239m	R105.556m	R30.560m
B09	359	R74.916m	R67.345m	R12.486m
B10	301	R54.613m	R47.176m	R9.102m
B11	327	R158.216m	R98.420m	R32.962m
TOTAL	5,400	R1,334.175m	R1,161.558m	R256.428m

Source: Internal Flows and Capitalization risk model workbooks v10, Demand Employment Account and Link (2026).

No aggregate physical volume is reported because food baskets, work orders, care encounters, learner months, transactions, production orders, billable hours, utility connections, member cases, customer sales and specialist days are different things. Adding them would create a false unit. The composite volumes below are provisional commercial denominators only. Every operating enterprise must replace them with its own product or service schedule.

Sector	Planning sale unit	Planning price	Annual volume	Principal customer classes
B01	Food basket equivalent	R500	242,229	External; households; local firms
B02	Work order equivalent	R25,000	5,548	External; capital/institutional; local firms

Sector	Planning sale unit	Planning price	Annual volume	Principal customer classes
B03	Service encounter	R450	213,991	External; households; local firms
B04	Learner month equivalent	R1,800	57,740	External; local firms; households
B05	Transaction equivalent	R250	455,854	External; households; local firms
B06	Production order equivalent	R2,500	73,342	External; local firms; capital/institutional
B07	Billable hour equivalent	R650	256,663	External; local firms; households
B08	Connection month equivalent	R1,500	81,492	External; local firms; capital/institutional
B09	Member case month equivalent	R650	115,256	External; local firms; households
B10	Customer sale equivalent	R600	91,022	External; local firms; households
B11	Billable specialist day equivalent	R6,000	26,369	External; local firms; capital/institutional

Source: Internal Flows risk model workbook v10, Demand Controls and Demand Employment Account. Composite units are planning devices pending enterprise SKU and service schedules.

7.10 Scaling demand across the federation

A larger network may improve industry diversity, risk pooling and shared capacity, but it also multiplies the customer and liquidity requirement. Seventeen communities do not become sufficient merely because the labour account derives 102,000 productive people. At the current mix, the 91,800 local people require R22.681 billion of annual B01-B11 sales and R4.359 billion of working capital. The fifty-community reference requires R66.709 billion and R12.821 billion before state adjustments.

Count	Population	Local people	Annual sales required			Break even sales	Working capital
1	10,000	5,400	R1.334bn			R1.162bn	R0.256bn
17	170,000	91,800	R22.681bn			R19.746bn	R4.359bn
50	500,000	270,000	R66.709bn			R58.078bn	R12.821bn
Count	Derived people	Local	External	Contracts	FTE	Shock local	Accepted
1	6,000	5,400	600	6,165.74	5,558.02	3,985	0
17	102,000	91,800	10,200	104,817.62	94,486.34	67,740	0
50	300,000	270,000	30,000	308,287.13	277,901.00	199,235	0

Source: External Revenue Anchor risk model workbook v10, Labour Federation Summary and Federation Employment Demand. The combined shock remains a planning condition pending E18.

The year-twenty state weighted fifty-community path is smaller than the static 270,000-local person target because communities occupy different operating states. It carries about 188,035 planning local people, requires R46.458 billion of annual sales and R8.929 billion of working capital, and supports about 138,752 local people under the combined demand shock. Accepted people remain zero. State adjustment changes the size of the requirement; it does not convert it into evidence.

NO SCALE TRANSFER

A customer schedule accepted for the fifty-community reference cannot be divided by fifty and attributed to a seventeen-community candidate. E15 must verify demand, E16 operating forms and E17 the unique people and work quality account in each community. N10 must identify the seventeen communities, sectors, buyers, volumes, prices, collections, people, contracts, hours, FTE, payroll and working capital. The candidate's accepted value remains zero until that exact schedule is accepted.

7.11 The recruitment and capital release rule

The capitalisation model links every B01-B11 sector to its independently accepted person, FTE and demand ceiling. At the present evidence state, source gated local people are zero, source eligible productive capex is R0, and R481.488 million of productive capex is held. Required sales cycle working capital is also held. Baseline measurement, product design, customer discovery, maintenance, training

design and contract negotiation may proceed under separately approved budgets. A planning allocation may not be represented as funded employment and may not trigger full productive capex release.

Gate	Minimum evidence	Decision rule
Customer	Named buyer or statistically controlled household demand; product or service; unit; volume; price; term	Recognise only demand attributable to the same community, sector and period
Cash conversion	Order, invoice, receipt, collection rate and concentration	Use collected or contract adjusted revenue, not gross addressable demand
Employment and quality	Unique person ID, contracts, payroll, paid hours, FTE, wage, safety, stability, supervision and progression	Count each person once; count no more FTE than collected revenue can carry; publish work quality distributions
Working capital	Inventory, work in progress, receivable days, payable days, seasonality and stress buffer	Fund the sales cycle before accepting the supported employment level
Productive capex	Asset, capacity, supplier quote, draw milestone and demand supported utilisation	Release no productive capex above the accepted person, FTE and output ceiling
Independent acceptance	E14 reconciled account, E15 demand, E16 operating forms, E17 labour quality and N10 candidate schedule	Only independently accepted records may support an achieved employment claim

Source: *Autonomy Achievement Register risk model edition v10, criterion C6 and evidence items E14-E18, N05, N06, N10 and N11-N13.*

7.12 From external sales to usable cash

The export cash account changes the governing meaning of export cover. Gross revenue measures market scale. Local value captured measures how much value remains after direct imported inputs and export logistics. Neither amount is automatically available to pay the import floor. The funding test must continue through collections, local operating costs, cash tax, maintenance, replacement, internal debt service, disaster reserves and working capital. Only the residual recurring unrestricted cash may be compared with the recurring import obligation.

Recurring cash cover = recurring unrestricted export cash - unavoidable import floor.

Launch-year cash = recurring unrestricted export cash - export working capital stock

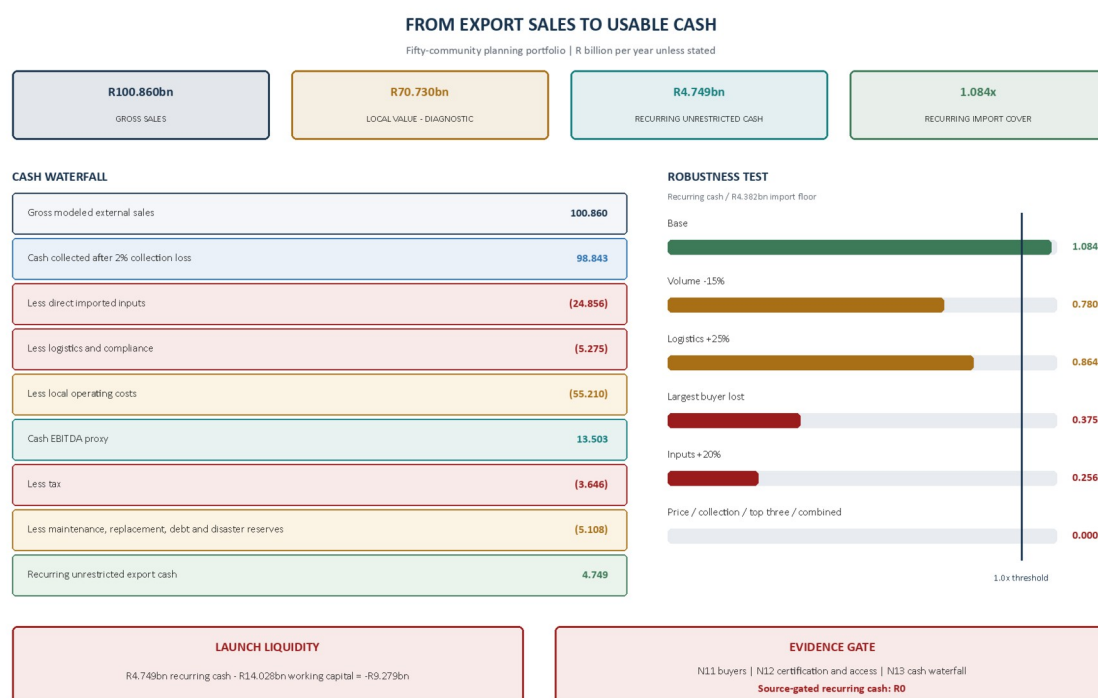


Figure 17. export cash waterfall and robustness boundary. The former 16.14x local value ratio is retained only as a diagnostic; recurring cash cover is 1.084x and launch-year liquidity is negative.

7.13 The modeled cash waterfall

The table follows the fifty-community anchor portfolio from invoiced sales to recurring cash. Amounts per community are simple portfolio averages and are not transferable to a seventeen-community candidate. A candidate specific schedule must use the actual anchor mix, buyers, contract terms, delivered costs and operating structure.

Cash stage	50-community portfolio	Average per community	Interpretation
Gross modeled external revenue	R100.860bn	R2.017bn	Invoiced sales scale; not cash
Collected revenue	R98.843bn	R1.977bn	After the modeled 2% collection loss
Direct imported inputs	(R24.856bn)	(R497.11m)	Outside production inputs
Logistics and compliance	(R5.275bn)	(R105.49m)	Freight, certification and market access costs
Local operating costs	(R55.210bn)	(R1.104bn)	Wages, local supply and operating overhead
Cash EBITDA proxy	R13.503bn	R270.06m	Cash before tax and lifecycle claims
Cash tax	(R3.646bn)	(R72.92m)	Tax outflow before any separately evidenced public expenditure
Maintenance reserve	(R0.768bn)	(R15.36m)	Funded upkeep of anchor assets
Asset replacement reserve	(R1.921bn)	(R38.41m)	Funded replacement over the modeled asset life
Internal debt service	(R1.431bn)	(R28.62m)	Debt service claim on operating cash
Disaster reserve	(R0.988bn)	(R19.77m)	Funded resilience provision
Recurring unrestricted export cash	R4.749bn	R94.98m	Cash available for the recurring import floor test
Unavoidable import floor	R4.382bn	R87.64m	Recurring outside requirement
Recurring cash cover	1.084x	1.084x	Passes the base threshold with a narrow margin
Export working capital stock	R14.028bn	R280.57m	Inventory and receivable funding required before steady collections
Launch-year cash after working capital	-R9.279bn	-R185.59m	Launch-year cover is -2.118x

Source: External Revenue Anchor export cash Workbook v7, Export Cash Waterfall (2026).

DIAGNOSTIC PRESERVED, FUNDING CLAIM WITHDRAWN

Local value captured remains R70.730 billion, or 16.14 times the import floor. That ratio describes economic retention after direct imported inputs and logistics. It is not cash, excludes material claims on the retained value and may not be used to fund imports, infrastructure or reserves. The governing recurring cover is 1.084x.

7.14 Buyers, certification and concentration

Every anchor has a customer control schedule with a planning unit, price and volume, together with fields for the named buyer, contract reference, contracted volume, contracted price, collection terms, largest buyer share, top-three share and certification status. The schedule does not manufacture evidence. Named buyers, executed contracts and certification references are presently absent, so source gated recurring cash is R0 even though the planning formulas produce R4.749 billion.

Control	What must be named	Why it changes the cash result
N11 Buyer and concentration evidence	Buyer, contract, product, unit, committed volume, price, payment term, largest buyer share and top-three share	Converts a portfolio allocation into contracted demand and exposes customer loss risk
N12 Certification, logistics and market access	Standard, certifying body, approval reference, route, capacity, freight cost, border or platform requirement and insurance	Tests whether modeled volume can legally and physically reach the buyer at the stated delivered cost
N13 Full cash waterfall and funded reserves	Collections, imported inputs, logistics, local costs, tax, maintenance, replacement, debt service, disaster reserve and working capital custody	Prevents local value, unfunded provisions or borrowed liquidity from being counted as unrestricted cash

Source: *Autonomy Achievement Register risk model edition v10, evidence controls N11-N13 and E18 (2026).*

7.15 Concentration and downside stress

The base case has little room for error. The import floor requires 4.344 per cent of gross anchor revenue to survive as unrestricted cash; the model produces 4.709 per cent. That is only 7.73 per cent cash shock tolerance. The stress table therefore asks whether the same portfolio still funds imports when a buyer, price, volume, collection or cost assumption moves against it.

Scenario	Modeled change	Recurring cash cover	Result
Base	No additional shock	1.084x	PASS
Volume -15%	Delivered export volume falls by 15%	0.780x	FAIL
Price -10%	Realised export price falls by 10%	0.000x	FAIL
Collection -10pp	Cash collection falls by ten percentage points	0.000x	FAIL
Inputs +20%	Imported input cost rises by 20%	0.256x	FAIL
Logistics +25%	Logistics and compliance cost rises by 25%	0.864x	FAIL
Largest buyer lost	The largest modeled buyer is removed	0.375x	FAIL
Top three buyers lost	The three largest modeled buyers are removed	0.000x	FAIL
Combined downside	Volume, price, collection and cost shocks coincide	0.000x	FAIL

Source: *External Revenue Anchor export cash Workbook v7, Export Cash Stress (2026).*

ROBUSTNESS CONCLUSION

Only the base case exceeds 1.0x. Every modeled downside fails, and the minimum stress cover is zero. The current anchor combination is therefore not robust enough to establish self-funding. The design response is not to restore the 16.14x diagnostic as funding. It is to improve margins, reduce working capital intensity, diversify buyers and anchor families, secure certification and logistics, fund reserves, and replay the complete candidate network.

8. Full employment and the skills production pipeline

8.1 Near full productive participation

The employment objective is a guarantee of access to paid, useful and progressive work for the locally derived productive population. It is not a claim that every resident holds a conventional full time wage job. The base planning account derives 6,000 productive people, assigns 5,400 to local production and records 600 in external or remote paid work. Across seventeen communities the corresponding figures are 102,000, 91,800 and 10,200. The achieved count is zero because no complete E15-E17 or N10 evidence has been independently accepted.

Full employment is dynamic. People enter and leave the productive population; customer demand rises and falls; industries grow, mature and decline; technology changes labour requirements; and care, health, disability accommodations and migration change participation. The guarantee must therefore operate through regular person level reconciliation, matching, demand development, paid learning and progression rather than through a once off job allocation.

The job guarantee literature supports a standing employment buffer with locally useful work and a stable wage floor, but design choices over eligible work, administration, inputs and displacement are decisive (Tcherneva, 2018). In South Africa, sam based analysis of a targeted social care programme demonstrates why the guarantee must be modelled as a distinct production activity rather than as an undifferentiated cash injection (Kim, 2011). The project therefore separates the right of access from the annual number of roles that have authorised demand, supervision, inputs and finance.

8.2 Work quality is part of the employment result

A person count is necessary but not sufficient. The model publishes planning distributions for wages, paid hours, safety, contract stability and progression. These distributions describe the intended operating envelope. They do not become outcomes until payroll, contracts, rosters, incident systems and progression records are independently accepted.

Dimension	Planning distribution	People	Evidence boundary
Wage	Below R7,500: 844.10; R7,500-R9,999: 1,705.65; R10,000-R14,999: 3,155.95; R15,000-R19,999: 294.30; R20,000+: 0	6,000	Observed payroll evidence required
Paid hours	Full time: 4,895.05 people at 40 hours; part time: 1,104.95 people at 24 hours	6,000	5,558.02 FTE and 6,165.74 contracts
Safety	High risk: 2,215; medium risk: 2,430; low risk: 1,355	6,000	Controls and incident records required
Stability	Indefinite full time: 3,426.54; fixed term full time: 1,468.52; long term part time: 773.47; seasonal or project part time: 331.49	6,000	Observed contract register required

Dimension	Planning distribution	People	Evidence boundary
Progression	Paid apprenticeship: 720; occupational progression: 4,200; leadership or enterprise: 480; transition and reskilling: 600	6,000	Named route and assessment required

E17 decent work GATE

E17 must reconcile each resident to one unique person record and then to every paid contract, hour, FTE fraction, wage, safety class, stability class and progression route. Results must also be reported by age, gender, disability, care responsibility and prior labour market status. No average may conceal a group that is excluded or concentrated in unsafe, unstable or very low paid work.

Source: Internal Flows risk model workbook v10, Work Quality Distribution. All values are planning distributions pending E17; employment continuity remains pending E18.

8.3 The skills pipeline is a production system

Pipeline stage	Operating rule	Evidence
Foundation	Literacy, numeracy, digital access, safety and work readiness tied to real production contexts	Assessment and individual capability plan
Paid rotation	Learners move through supervised enterprise, public service and maintenance roles	Hours, outputs, mentor sign off and wage record
Credential	Modular recognition mapped to NQF, OFO, SETA, TVET or professional routes	Externally legible credential or recognition of prior learning
Productive placement	A funded role below the accepted person, FTE and demand ceiling, with assets, decent work conditions and progression	Person ID, customer evidence, contract, wage, hours, FTE, safety, stability, output, collections and working capital
Upgrading	Workers and enterprises adopt higher productivity methods without abandoning displaced people	Reskilling plan, redeployment and productivity gain
Leadership and ownership	Experienced workers progress into supervision, enterprise formation and governance	Equity, membership, management or professional responsibility

Source: Employment Kernel labour account workbook v3 and Internal Flows risk model workbook v10, synthesised for policy use.

The employment guarantee cannot freeze the economy in its first form. Better tools and methods will reduce the labour required for some tasks. The response should be planned movement into new work, not permanent exclusion. The federation therefore needs a visible pipeline of new activities and a funded reskilling reserve. Full employment becomes a continuing capacity to absorb change, not a promise to preserve every job.

9. Financial institution and evolutionary capital formation

9.1 Institutional form comes first

The model cannot call every community owned finance vehicle a bank. A savings or lending fund, a co-operative financial institution, a registered co-operative bank and a bank registered under the Banks Act have different legal powers, liabilities, capital requirements, liquidity obligations and settlement arrangements. The institutional form therefore has to be selected before any financial result can be relied upon. A change of form is a change of model, not a change of label.

The current planning route is a closed member lending fund. Members provide paid in capital; the fund holds that cash in a custody account at an authorised bank and lends only cash already available. It does not accept public deposits, carry withdrawable deposit liabilities or create money when it lends. This conservative default is not a legal conclusion. The entity specific authority, credit perimeter, consumer protection duties, tax treatment and custody arrangements still require professional confirmation.

Institutional route	Monetary treatment	Authority and reliance condition
Closed member lending fund (selected)	Paid in member equity; cash funded lending; deposits and funding liabilities R0; custody account at an authorised bank	Planning default only. Requires entity specific legal opinion, governance, credit and consumer law confirmation.
Co-operative financial institution	Member funding is a liability; loans remain cash funded; withdrawals reduce available cash	Requires the applicable Prudential Authority registration and supervision route. Not treated as codi covered in the current model.
Registered co-operative bank	A loan may create a matching deposit; withdrawals and external payments reduce deposits and settlement cash	Registration under the Co-operative Banks Act. Current PA route includes prior CFI status, at least 200 members and at least R5m in deposits; CODI treatment applies.
Banks Act bank	A loan creates a matching deposit; full capital, liquidity, deposit, impairment and settlement ledgers apply	Prudential Authority authorisation and registration. Current guidance includes a R250m minimum capital requirement for a commercial bank.

Sources: South African Reserve Bank Prudential Authority; Co-operative Banks Act 40 of 2007; Banks Act 94 of 1990; and Corporation for Deposit Insurance guidance, accessed August 2026.

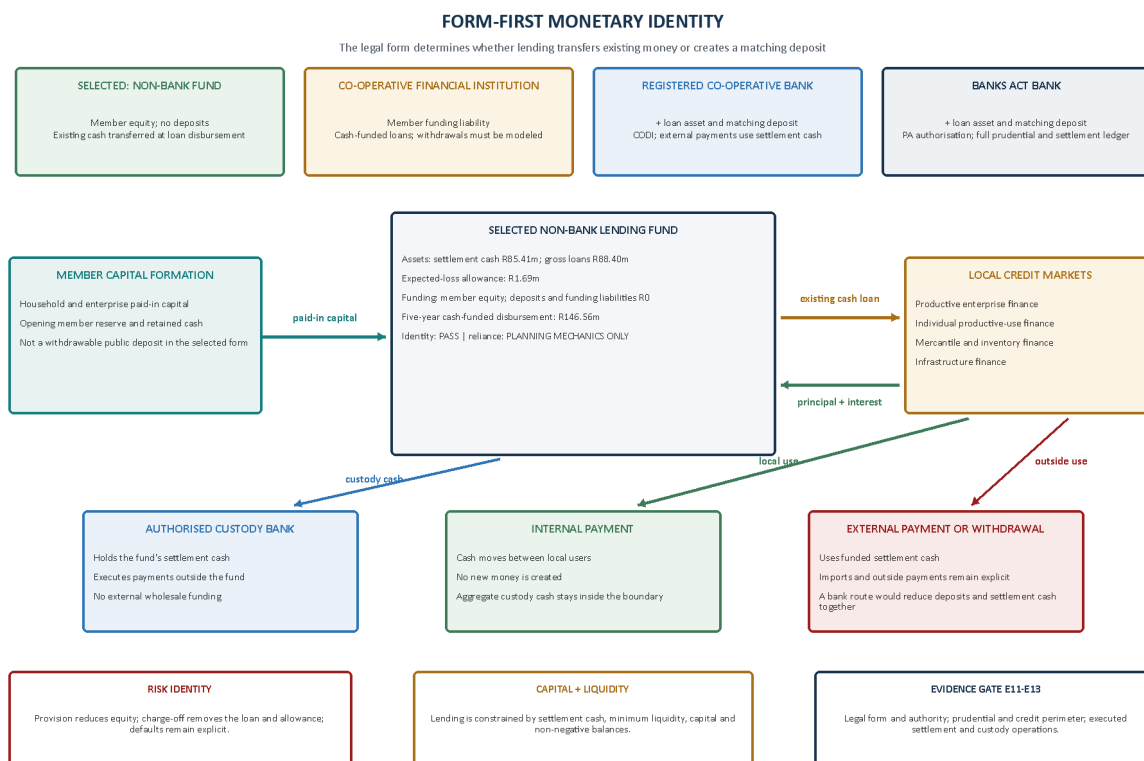


Figure 5. form first monetary identity. The selected non-bank fund transfers existing money; a deposit taking bank requires a different balance sheet and settlement ledger.

9.2 Monetary identity and credit markets

For the selected non-bank fund, closing custody cash equals opening cash plus paid in member capital, principal collections and cash income, less loan disbursements, operating costs and other cash outflows. Closing gross loans equal opening gross loans plus new disbursements, less principal collections and charge offs. The expected loss allowance rises when a provision is recognised and falls when a provided loan is charged off. A provision reduces equity before the cash loss is finally known; a charge off removes both the gross loan and its allowance without creating a second loss.

$$C_t = C_{t-1} + M_t + P_t + I_t - L_t - O_t - W_t - X_t$$

$$G_t = G_{t-1} + L_t - P_t - D_t \quad \text{and} \quad A_t = A_{t-1} + V_t - D_t$$

Here C is custody or settlement cash, M paid in member capital, P principal collected, I cash income, L loan disbursement, O operating cost, W any permitted withdrawal and X other external cash outflow. G is the gross loan book, D charge offs, A the expected loss allowance and V the new provision. The event ledger records both sides of every movement and rejects a result if the balance sheet, funding liability or settlement cash identities do not close.

A deposit taking bank follows a different identity. Loan origination increases the loan asset and creates a matching deposit liability. A payment between customers of the same institution changes ownership but not aggregate deposits or settlement cash. A withdrawal or payment to another institution extinguishes the relevant deposit and consumes funded settlement liquidity. The South African settlement system is therefore not an invisible backstop: outside payments require cash or eligible liquidity through authorised payment and settlement arrangements.

Year-five selected fund result	Current value	Interpretation
Custody / settlement cash	R101.69m	Funded cash remaining after member inflows, lending, collections and costs
Gross loan book	R83.74m	Loans outstanding before the R1.74m expected loss allowance
Five-year cash funded disbursement	R155.26m	Existing money transferred; cumulative loan created deposits are R0
External credit payment settlement	R0 in the selected replay	Not permission to ignore imports; outside use must consume cash when entered
Non-bank capital ratio	219.36%	Planning solvency metric, not a statutory banking capital ratio
Non-bank liquidity ratio	78.61%	Cash share under the selected fund method, not proof of regulatory compliance
Credit transmission	R127.77m output; about 246 jobs; R57.80m capex	Modeled enabling effect, not observed performance
Identity and result reliance	IDENTITY PASS; PLANNING MECHANICS ONLY	Results remain conditional on evidence E11-E13
Credit market	Year-five closing book	Eligible use and core control
Primary enterprise finance	R44.20m	Equipment, premises, working capital and capability; demand, cash flow, asset and loss tests
Individual productive finance	R11.15m	Tools, mobility, home enterprise and credentials; affordability and productive use controls
Mercantile finance	R8.83m	Inventory, receivables and distribution; turnover, margin, buyer and stock controls
Infrastructure finance	R19.57m	Energy, water, housing, logistics and shared assets; lifecycle cash flow, maintenance and authority
FINANCIAL RELIANCE RULE No credit result may be treated as institutionally feasible until E11 identifies the selected legal form and authority, E12 establishes its deposit taking, prudential, CODI, credit and consumer law perimeter, and E13 proves the executed custody, clearing, settlement, withdrawal and stressed liquidity arrangements.		

Source: monetary identity and supply and use revisions to the Internal Flows Model and Autonomy Achievement Register (2026).

9.3 Evolutionary capital model

The capital workbook supports the selected closed member lending fund as its calculated route. If a co-operative financial institution, registered co-operative bank or Banks Act bank is selected, the workbook

marks the finance result RECALCULATION REQUIRED and does not silently reuse the non-bank credit result. A licensed bank route would need deposits, withdrawals, deposit interest, CODI where applicable, prudential capital, liquidity, impairments and settlement balances to be recalculated through the capital path.

The relevant development finance lesson is institutional discipline rather than scale imitation. Patient finance can build markets and productive capability, but it requires a defined mission, additionality, technical appraisal, portfolio limits, loss recognition, learning and independent governance (Mazzucato and Penna, 2016; Griffith-Jones and Ocampo, 2018). The internal funding constraint makes these controls more important: losses fall on the same community whose savings and productive assets capitalise the fund.

The autonomy capital requirement before the risk reserve is R3.871 billion per community. The seventeen-community severe target adds R112.324 million per community, bringing the risk adjusted requirement to R3.984 billion. The capital schedule reports R1.282 billion of modeled federation finance after this allocation. This does not mean the reserve is funded. Verified candidate reserve stock and contingent liquidity remain R0, so the federation wide E18 funding gap remains R1.9095 billion.

Capital availability and commercial eligibility are separate gates. The financing path may show a source of cash while the labour and demand accounts still show no accepted production. The current gate therefore holds R481.488 million of productive capex and all demand linked working capital. Only R0 is source eligible. Release rises only within the jointly accepted E15 demand, E16 operating form, E17 unique person and work quality, and E18 continuity ceilings.

The federation facility is also modeled as a member owned revolving fund, not a deposit taking bank. It carries no deposits and no external wholesale funding. Self-funding is achieved only if recurring unrestricted export cash, net resource loop savings, repayments and separately recognised public expenditure arrive early enough to finance the capital queue while preserving liquidity and absorbing defaults. Once local value captured is replaced by the export cash waterfall, the current fifty-community selected scenario replay reaches year thirty-five with a R522.104 billion capital backlog. It records seven liquidity failures and has no material excess reserve. Candidate sizes from seventeen through forty-nine have not yet been replayed. The model therefore does not establish that the federation is self-funding at the current coefficients.

10. Fiscal collection, public expenditure and local value

Tax is a structural extraction from local private flows and an essential source of collective capacity, but tax generated in a place is not automatically retained by or returned to that place. National taxes enter the National Revenue Fund. Under section 213 of the Constitution, withdrawals require an Act of Parliament

or a direct constitutional charge; section 214 and the annual Division of Revenue process govern the equitable division of nationally raised revenue. Provincial and national votes, municipal own revenue and municipal budgets follow their own constitutional and statutory routes. Their jurisdictions and financial years may differ. The model therefore separates gross tax generated, a policy routing comparator, legally routed budget, actual local expenditure and accepted local public value.

This separation also reflects South African municipal conditions. property rating power contributes to municipal fiscal autonomy, but it remains legally bounded and does not erase dependence on service charges and intergovernmental transfers (Fuo, 2023). Evidence on city finances shows that sustainable revenue, capital investment, operations, maintenance and governance interact; a nominal allocation cannot compensate for weak collection or failed delivery (South African Cities Network, 2022). The community compact must therefore be written into lawful budgets, contracts and asset responsibilities rather than represented as an automatic tax return coefficient.

The broader autonomy ledger records R175.65 million of gross tax generated per community and year, including the external revenue architecture. A thirty-five per cent routing assumption produces a R61.48 million policy comparator. The internal B01-B11 labour account separately records R148.588 million of tax extraction at year five. Neither amount is an appropriation, transfer, receivable or forecast. Because no executed route, budget, expenditure and accepted boundary outcome have been supplied, routed fiscal expenditure, recognised local expenditure and accepted public value are all R0.

FISCAL RECOGNITION RULE

Gross tax is an outflow. A local fiscal inflow exists only when a lawful authority appropriates or budgets it, the responsible institution spends it inside the boundary, and the specified service or asset is delivered and accepted. A compact may coordinate these instruments, but an agreement cannot itself appropriate public money.

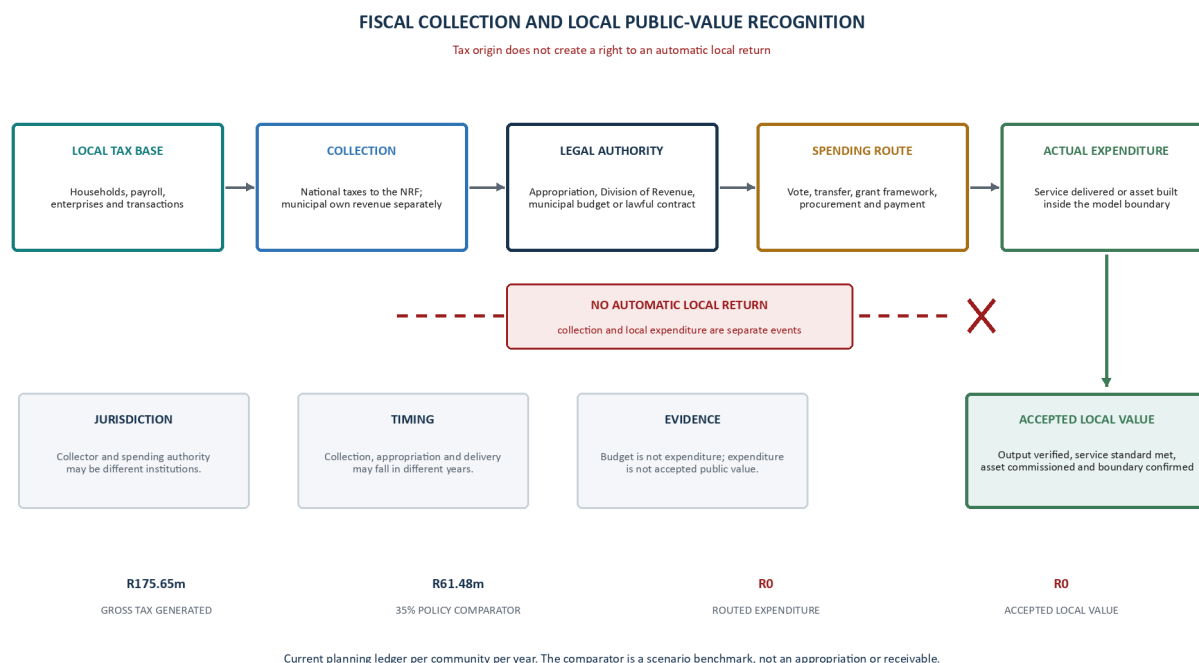


Figure 6. Fiscal collection and local public value recognition. The red break is deliberate: tax origin does not create an automatic local return flow.

The former twelve per cent government overhead and fifty-four per cent infrastructure assumptions remain available only as downstream policy parameters. Twelve per cent is a ceiling on overhead attributed to recognised local expenditure, not a deduction from gross tax that creates a net return. Fifty-four per cent is a proposed use allocation within accepted public value, not a claim on collected revenue. With recognised expenditure at zero, neither parameter produces a local inflow.

Possible South African route	Authority and model treatment
Municipal own revenue	Property rates, service charges and other lawful municipal revenue enter the municipal financial system and may be spent only through a council approved budget and applicable MFMA controls. Origin alone does not reserve a share for the model boundary.
Local equitable share	The annual division of nationally raised revenue provides an unconditional municipal transfer under the constitutional and intergovernmental framework. It enters the model only when the municipal budget and expenditure identify delivery inside the boundary.
Conditional grant	The annual Division of Revenue instrument and grant framework specify purpose, allocation, conditions, timing and reporting. The model recognises value only after eligible local expenditure and delivery are evidenced.
National or provincial voted programme	Parliament or a provincial legislature appropriates a departmental vote under the applicable public finance framework. Local value is attributed when expenditure and the resulting service or asset can be traced to the boundary.
Lawful public contract or service agreement	A competent public institution may procure a defined output under its approved budget and procurement authority. Contract value counts only as delivery occurs; the agreement itself does not create an appropriation.

Source: Constitution of the Republic of South Africa, Chapter 13; Intergovernmental Fiscal Relations Act 97 of 1997; PFMA 1 of 1999; MFMA 56 of 2003; and the 2026 Division of Revenue Bill.

Fiscal principle	Required institutional expression
Separate ledgers	Publish gross tax generated, comparator share, lawful route, approved budget, expenditure, overhead, service output and accepted value as distinct fields.
Jurisdiction	Identify the collecting authority, appropriating legislature or council, spending institution and asset or service owner.
Timing	Record collection, appropriation, transfer, commitment, payment, delivery and acceptance periods separately.
Maintenance first	Protect condition based maintenance and replacement before commissioning new prestige assets.
Equalisation	Protect minimum essential services through lawful intergovernmental and federation rules without inventing a tax retention entitlement.
Anti-capture	Separate procurement, verification, payment and asset custody; publish related party interests and unit costs.

Source: fiscal separation design implemented in the linked workbooks. Values remain modeled until independently accepted evidence is entered.

11. Four-state evolution, decline and disaster

11.1 State entry is an ordered decision

The four states are not labels applied after the fact. At each reporting date, the model evaluates the decline rule first, then self-financing, then evolution, and finally catalysis. This order matters. A community with strong employment cannot be called self-financing while an acute shock is active, essential physical coverage has failed or reserve liquidity is inadequate. The state is assigned from the same accepted operating, labour, physical, asset, liquidity and anchor cash records used elsewhere in the model.

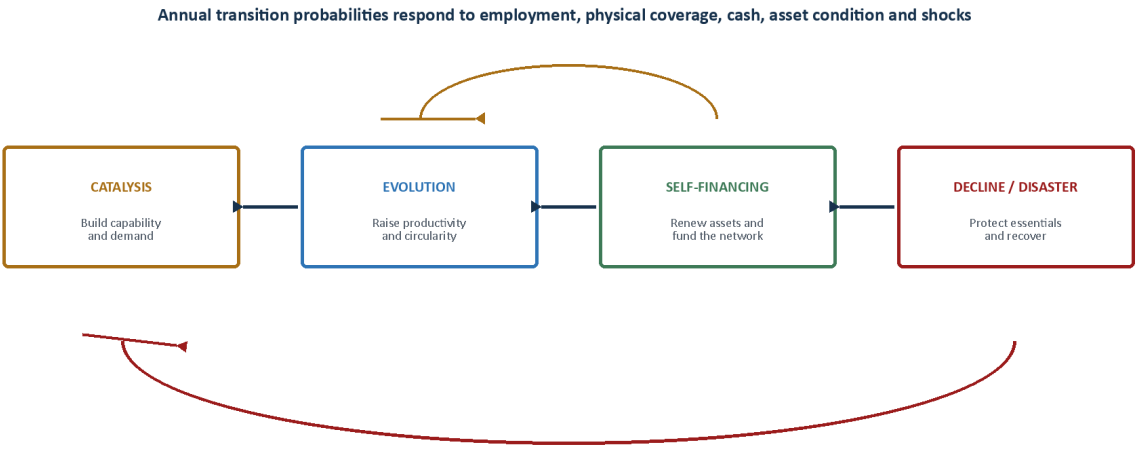


Figure 7. Four-state economic evolution. A community can advance, regress or enter recovery, while the federation finances the changing distribution.

Priority and state	Entry condition	Evidence needed to leave or confirm the state
1. Decline/disaster	Enter when an acute shock is active, or when employment is below 45%, essential physical coverage is below 50%, asset condition is below 50%, liquidity cover is below 0.50x, or anchor cash is below 50% of plan.	Essential services stabilised, acute event closed, asset and liquidity recovery plan funded, and two reporting periods above the decline thresholds.
2. Self-financing	Enter only when employment is at least 90%, own funding coverage is at least 1.00x, the post-loop and renewal balance is non-negative, physical coverage is at least 85%, asset condition is at least 80%, liquidity cover is at least 1.00x, and anchor cash is at least 85% of plan.	Two accepted reporting periods satisfying every threshold, with no active acute shock flag and a funded recovery reserve.
3. Evolution	Enter when no decline trigger is active and employment is at least 70%, own funding coverage is at least 0.60x, physical coverage is at least 70%, asset condition is at least 65%, and liquidity cover is at least 0.75x.	Accepted operating, labour, physical, asset, liquidity and anchor records for two consecutive reporting periods.
4. Catalysis	Enter when no decline trigger is active but one or more evolution thresholds are not yet met. This is the default build state, not a residual success category.	Accepted evidence that every evolution threshold has been met for two consecutive reporting periods.

CURRENT CLASSIFICATION

The one-community planning profile is **Catalysis** under these ordered rules. The fifty-community state dashboard is in **Decline/disaster** because the recovery reserve has zero verified cover and the capital system still has liquidity failures. Neither classification is an observed result. The evidence reliant state remains **EVIDENCE REQUIRED** until E18 is accepted.

11.2 The complete conditional transition system

A transition matrix states the probability that a community in one state will occupy each possible state in the next annual period. The model uses one baseline matrix and one matrix for each of four shared events. Every row sums to 100 per cent. The matrices are planning assumptions, not estimates from South African community histories.

Condition	Current state	Catalysis	Evolution	Self-financing	Decline/disaster
Base	Catalysis	45%	40%	5%	10%
Base	Evolution	10%	50%	30%	10%
Base	Self-financing	3%	12%	78%	7%
Base	Decline/disaster	40%	20%	2%	38%
Drought	Catalysis	55%	20%	2%	23%
Drought	Evolution	18%	38%	15%	29%
Drought	Self-financing	8%	22%	50%	20%
Drought	Decline/disaster	30%	14%	1%	55%
Commodity collapse	Catalysis	50%	24%	3%	23%
Commodity collapse	Evolution	15%	40%	16%	29%

Condition	Current state	Catalysis	Evolution	Self-financing	Decline/disaster
Commodity collapse	Self-financing	6%	22%	55%	17%
Commodity collapse	Decline/disaster	30%	15%	2%	53%
Infrastructure failure	Catalysis	52%	22%	2%	24%
Infrastructure failure	Evolution	16%	37%	14%	33%
Infrastructure failure	Self-financing	8%	18%	48%	26%
Infrastructure failure	Decline/disaster	28%	13%	1%	58%
Anchor market loss	Catalysis	50%	23%	2%	25%
Anchor market loss	Evolution	17%	34%	12%	37%
Anchor market loss	Self-financing	9%	22%	43%	26%
Anchor market loss	Decline/disaster	31%	14%	1%	54%

For a first order annual transition process, the expected uninterrupted duration in state i is the inverse of one minus the probability of remaining in that state.

$$\text{Expected duration}_i = \frac{1}{(1 - P_{ii})}$$

Condition	Catalysis	Evolution	Self-financing	Decline/disaster
Base	1.82 years	2.00 years	4.55 years	1.61 years
Drought	2.22 years	1.61 years	2.00 years	2.22 years
Commodity collapse	2.00 years	1.67 years	2.22 years	2.13 years
Infrastructure failure	2.08 years	1.59 years	1.92 years	2.38 years
Anchor market loss	2.00 years	1.52 years	1.75 years	2.17 years

The duration calculation is descriptive. It shows what each matrix implies if its probabilities remain constant. It does not predict how long a particular community will remain in a state, and it must not be confused with the separately costed recovery horizon for a particular event.

11.3 Correlated shocks and recovery finance

The federation cannot assume that shocks arrive one community at a time. Drought can cross municipal boundaries. Commodity and customer losses can strike communities that sell into the same market. Shared power, water, logistics or digital infrastructure can fail across a region. The model therefore estimates a tail planning count of affected communities after an event has occurred.

$$\text{Var}(K_e \mid \text{event}) = N q_e (1 - q_e) [1 + (N - 1) \rho_e]$$

$$K_{e,95} = \min\left(N, \left\lceil N q_e + 1.645 \sqrt{\text{Var}(K_e | \text{event})} \right\rceil \right)$$

N is the number of communities, q is the conditional exposure share and ρ is the assumed pairwise community correlation. The 1.645 multiplier is a normal approximation planning input. It is not an actuarial confidence claim, and the equal correlation structure is only a first representation of dependence.

Event	Annual probability	Conditional exposure	Pairwise rho	Output loss	Recovery horizon	Cash recovery per affected community
Drought	15%	30%	0.25	25%	2.0 years	R96.000m
Commodity collapse	12%	25%	0.35	30%	2.0 years	R75.000m
Infrastructure failure	10%	20%	0.20	35%	1.5 years	R177.500m
Anchor market loss	8%	20%	0.45	45%	2.5 years	R83.000m

Cash recovery per affected community equals repair or replacement capital plus emergency operating expenditure over the recovery horizon plus working capital. It is a cash need, not an estimate of total social or welfare loss.

Event	Affected at 17	17-community cash	Affected at 50	50-community cash	Expected annual 50-community burden
Drought	13	R1.248bn	35	R3.360bn	R504.000m
Commodity collapse	12	R900.000m	34	R2.550bn	R306.000m
Infrastructure failure	9	R1.597bn	26	R4.615bn	R461.500m
Anchor market loss	12	R996.000m	33	R2.739bn	R219.120m

The reserve rule is deliberately transparent. It takes the largest modeled event claim and adds 25 per cent of the second largest claim to represent a simple compound event overlay.

$$\text{Severe reserve target} = \text{largest event cash} + 0.25 \times \text{second largest event cash}$$

N	Expected annual burden	Largest event	Second event	Overlay	Severe reserve target	Target per community
17	R534.630m	R1.597bn	R1.248bn	25%	R1.909bn	R112.324m
50	R1.491bn	R4.615bn	R3.360bn	25%	R5.455bn	R109.100m

RISK FINDING

The seventeen-community target is R1.9095 billion, equal to about R112.324 million per community. The fifty-community target is R5.455 billion, equal to R109.100 million per community. A larger federation modestly lowers the allocation per community under these assumptions, but the total reserve rises because more communities can be affected together. Verified reserve stock and verified contingent liquidity are R0 at both scales. The current model therefore establishes neither adequate risk pooling nor a self-funded recovery system.

Source: *risk_model_config_v1.json* and linked risk model v10 workbooks. All probabilities, correlations, durations and costs are planning inputs pending E18.

11.4 Avoiding structural stagnation

A circular system becomes fragile if circularity is used to preserve every local producer regardless of productivity, quality or ecological performance. Enterprises may need to merge, close or change technology. Workers need paid transition rights. Useful assets should be reassigned. The industry portfolio must respond to changing demand, resource constraints and observed failure patterns.

Decline is not a moral judgement. It is a measurable operating state with a funded recovery protocol. Recovery work remains productive work when it has a budget, a defined output, safe conditions and a progression path. The federation protects people and essential capacity while allowing obsolete arrangements to end. This distinction follows the ecological meaning of resilience as persistence and reorganisation under disturbance, not the preservation of an unchanged equilibrium (Holling, 1973).

12. Federation governance and mutual autonomy

12.1 Subsidiarity with enforceable common rules

Governance should operate at more than one level. Each community keeps authority over work that depends on local knowledge and accountability. The federation takes responsibility for functions that gain from scale, including shared finance, specialist capacity, risk pooling and common standards. This follows Ostrom's account of nested centres of authority with mutual monitoring (Ostrom, 2010). Local discretion is therefore paired with binding rules for accounting, banking, labour, environmental performance and evidence.

Community responsibility	Federation responsibility
Resident and capability register	Common data definitions, privacy and audit standard
Everyday production and essential services	Industry diversification, market access and shared specialist capacity
Selected community financial institution, member capital and permitted local credit	Member owned non-bank revolving facility, risk pooling, loss rules and recovery finance
Local fiscal ledger and asset register	Lawful intergovernmental routes, equalisation, benchmark costs and independent verification
Skills matching and apprenticeships	Portable credentials, specialist academies and cross-community mobility
Material recovery and maintenance	Shared processing hubs, reverse logistics and industrial symbiosis
Local anchor supplier development	Portfolio diversification, export standards and customer concentration control

Source: *proposed allocation of authority, informed by polycentric governance principles.*

12.2 Ownership and accountability

The model can accommodate municipal, cooperative, community trust, private, public benefit and mixed ownership, but ownership must be matched to risk, control and residual value. Essential infrastructure may require public or trust custody; competitive enterprises require commercial discipline; the selected financial institution requires form specific legal, capital, liquidity, credit, settlement and consumer protection governance; and member institutions require democratic accountability. No form is presumed virtuous without performance and anti-capture controls.

Cooperative governance has predictable stresses. Member heterogeneity, capital constraints, weak monitoring and horizon or control problems can intensify as an enterprise matures (Cook, 1995). Cooperatives may show resilience in crisis, but that evidence is conditional on member centred structures and cannot be converted into a blanket solvency assumption (Birchall and Ketilson, 2009). Evidence from Mondragon's multinational cooperatives also shows that growth can separate formal cooperative identity from participation in practice (Bretos, Errasti and Marcuello, 2018). The blueprint therefore requires periodic tests of member coverage, voting participation, capital rights, management accountability, subsidiary status and the distribution of benefits and losses.

Every material decision should identify the accountable owner, evidence custodian, independent verifier and affected members. The owner and verifier may not be the same person. related party transactions, procurement results, loan concentrations, service outcomes and asset condition must be published at a level that protects personal data while enabling collective oversight.

13. Implementation pathway

13.1 Stage gated mobilisation

Implementation should begin with one selected South African community and a charter capable of coordinating the seventeen-community architecture while admitting additional communities if the viability rule requires them. The initial programme should define the boundary, establish lawful authority, replace planning assumptions with operating evidence and put the minimum institutional machinery in place before major capital is released.

Phase	Indicative horizon	Principal work	Gate to advance
0. Authority and baseline	0-6 months	Select sites; establish mandates; register residents, productive status, existing work, assets, demand, current supply, imports, institutions and risk exposures; start the controlled transaction, labour and state history accounts	Independent acceptance of authority and the physical baseline; approval of E14-E18, N10 and N11-N13 collection protocols

Source: proposed implementation synthesis of the 90-day mobilisation, fifteen-year capital path and four-state model.

13.2 The first ninety days

The first ninety days should produce a controlled evidence base rather than visible but ungrounded projects. Required outputs include signed community and public authority, a named evidence custodian, an independent verifier, a controlled repository, a resident and capability baseline, measured requirements for seven physical resource classes, current local supply, feasible ceilings, unavoidable imports and a preliminary industry and anchor map. The programme must approve E14 for supply and use, E15 for demand, E16 for operating forms, E17 for the labour and work quality account, N10 for the exact candidate, and N11-N13 for buyers and export cash. Together these controls require unique resident and person identifiers, cohort status, participation constraints, accommodations, existing employment, contracts, wage and payroll feeds, paid hours, FTE conversion, safety, stability, progression, sector and counterparty codes, product schedules, invoices, collections, working capital, assets, inventories, imports, exports and native resource units.

The same period must establish the E18 risk protocol. Each community needs a dated state panel, a common event taxonomy, geographic exposure records, asset and service failure histories, recovery work orders, emergency operating costs, working capital draws and reserve custody records. Ninety days can establish the definitions and baseline. It cannot create a credible transition history. The planning matrices must remain provisional until repeated observations and actual events provide enough evidence to estimate them.

Only after this gate should the programme authorise closure design, productive capital formation and major offtake work. Baseline measurement, maintenance, enumeration, environmental restoration and skills assessment may create paid preparatory roles when they have an approved budget, output, decent work conditions, supervision and progression. They may not be counted as continuing productive employment after their funded work ends. Recruitment and productive capex release must remain below the jointly accepted person, FTE and demand ceiling.

13.3 Federation sequence

A staged implementation of the seventeen-community structural lower bound should not capitalise every community simultaneously at identical intensity. Sequencing creates learning, preserves liquidity and allows stronger communities to support later entrants. The coordinating institution must nevertheless exist from the beginning so that industry selection, financial form, risk, settlement and common standards are governed before local path dependence hardens. The reserve must be sized and held for the exact federation; a fifty-community facility cannot be divided by fifty and attributed to seventeen. This sequence builds the model deliberately while preserving the ability to increase the network size if the viability rule requires it.

14. Empirical validation, limitations and conditions for revision

14.1 Six objective criteria

Criterion	Modeled result	Evidence required for achievement
C1. circular economy dimensions remain separate	Composite score NOT USED; monetary and physical identities PASS; achievement NOT ESTABLISHED	E14-verified monetary account plus value added, provision, service and native unit physical evidence, each accepted against its own boundary
C2. No involuntary dependence above import floor	Closing modeled dependence R0	Observed imports at or below independently accepted unavoidable floor, with E18 continuity under the four event conditions
C3. No permanent external financing	External finance R0, but R522.104bn terminal backlog, seven liquidity failures and a R1.9095bn candidate reserve gap remain	E14-verified accounts, zero terminal backlog, E16-accepted operating forms, and an E18-verified severe reserve funded entirely inside the exact federation
C4. Exports fund unavoidable imports	1.084x modeled recurring cash cover; -2.118x launch-year cover; 0.000x source gated cover; event conditioned recovery claims remain planning inputs	N05-N06 realised offtake and collections; N11-N13 buyer, market and cash evidence; E18 recovery cost and reserve evidence
C5. Fiscal expenditure produces essential public value	R0 recognised expenditure and R0 accepted public value; R61.48m policy comparator gap; R0 E16-recognised support	Lawful route, approved budget, expenditure ledger, service and asset results, E16 support reconciliation and E18 continuity planning
C6. Productive employment is derived, decent and demand backed	6,000 planning people; 5,400 local and 600 external or remote; 0 E15-E18 accepted people; R0 source eligible productive capex	E14-E17 employment and operating evidence, N10 candidate schedule, N11-N13 export cash and E18 employment continuity capacity

Source: *Autonomy Achievement Register risk model edition v10 (2026)*. Three of six model criteria pass; none is presently verified as an achieved outcome.

14.2 Validation programme

The current achievement register contains thirty-nine evidence items. The new E18 control covers observed state transitions, correlated shocks, recovery costs, duration and reserve custody. The other controls cover site baselines, technical ceilings, imports, capital, authority, trade, buyers, market access, financial institutions, fiscal delivery, supply and use, demand backed employment, operating forms, labour quality and commissioning. At the date of publication, zero items are independently verified. The correct status is NOT YET ACHIEVED.

E14 remains the common economic account control. For every reporting period, it requires B01-B11 production and sales, supplier invoices by buying sector, payroll and operating surplus, household and public expenditure, fixed asset formation, inventories, imports, exports, waste, recovery and all seven

native unit resource balances. The product account, every industry account and every physical resource account must reconcile to the documented community boundary. E14 is required by all six achievement criteria because no autonomy or employment claim is credible if the economic interactions are not observed.

E15 adds the missing community demand to employment proof. It requires enterprise product or service schedules, units, prices, named customers or statistically controlled household demand, order or usage volume, terms, collections, payroll rosters, paid hours, FTE conversion, loaded wages and working capital cycles. N10 applies the same rule to the exact seventeen-community candidate and prohibits evidence transfer from the fifty-community reference. N05 and N06 separately verify external offtake and realised collections. N11 verifies named buyers, contracted volumes and prices, and concentration. N12 verifies certification, logistics and market access. N13 verifies the complete cash waterfall, working capital custody and funded reserves. Together these controls connect a job claim to a buyer, an operating cycle and cash that is genuinely available.

E16 adds the operating form proof. For each B01-B11 sector it requires an approved classification and the executed customer contract, tariff, appropriation, member mandate or service agreement that carries the activity. Any public value contract must disclose gross cash and delivery cost. Any cross-subsidy must identify the donor and recipient and reconcile to a zero portfolio residual. Any capital support must identify its authority, source and custody. The same cash may not be counted as customer revenue, subsidy and capital support. Until this evidence is independently accepted, recognised support remains R0.

E17 adds the labour account proof. It begins with a resident register and derives the productive population by age, education, care, health or disability availability, reasonable accommodation, other participation constraints and migration. It then reconciles each unique person to existing employment status, every paid contract, paid hours, FTE, wage, safety class, stability class and progression route. Submitted records remain separate from independently accepted records. The community may not claim full employment from a role architecture, a contract count or an average FTE alone.

E18 adds the risk and recovery proof. It requires a dated community state panel; observed state to state counts with denominators and duration histories; a geocoded register of drought, commodity, infrastructure and anchor market events; transparent estimation of shared exposure and dependence; invoices, bills of quantities, emergency operating costs, working capital needs and actual recovery periods; and bank, custody, mandate and facility evidence that the severe reserve comes only from the defined federation. E18 controls criteria C2 through C6. A planning matrix or an annual reserve expense cannot substitute for a funded reserve stock.

The empirical programme should compare at least five community archetypes: township, rural service town, mining adjacent town, peri urban settlement and agricultural district. Each site requires a social accounting matrix or equivalent local transaction account, material flow analysis, asset condition assessment, household demand survey, enterprise census, skills map, import schedule and institutional analysis. Coefficients should be reported as distributions and stress ranges, not single deterministic values.

14.3 Conditions requiring revision or withdrawal

The model must be revised or withdrawn if...	Required response
The seventeen-community candidate fails any complete facility, liquidity, internal capital, loan service or stress gate.	Reject seventeen as a viable candidate while retaining it only as the current structural counting lower bound; assess larger federation sizes or revise the design.
The seventeen-community federation cannot fund the R1.9095bn severe reserve from its own members, or the reserve is needed elsewhere at the same time.	Reject the claim of self-funded recovery at seventeen; change the portfolio, build the reserve before expansion, introduce stronger internal risk transfer or assess a larger federation.
Observed transition rates, shared shock counts, recovery periods or cash costs fall outside the published planning ranges.	Replace the matrices and cost assumptions, recalculate the reserve at every candidate size, and repeat the full facility and employment continuity tests.
No candidate from seventeen through fifty passes the complete viability rule.	Report the minimum as outside the assessed range or unestablished; do not promote the fifty-community reference by default.
Recurring unrestricted export cash cannot cover unavoidable imports after actual collections, full operating costs, tax, working capital, lifecycle provision, debt service, reserves and customer concentration stress.	Change the anchor portfolio, improve margins and cash conversion, diversify buyers, reduce working capital intensity or revise the autonomy objective.
Observed E14 accounts materially differ from the planned B01-B11 input structure, capital formation or external sales residual.	Replace the coefficients, rebalance the sector portfolio and rerun every community and federation identity before committing capital.
Accepted customer demand, collections and working capital support materially fewer than 5,400 local people or 4,958.02 local FTE per community, or fewer than 91,800 local people across the candidate.	Reduce or resequence recruitment and capex, change the product and customer portfolio, or reject the full employment claim at that scale.
An essential sector cannot clear the selected commercial screen and no executed public value contract, balanced cross-subsidy or capital support instrument closes the residual requirement.	Improve prices, demand, productivity, cost or asset intensity; execute and evidence a lawful support route; resize the activity; or remove it from the viable portfolio.
The derived productive population materially changes when actual age, education, care, health, disability accommodations, participation, migration or existing employment data replace the planning cohort.	Rebase the productive population, sector allocation, demand envelope, payroll, capital path and federation totals from site data.

The model must be revised or withdrawn if...	Required response
Unique person reconciliation fails, or contracts and FTE are used to inflate the employment count.	Stop the achievement claim, deduplicate person records, rebuild contracts and hours, and rerun E15-E17 before releasing further productive capital.
Observed wage, safety, stability or progression distributions fall below the accepted decent work rule.	Improve work design and funding, remediate affected groups, resize the portfolio or reject near full employment as achieved.
Shared capacity benefits at 12,000-20,000 residents do not materialise in operating evidence.	Treat scale as neutral and retain 10,000 only as an administrative kernel.
Local procurement raises costs or lowers quality without producing durable capability.	Tighten supplier graduation, competition and value for money controls.
The selected financial institution concentrates losses, runs short of settlement cash, excludes vulnerable members or creates unaffordable household debt.	Recognise losses, preserve liquidity, reprice, limit or stop affected products, and strengthen form specific prudential and consumer protections.
Circular interventions merely shift waste, energy use or costs elsewhere.	Use physical lifecycle measures and discontinue interventions with negative net impact.
Governance capture prevents transparent allocation, verification or member remedy.	Suspend capital flows and reset authority before scaling.

Source: author defined model validity framework. A model used for policy must state the evidence that would require revision or withdrawal.

14.4 Implementation design and institutional learning

Initial implementation should do more than demonstrate activity. Before major capital is released, the programme should publish its boundary, assumptions, outcome measures and decision rules. The baseline should record who lives in the community, how people currently earn and spend, which goods and services enter from outside, what firms can supply and the condition of shared assets.

The rollout should be staged so that later communities can learn from earlier ones. Where practical, each implementation archetype should be compared with a similar community that has not yet received the intervention. The comparison will not answer every causal question, but it will help distinguish programme effects from wider changes in employment, prices, infrastructure and trade.

An independent custodian should preserve the data and an independent verifier should assess each gate. Results should be published at regular intervals, including failures, delays and deviations from the model. A transparent record of what did not work is a productive asset: it allows the federation to revise its rules before mistakes become institutions.

15. A proposed policy manifesto

STATUS OF THIS MANIFESTO

This is a proposal for public deliberation and a staged implementation programme. It is not adopted government policy, enacted law, appropriated expenditure, community consent or evidence of success. Each commitment must remain within constitutional and statutory authority and must pass the model's published evidence gates.

15.1 The work that waits to be organised

Consider one ordinary planning day. A resident is looking for paid work. Nearby, a roof needs repair, a food enterprise needs reliable cold storage, a child needs learning support and a small manufacturer is waiting for a component. Public administration, enterprise support, infrastructure, education and labour policy often record these as different problems. This manifesto proposes that they be organised as one productive system, without pretending that every need is automatically a funded job or every local supplier is automatically viable.

The first moral claim is simple. A willing person should not become invisible because the economy has failed to connect useful work to demand, finance, tools and institutions. The practical claim is harder. A paid role must have an authorised purpose, a customer or public obligation, the inputs needed to produce, a safe workplace, a wage, supervision and a path to better capability. The job guarantee literature supports a standing employment option, but it also makes design, administration and the choice of useful work central to credibility (Tcherneva, 2018).

Near full employment in this model is therefore a continuing public and economic capacity, not a once off hiring target. The community must know who wants to participate, what each person can do, what support is needed and where demand exists. It must also recognise education, care, health, disability, migration and existing external work. No resident is reduced to a labour input, and no role count is allowed to stand in for a person.

15.2 Follow one transaction through the economy

Suppose a built environment enterprise pays a resident to repair the roof of a community facility. Part of the wage may buy food from local producers and traders. Part may repay a household loan or become a member share in the community financial institution. The contractor buys fabricated parts from the repair sector, utilities from the local provider and specialist material from outside the boundary. Tax is collected and leaves the private local circuit. If government later funds a service or asset, that return must follow a lawful budget and appear as a separate transaction.

The same sequence produces different economic effects. Food is consumed. An imported membrane is a necessary external input. A repaired roof remains as infrastructure and carries a future maintenance obligation. The worker's experience adds to the community's stock of capability. The enterprise's loan repayment restores lending capacity. Waste material may become a secondary input if its quantity, quality and recovery cost are measured. The value of the model lies in keeping these consequences visible at the same time.

A circular economy is not created because money passes through several local hands. It exists only to the extent that the community can produce useful output, meet essential services, retain and renew assets, reduce avoidable imports, recover physical resources and fund the imports it cannot replace. Export earnings matter because a community that remains open to the world must be able to pay the world. The aim is not closure. It is the capacity to choose, trade and recover without permanent emergency dependence.

The 10,000-person kernel makes these relationships visible enough to govern. It is not expected to contain every specialist capability or absorb every shock. Federation is the second half of the design. Seventeen communities form the structural lower bound because that count meets the current representation conditions. The number is not sacred. Its policy significance depends on the federation meeting the complete financial, physical, employment, trade and resilience conditions in operation.

15.3 Twelve proposed commitments

- 1. The model begins with every person.** Each community should maintain a current resident and capability account that records participation, existing work, learning, care constraints and required accommodation. The purpose is to create a credible path into paid contribution for every willing person in the verified productive population, while respecting the lives and choices that do not fit a conventional job count.
- 2. The design connects paid work to useful demand.** No placement should be announced without a product or service, an authorised customer or public obligation, inputs, working capital, safe conditions, paid hours and a progression route. The right to a pathway into work is a policy commitment. The number of roles that can be sustained remains an evidence question.
- 3. The aim is an economy, not a collection of projects.** Food, housing and maintenance, care, education, trade, repair, utilities, finance, digital services, culture and productivity support must function as a connected portfolio. A grant funded activity that cannot buy inputs, reach a customer, maintain its assets or survive the end of a programme is not yet part of a durable productive system.
- 4. The design produces locally where capability is real, and trades where it is not.** Local procurement should build suppliers that can meet cost, quality, safety and environmental standards. Necessary imports remain legitimate. External sales should fund the unavoidable import floor, working capital, maintenance, debt service and reserves after cash has been collected. Local first must never become local regardless of consequence.

5. Community capital works for the community. Member shares, retained surplus, household saving and federation reserves should finance productive firms, mercantile activity, infrastructure and affordable household uses inside the defined system. Credit must name its purpose and repayment source. Losses must be recognised, liquidity protected and borrowers treated fairly. A community financial institution is a discipline, not a licence to create unpayable debt.

6. Public money remains visible. Tax paid by residents and enterprises is an outflow until a competent authority lawfully budgets, spends and delivers something within the boundary. Government overhead, service delivery and capital formation should be reported separately. Public value should be recognised only when the service works or the asset is commissioned and maintained. This follows the constitutional demand for transparent and accountable public finance, not an assumption that locally generated tax automatically returns (Republic of South Africa, 1996).

7. The programme maintains what it builds. A school roof, water network, workshop, road, clinic or processing facility is not complete on the day it opens. Every asset should carry an operator, condition record, maintenance plan, replacement provision and decommissioning route. Maintenance is productive work because it preserves service, capital and safety. Building without renewal transfers a hidden liability to the next generation.

8. The model accounts for the physical economy. Money measures only part of circularity. Water, energy, food and nutrients, construction materials, manufactured goods, packaging and residual waste should each be balanced in their own units. Recovery should be credited only when a usable secondary input replaces a real requirement at an acceptable lifecycle cost. Industrial symbiosis must be demonstrated through identified exchanges, not inferred from proximity or intention (Chertow, 2000).

9. The design protects people through economic change. Productivity, technology and new markets should change the portfolio. Firms may improve, merge, change form or close. The obligation is to prevent that change from turning into permanent exclusion. Paid learning, transition income, recognised credentials, portable records and routes into new work or ownership should move with the person. The economy must be allowed to evolve while people retain a claim on its future.

10. The federation shares specialist capacity and recovery risk. No 10,000-person community should be required to carry every laboratory, specialist service, export platform or disaster reserve alone. The federation should pool functions that gain from scale while preserving local authority over work that depends on local knowledge. Mutual support must be funded for correlated shocks, not only for one isolated failure.

11. Governance stays close to the consequence. Residents, workers, enterprises and public institutions should know who owns each decision, who holds the evidence and who can challenge misuse. Communities retain operational authority; the federation enforces common financial, labour, environmental and evidence standards. This is a polycentric design with nested responsibility and mutual monitoring, not a remote hierarchy or a loose network without rules (Ostrom, 2010).

12. Measurement precedes proclamation, and scaling follows evidence. The programme should publish its assumptions, contracts, material balances, employment quality, asset condition, public expenditure, losses and failures. Independent verification must remain separate from delivery.

Seventeen forms the initial federation because the model establishes it as the structural lower bound. Replication follows only when the evidence shows that people are better served, the productive system closes and the federation can survive its stated risks.

15.4 A covenant between institutions

The community's duty is to make people, needs, assets and productive opportunities visible, and to govern local trade offs in public. The federation's duty is to organise the capabilities that cannot be carried locally: specialist services, diversified external markets, common standards, shared finance, settlement, risk pooling and recovery. Government's duty is to provide lawful authority, rights protection, public service obligations, transparent budgets, regulatory oversight and procurement that develops capability without abandoning value for money.

Enterprises must produce something that a household, another firm, an institution or an external buyer is willing and able to pay for. The community financial institution must protect members' capital, price risk honestly and lend only where use and repayment can be traced. Training institutions must teach against real production standards and keep progression records portable. The independent evidence function must be able to say that a claim has failed, even when delivery institutions and political sponsors want it to pass.

No participant can discharge its duty by moving the problem to another ledger. A firm cannot call unpaid demand revenue. A bank cannot call a new loan capital formation without recording the matching liability and cash requirement. Government cannot call tax a local benefit before expenditure and delivery. The federation cannot call a reserve funded while the same money is committed elsewhere. A circular claim cannot use financial recirculation to conceal a physical deficit.

15.5 From model to public action

This manifesto does not ask South Africa to accept a completed success story. It asks institutions and communities to undertake a disciplined programme in public. Begin with a lawful mandate and an independently accepted baseline. Protect the people who participate. Release capital in stages against demand, capability and evidence. Publish the results, including delays, losses and failed assumptions. Change the rules when the evidence requires it, and redesign or stop any part of the programme that cannot meet its own conditions.

The National Development Plan links employment, productive capacity, exports, skills, infrastructure and a capable state (National Planning Commission, 2012). The 10,000 People Economy proposes a local operating unit through which those objectives can be joined and observed. The kernel makes the obligation concrete. The federation makes specialist capability and mutual recovery possible. The evidence programme keeps the promise honest.

PROPOSED PUBLIC COVENANT

The 10,000 People Economy Project proposes a lawful, staged and independently verified implementation programme in which every willing person can be seen, useful work can be organised, local capability can grow, essential imports can be funded, assets can be maintained and communities can face change together. The programme will be judged successful only when the evidence permits that conclusion.

Conclusion

The 10,000 People Economy is a micro kernel for organising people, production, finance, public value and resource stewardship. One kernel is too narrow to carry every modern capability and risk. Federation completes the architecture. Seventeen is the structural lower bound because it is the first whole number that crosses the industry family and state representation conditions. The resulting model contains 170,000 residents and 102,000 derived productive people: 91,800 assigned to local production and 10,200 in external or remote paid work. These figures define the scale and productive obligation of the model. Economic sufficiency depends on the complete viability rule.

The radical element is integration rather than isolation. The model accepts external trade, specialist imports, public authority and technological change. It rejects permanent unmanaged leakage, capital without local capability, employment without progression, infrastructure without maintenance, tax without visible public value and circularity without physical evidence.

This revision closes the model's former interaction gap at the planning level. It states how much each sector produces, buys from local and imported suppliers, sells to households and other businesses, turns into assets and inventory, and sends outside the community. It also reconciles seven physical resources in their own units and carries the monetary account through the four-state federation. What remains open is more important: E14 must replace allocation rules with actual transactions, asset movements and physical measurements. Until then, reconciliation proves internal consistency, not economic viability.

The demand account closes the logical gap between assigning people to sectors and demonstrating employment. At the seventeen-community scale, 91,800 local people require R22.681 billion of annual B01-B11 sales and R4.359 billion of working capital. The combined demand shock supports about 67,740 local people, and independently accepted people remain zero. No full employment claim and no productive capex release may exceed the jointly accepted E15-E17 and N10 ceiling.

The export cash account separates external revenue from spendable funding. The former 16.14x ratio is explicitly a local value diagnostic. The governing fifty-community result is R4.749 billion of recurring unrestricted export cash against a R4.382 billion import floor, or 1.084x cover. The R14.028 billion working

capital requirement makes launch-year cash negative, every modeled downside stress falls below 1.0x, source gated export cash is R0 and the year-thirty-five capital backlog is R522.104 billion. The current portfolio therefore does not establish a self-funding circular economy.

The operating form account separates essential production from commercial viability. B01 and B06 remain outside the fifteen-year screen, with a combined R23.386 million annual support requirement. The model shows R107.205 million of potential donor capacity, but assigns none and recognises no support until E16 proves the authority, instrument, source, delivery cost, donor recipient identity and accounting treatment. These sectors may be essential, but operating form viability is not yet established.

The labour account replaces the former fixed productive population ratio. The model derives 6,000 productive people from the resident profile, distinguishes 5,400 local from 600 external or remote workers, and separates people from 6,165.74 position contracts and 5,558.02 FTE. It also publishes planning distributions for wages, hours, safety, stability and progression. E17 keeps all of these as planning values until person level evidence is reconciled and independently accepted.

The four-state account replaces shorthand labels with ordered entry rules, twenty conditional transition rows, implied state durations, four correlated events, cash recovery costs and severe reserve targets. The result is sobering. Seventeen communities require R1.9095 billion of verified internal recovery capacity, while fifty require R5.455 billion. Both currently have R0 verified reserve funding. The reference replay also retains seven liquidity failures and a R522.104 billion terminal backlog. A bigger federation improves diversification only if it also creates usable liquidity, less correlated industries and the capacity to replenish the reserve.

The reconciled control result is therefore not a qualified success. Three of six criteria pass at model level, none of the thirty-nine evidence items is verified, and the overall implementation status remains NOT YET ACHIEVED. The current baseline carries R115.710 million a year of avoidable external dependence and an estimated R2.430 billion local provision closure programme per community. The integrated base stress result is RECOVERY PLAN REQUIRED. These values define the remaining implementation and validation work; they do not describe a functioning circular economy.

The academic architecture defines which flows, stocks and institutions must close. Six analytical frameworks, fifty reproduced equations and project rules, five international cases and one transfer protocol make the logic inspectable while preserving the South African spatial and municipal boundary. The literature strengthens the design but does not improve a model result by citation. Its practical effect is to expose the regional coefficient, local SAM, physical metering, governance and field estimation work still required before causality or viability may be claimed.

The academic analysis and the proposed manifesto belong in one document because every public commitment must answer to the same model and evidence. They do not have the same authority. The analysis explains what is known, derived, assumed and still unverified. The manifesto states what should be attempted and why. Appendices C and D connect those commitments to governing rules, evidence gates, accountable institutions and explicit responses when proof fails.

The practical next step is a staged implementation and comparative assessment of federation sizes from seventeen to fifty. Each scale should be assessed through the same 35-year facility, capital, fiscal, supply, labour, demand and export accounts under the base case, drought, commodity collapse, infrastructure failure and anchor market loss. E18 must replace provisional probabilities, correlations, durations and recovery costs with observed evidence and must establish that the reserve is held inside the exact federation. This work will determine the minimum viable federation, the adequate risk pool and the scale at which near full productive participation can be sustained.

The practical and political value of the model lies in moving full employment from an aggregate aspiration to an account of people, enterprises, customers, cash, assets, institutions and physical resources that can be governed. South Africa need not wait for national prosperity to reach every community by accident. It can organise productive capability deliberately, beginning at a scale where people and flows remain visible and federating the functions that no community can carry alone. The ambition is radical, but the discipline is equally demanding: every expansion of employment must be matched by useful output, every movement of capital by a recoverable purpose, and every claim of circularity by evidence in the physical economy.

Appendix A. Headline model parameters

Parameter	Current model value	Status
Residents per community	10,000	Fixed design target
Derived productive people	6,000	Planning result from age, education, care, health or disability, other participation and migration inputs
Productive share of residents	60.0%	Output of the current cohort waterfall; never a fixed ratio
People requiring accommodation but included	400	Support requirement, not exclusion from productive status
Local B01-B11 productive people	5,400	Unique people assigned once across the local portfolio
Existing external or remote workers	600	Retained in the community labour account; not assigned again to B01-B11
Local position contracts	5,565.74	Multiple part time contracts may map to one person
Total position contracts	6,165.74	Local contracts plus 600 external or remote positions
Local FTE	4,958.02	Local paid hours divided by the 40-hour model standard
Total productive FTE	5,558.02	Local and external paid hours divided by the model standard
Average paid hours	37.05 per productive person/week	Planning distribution; observed rosters required
Legacy role design slots	6,460	Capacity comparator only; not another person or employment total
Work quality dimensions	5	Wage, hours, safety, stability and progression are separately distributed
Submitted / accepted labour evidence	0 / 0 people	E17 remains EVIDENCE REQUIRED
Full employment month	Month 42	Scenario output
Structural lower bound communities	17	Necessary representation threshold under current assumptions; not a viability finding
Lower bound scenario population	170,000	17 × 10,000
Lower bound derived productive people	102,000	91,800 local and 10,200 external or remote
Lower bound contracts / FTE	104,817.62 / 94,486.34	Different measures of the same 102,000 people
Annual local wages	R679.475m/community	Gross wages assigned to B01-B11 people
Annual local employer payroll	R716.847m/community	Wages plus modeled employer costs
Annual household wages	R780.275m/community	Local plus external or remote worker wages
Annual B01-B11 sales required	R1.334bn/community	Revenue needed to carry 5,400 local people and their paid hours
Break even sales	R1.162bn/community	Paid hour payroll plus fixed overhead after non-labour costs
Sales cycle working capital	R256.428m/community	Inventory, work in progress, receivables and payment timing
Combined shock supported local people	3,985/community	Customer volume and collection stress applied to the planning account

Parameter	Current model value	Status
Demand backed people accepted	0	E15-E18 community evidence and N10 candidate schedule are not accepted
17-community annual sales required	R22.681bn	91,800 local people; candidate specific customer schedule required
17-community break even sales	R19.746bn	Paid hour commercial threshold across the candidate
17-community working capital	R4.359bn	Cannot be inferred from the fifty-community reference
17-community combined shock local people	67,740	Planning stress result; independently accepted value is zero
Operating form classes	4	Commercial enterprise, regulated utility, public service provider and explicitly supported productive infrastructure remain distinct
Sectors outside 15-year commercial screen	2	B01 food and agro processing; B06 manufacturing, repair and circular infrastructure
B01 / B06 legacy payback	55.85 / 53.34 years	Current archetype assumptions; neither passes the selected screen
Annual support requirement	R23.386m/community	Contribution required to bring both weak return sectors to the selected screen
Planning donor capacity	R107.205m/community	Analytical capacity only; not assigned, executed or recognised
Demand envelope commercial headroom	R172.617m/community	Conditional on E15; not automatically transferable cash
Recognised sector support	R0	Public value contribution, cross-subsidy receipts and capital support remain gated by E16
Cross-subsidy identity residual	R0	Donor transfer and recipient receipt must be the same portfolio cash
Operating form viability	NOT ESTABLISHED	B01 and B06 require improved economics or an E16-accepted support route
Household spend recirculation	56.28%	Monetary flow measure
Year-five domestic output	R3.348bn/community	R1.331bn B01-B11 plus R2.017bn selected anchor
Year-five imports	R1.136bn/community	Household and intermediate imports in the boundary account
Year-five intermediate use	R977.427m/community	R62.384m local plus R915.044m imported inputs
Year-five household final use	R446.783m/community	Includes R221.398m of household imports
Year-five permanent infrastructure	R138.077m/community	Durable asset formation requiring lifecycle provision
Year-five capability and inventory	R23.500m/community	Capability investment plus inventory change
Year-five exports / rest-of-SA sales	R2.899bn/community	Balancing external use pending executed demand evidence
Gross value added / retained value share	70.81% of output	71.85% B01-B11 GVA plus separately disclosed anchor retained value proxy

Parameter	Current model value	Status
Monetary and physical supply use identities	IDENTITY PASS	Planning accounts; observed reliance requires E14
Current cost weighted local provision	46.36%	Value weighted provision measure, not circularity
Maximum feasible cost weighted local provision benchmark	76.41%	Configured provision benchmark, not circularity
Current involuntary external dependence	R115.710m/community/year	Avoidable external essential value above the unavoidable import floor; current baseline, not the modeled closure state
Local provision closure capex	R2.430bn/community	Planning capital required to remove the current involuntary dependence gap; no executed programme is implied
Essential service thresholds met	1 of 2	Housing/public realm below threshold; primary healthcare above threshold
Physical supply and use records	7 native unit resource balances	Planning values; independent evidence required
Composite circularity score	NOT USED	Dimensions may not be averaged
Circular economy achievement	NOT ESTABLISHED	Requires separate evidence for every dimension
Unavoidable import floor	R87.637m/community/year	Model output requiring site import study
Local value captured	R1.415bn/community/year	Economic retention diagnostic after direct imported inputs and logistics; not available funding
Local value / import floor diagnostic	~16.14x	Retained only for economic analysis; not a cash cover ratio
Recurring unrestricted export cash	R94.98m/community/year	After collection loss, full operating costs, cash tax, lifecycle reserves, debt service and disaster reserve
Recurring cash cover	1.084x	Base case only; every modeled downside stress falls below 1.0x
Export working capital stock	R280.57m/community	R14.028bn across the fifty-community reference
Launch-year cash after working capital	-R185.59m/community	-R9.279bn across fifty communities; launch-year cover -2.118x
Source gated recurring export cash	R0	N05-N06 and N11-N13 evidence not independently accepted
Internal B01-B11 tax extraction	R148.588m/community/year	Year-five labour account outflow; not a local receivable
Gross tax generated	R175.65m/community/year	Broader autonomy model outflow; not a local receivable
35% fiscal policy comparator	R61.48m/community/year	Broader autonomy scenario benchmark; not an appropriation or transfer
Recognised local fiscal expenditure	R0	Held at zero until lawful route, budget, expenditure and boundary evidence exist
Accepted local public value	R0	Held at zero until service or asset delivery is independently accepted

Parameter	Current model value	Status
Recurring cash less broader autonomy funding need	-R802.1m/community/year	Governing combined financial balance after the export cash correction
Autonomy capital requirement	R3.984bn/community	Risk adjusted productive, closure and pooled recovery reserve capital
Federation finance	R1.282bn/community	Modeled cumulative source after the candidate reserve allocation
External finance	R0	Hard model boundary
Selected community financial institution	Closed member lending fund (non-bank)	Planning route; legal and operating evidence required
Selected lending mechanism	Existing money transfer	Paid in member equity; loan created deposits and funding liabilities are R0
Year-five fund position	R101.69m cash; R83.74m gross loans	Before R1.74m expected loss allowance
Five-year cash funded disbursement	R155.26m	Cumulative loan created deposits R0
Financial institution identity	IDENTITY PASS	All modeled monetary event and balance identities close
Financial result reliance	PLANNING MECHANICS ONLY	Requires verified evidence E11-E13
Federation financial form	Member owned revolving facility (non-bank)	No deposits and no external wholesale funding
Conditional transition matrix	20 rows	Base and four event conditions, each with four origin states
Planning community state	Catalysis	Ordered classifier result; evidence reliant state remains EVIDENCE REQUIRED
Integrated base stress result	RECOVERY PLAN REQUIRED	Physical coverage and internally funded recovery capacity do not yet support a resilient result
17-community affected count range	9 to 13	Tail planning counts across the four modeled events
17-community severe reserve target	R1.9095bn	R112.324m per community; verified reserve and contingent liquidity R0
50-community affected count range	26 to 35	Tail planning counts across the four modeled events
50-community severe reserve target	R5.455bn	R109.100m per community; verified reserve and contingent liquidity R0
Risk result reliance	PLANNING INPUTS - E18 REQUIRED	No probability, correlation, duration or cost is treated as observed
50-community year-35 network backlog	R522.104bn	Current export cash replay fails the capital closure gate
Overall objective status	NOT YET ACHIEVED	The model and evidence gates do not jointly pass
Model criteria passing	3 of 6	C3 capital closure, C5 fiscal public value and C6 demand backed employment remain open
Evidence items verified	0 of 39	NOT YET ACHIEVED; E18 adds risk, recovery cost and reserve custody proof
Fully replayed reference	50 communities	Selected scenario 35-year replay currently fails capital closure; not a minimum viable finding
Minimum viable federation	NOT ESTABLISHED	Requires the complete candidate decision rule

Source: linked model workbooks and Autonomy Achievement Register, August 2026.

Appendix B. Initial evidence package

Evidence domain	Minimum proof before implementation claim
Authority	Executed mandates, defined boundary, signatories, custodian, independent verifier and controlled repository
Population and skills	Resident register, demographic profile, participation constraints, skills, credentials and productive status
Physical economy	Measured needs, current supply, feasible provision benchmarks, landed import costs and asset condition for seven resource classes
Enterprises	Unit economics, demand, supplier capacity, jobs, productivity, quality and environmental performance
Supply and use account (E14)	B01-B11 production and sales, buyer supplier invoices, payroll and surplus, household and public uses, assets, inventories, imports, exports, waste, recovery and reconciled native unit balances
Demand to employment account (E15)	For each community and enterprise: named product or service, unit, customer, volume, price, collection terms, revenue, loaded wage, payroll/FTE and sales cycle working capital
Operating forms and support flows (E16)	Approved classification; executed customer, tariff, service, appropriation or member instrument; gross public value cash and delivery cost; cross-subsidy donor and recipient; capital support authority and custody; no double count reconciliation
Derived labour and work quality (E17)	Resident cohort and migration register; participation and accommodation status; existing employment; unique person identifiers; every paid contract; wages; paid hours; FTE; safety; stability; progression; demographic distribution; no double count reconciliation
Four-state risk and recovery (E18)	Dated community state panel; observed transition counts and durations; geocoded event register; dependence estimates; recovery capex, emergency operating and working capital records; internally funded reserve custody for the exact federation
Seventeen-community schedule (N10)	Candidate specific communities, productive people, local and external workers, contracts, hours, FTE, work quality, sectors, buyers, volumes, prices, collections, payroll and working capital; no proportional transfer from the fifty-community reference
Capital	Asset titles or use rights, paid in member capital, facility approvals, retained cash, dated draw schedules and capital origin evidence
Financial institution	Selected legal form and authority; deposit taking, prudential, CODI, credit and consumer law perimeter; custody, settlement, withdrawal, liquidity, default and loss records
Trade buyers and concentration (N11)	Named buyers, executed contracts, products, units, committed volumes, prices, payment terms, largest buyer share and top-three share
Certification and market access (N12)	Standards, approvals, route capacity, freight and compliance costs, border or platform requirements, insurance and contingency routes
Export cash waterfall (N13)	Collections, imported inputs, logistics, local operating costs, tax, maintenance, replacement, internal debt service, disaster reserve, working capital custody and recurring unrestricted cash
Fiscal route and public value	Competent authority, legal route, approved budget, transfer or vote, expenditure ledger, boundary attribution, service acceptance, overhead evidence and asset register
Circular economy dimensions	Household spend recirculation; sector value added; local provision and imports; named service obligations; material, water and energy balances; recovery yields; residuals; lifecycle impact
Commissioning	Operating tests showing capacity, quality, reliability, safety and maintenance readiness
Outcomes	Employment quality, household welfare, service access, local value retained, resilience and distributional effects

Source: condensed from the 39-item Autonomy Achievement Register risk model edition v10 and programme charter controls.

Appendix C. Proposed manifesto to model crosswalk

This appendix makes the proposed manifesto answerable to the analytical model. A commitment has no operational standing until its mechanism, proof and failure response are assigned. Rule numbers refer to the economic constitution in Section 5. Evidence codes refer to the controlled evidence package described in Sections 13 and 14.

Proposed commitment	Governing rule and mechanism	Evidence gate	Response if proof fails
1. Begin with every person	Rules 1-2: maintain the resident boundary, derive the productive population and provide a paid work or paid learning pathway.	E17 resident, participation, accommodation, existing work and unique person records.	Rebase the population and support design. Do not use a fixed ratio or role count.
2. Connect paid work to useful demand	Rule 3: reconcile each person, contract, hour and FTE to a funded product, service or public obligation.	E14 sales and payroll; E15 customer, volume, price, collection and working capital proof; E16 authority.	Reduce or resequence recruitment and capital until demand and decent work conditions are accepted.
3. Build an economy, not projects	Rules 11-12: develop suppliers and maintain a differentiated, connected industry portfolio.	E14 industry supply and use account; E16 operating form and support route; N10 candidate schedule.	Change the portfolio, operating form or scale. End unsupported stand alone activity.
4. Produce locally and trade deliberately	Rules 4-5 and 12: build competitive local capability while exports fund necessary imports and concentration is limited.	E14 imports and local supply; N11 buyers; N12 market access; N13 recurring unrestricted cash.	Improve the offer, diversify buyers, reduce import exposure or revise the autonomy claim.
5. Keep community capital working locally	Rules 8-9 and 15: originate capital internally, bind credit to use and repayment, and protect renewal priorities.	E11-E13 legal form, capital origin, custody, liquidity, lending, losses and application records.	Stop or limit affected products, recognise losses, restore liquidity and correct use outside the boundary.
6. Make public money visible	Rules 10-11: separate tax collection, appropriation, expenditure, delivery, overhead and local public value.	Lawful route, approved budget, expenditure ledger, E16 public value instrument and accepted service or asset result.	Recognise no local fiscal inflow or value. Correct the route, delivery or accounting before reliance.
7. Maintain what is built	Rules 6-7 and 15: give each asset an operator, condition record, maintenance plan and replacement provision.	E14 fixed asset account, commissioning tests, condition inspections and funded lifecycle schedule.	Defer commissioning, repair the maintenance gap or retire the asset from productive capacity.
8. Account for the physical economy	Rules 6-7 and 16: balance seven resource classes in native units and test real substitution and lifecycle effects.	E14 material, water, energy, recovery, residual and asset records with independent measurement.	Withdraw the circularity claim and redesign any intervention that shifts rather than reduces burden.

Proposed commitment	Governing rule and mechanism	Evidence gate	Response if proof fails
9. Protect people through change	Rules 2-3 and 17: connect productivity change to transition rights, paid learning and new demand backed work.	E17 wage, hours, safety, stability, progression and transition records, reconciled to E15 demand.	Fund remediation and transition, redesign the work or reject the decent employment claim.
10. Share capacity and recovery risk	Rules 12-14: diversify the network, pool specialist functions and hold recovery capacity for correlated events.	E18 state histories, event dependence, recovery costs and reserve custody for the exact federation.	Increase or redesign the federation, reserve and industry mix. Do not claim adequate risk pooling.
11. Govern close to the consequence	Rules 8-16: apply subsidiarity with binding financial, labour, environmental and evidence controls.	Executed mandates, ownership records, decision rights, conflicts, procurement results, member remedies and independent verification.	Suspend affected authority or capital, remedy capture and re-establish lawful accountable control.
12. Measure, publish and scale after proof	Rules 16-17: separate modeled, submitted, accepted and achieved status, then revise the system against outcomes.	All E14-E18 and N10-N13 controls, six criteria, conditions for revision and a published decision record.	Do not replicate. Publish the failure, revise or withdraw the affected model claim, and repeat the complete assessment.

Source: author crosswalk between the proposed manifesto, the seventeen governing rules and the controlled evidence programme. The crosswalk is a proposed implementation control, not existing law.

Appendix D. Proposed policy instruments and accountability

The manifesto requires institutions, not slogans. The instruments below are proposed components of a implementation programme. Their legal form, public authority, fiduciary duties and regulatory perimeter must be settled before activation. No table entry creates a mandate, licence, appropriation or contractual right.

Proposed instrument	Purpose	Accountable locus	Activation gate
Community participation and capability register	Define the resident boundary, derive productive status and record skills, constraints, support and existing work without double counting.	Community operating institution, with privacy oversight and independent evidence custody.	Lawful mandate, data protection, resident notice, unique identifiers and accepted baseline.
Productive participation guarantee	Provide a standing route into paid work, paid learning or useful public service under decent work and progression rules.	Community delivery institutions and employers under federation labour standards; competent government for public work.	E15-E17 demand, authority, funding, person, contract, wage, hours, safety and progression proof.

Proposed instrument	Purpose	Accountable locus	Activation gate
Sector production and demand compacts	Connect each B01-B11 activity to products, customers, inputs, working capital, employment, operating form and performance.	Enterprise boards and community portfolio authority, reviewed by the federation.	Accepted unit economics, E14-E16 accounts, customer evidence and tranche specific capital approval.
Local supplier development and procurement rule	Use household, enterprise and public purchasing to build capable suppliers while protecting price, quality, safety and competition.	Community buyers, enterprises and competent public procurement authorities.	Transparent criteria, lawful process, conflict controls, value for money test and supplier graduation plan.
Closed member lending fund	Retain member capital and make existing money loans for productive, mercantile, infrastructure and bounded household uses inside the system.	Member governed financial institution within its confirmed legal and regulatory perimeter.	E11-E13 authority, paid in capital, custody, settlement, liquidity, affordability, loss and consumer protection controls.
Federation capital and settlement facility	Sequence internal finance across communities, protect working capital and renewal, and settle approved cross-community obligations.	Federation finance institution with independent prudential oversight and member representation.	Executed charter, capital origin, draw rules, custody, liquidity stress, loss allocation and zero external wholesale funding.
Export, import and market access compact	Diversify external revenue, fund the import floor and manage buyers, certification, logistics, collections and concentration.	Federation market platform with accountable anchor enterprises and community reporting.	N11-N13 contracts, access, delivered costs, cash waterfall, working capital, reserves and downside cover.
Public value compact	Connect lawful public expenditure to named services, assets, overhead, operating standards and accepted local outcomes.	Competent sphere of government and authorised service provider, with community reporting.	Appropriation or lawful transfer, E16 instrument, expenditure ledger, service acceptance and asset register.
Circular asset and resource ledger	Track fixed assets and seven physical resource classes, including maintenance, replacement, recovery, residuals and lifecycle effects.	Community asset custodians and utilities under federation accounting standards.	Commissioned metering, asset identifiers, condition baseline, native unit balances and independent inspection.
Four-state recovery and mutual reserve protocol	Classify operating state, respond to decline first, estimate shared shocks and hold internal recovery capacity for the exact federation.	Federation risk authority with community triggers, reserve custodian and independent verifier.	E18 histories, correlations, durations, cost evidence, reserve funding, custody and validated release rules.

Proposed instrument	Purpose	Accountable locus	Activation gate
Independent evidence and public decision office	Preserve the data, verify each gate, publish status and record whether the programme advances, pauses, changes or stops.	Institutionally separate verifier answerable to a public charter, affected communities and lawful oversight.	Independence, methods, audit trail, publication rule, appeal route and authority to reject unsupported claims.

Source: proposed institutional translation of Sections 5, 9, 10, 12, 13 and 14. Applicable South African law and competent public authority govern every instrument.

Appendix E. Controlled model release and reconciliation

This edition is reconciled to the controlled model release below. The fingerprints bind the paper's numerical claims to specific local artifacts. A later change to any listed artifact changes its SHA-256 value and requires the affected paper tables, narrative claims and analyses to be reconciled again before publication or policy use.

Model artifact	Controlled release	Authority in this paper	SHA-256 fingerprint
Employment kernel	Labour account v3	Resident to productive populationproductive population waterfall; people, contracts, hours, FTE and progression.	5D8C8494F8918B4B 506D325B38E155BB BE852DA0BEF26735 0D6571A850E9F1E7
Internal economy	Internal flows risk model v10	Monetary and physical supply use, demand, labour, finance, fiscal and community state accounts.	455AF8EDFC3DFF36 1B107BD43874F03B BE4DB4155318F93F C5D4F820143CFF7D
Capital formation	Capitalization risk model v10	Productive and closure capex, internal funding waterfall, facility queue and recovery reserve.	9EE44B4781AB04C4 2FDF039D8E171AC 65E6BD6F998FEA2B 01844C5E208DCA1E
External revenue	External revenue risk model v10	Anchor portfolio, export cash waterfall, federation replay, scale solver and shared shock model.	1C4F21AD6A7B9D68 96E304CA7EA69A45 3366469AB9D62C0E 7B61BEE39E0BBC34
Achievement control	Autonomy achievement risk model v10	Six criteria, thirty-nine evidence items, current gaps and implementation claim controls.	F86331F412B50E92 69F185D0835216D9 811BEF17D4B098B5 77517DE889419B84
Risk assumptions	Four-state risk configuration v1	Event probabilities, conditional exposure, community correlation, recovery costs and reserve overlay.	E642A4084E174868 821DA2B05DF928FA C680615D2451CB24 DF631A5F6AF5D3BC

Source: local controlled model artifacts. SHA-256 values are shown as four groups of sixteen hexadecimal characters; remove spaces to recover the full digest.

Reconciliation rules

Rule	Required treatment
One governing release	Use the five linked model workbooks and the risk configuration listed above as one release. Do not combine a current dashboard with an older downstream account.
No silent promotion	Keep modeled, submitted, independently accepted and achieved values separate. A formula pass cannot replace customer, capital, legal, physical or person level evidence.
Trace every headline	Each numerical claim in the abstract, conclusion and manifesto crosswalk must reconcile to Appendix A and to a named current workbook output.
Rebuild after change	When a controlled artifact changes, compare affected outputs, update the paper, rerun structural checks and inspect every rendered page before issuing a new edition.
Preserve failed results	Do not remove a failed stress, liquidity gap, dependence gap or evidence gap because a different model dimension passes.

Source: author defined release control protocol for the 10,000 People Economy model and paper.

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