Road-to-rail strategy

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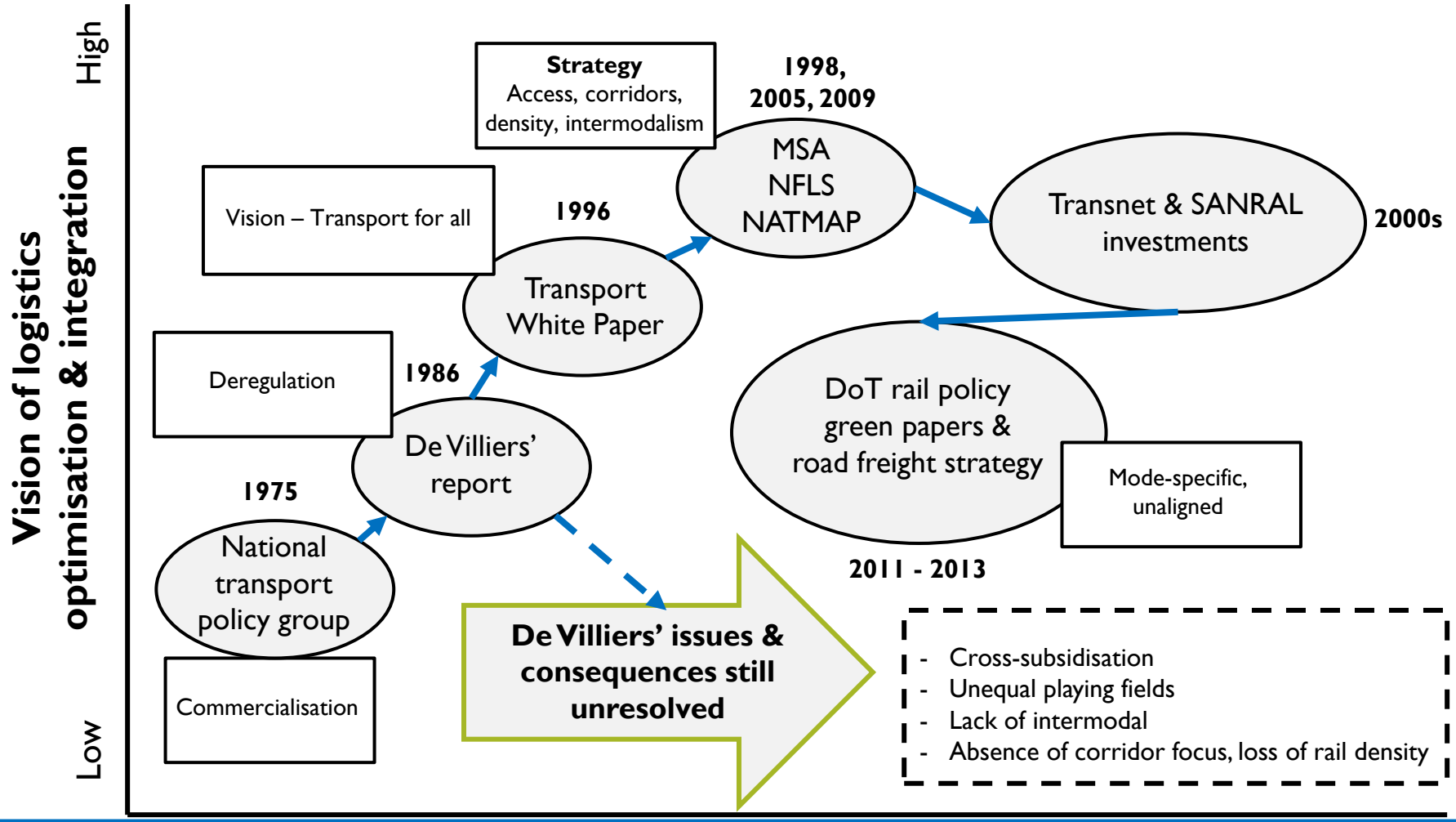
Freight

- Transport policy evolution
- Methodology
- Freight demand
- Freight supply
- Freight-flow segmentation – rail-friendly freight
- Benchmarking rail
- Private sector feedback
- Narrative of the current crisis
- Proposed strategy

Democratic SA vision of optimisation and integration reduced to focus on regulation, mode-specific strategies, and 'document paralysis'



Lack of implementation, exacerbated by recent events

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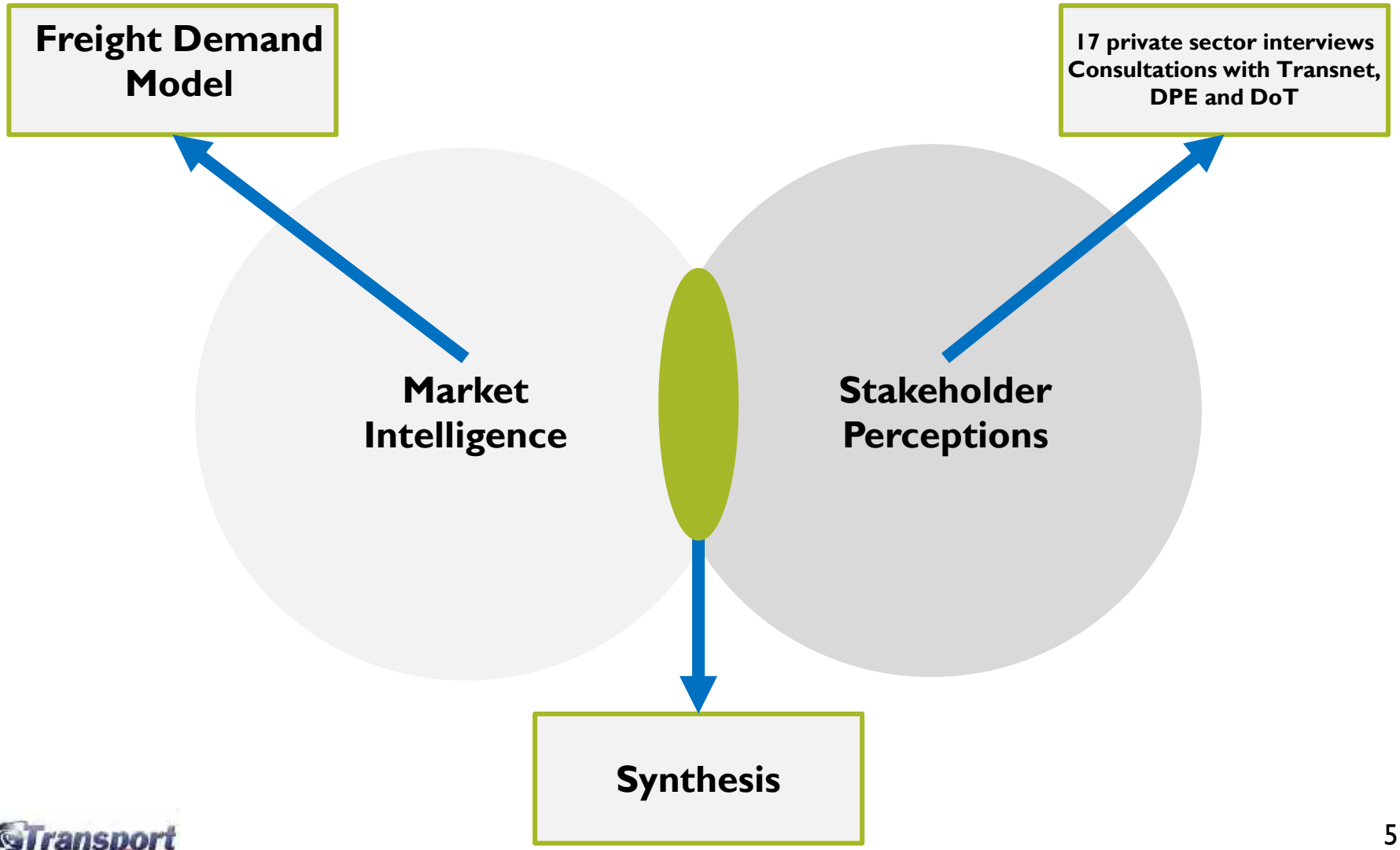
A data-driven approach was followed



It is the same methodology we applied in other places around the world


South Africa


Sub-Saharan Africa

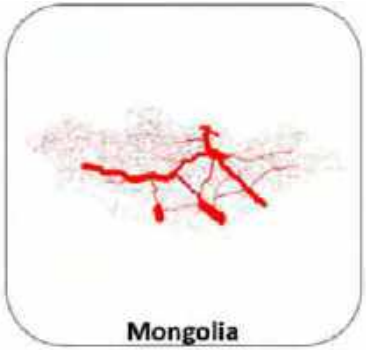

Western Cape


India

We include as many variables as possible:

- Costs
- Other activities cash to cash cycle/ warehousing/ administration
- Including all externalities: emissions/noise/ congestion/policing/ accidents/land use


Kolkata

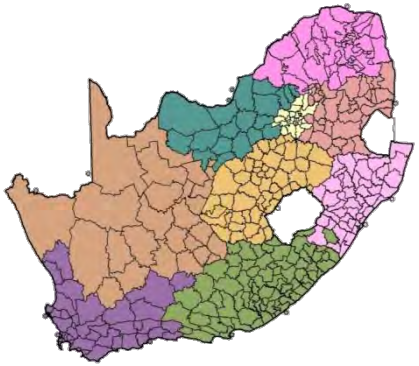

Mongolia


Uzbekistan

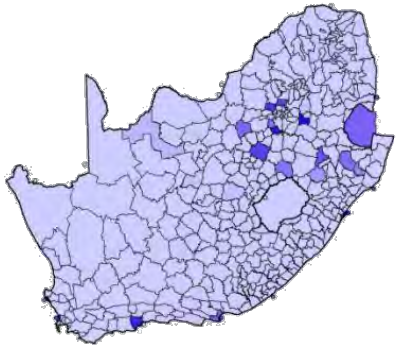

South Sudan (in production)

Logistics activities include a large array of intelligence on volumes, modes, forecasts

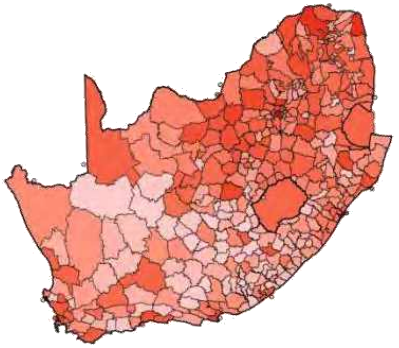
The South African model is detailed, with forecasts



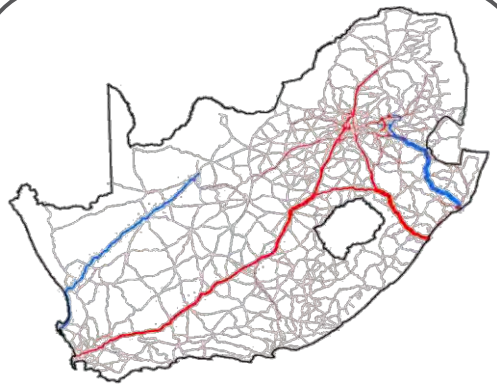
Provinces and districts



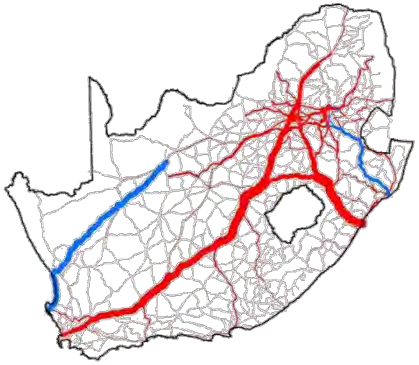
Example: Origin MDs (fuel)



Example: Destination MDs (fuel)



Base year flows (all)



30 Year forecast (all)

- Ton/TEU/Tonne-km/Cost
- Exim and domestic
- 83 Commodities
- All Origins/Destinations
- 30-year forecast
- 5 modes
- Cost per flow/mode

How much / what / where / when / how / price

11 updates – >100 000 hours

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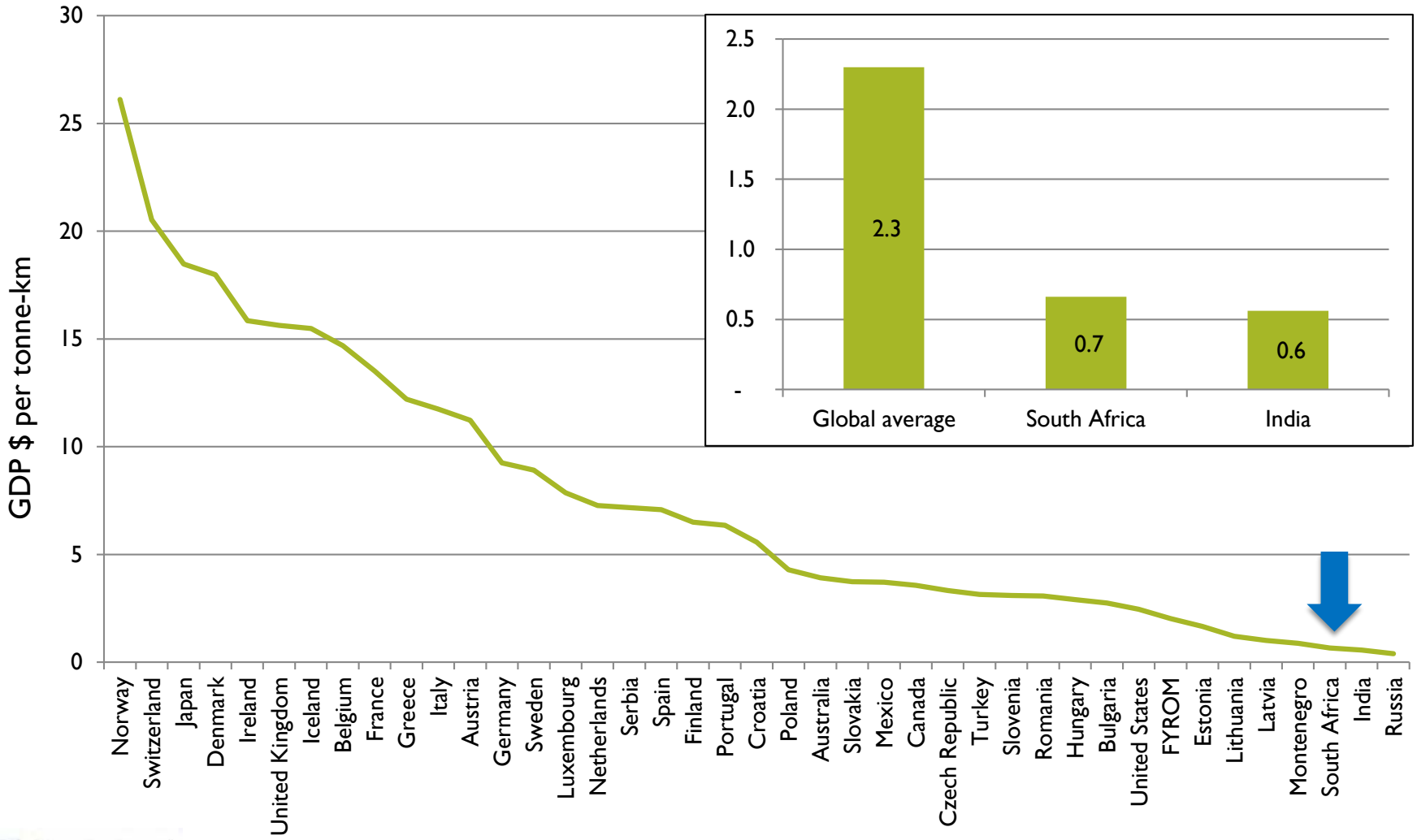
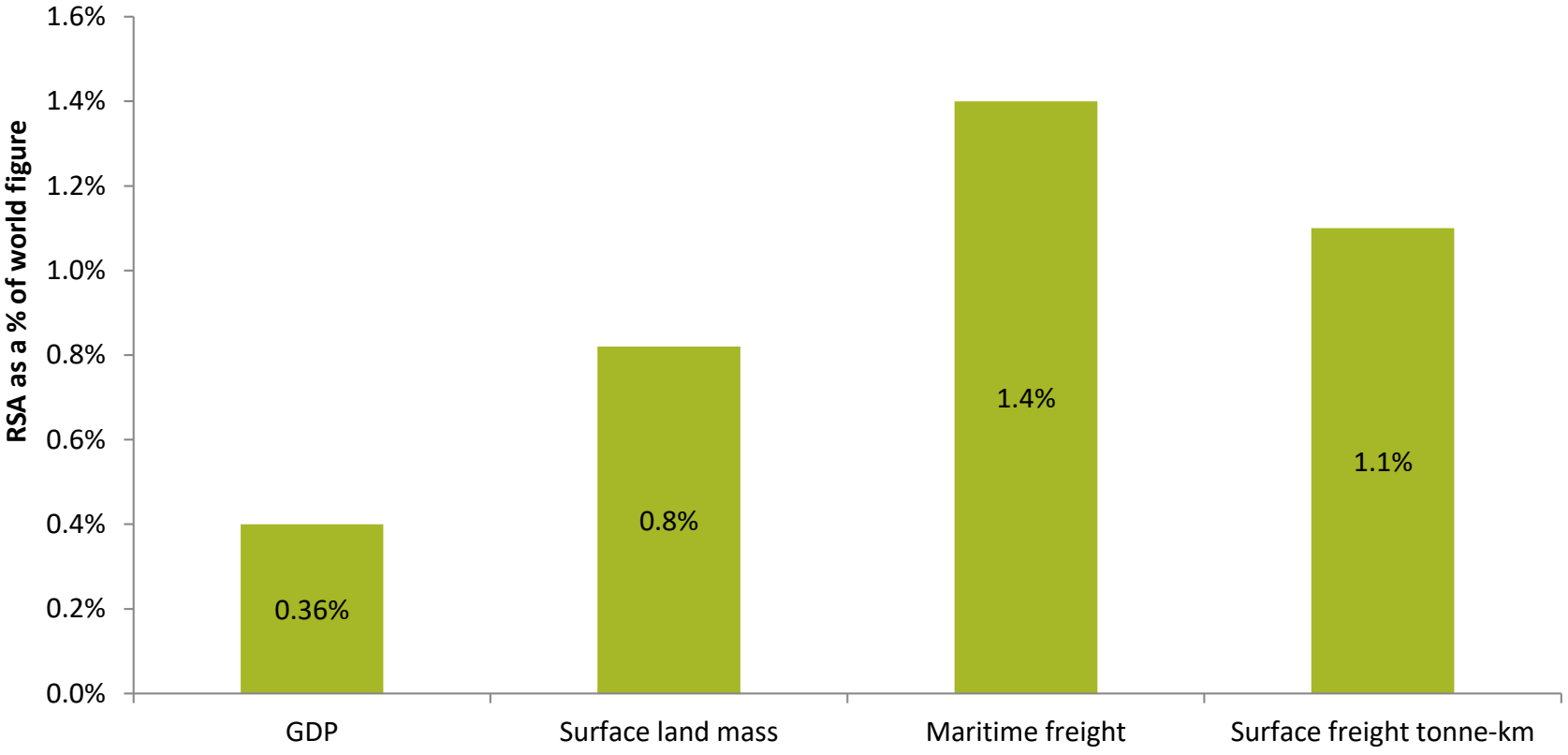
South Africa is a spatially-challenged country



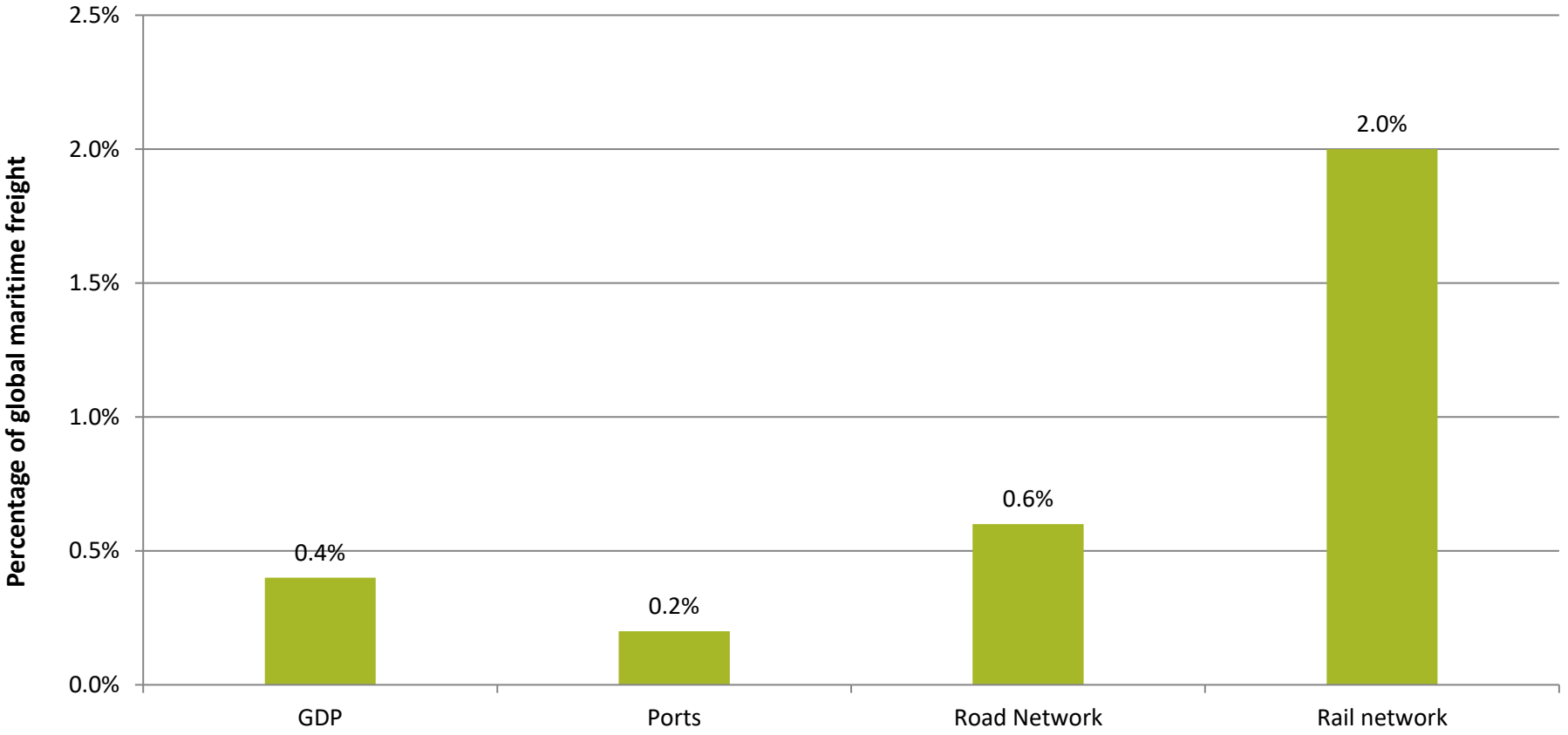
With a huge tonkilometer demand



Source: In 2004 the world produced about 49 000 Mt CO2 - equivalent of which South Africa emitted 440 Mt CO2 – equivalent roughly 1% -Scenario Building Team (SBT) 2007, Jones, T.Rodrigue, J.P., Gielen, D. – low calculation based on 2002 data / Comparison of Datamonitor 2009 (2008 data) and world GDP (2008) – high calculation

Global share of land mass, maritime freight and surface tonkilometres required to keep the economy going is larger than the share of global GDP

And a sufficient transport network



Source: Worldportsource.com. n.d [Online]. Available: http://www.worldportsource.com/countries.php [2018, June 20]. ; Logistics Barometer South Africa 2015

But large problems. Relative port numberse lower, but ports are well distributed and connected, however inefficient. Some rail infrastructure, rural and district roads are in a poor condition. Spatial connection of the elements through intermodal hubs, economic zones and freight villages are practically non-existent.

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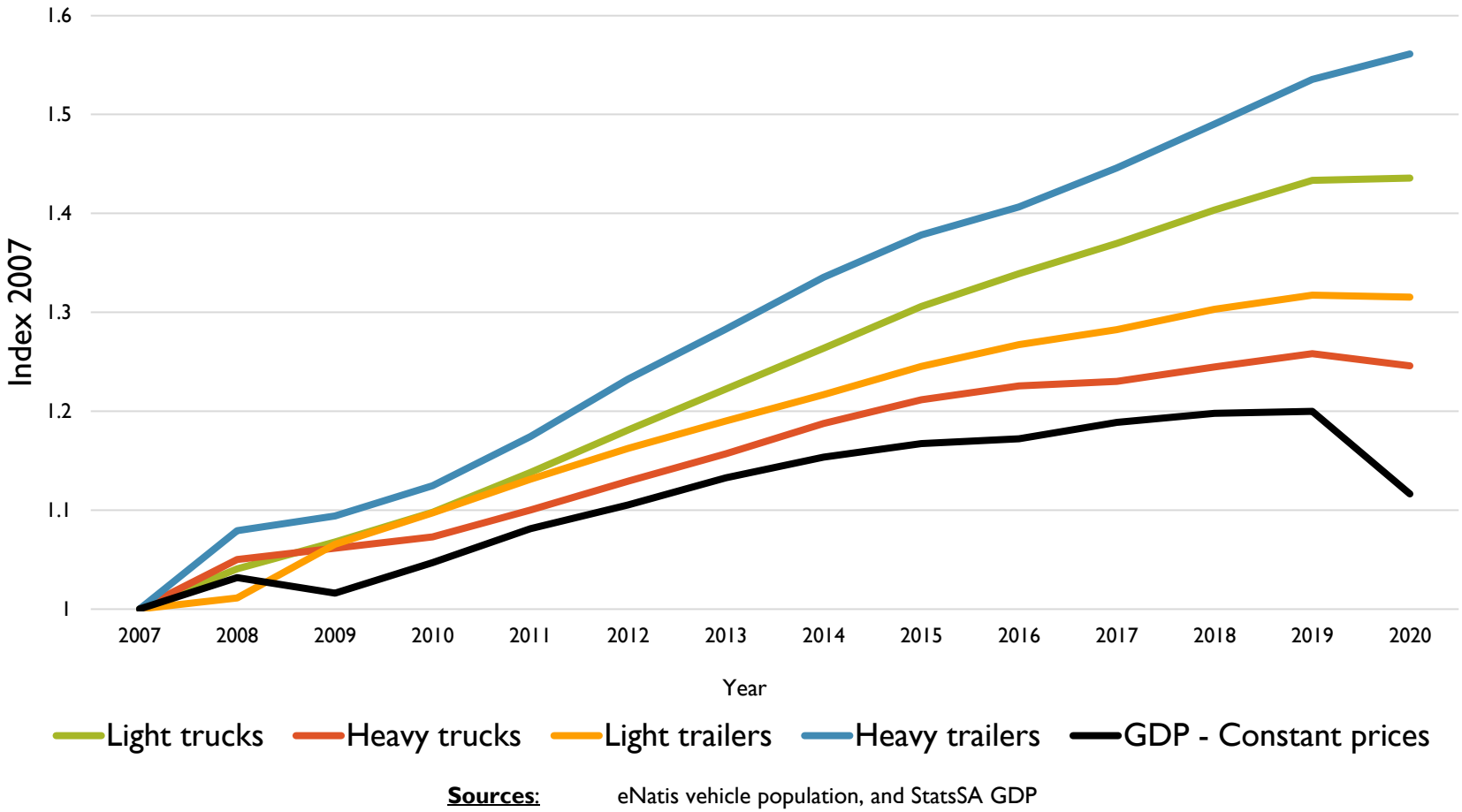
South Africa invested heavily in road transport relative to GDP growth, with fast heavy trailer growth

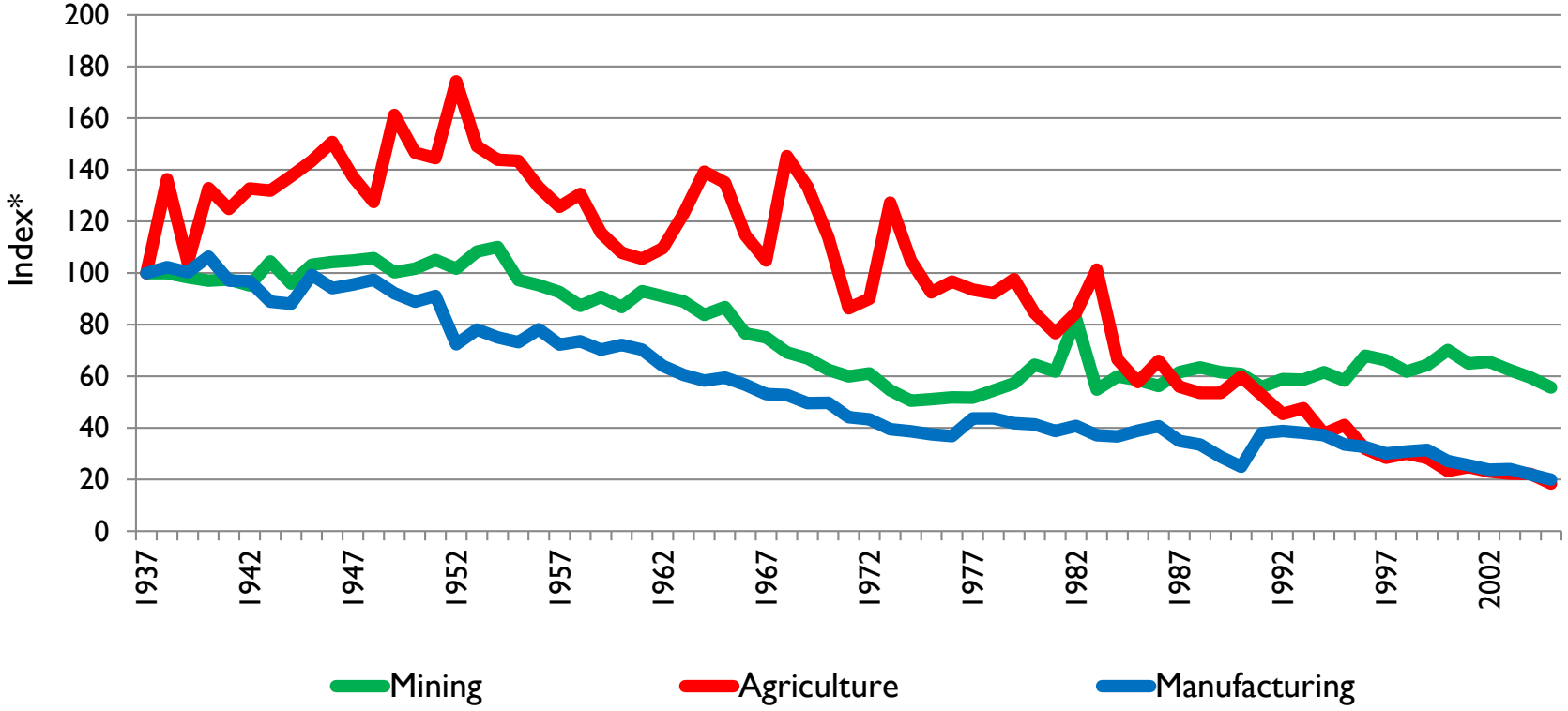


Sources: eNatis vehicle population, and StatsSA GDP

Transporters use multiple trailers to increase depot turnaround time of horses

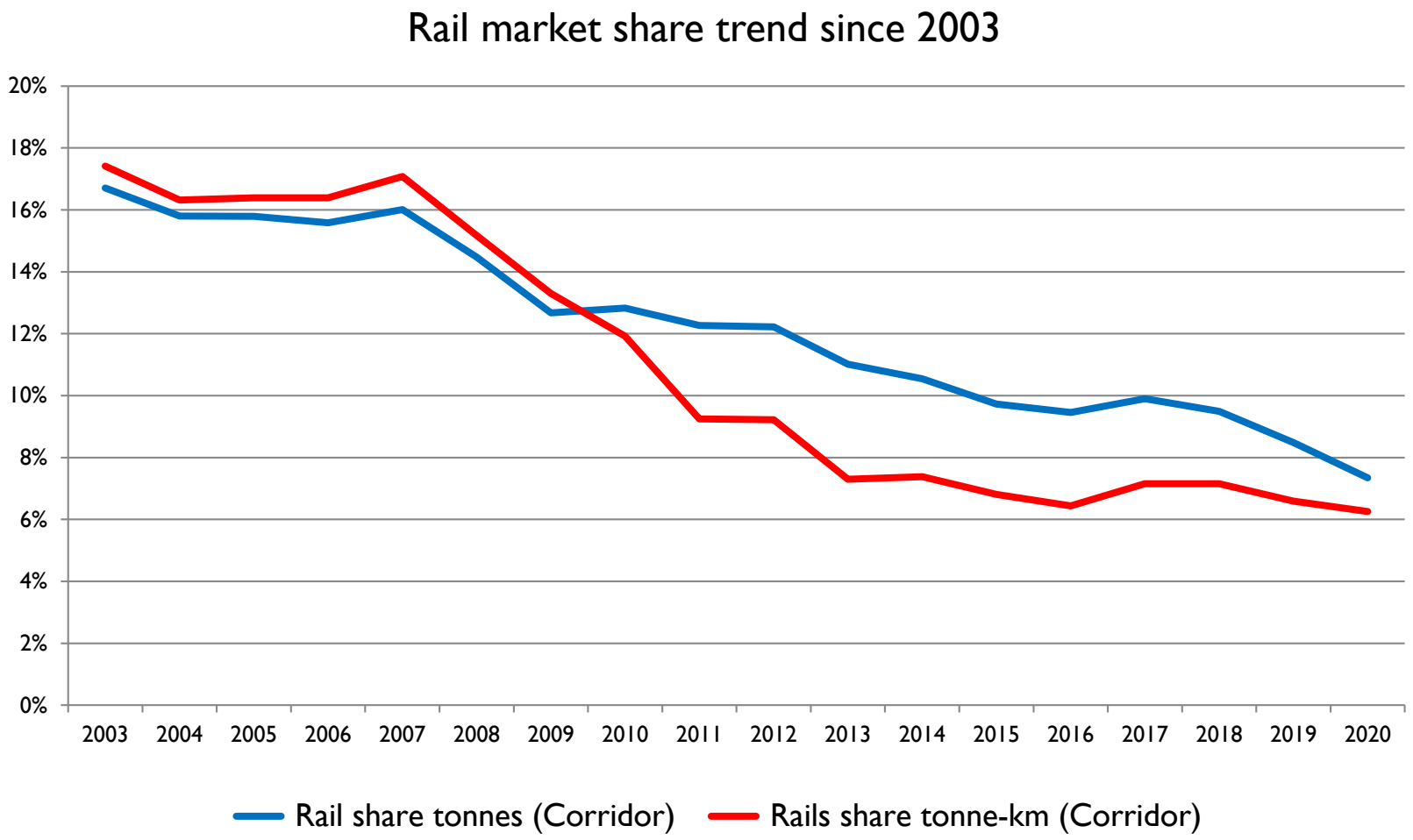
Rail market share declined since the early 20th century

- Transnet's transported tonnes to GDP decreased between 1937 and 2007:
  - Mining: -40%
  - Agricultural & manufacturing: -80%



*Indexed correlation of the relationship between rail transport and physical production in the economy

Renaissance in the beginning of the second millennial decade was short-lived



Source: GAIN Freight Demand Model

Rail market share discussions must be refined

Calculation base	2019 Totals	2011 Rail market share	2019 Rail market share
Supply/demand all prod (million tonnes)	838	25%	25%
Tonnes shipped (million tonnes)	1 587	23%	16%
Tonne-km (billions)	384	35%	37%
Tonne-km excl. all export mining (billions)	170	11%	10%
Outsourced income (Rand millions)	148 742	31%	27%
GFB corridor freight (million tonnes)	241	19%	11%
Palletized long-distance (million tonnes)	53	2%	1%

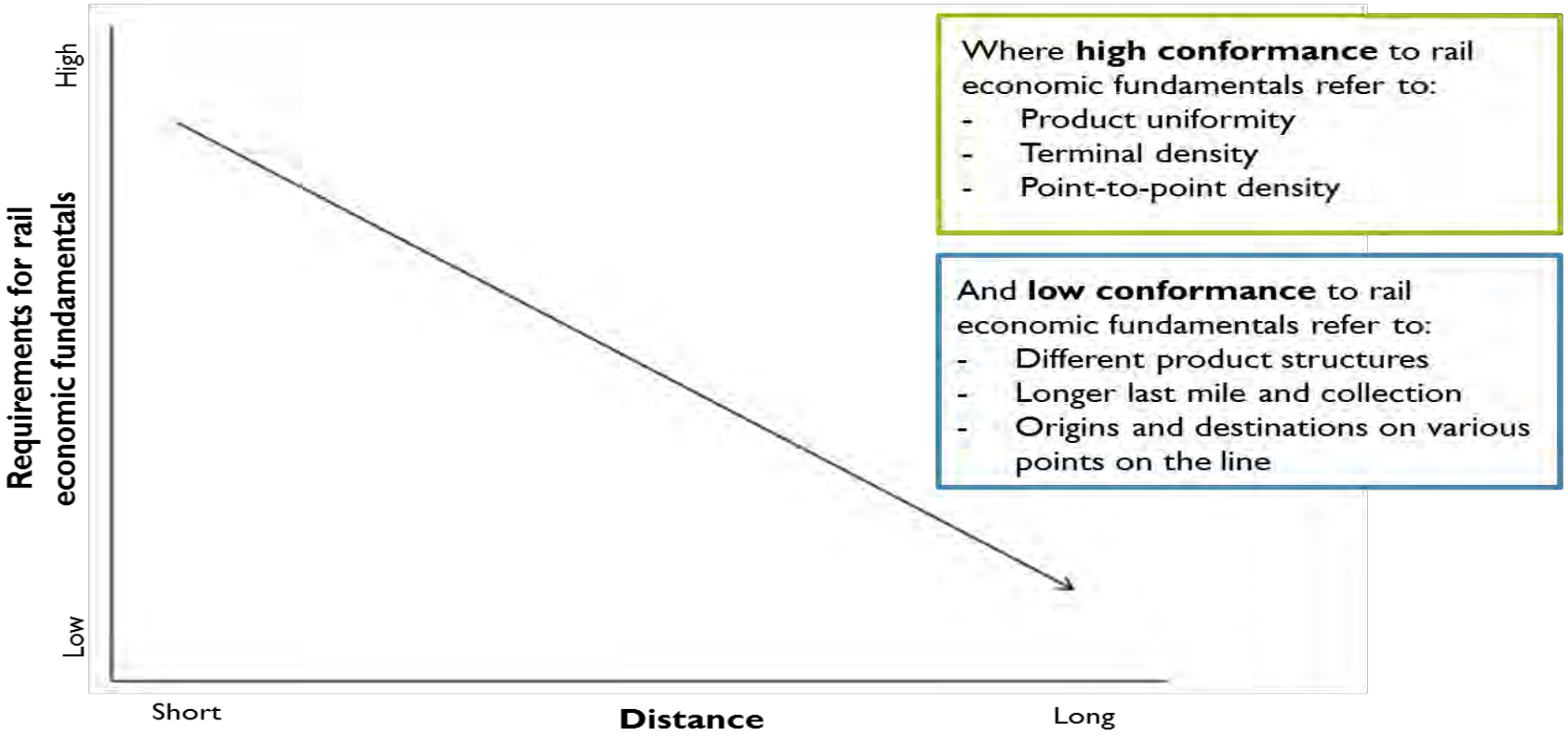
Source: GAIN South Africa Freight Demand Model™

Rail has 78% market share of rail-friendly freight tonne-km, and 65% of rail-friendly tonnes

Rail market share discussions must be refined

- Rail market share should be calculated based on servicing ***rail-friendly freight***
- Rail-friendly freight is determined by:
  - Density of terminals
  - Density of lines
  - Uniformity of commodity/product
  - Distance (if all the above are met, rail can also provide services over shorter distances)
- Value trade-offs are between the cost of time vs. the lifecycle cost of transport – it is not true that rail is not suitable for any high value freight

There is a trade off between distance and other rail economic fundamentals



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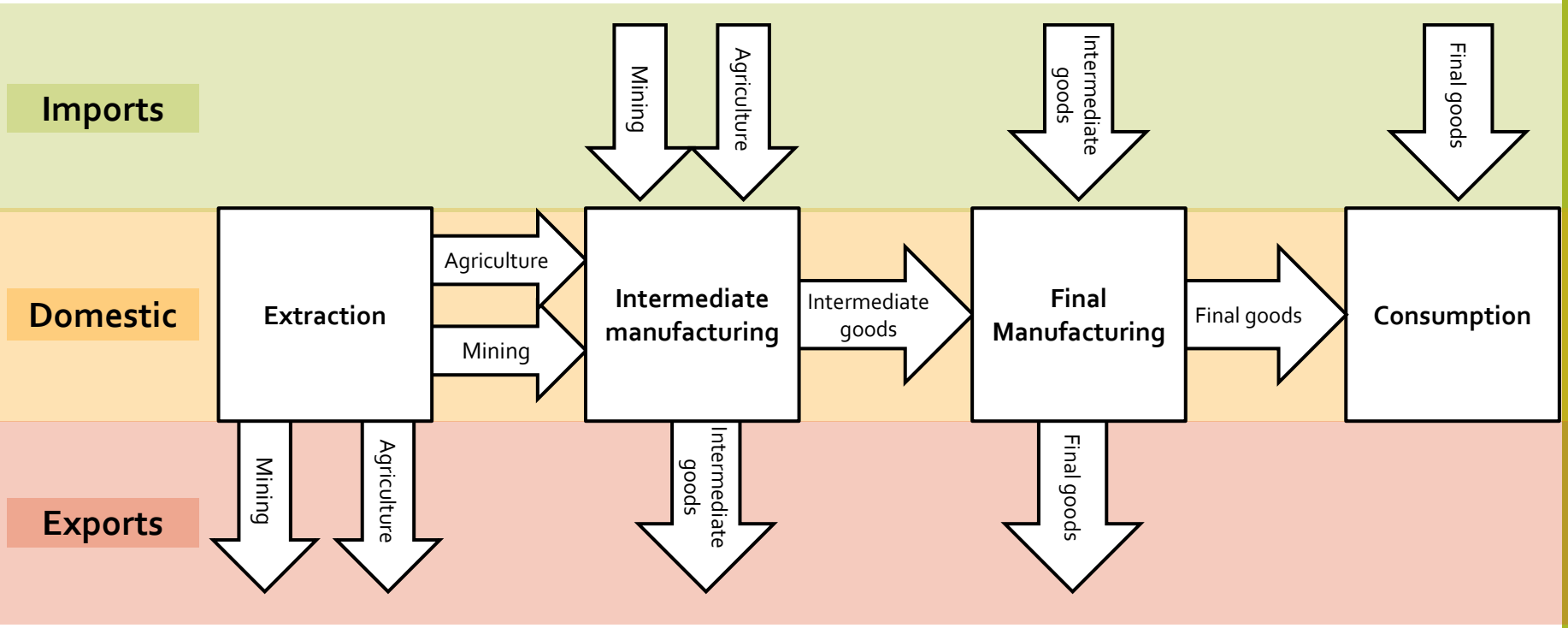
Freight-flow segmentation is informed by the basic supply chain structure of an economy

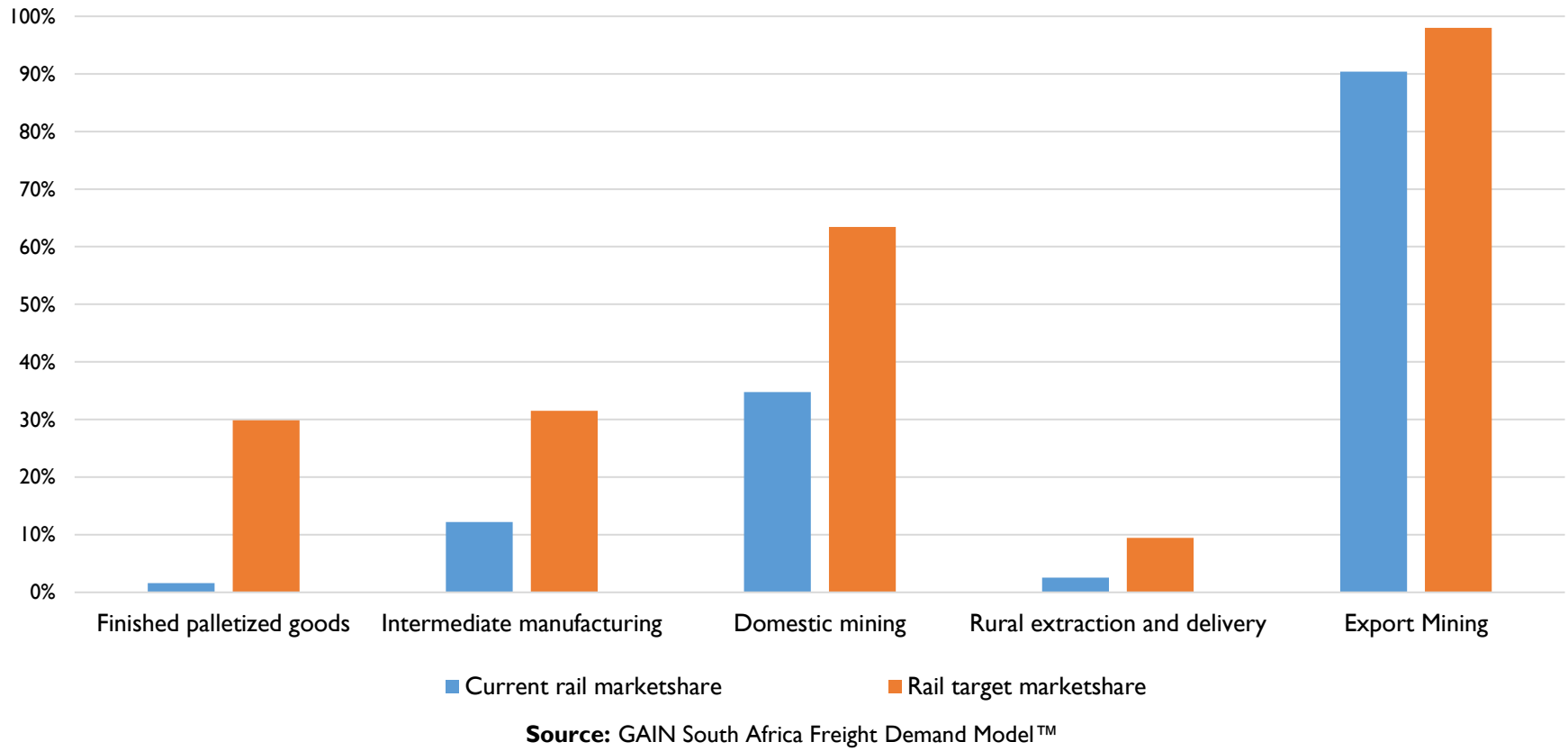


This results in five overarching freight typologies which can inform modal shift opportunities

Typology	Description
Rural extraction and delivery	The flow of agricultural bulk from rural areas and delivery of consumer goods to these areas
Large volume export mining flows	Exports of coal, iron ore and manganese
Domestic mining flows	Movement of local minerals to domestic beneficiation centres
Intermediate manufacturing flows (siding to siding)	Flow of semi-beneficiated commodities between intermediate and final processing facilities
Finished palletised goods	The flow of FMCG commodities of higher value between manufacturing facilities, distribution centres and retailers

"Ring-fenced" flows such as bulk liquid buoys and pipelines and conveyor belts are excluded from this analysis

The biggest market share gap is in palletised freight



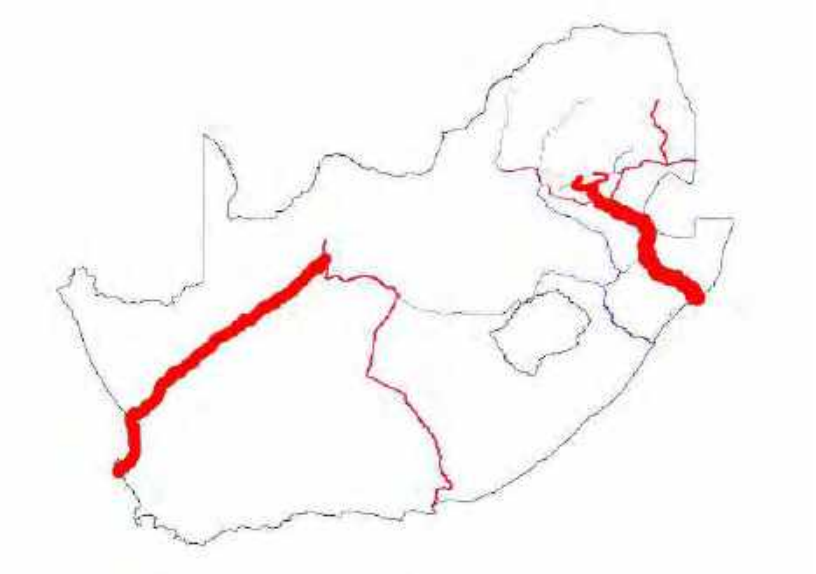
Source: GAIN South Africa Freight Demand Model™

The aggregate of this is that rail has 78% market share of rail-friendly freight tonne-km, and 65% of rail-friendly tonnes

The rail task for bulk export minerals is more than 90% fulfilled

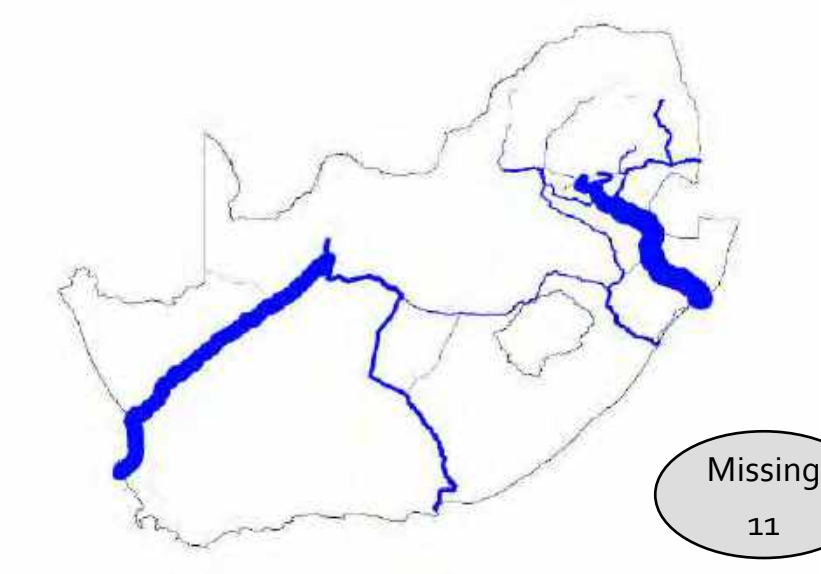
Today

(What it is and what it should be)



2050

(What it should be)



Missing 11

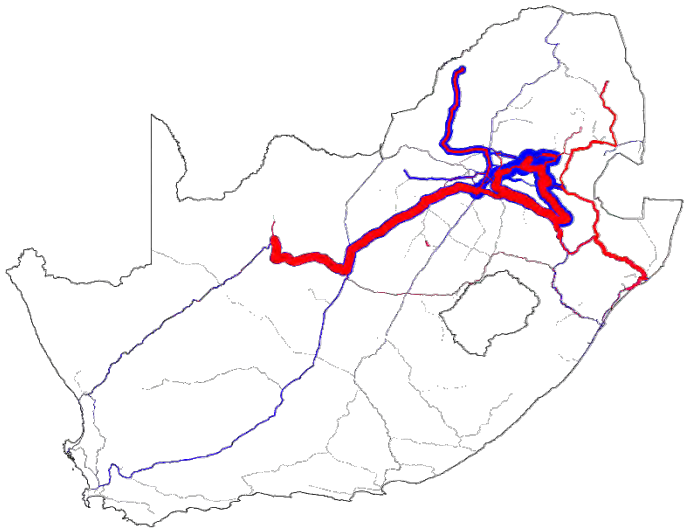
Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 123 billion should be 134 billion tonne-km and should reach 199 billion tonne-km by 2050

The gap in the transport of domestic minerals is mostly around the coal fields

Today

(What it is and what it should be)



2050

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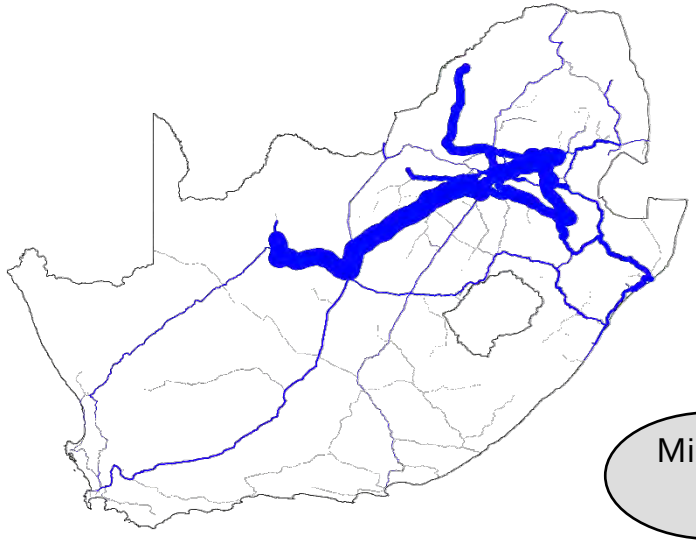


Missing 9

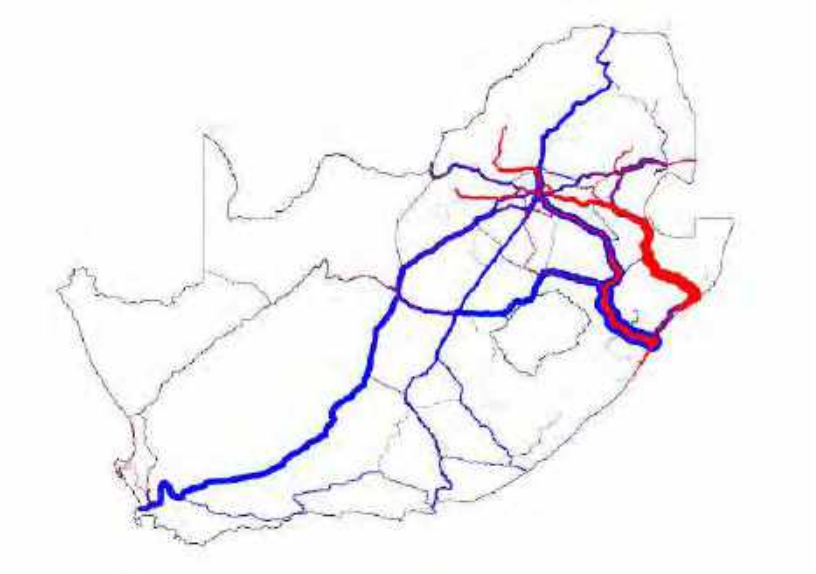
Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 11 billion should be 20 billion tonne-km and should reach 26 billion tonne-km by 2050

Rail's intermediate manufacturing gap (siding-to-siding) is prominent

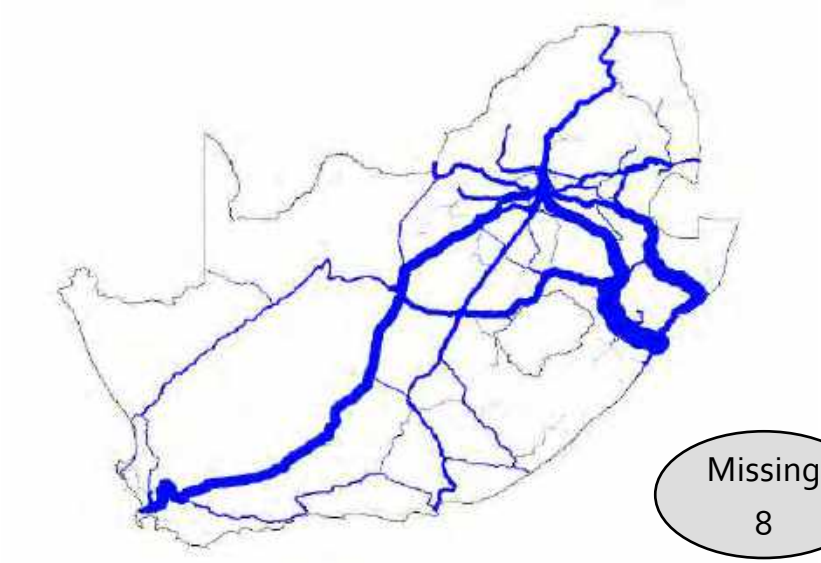
Today

(What it is and what it should be)



2050

(What it should be)



Missing 8

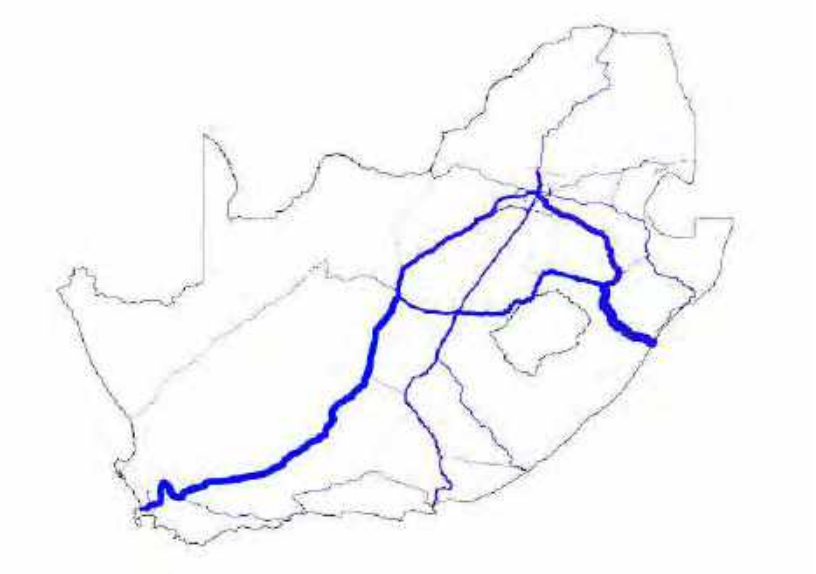
Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 4.5 billion should be 12 billion tonne-km and should reach 17 billion tonne-km by 2050

The absence of domestic intermodal solutions is stark against long-distance, high-density flows

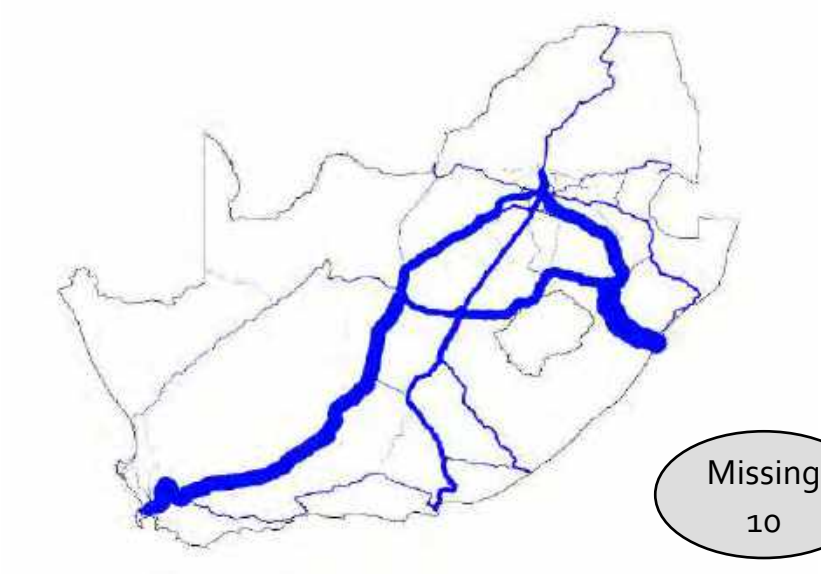
Today

(What it is and what it should be)



2050

(What it should be)



Missing 10

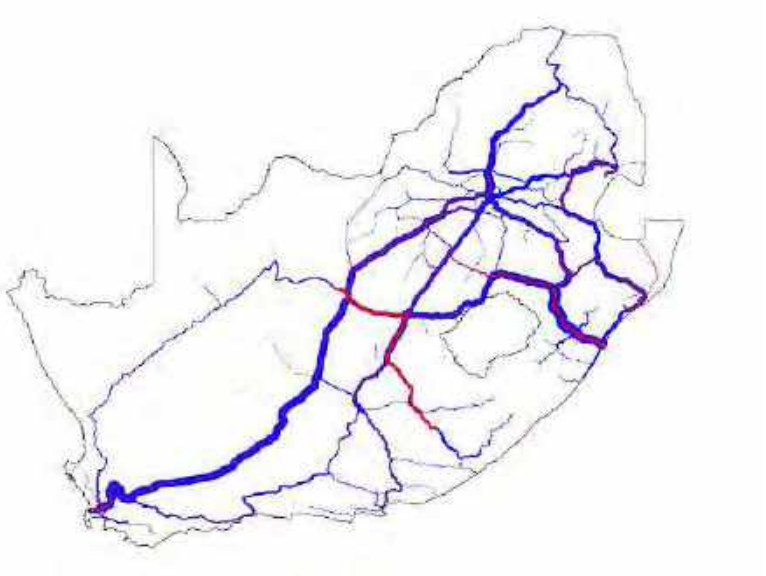
Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 0.5 billion should be 10 billion tonne-km and should reach 22 billion tonne-km by 2050

Some rural freight could be served rail with the correct business model decisions

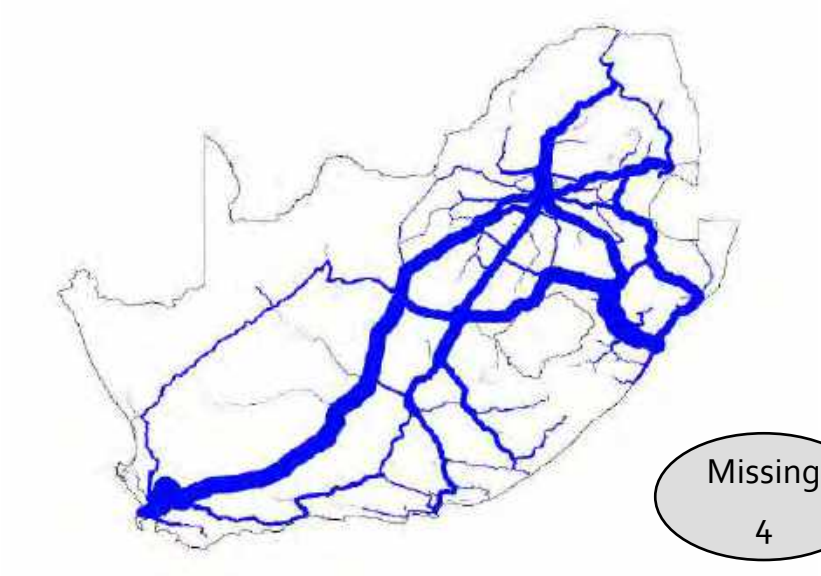
Today

(What it is and what it should be)



2050

(What it should be)



Missing 4

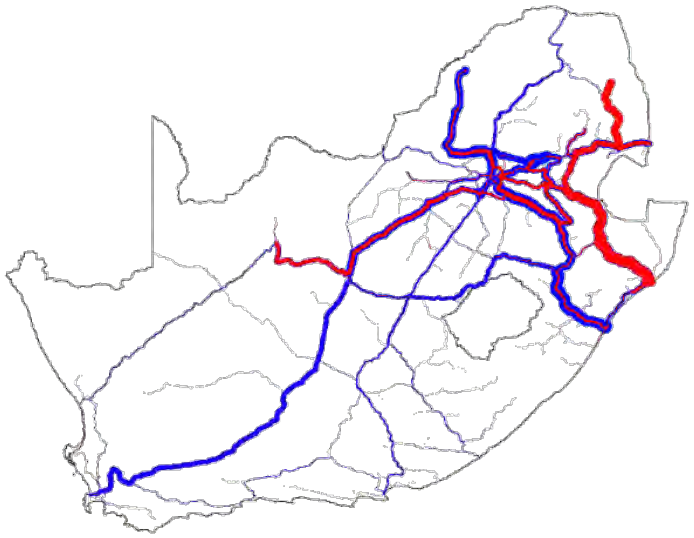
Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 1.6 billion should be 6 billion tonne-km and should reach 12 billion tonne-km by 2050

GFB performance is less than half of what it should be and must quadruple by 2050

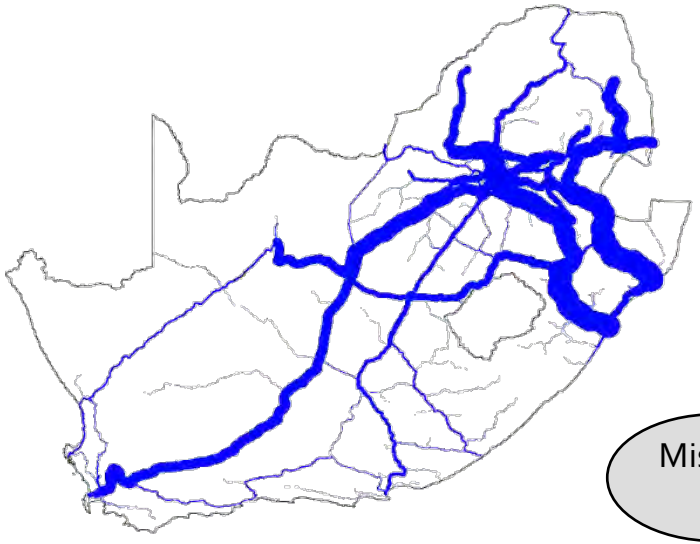
Today

(What it is and what it should be)



2050

(What it should be)



Missing 31

Source: GAIN South Africa Freight Demand Model™

Current tonne-km of 18 billion should be 47 billion tonne-km and should reach 77 billion tonne-km by 2050

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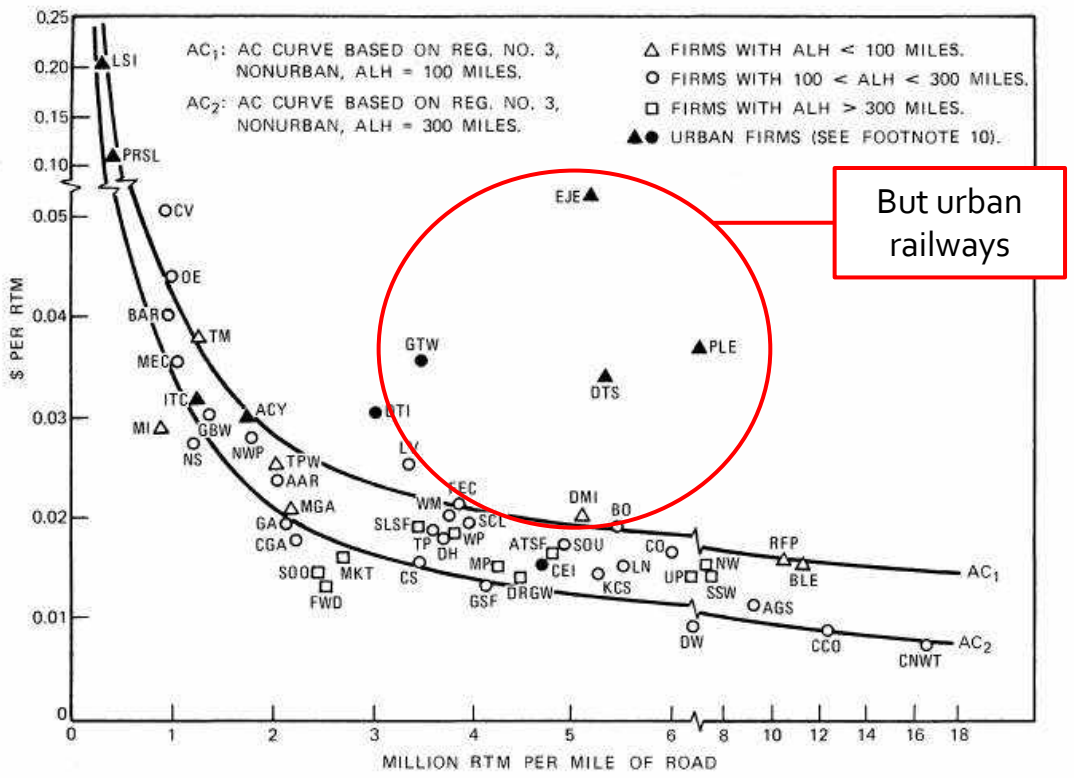
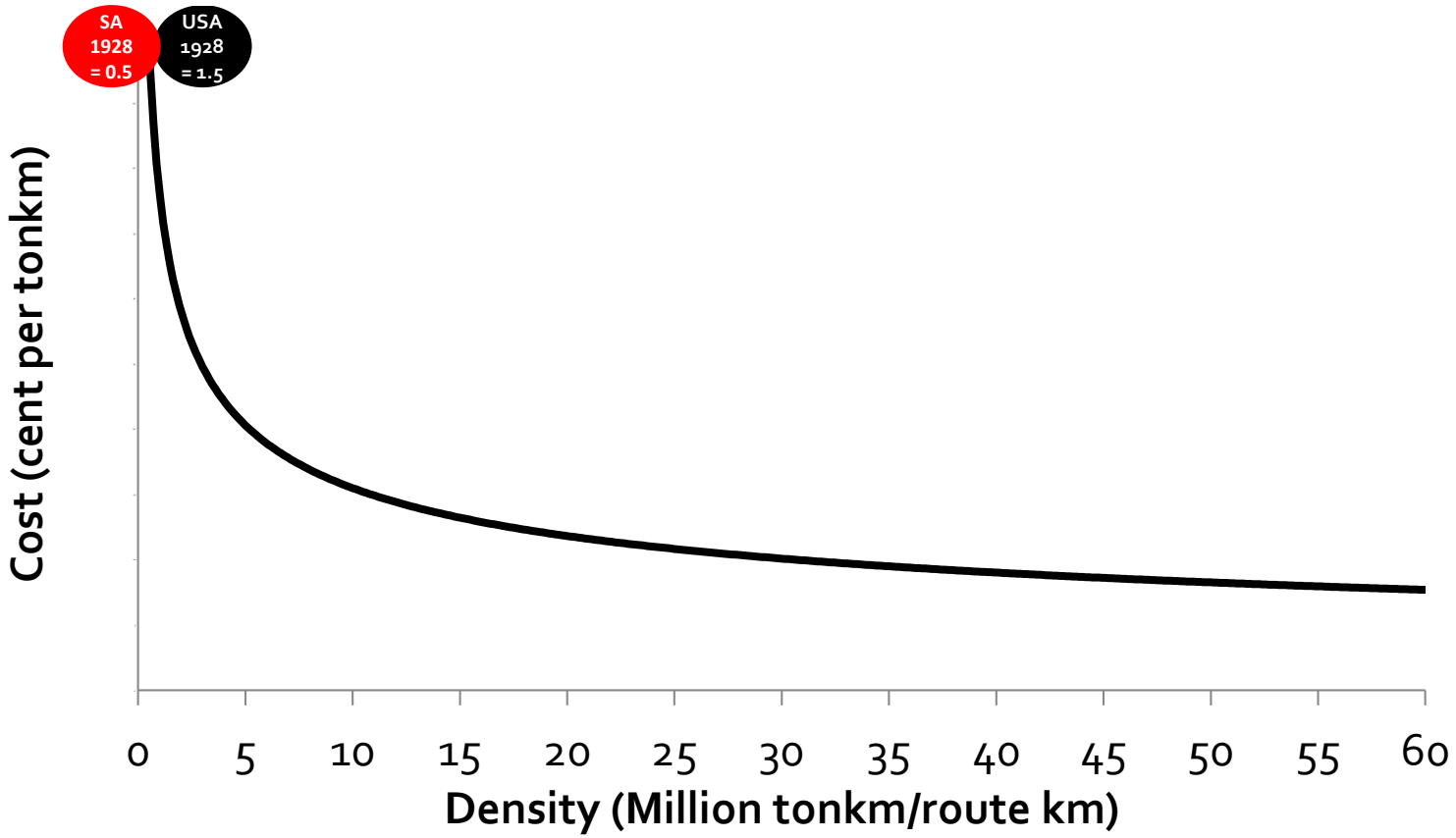
Rail density is the most important success indicator: Harris' seminal curve

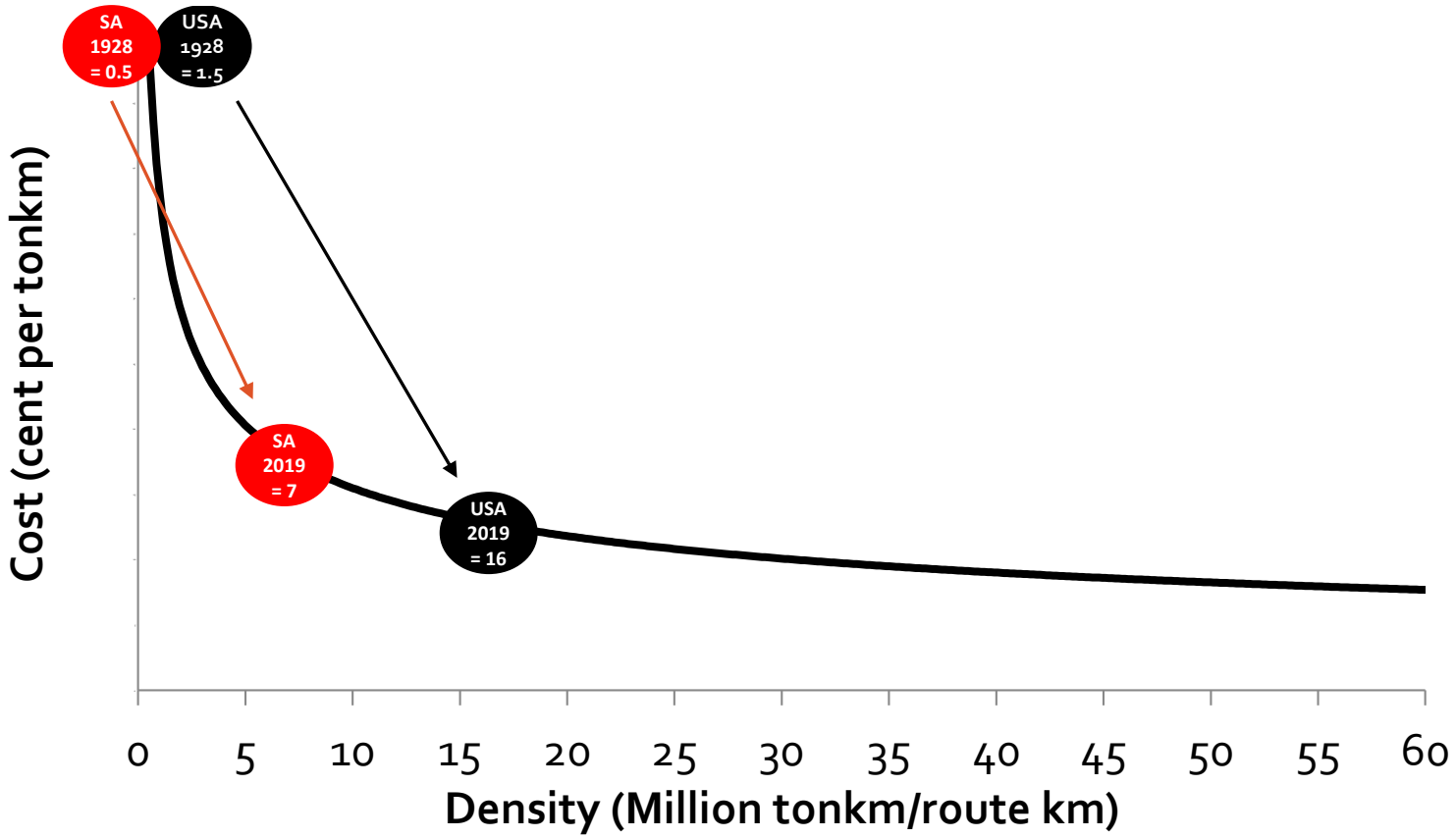


Source: Harris R.G. 1977. Economies of Traffic Density in the Rail Freight Industry, The Bell Journal of Economics

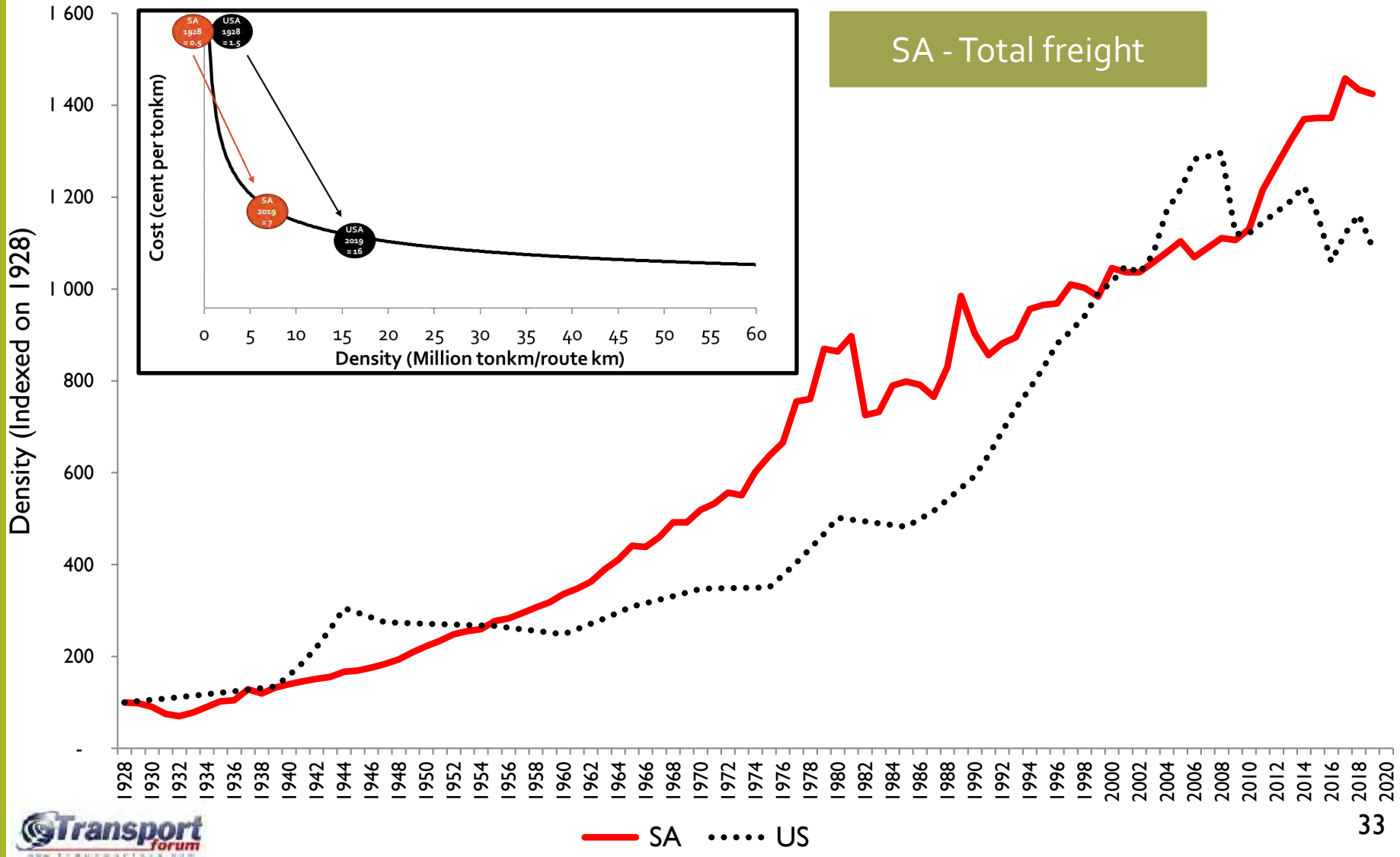
South Africa and USA rail density – 1928



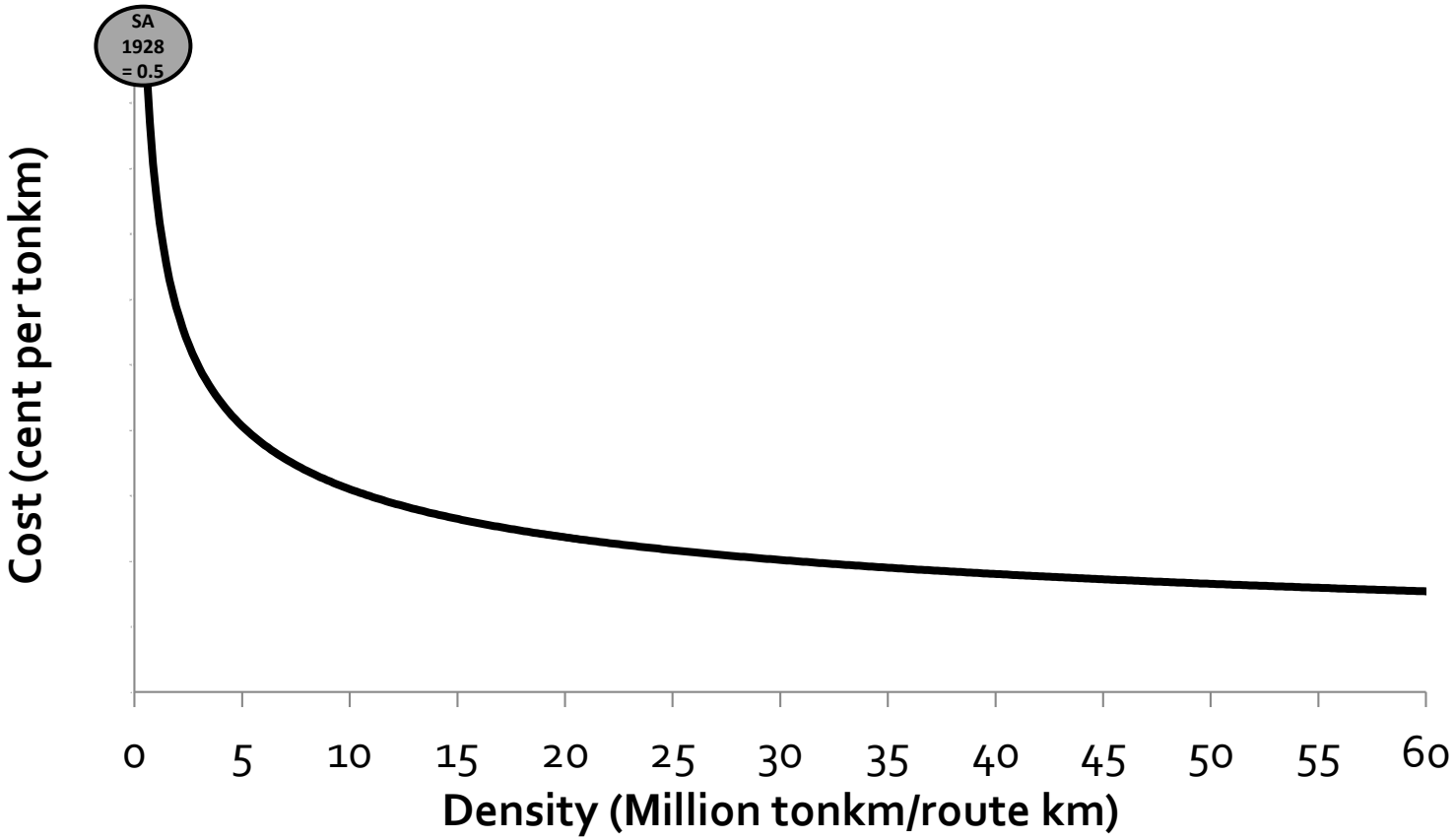
South Africa and USA rail density – 1928 and 2019: Great South African performance



South Africa's 'density index' for total rail freight indeed compares well



But simple segmentation suggest otherwise



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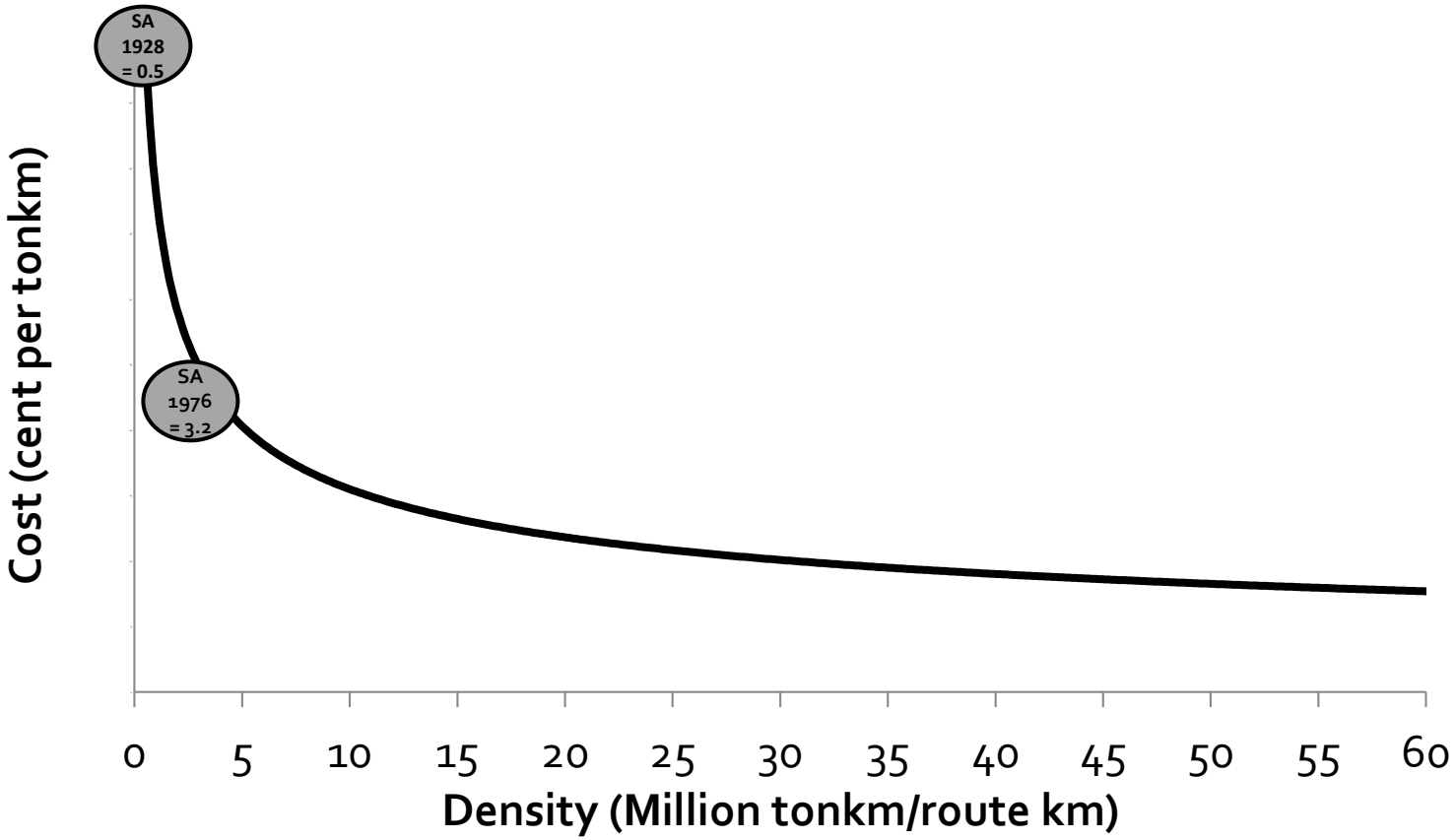

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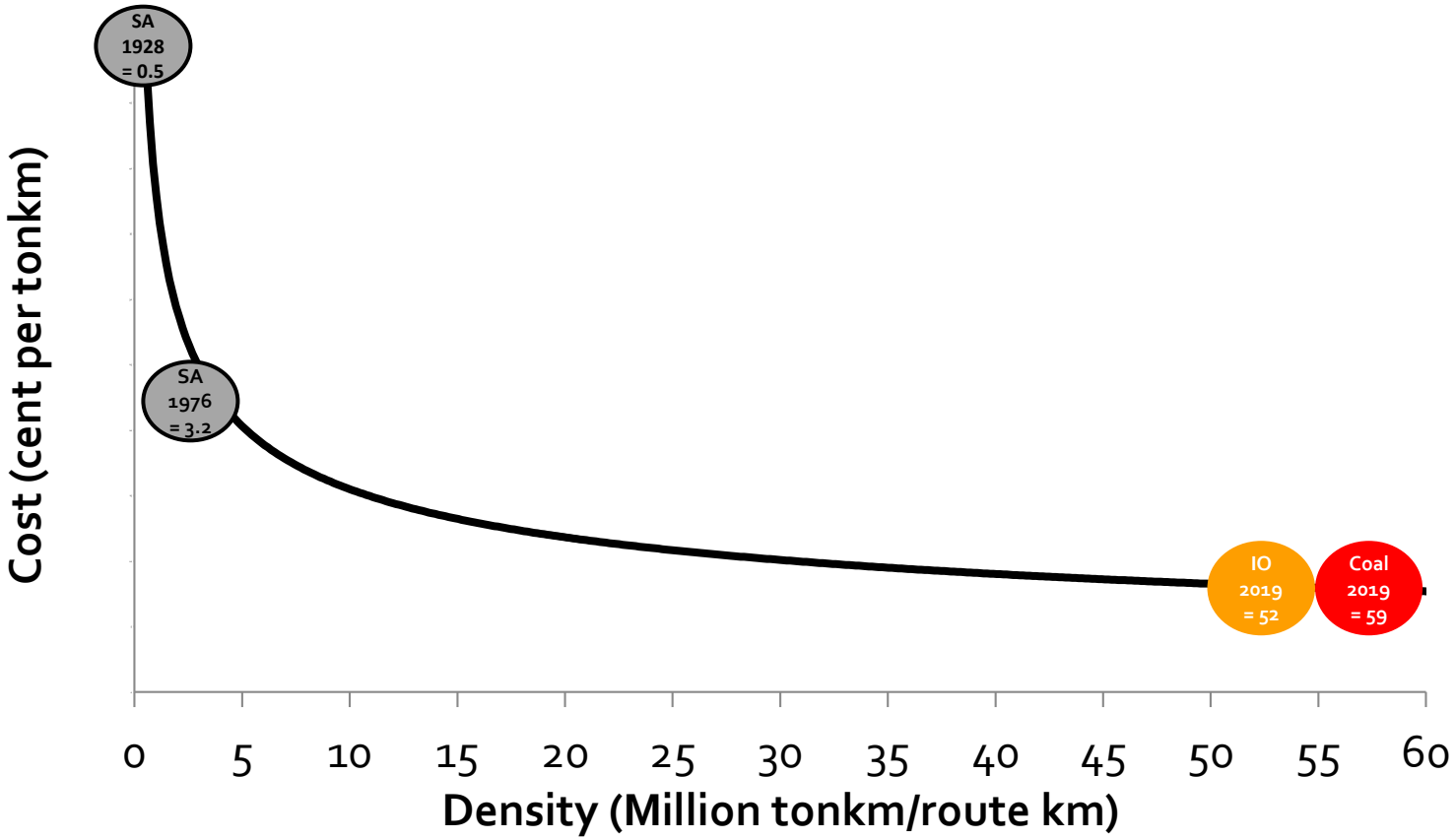

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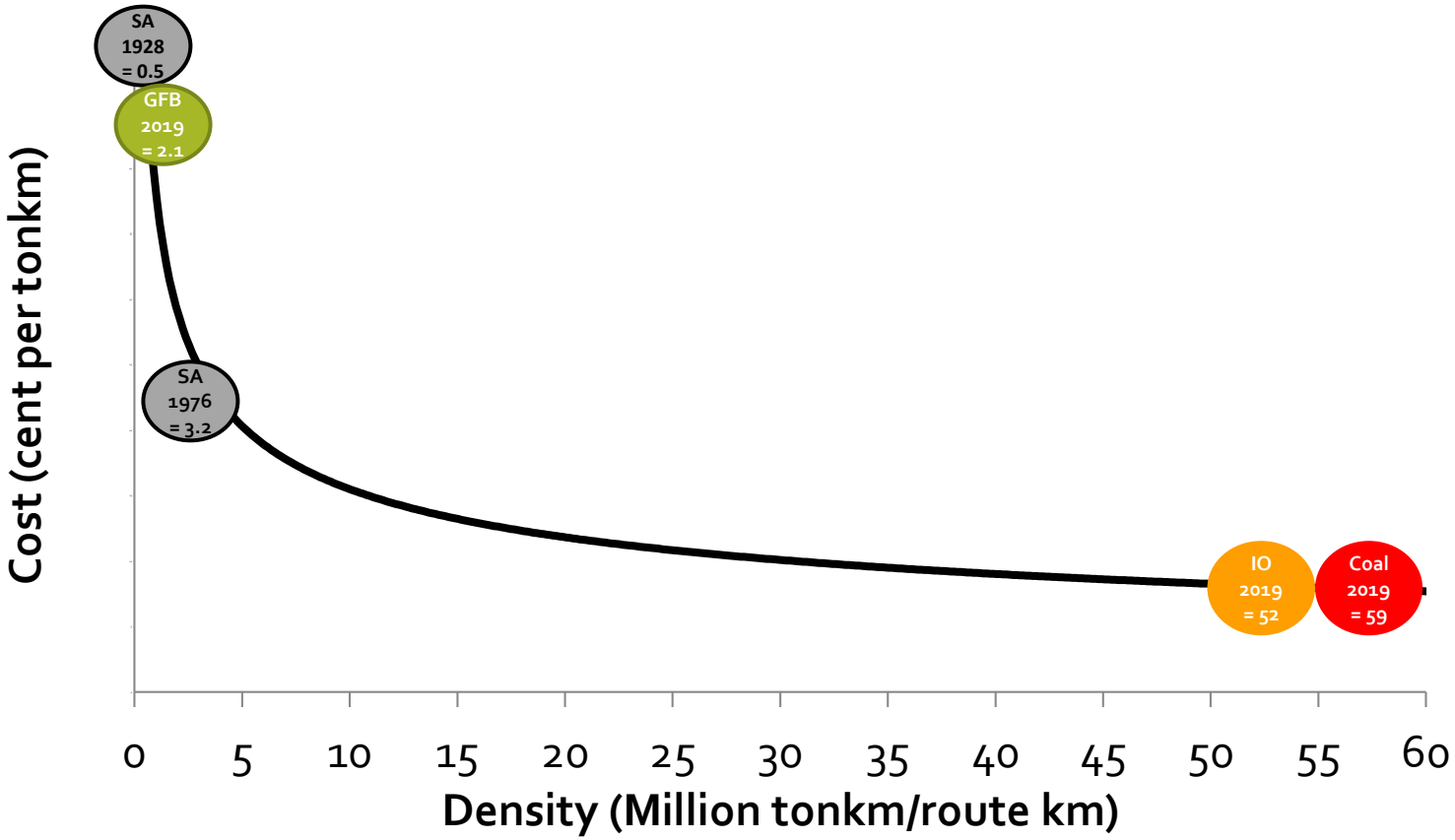
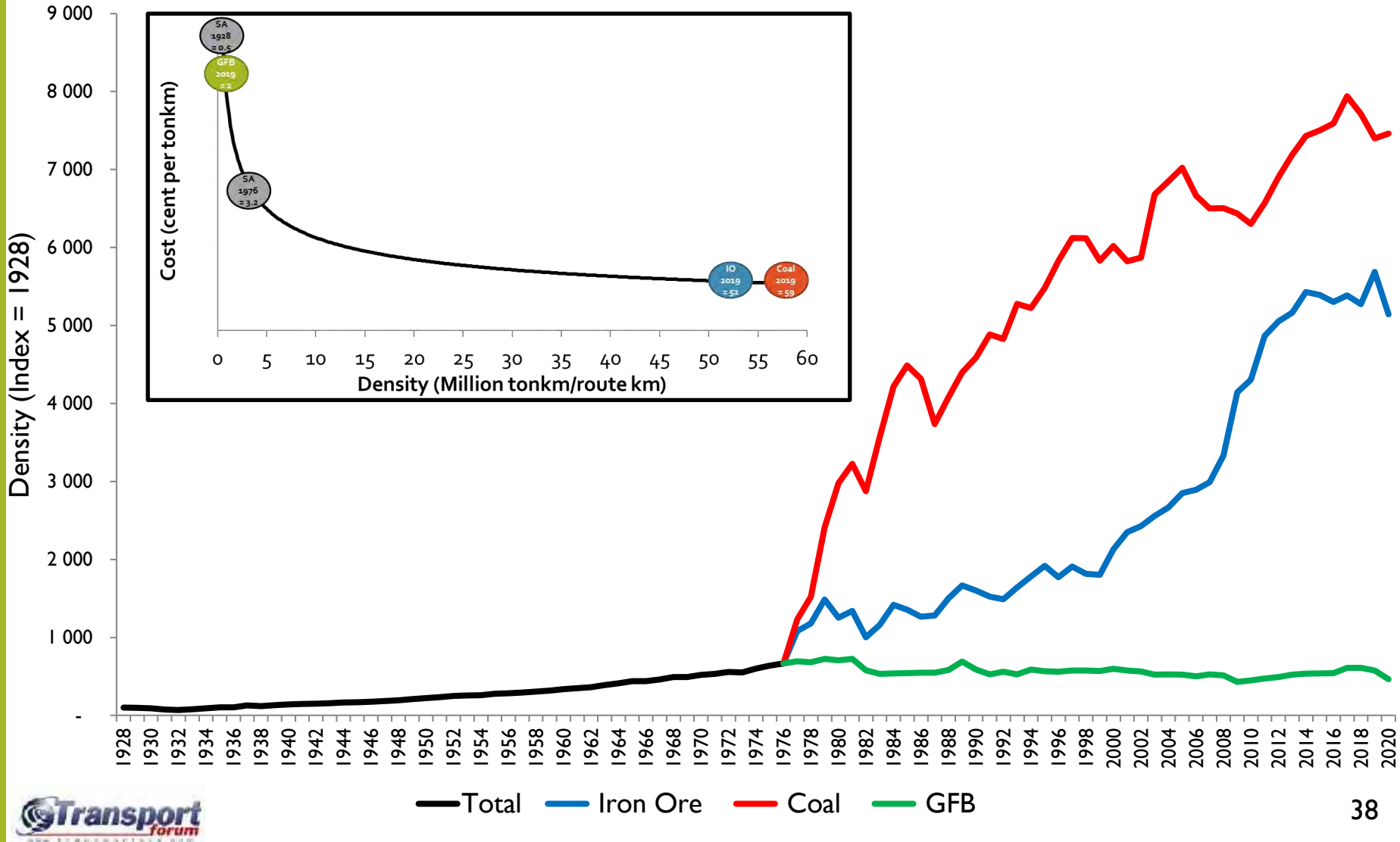
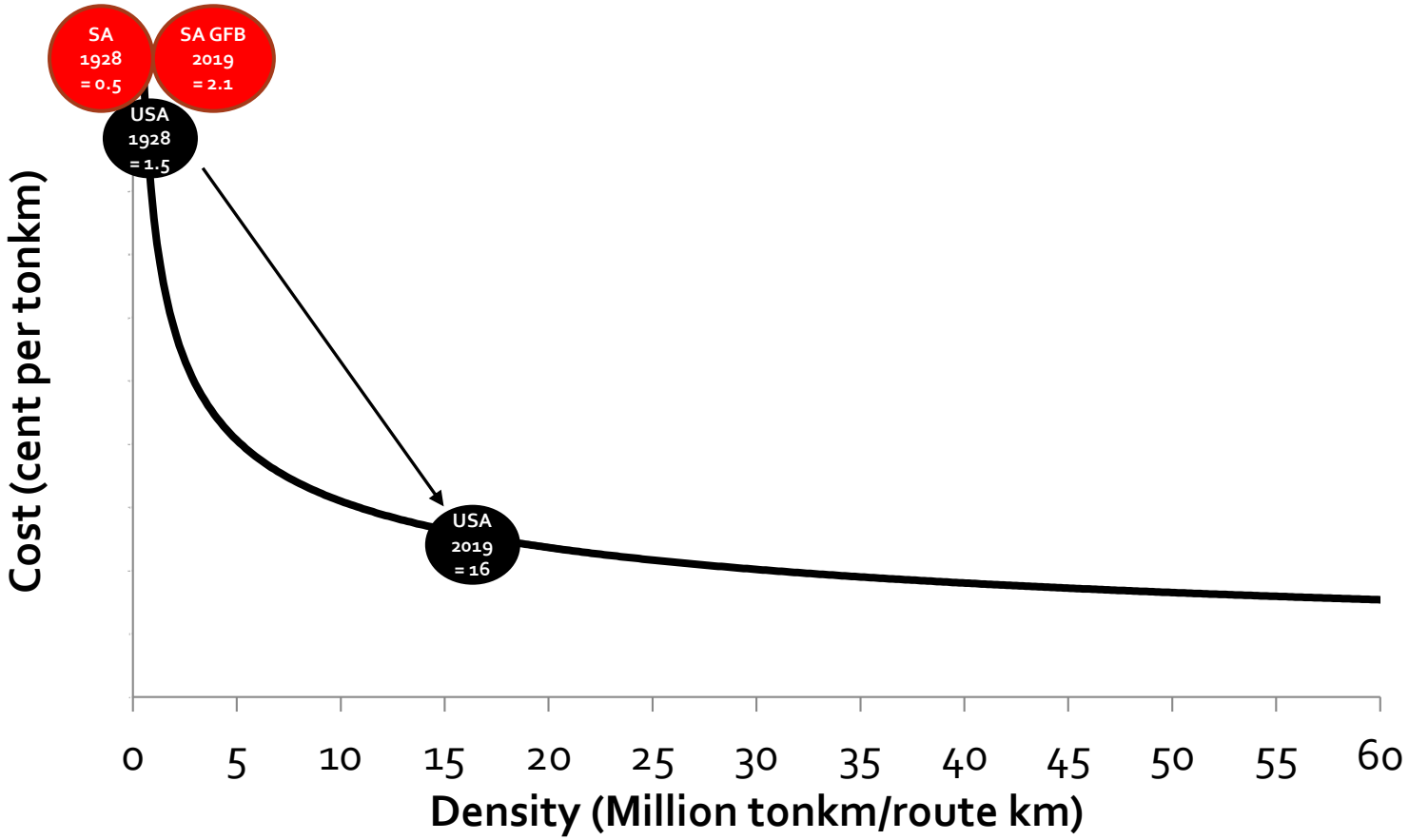


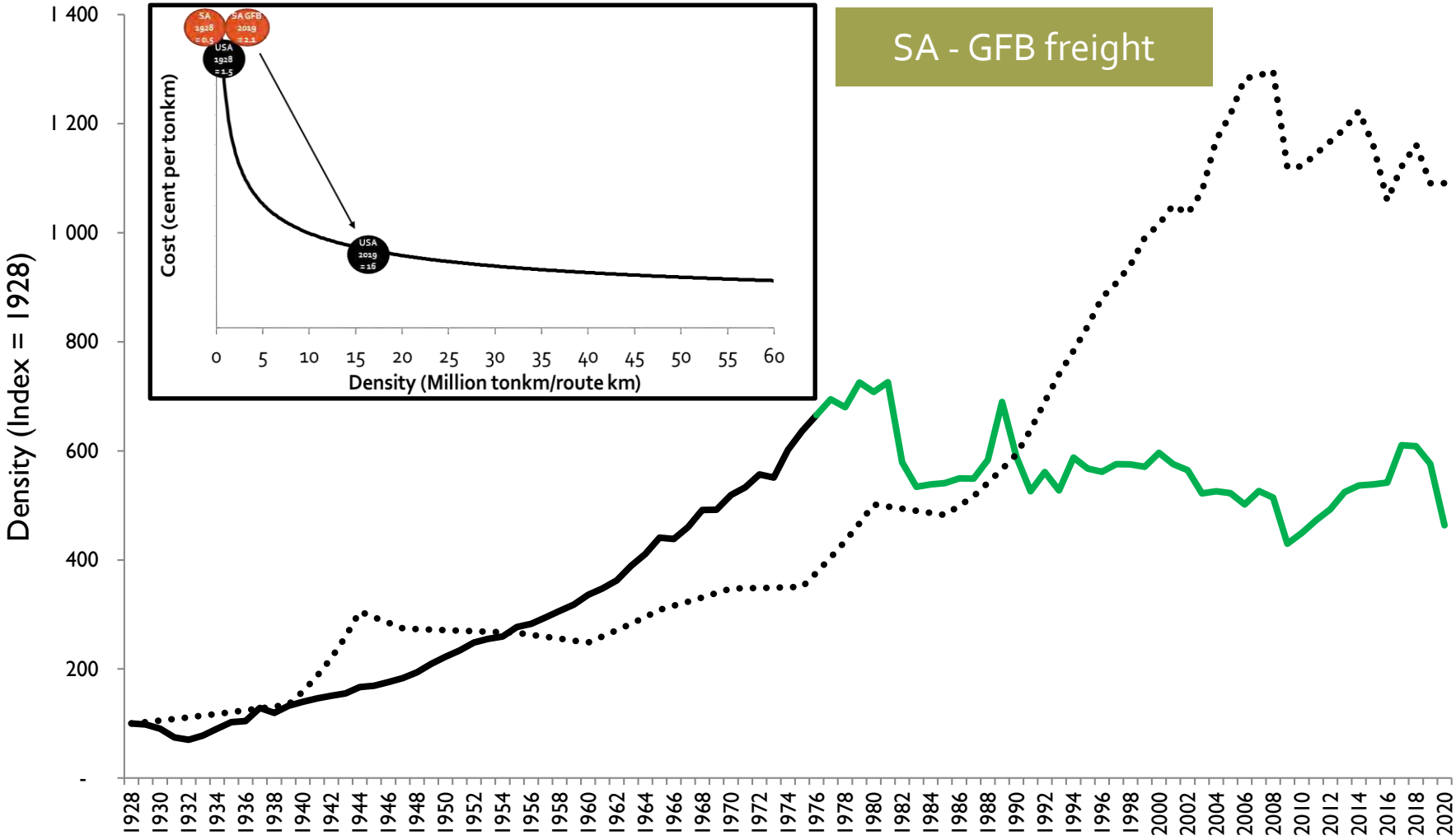
Segmented rail density index development confirm that rail density is driven by the export lines



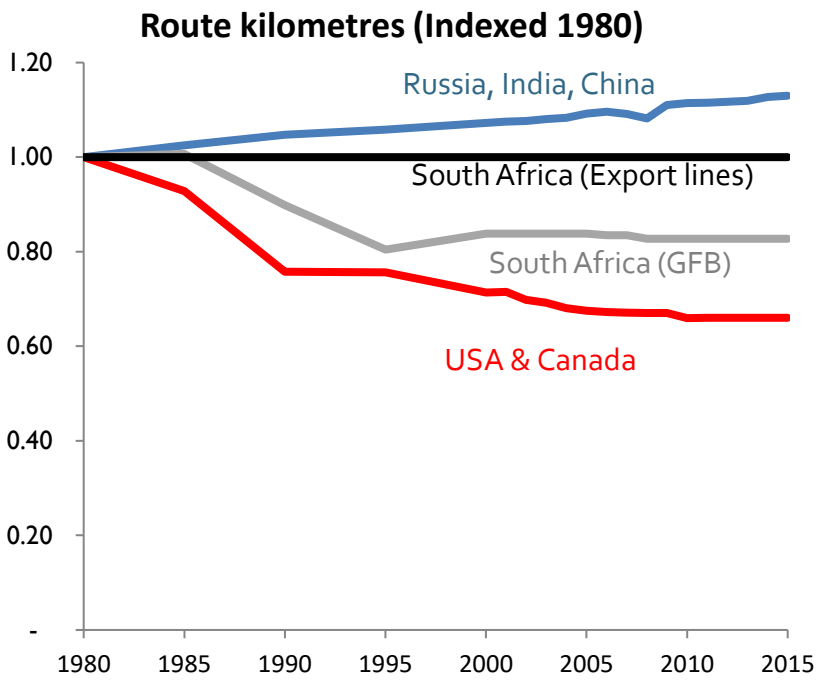
South Africa and USA rail density – 1928 and 2019 - for GFB only looks dismal

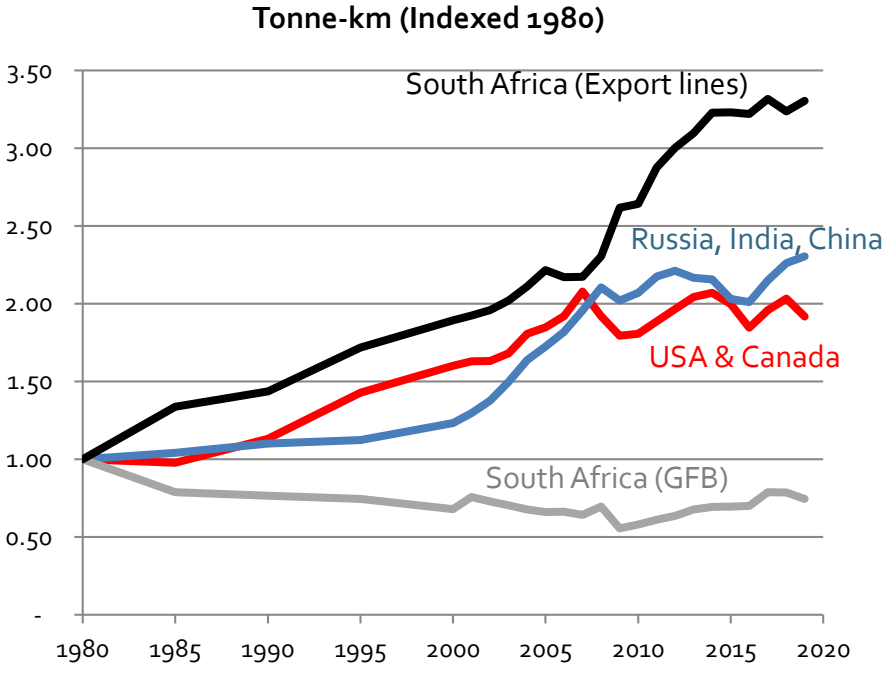


The density gap for GFB is enormous



North American railways-based success on densification, rationalising route-km; the RIC railways on expansion (development-state driven)





Source: analysis by GAIN Group : using South Africa Freight Demand Model™ and UIC data

Countries in these comparisons have 93% of global rail tonne-km

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Private sector feedback

- Despondency is palpable
- The gap is a supply gap
- Informed respondents understand vandalism effect
- There are no expectations from regulation or the DoT
- Lack of stewardship caused by personnel "moving around"
- ***Despite all this, freight owners stated their intent to use rail***
- ***And LSP's stated their intent to collaborate***

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- Narrative of the current crisis
- Proposed strategy

Political and external factors play a large role

- From development-state goal to political interference
- Cross-subsidisation
    - High-value to low-value freight
    - Export lines to GFB
- Failure to enforce road transport quality system
- Failure to create heavy and domestic intermodal solutions
- Failure to focus on corridors
- Unbalanced rationalisation (fleet/people vs. network)
- Removal of the "institutional memory" of the challenge

Freight

- Transport policy evolution
- Methodology
- Freight demand
- Freight supply
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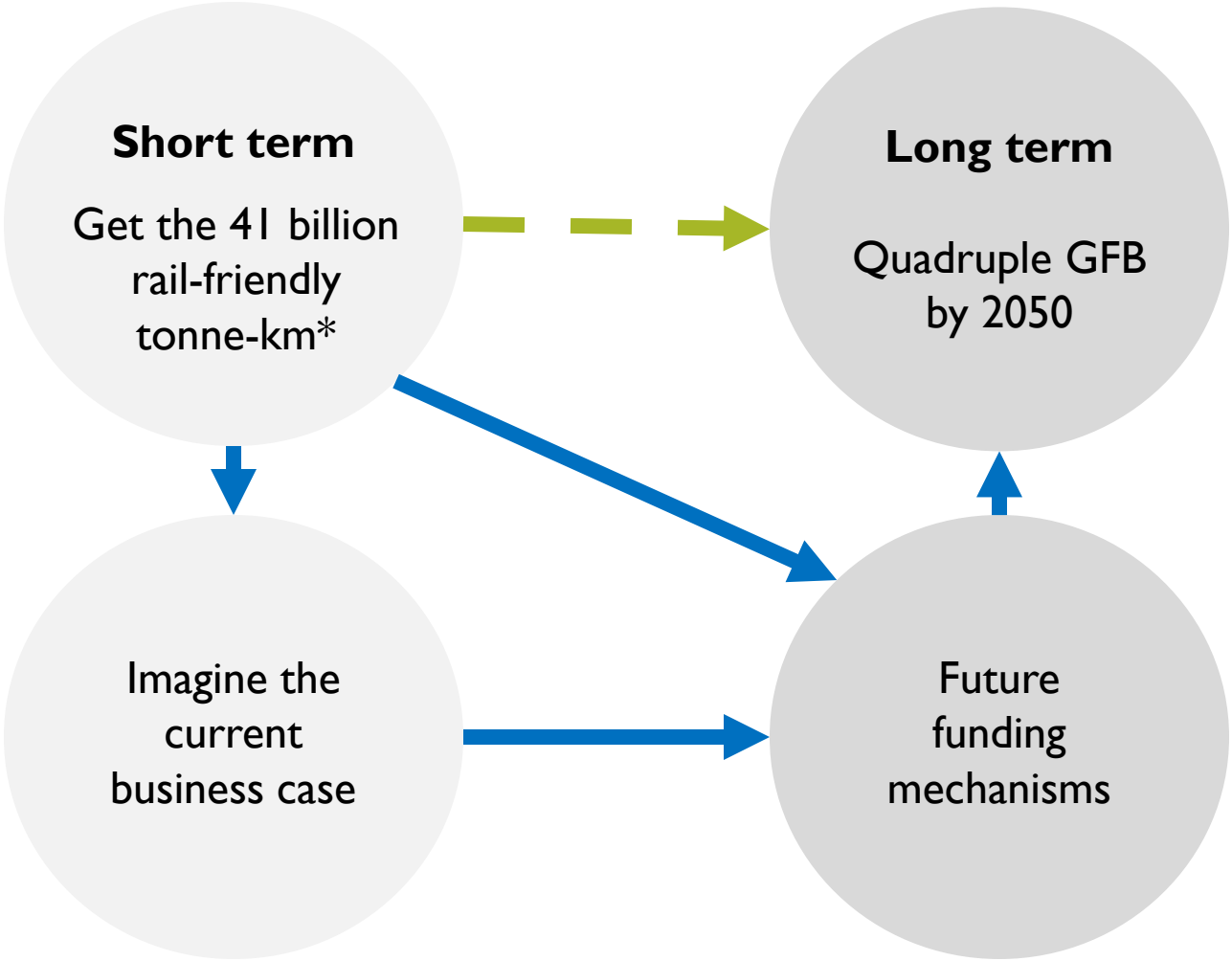
Key strategic objectives can be considered short and long term



*11 billion tonne-km export minerals and 30 billion tonne-km general freight

Freight

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- Proposed strategy: Short-term objective

The income statement impact is sizeable

- 11 billion tonne-km export minerals = R 3 billion at current tariffs
- 30 billion tonne-km general freight = R 18 billion at current tariffs
  - Assuming 20% discount on half of additional general freight = R 16 billion additional income
- Additional export minerals + general freight = increased revenue of **R 19 billion**
- Additional costs consider returns to density:
  - Even at current cost structure, given 20% loss assumption, but 70% returns to density = **R 7 billion** additional costs
- Net positive business case **R 12 billion** – requires 3 strategies to realise:
  - Invest
  - Improve asset utilisation – remove operational constraints
  - Improve service levels, stewardship and product design

Investment could be a challenge – Shared ownership and investment in the 5 segments?

- Export and domestic mining terminals are already privately owned – wagons?
- Intermediate manufacturing sidings are also privately owned – wagons?
  - Some sidings are municipal-owned - requires a solution
- Intermodal terminals could become privately owned – some new, (maybe private?) wagons required with hook-and-haul arrangements
- Subsidised concessions for low-density rural lines could be considered

The EMI approach is used to unpack the short term

External	The area that qualifies and controls the system (the contextual environment - the rules of the game)
Market	The area where the system as a whole competes for positioning and survival (the transactional environment - playing the game)
Internal	The aspects that are under the system's control (the business system - enabling the team)

The short-term focus is very specific

Internal

- Continuous and breakthrough improvement
- Better maintenance
- Security
- Improved signaling
- More loops
- Scheduling issues (drivers?)

Market

- Flow segmentation
- Expanded into sectors
- Wagon fleets and terminals are the customer face
- These make sure that released slots are filled

External

- Protect the railway's assets
- Then follows other steps

More operational slots → More filled slots → More protected slots

Freight

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- Freight supply
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- Benchmarking rail
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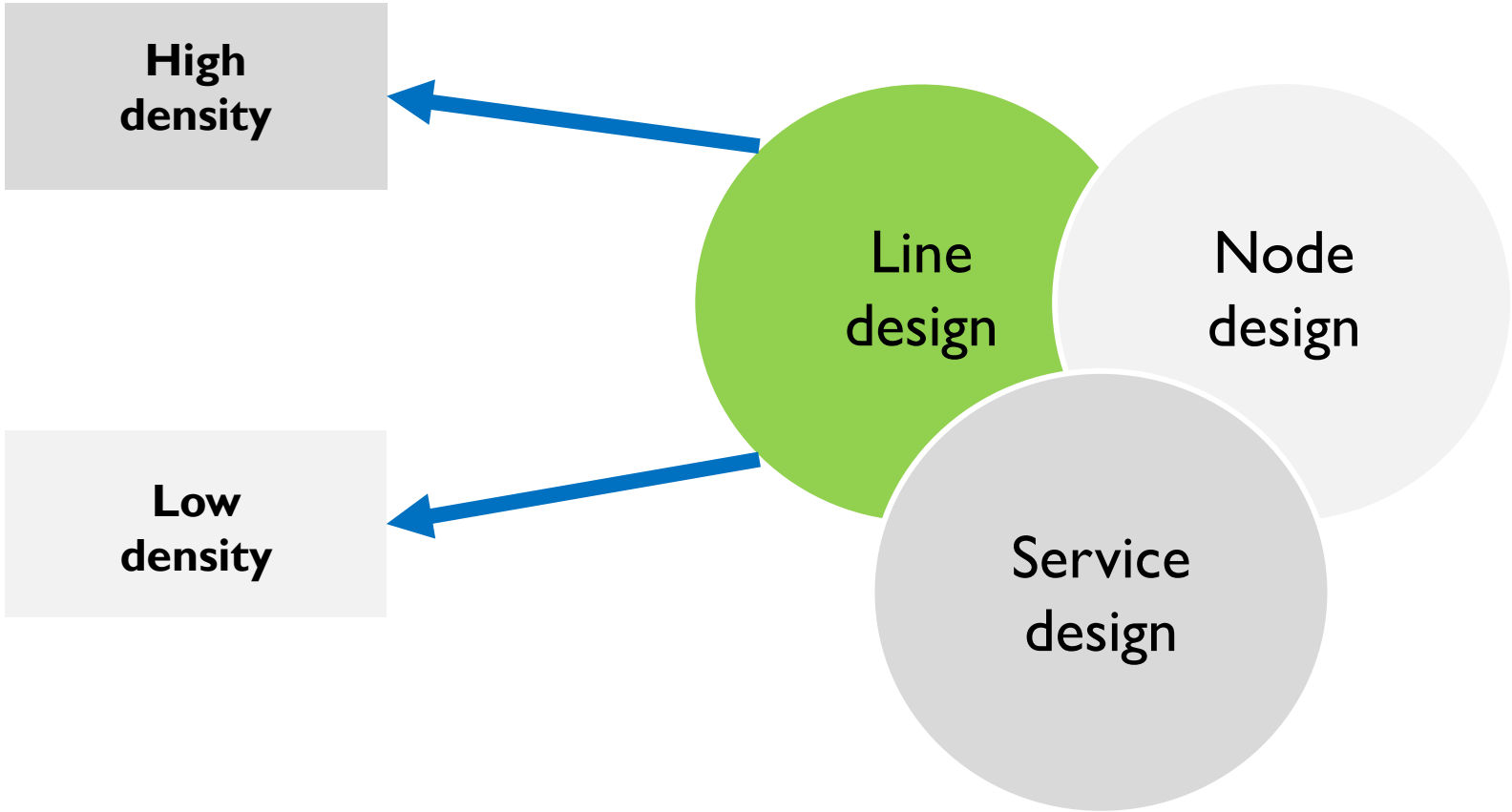
- Narrative of the current crisis
- Proposed strategy: Long-term objective

Quadrupling general freight by 2050

- This should be a long-term strategic focus of the ***country***
- It will require interventions from all involved, not only TFR and DoT
- The investment case is sound, in all respects
  - It is data-driven
  - Acceptable by all
- Structure and funding is what is required

This presupposes the achievement of the very first objective (recovering current rail-friendly freight) i.e. more slots on the same infrastructure, predictably delivered, effectively serviced and sold into the market.

There are three design areas to consider

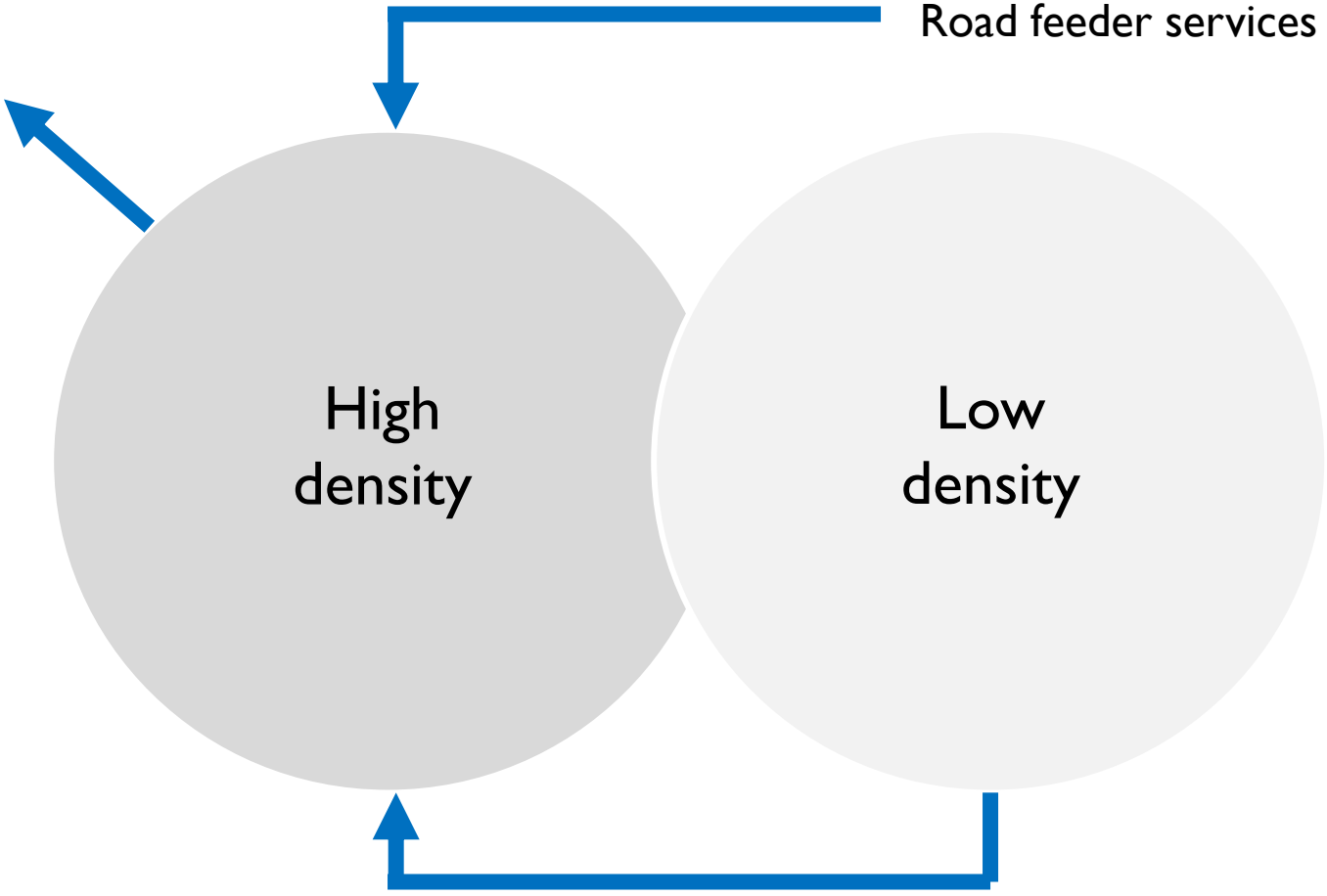


In line design, the high density - low density split is critical

Δ Link dense O/D's

Δ 8 700 km core

- Industrial
- Intermodal



Node design considers different types of terminals

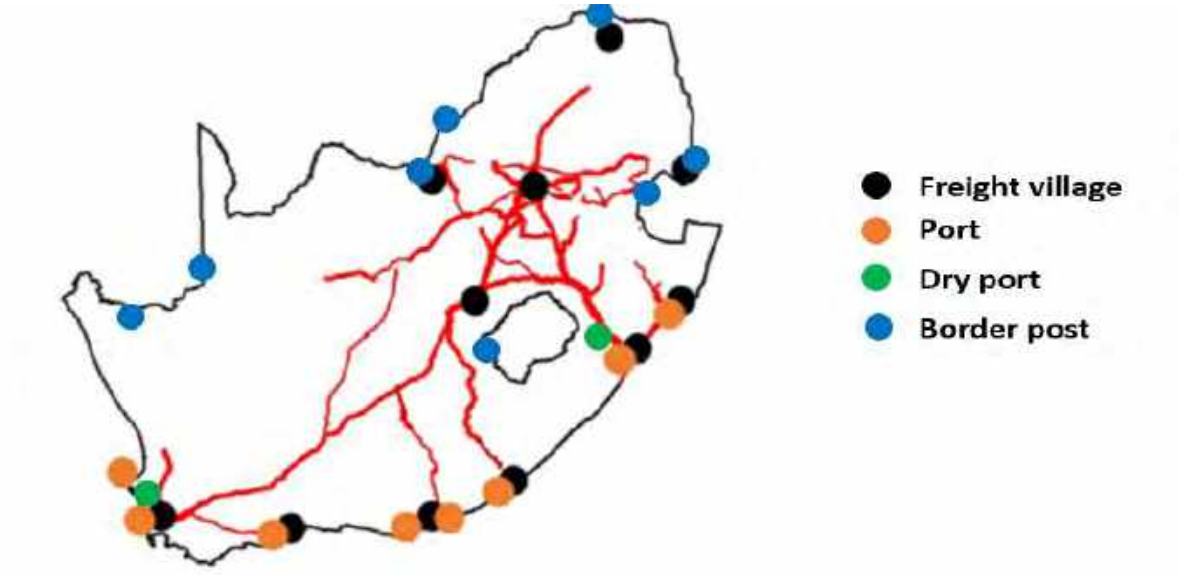
Facility description	**Use**
Rail siding or depot	Dedicated to a single user
Dedicated commodity terminal	Single focus transshipment
Multi-purpose terminal	Multi-purpose transshipment (MPT)
Logistics park	MPTs and warehouse combination
Logistics service centre	Logistics parks providing ancillary logistics services
Freight village	Logistics service centres with light manufacturing

~200 freight villages in Europe
Excellent opportunities for modal shift and model integration:
concentration of supply and demand, logistics focus and natural consolidation

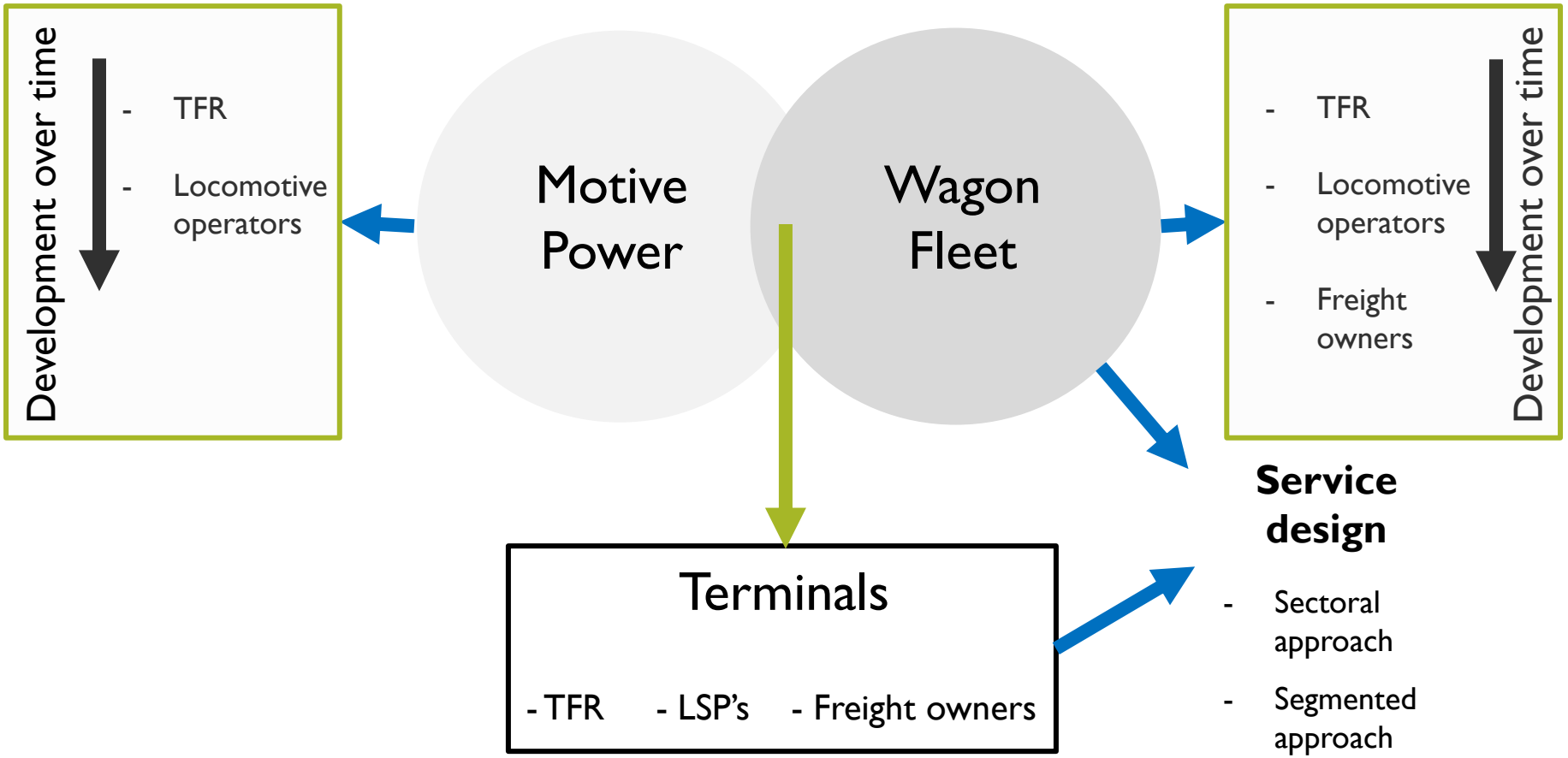
The freight village concept can be extended to ports and border posts, but with other special requirements

Ports	Efficient maritime transshipment connection in the supply chain
Dry ports	Effective port extended gate
Freight villages	Hinterland special economic zones
Border posts	Efficient free flow facilitation

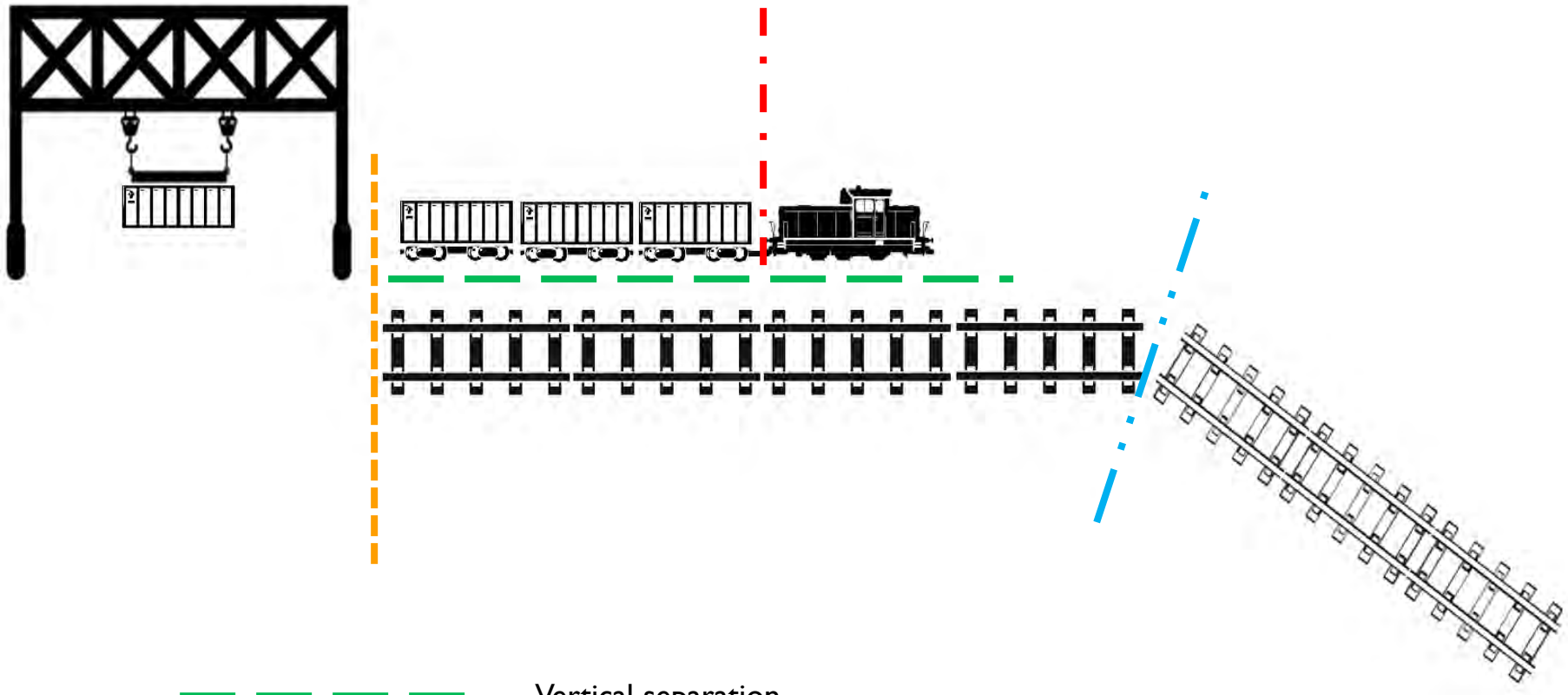
Potentially leading to about 30 key nodes in South Africa over the long term



Service design requires a split between motive power and the commercial "face" of rail



Separation is a broad concept



Vertical separation

Horisontal separation between low – and high-density lines

Horisontal separation between terminals and operating slots

Horisontal separation between locomotives and wagon fleets

Freight

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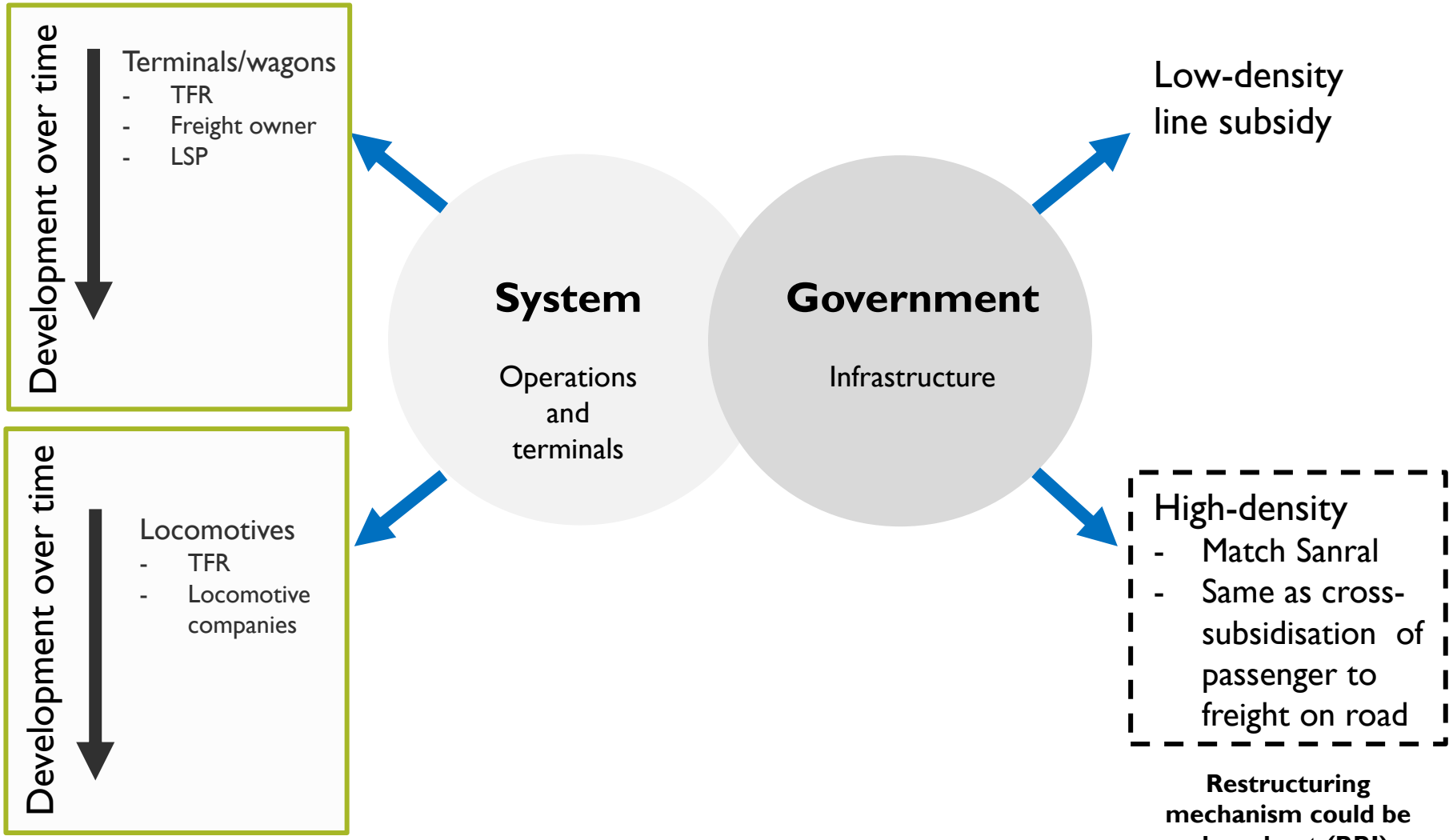
- Narrative of the current crisis
- Proposed strategy: Funding mechanisms and policy

There are different funding mechanisms



The role of policy

- Protect rail assets
- Stand down for immediate fixing
- Design long term
- Restructure according to design
- Then regulate

Freight

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- Proposed strategy: Key next step

A singular short-term strategic focus is critical

- Immediate focus: Asset utilisation (maximum filled slots and dispatched trains)
- Then follow sectoral strategies, domestic intermodal, separation decisions and work towards the growth 2050 objective
- Only disruption should be to reach this goal
- Work on the rest in parallel
  - Ring-fenced from the singular focus
  - Should not consume strategic energy of what is required short term
  - This means that **top leadership should be held accountable for the missing 41** billion tonne-km achievement only

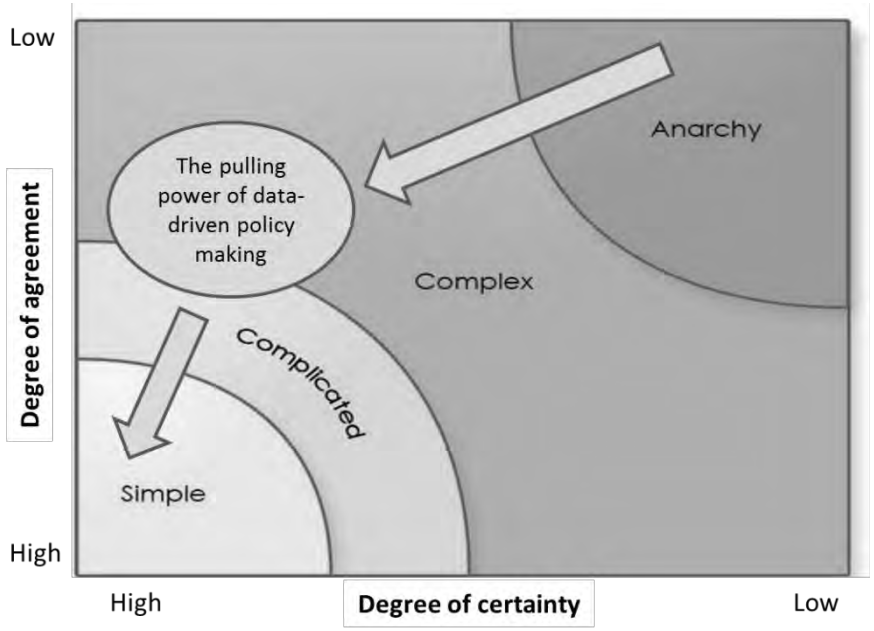
Critical and missing ingredients exist in the system

- **Governance**
  - Development goals but leave business objectives to management
- **Leadership**
  - A return to conscious competence
- **Development state ideals**
  - Balancing development state and profit orientation
- **Regulatory capacity**
  - Significant improvement in regulatory and oversight capacity is critical
- **Rail ethos**
  - Seamless insertion of functional rail into freight and passenger value chains
- **Market intelligence**
  - Data-driven strategy and execution not negotiable

Content

- Freight
- Passengers
- Cross-cutting issues
- Next steps

Evidence breeds consensus



Level of complexity

- **Anarchy –** Very little is known
- **Complex** – More is unknown than known
- **Complicated** - More is known than unknown
- **Simple** – Everything is known

Stacey (1993) diagram as quoted on Ansell and Geyer (2017), adapted

Where wisdom reigns there is no conflict between thinking and feeling: Jung