

Imperatives for the Advancement of Freight Intermodalism in South Africa: A systems thinking approach

Intermodal Interfaces driving Value

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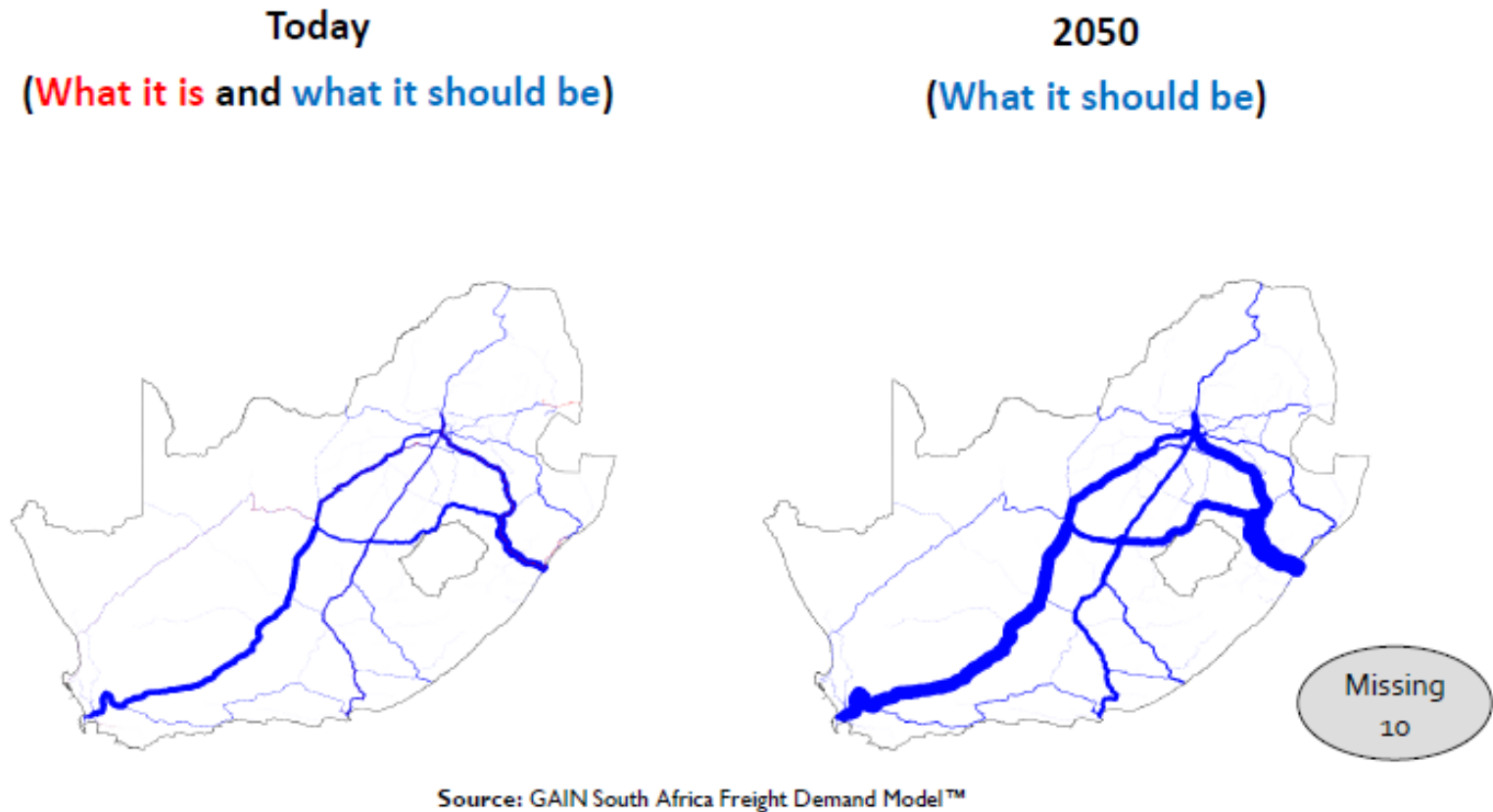
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Research Context: A Spatially Challenged Country requiring intermodal systems for the future



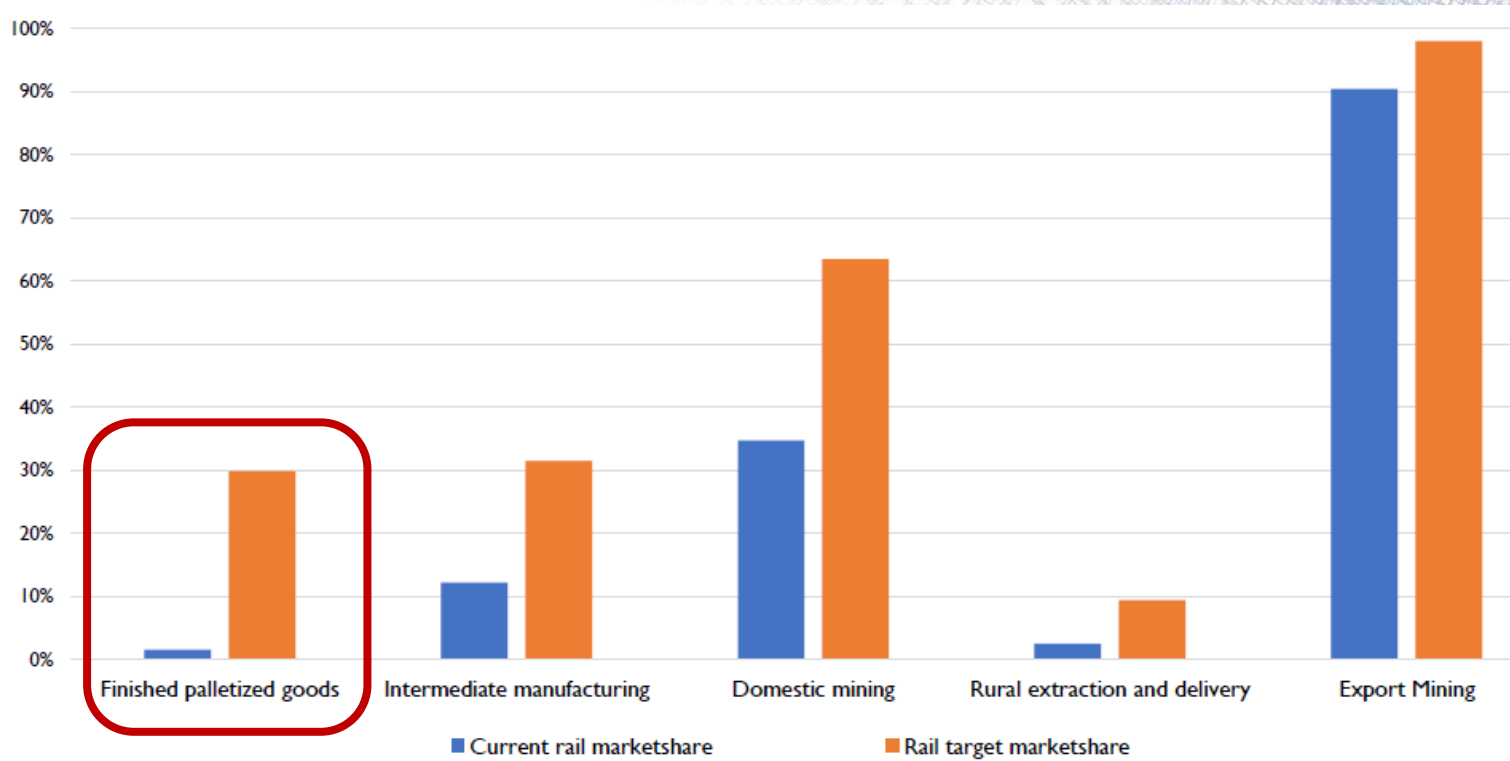
- *Long distance corridors (600 – 1500km) between production areas, economic hub and ports*
- *30 000 Track km, 20 000 Route Km rail network*
- *8 Commercial ports*
- *158 124km paved Road network. 6 million more vehicles on roads than in 1994*
- *Requires innovative freight solutions*

Research Context: Unsustainable Freight Logistics System



- **Current state is unsustainable – Road vs Rail Market Share**
Approximately 80 : 20
- **Intermodal Market Segment - Current Rail tonne-km of 0.5 billion should be 10 billion tonne-km and should reach 22 billion tonne-km by 2050**
- **Rail has deteriorated and does not fulfil its transport task**
- **Extra heavy, long road vehicles decimating the road infrastructure**

Research Context: Intermodal Opportunity



The biggest rail market share gap is in palletised freight – this requires the development of intermodal solutions

- *Requires innovation to counter Tautliner footprint advantage*
- *Ensure best modal choices are made for that time and circumstance, for the freight type and distance with good connectivity to nodes - ports, terminals and distribution centres*

A Complex Problem

*Expensive quick-fix solutions
for visible events*



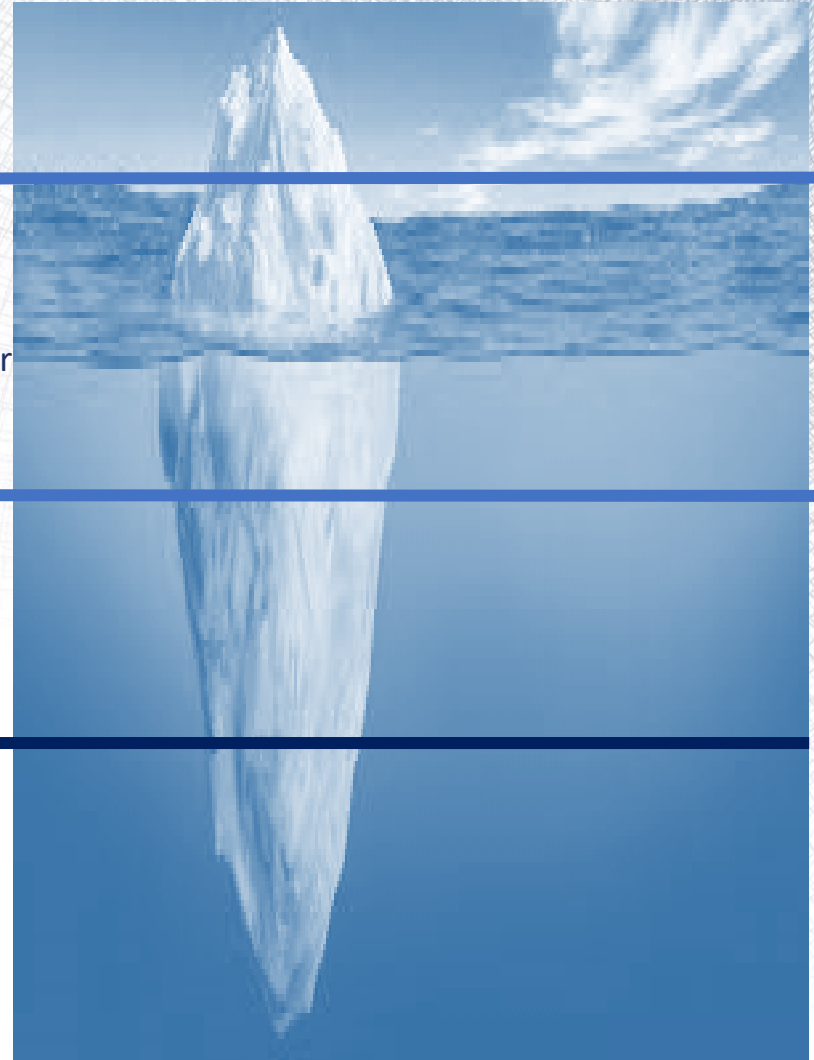
*Difficult, less expensive
designs and approaches that
address structural issues and
mental models for
sustainability*

EVENTS
Observable
React to

**PATTERNS &
TRENDS**
Behaviours /
Occurrences over
Time
Adapt to

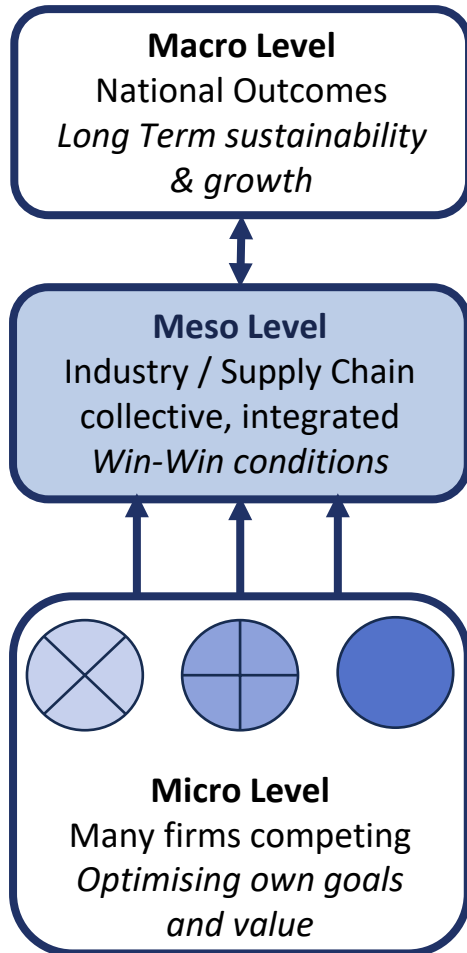
STRUCTURES
Rules, Norms,
Policies
Generative

**MENTAL
MODELS**
Mindset,
Beliefs, Values
Assumptions
Creative



*In SA the case for domestic intermodal has been made at
forums over last 30 years, yet nobody knows where to start.
Work in this field required, both to develop the theory and to
enable a start. This research aimed to address that gap*

Meso industry level interaction required



- ▲ Minimal “**effective collaboration** in practice, and issues related to this gap remain largely unexplored by academic researchers” (Ferrell et al., 2019).
- ▲ Intermodalism studies often emphasise the **interaction between “technologies”**...Not all emphasise the **human actors**, who **integrate and connect multiple system parts**
- ▲ **Complexity** - Why **human actors** need to **interact** and the impact of *unknown, random, unpredictable behaviours*
- ▲ Actual **implementation of existing plans and policies** - obstruction that hinders progress
- ▲ Application of *theory to real world practice*

Research Methodology for Qualitative Research Design

Systems Thinking Theoretical Framework
Theories, Principles, Tools, Constructs

Documentary Analysis

Identify actors and actor organisations
Track events, developments, trends, structures

Data Collection: SME Interviews

Engage transdisciplinary experts in semi-structured discussions

- Views of discipline, expertise, experience

Data Collection: Focus Groups

Engage active system actors

- Facilitated discussion - perceptions & beliefs
- Proxy for real system actor interaction

Data Analysis & Interpretation

Transcripts – analysis of online interviews & focus groups to generate themes

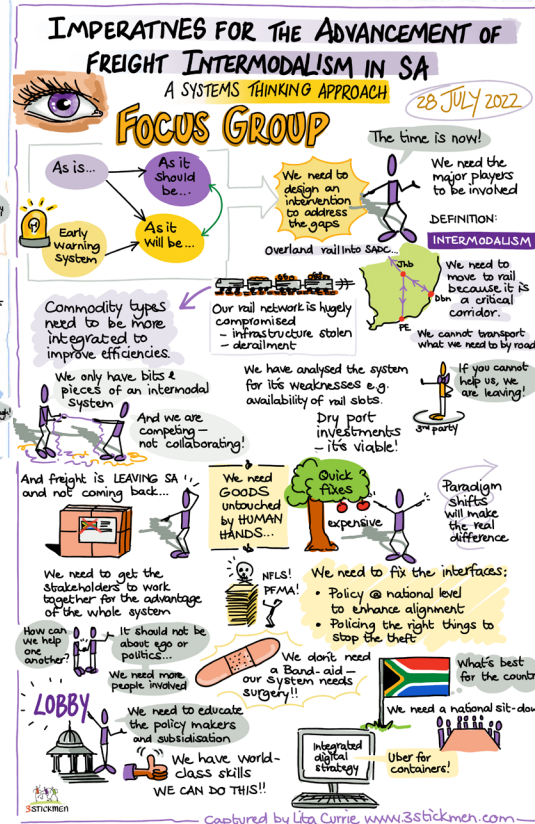
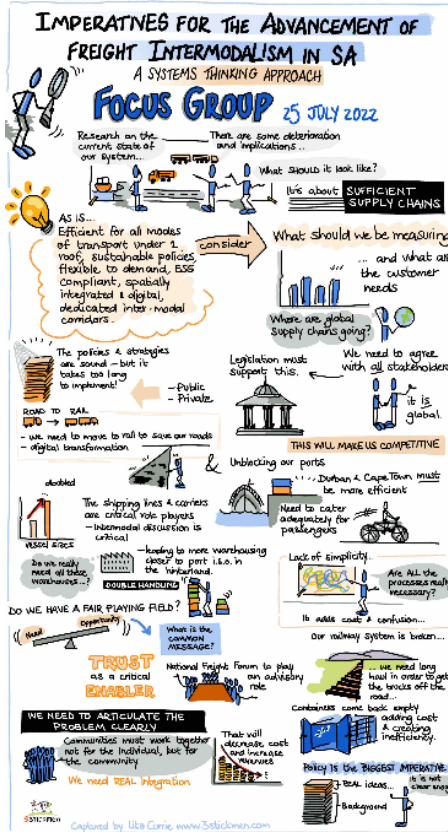
Synthesis & Discussion of Findings

Themes Development
Related to Theory & Research Questions

Systemic conceptual framework

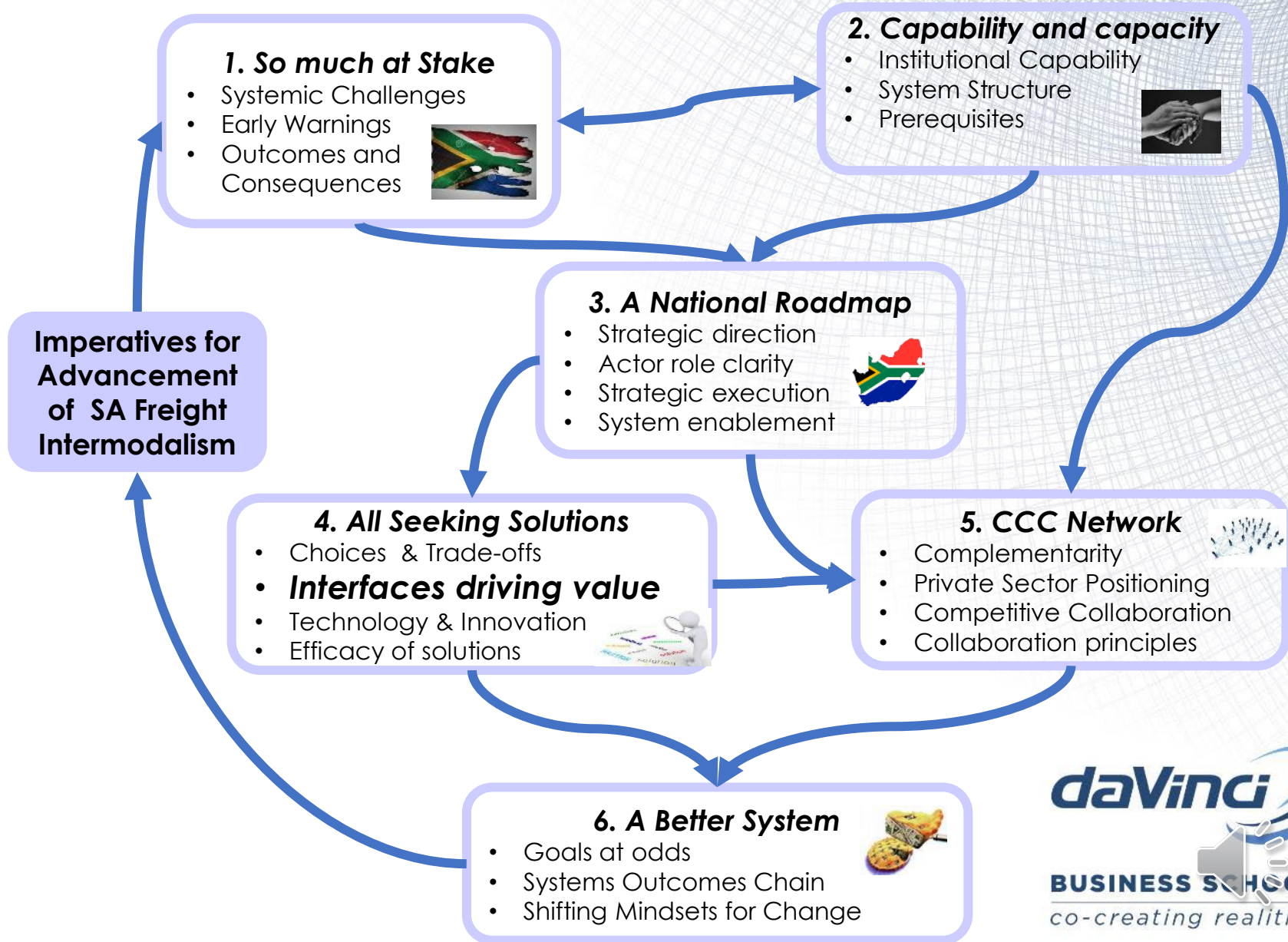
TIPS application
Imperatives
Conceptual Model
Framework

Focus groups – real system actors interacting

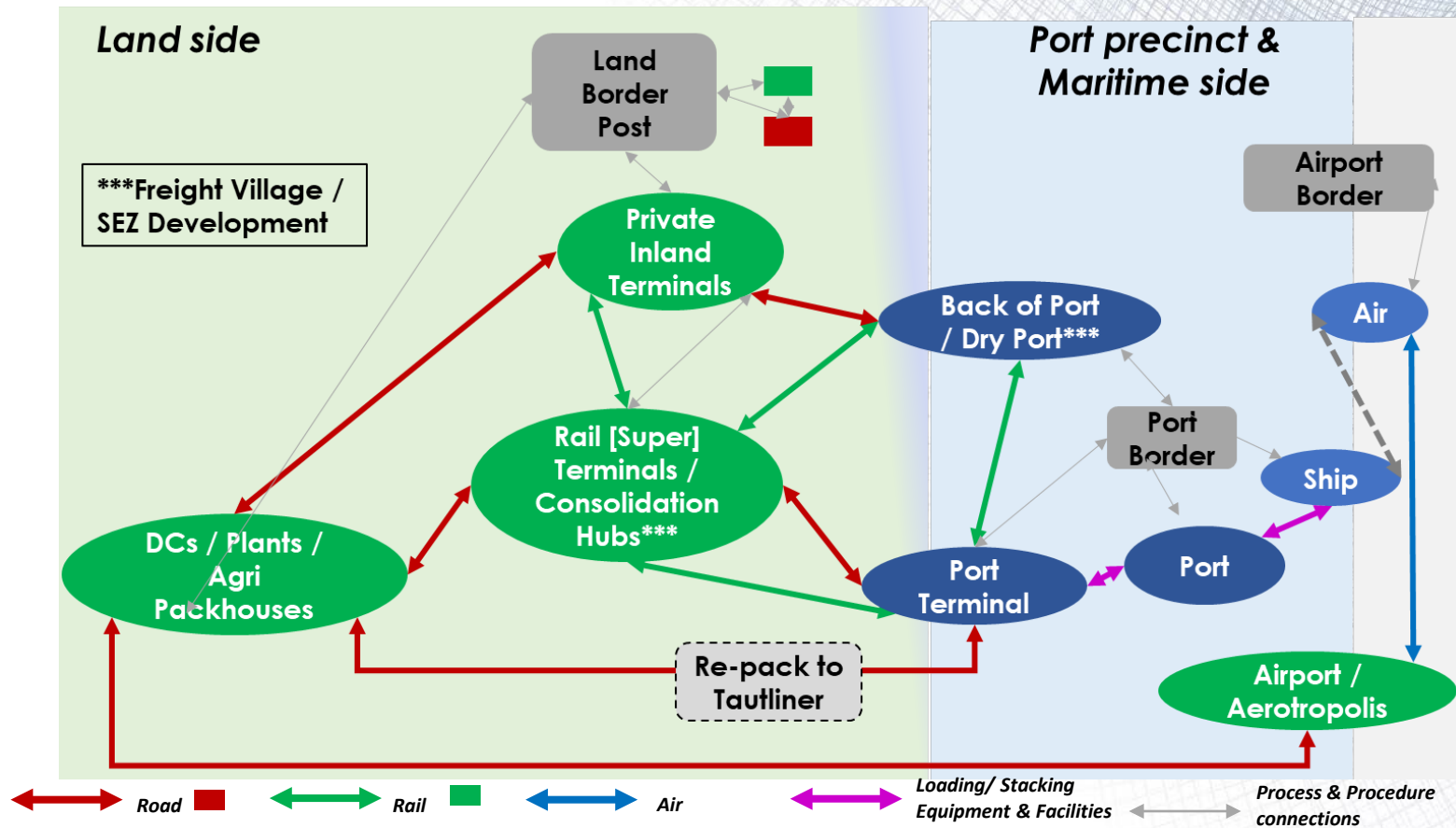


- Participation of **prominent executive industry actors** – Road Rail Ports LSPs Government Freight Customers
- Innovative hard Technology** and softer **People** aspects – and the **interdependencies between them** that could be **leveraged** in practical ways for better **System outcomes**
- Revealed **willingness and urgency to - Work together; Break down barriers; Rise above self-interest to drive system performance for the good of the industry and the country**

Emerging Themes

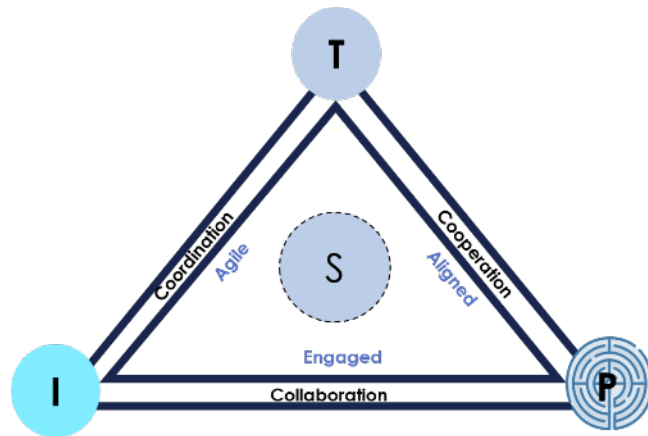


System Interfaces Drive Value



- *Connected processes → create steady rhythm and tempo of continuous, predictable and fluid freight flow across supply chains*
- *Transitions between nodes & modes → Effectiveness of interface transfer touchpoints that make or break the flow of freight in the value chain*
- *Overall integrated solution must be cheaper*

Interfaces and Connecting System Parts using Technology, People and Innovation to Drive Value



Voluntary actor participation

Collective resources, experience, innovation, technologies and knowledge to overcome inertia and create optimal solutions for holistic competitive advantage of the system

Focus on the interfaces between the freight system parts

Coordinate – T + I

- Intermodal equipment development for Interoperability
- Access systems to reduce pressure on nodes
- Real time Interface performance reporting and alerts to disruptions
- Modal alternatives & buffers - capacity, contingencies & resilience
- Schedule Coordination - optimise asset utilisation
- Big Data – Planning, Forecasting; adaptation for demand variability

Cooperate T + P

- Align and standardise processes, procedures, activities and resources
- Communicate for seamless and connected flows of freight
- Readiness, Preparedness, Repeatability
- Resource sharing and complementarity
- Pull freight through system from preceding activity interface

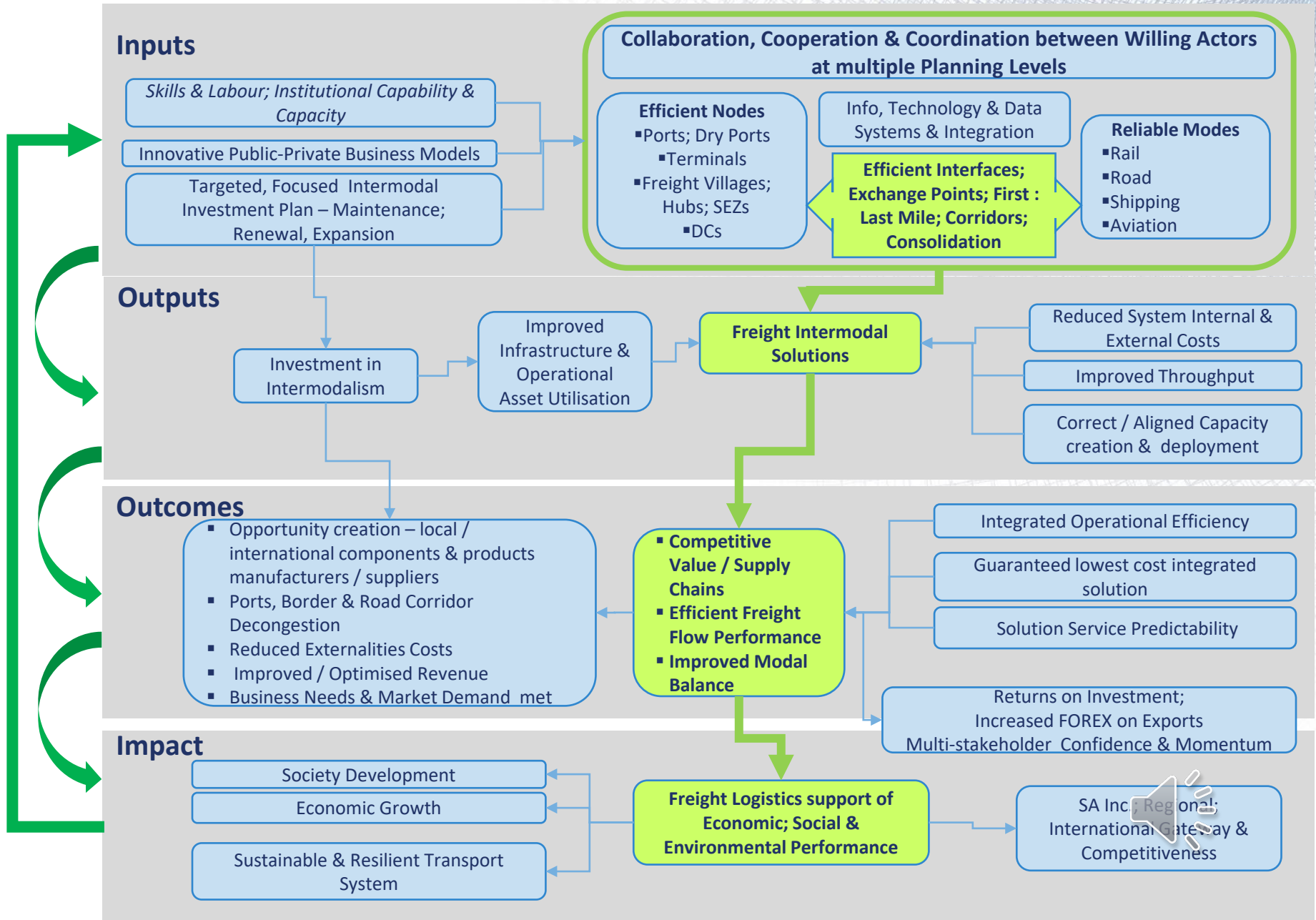
Collaborate I + P

Multi-Actor interaction – Rules of the Game

- intermodal freight system actors engage willingly to collectively define intermodal system goals and develop interventions
- Optimise capacity at interfaces
- Isolate interface obstructions & identify places of opportunity
- Agree on incentives & rewards sharing
- Negotiate Compromises & trade-offs



System Goal Congruence optimising Interfaces



The Findings: Imperatives for advancement

1. *A systems thinking approach and a **systemic win-win mindset** are imperative for advancing the freight intermodal system*
2. ***All parts must work**, optimising sub-system parts individually unlikely to results in holistic system performance → **interfaces drive value***
3. ***Collective pursuit of system purpose and performance** is a means to **unite system actors** around **congruent system goals***
4. ***Collaboration, coordination and cooperation** between actors are all required – various contexts*
5. *System advancement requires constant **synthesis of people, technology and innovation**: leverage **hard and soft constructs** imperative for system improvement TIPS™ framework*
6. *South Africa could adopt **local, modular** approaches to **accelerate implementation**: Master Plan to integrate the modules - replication at speed, learning and reduced cost and risk*
7. *An **integrated performance framework** to share data, communicate and track progress and successes*

A place to start. Drive Value at the Interfaces

Enable. Build change that accelerates and gains momentum

Conclusion

- *Improved freight intermodal performance is a national development priority for RSA*
- *Essential to restore rail condition and performance*
- *Intermodal advancement to realise outcomes:*
 - *Balanced application of constrained financial resources*
 - *Road to rail shift*
 - *Maritime connectivity*
 - *Regional integration*
- *Changes will manifest over time - Critical to start now*
- *Presidential National Logistics Crisis Committee – Break the self-reinforcing, perpetuating vicious cycle*
- *Overcome inertia – use Technology, Innovation, People to create value at intermodal interfaces*
- *Build a freight logistics system that enables and supports*
 - *the economy*
 - *the environment*
 - *the people of South Africa*



Thank you

The advocacy of intermodalism is less about balancing choices between road and rail modes → more about the imperative for collaborating, cooperating and coordinating efforts to collectively develop and co-create options to build a sustainable system that positively impacts society, the environment and the economy.