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# ***Logistics Data Collection and Modeling***

Jan Havenga and Zane Simpson

## Core message:

- Freight flow modeling is not an activity for itself
- Nor is logistics cost and performance measurement
- The objective is to provide a macrologistics instrument
- This instrument enables macrologistics
  - Cost benefit trade-offs for policy, infrastructure prioritisation, mode optimization, disaster and humanitarian planning, corridor development
- To achieve this requires a living, shared, standard model with national buy in, constant updates, flows and costs.
- The model must be flexible enough to receive updates from any commodity flow survey work



# Discussion points

Methodology

Rationale

Logistics performance measurement

Macrologistics – decision making enablement

Examples of Macrologistics in practice

Planning for the future



# Methodology



## Survey methods

- Least reliable overall, but good insight on industry dynamics
- Interviews, intercept studies



## Supply of transport

- Accurate but commodity blind
- Based on actual data:
  - Truck counts,
  - Rail traffic and
  - Port data



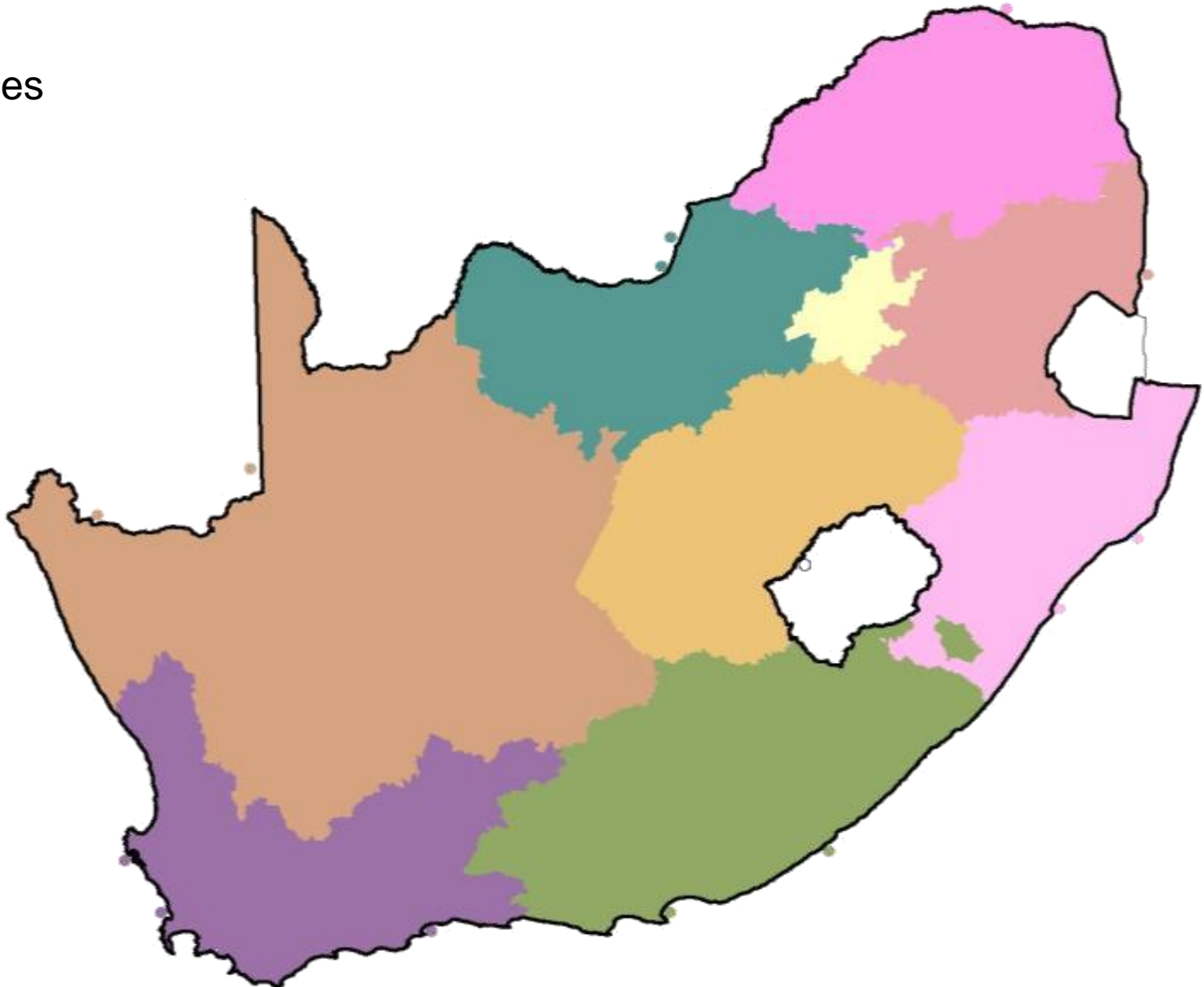
## Demand for transport

- Powerful but complex
- Demand and supply of commodities
- Apply gravity modelling
- Requires:
  - accurate economic data and
  - deep understanding of industries and demographics



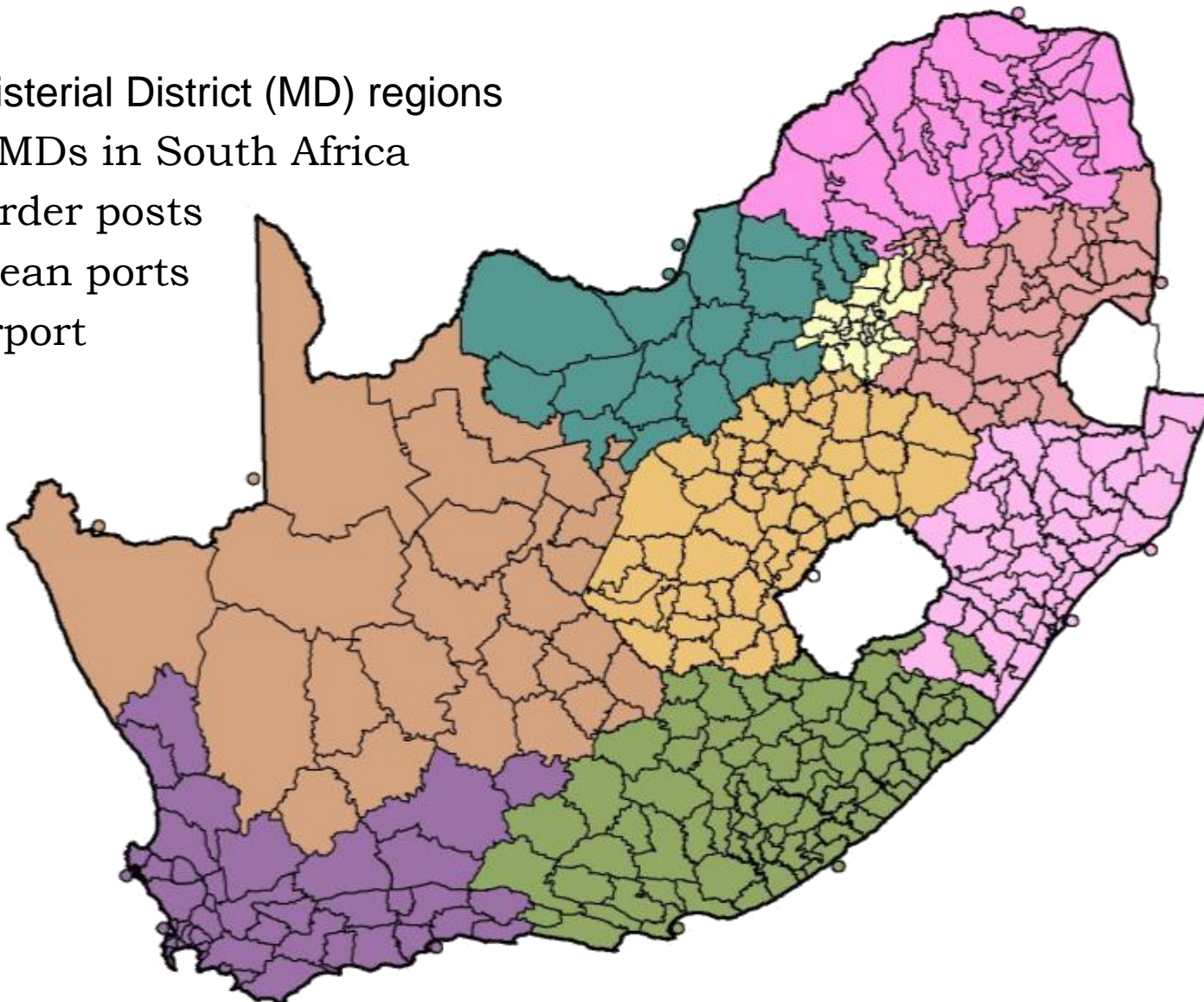
# Creating an evidenced based flow model: Supply and demand research per province

- 9 provinces



# Further detail: Research per district

- 372 Magisterial District (MD) regions
  - 356 MDs in South Africa
  - 8 Border posts
  - 7 Ocean ports
  - 1 Airport



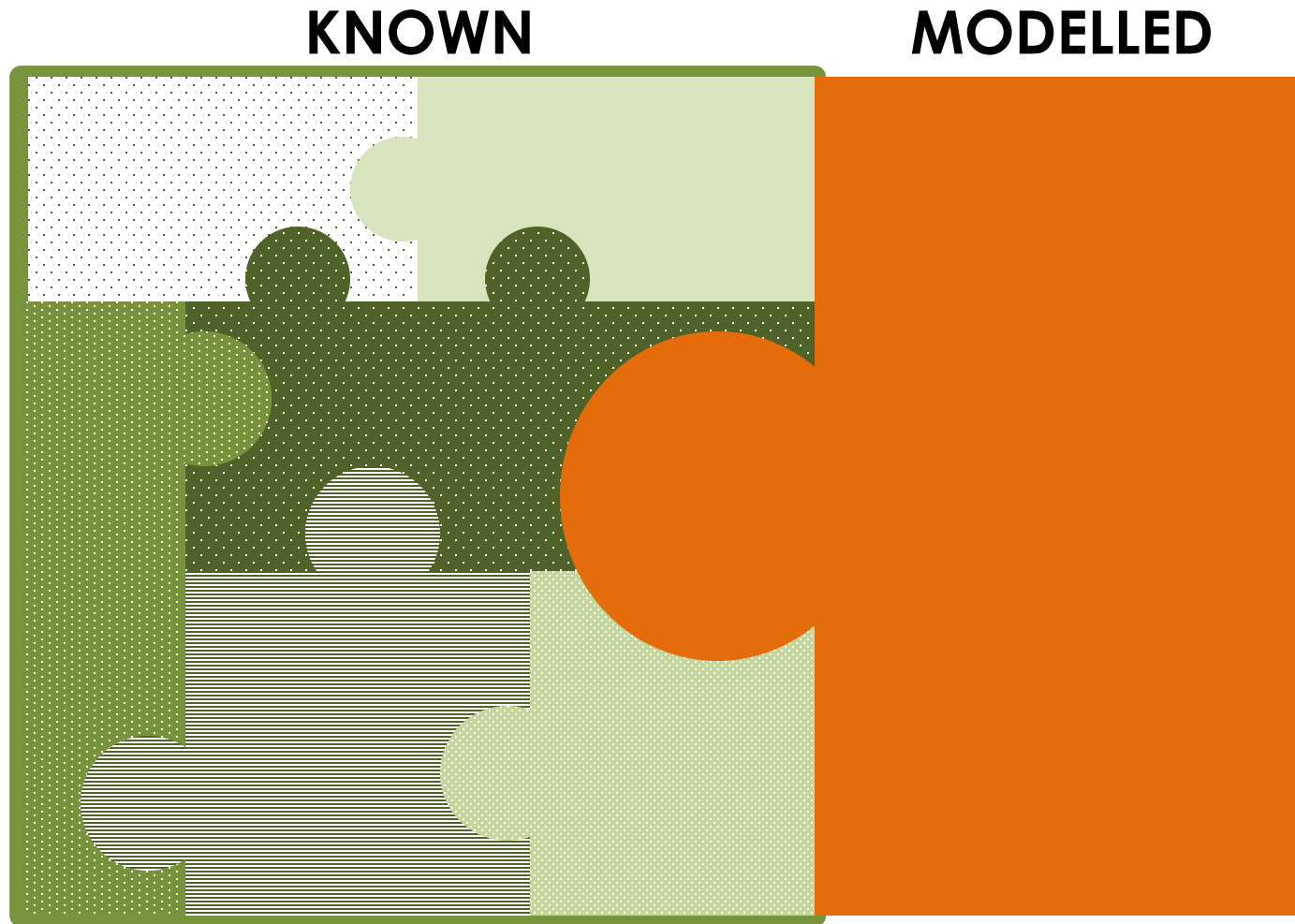
# Total economy: Supply and Demand

**KNOWN**

**MODELLED**



# Total economy: Supply and Demand



Can be related to Origin, Destination and Commodity

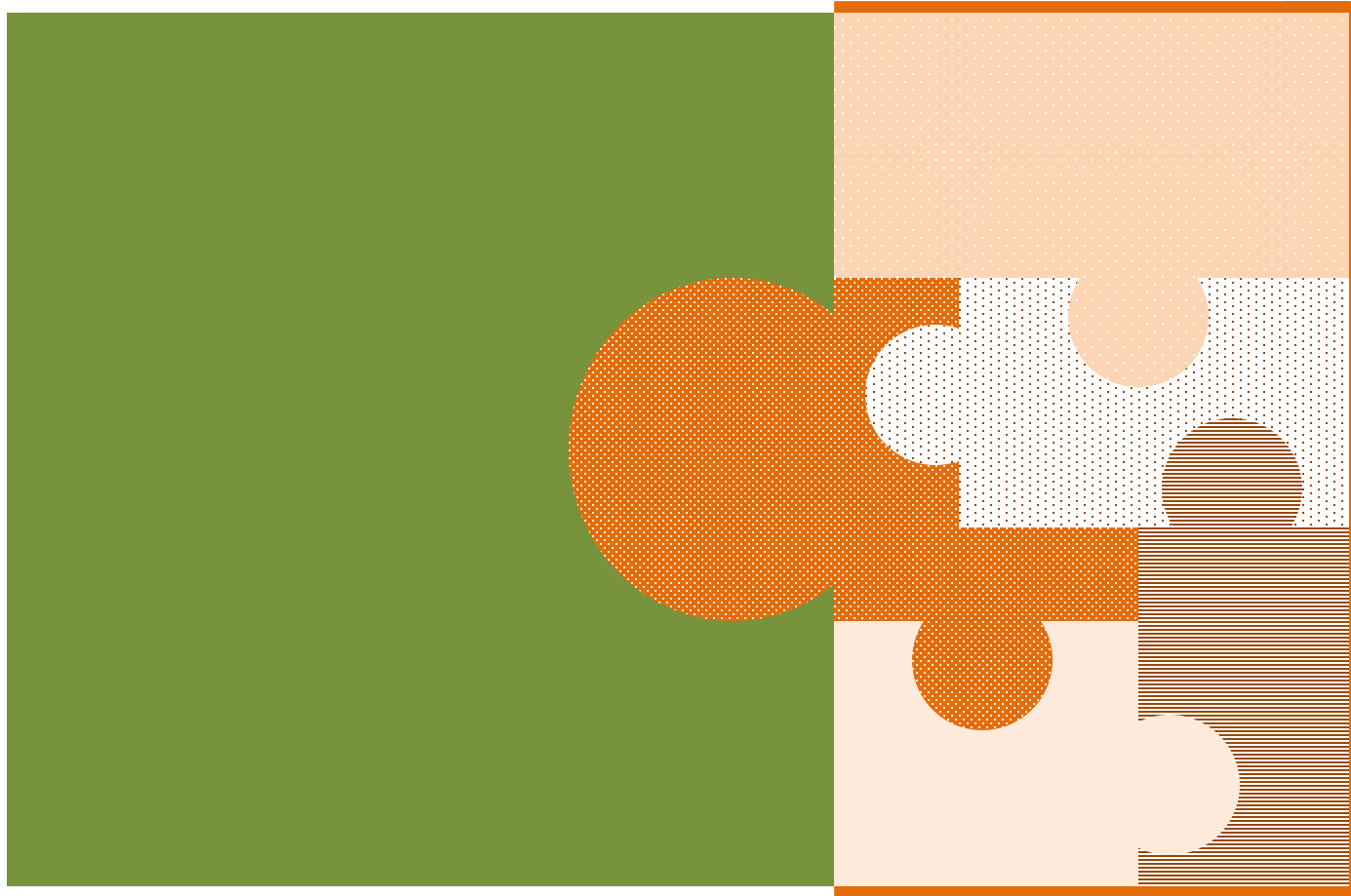




# Total economy: Supply and Demand

**KNOWN**

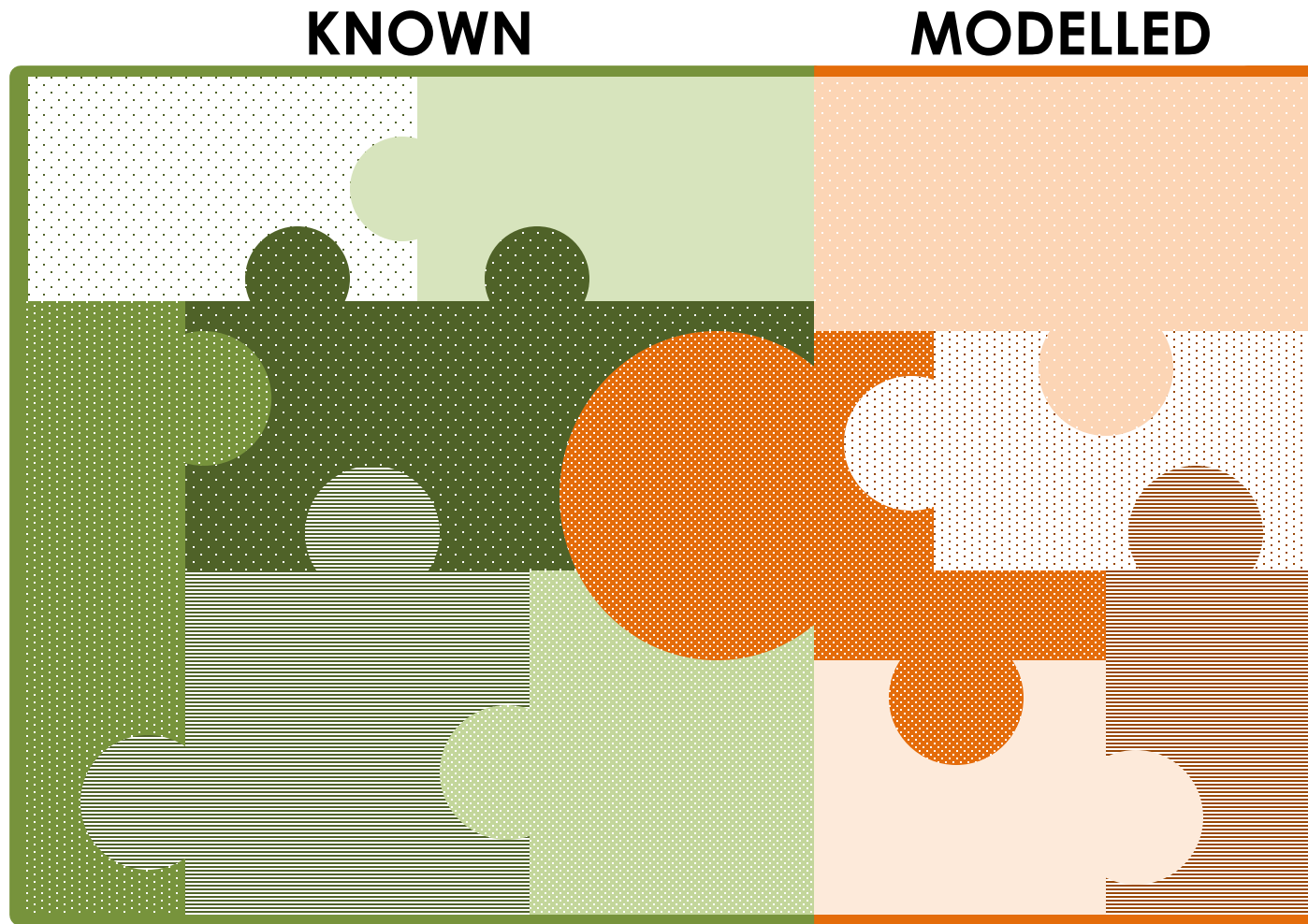
**MODELLED**



Can be related to a Commodity and either an Origin or Destination but requires disaggregation modelling



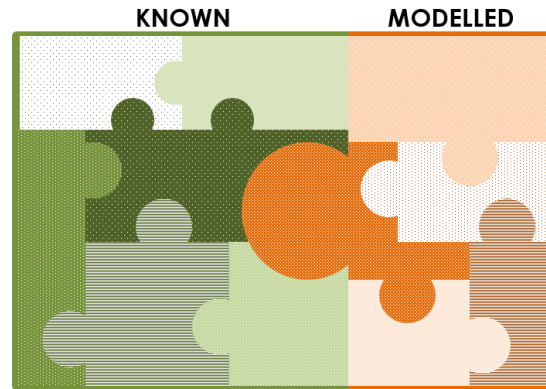
# Total economy: Supply and Demand



Integrated data for Origin Destination Commodity



# Typical data sources



- Railway freight ODC databases
- Pipeline freight ODC databases
- Waterway ODC freight databases
- Port data with hinterland connections
- Border post data with hinterland connections
- Customs data with hinterland connections
- **Commodity flow surveys**
- Port data without connections
- Border post data without connections
- Customs data without hinterland connections
- Industrial databases but with larger geographical areas
- Mining and agricultural databases but with larger geographical area
- Data from associations such as ports, textile and garment manufacturers, seafood exporters, food and drink exporters, automobile manufacturers, iron and steel, etc
- Data from container shipping lines
- Commodity specialists

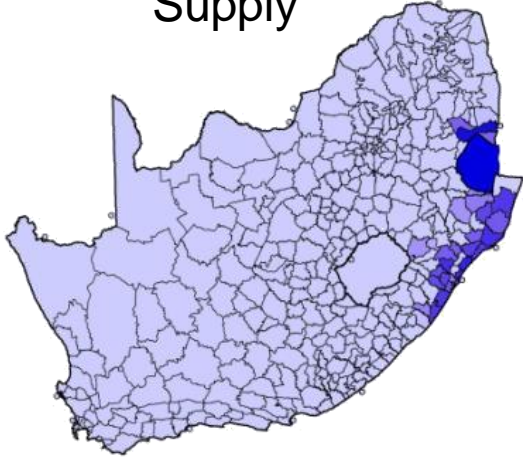
Gaps filled and balancing factors usually disaggregated input/output models



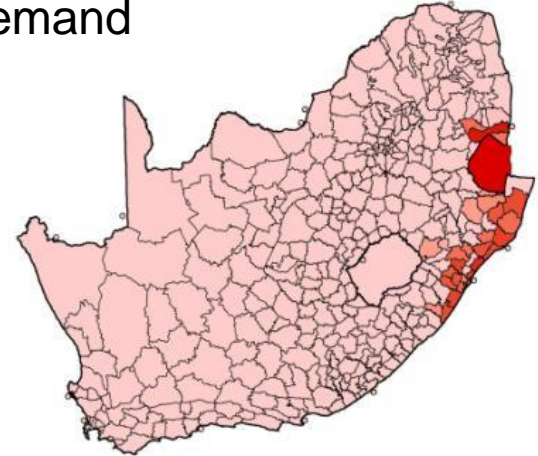
# Model OD flows from Supply and Demand

## South African example – Sugarcane

Supply



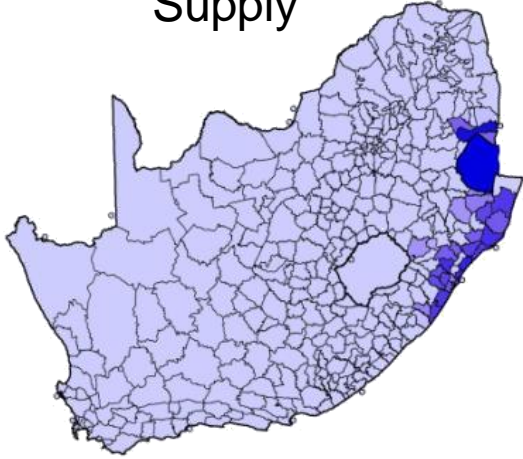
Demand



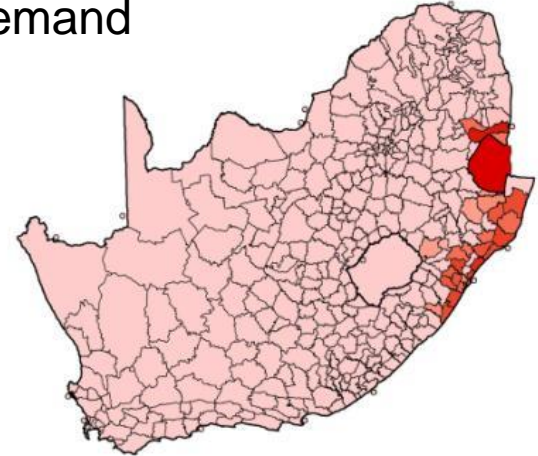
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## South African example – Sugarcane

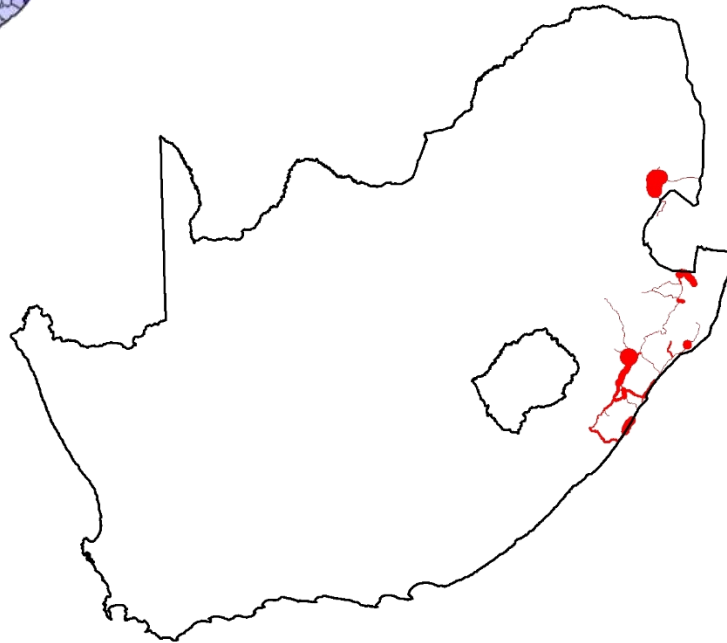
Supply



Demand

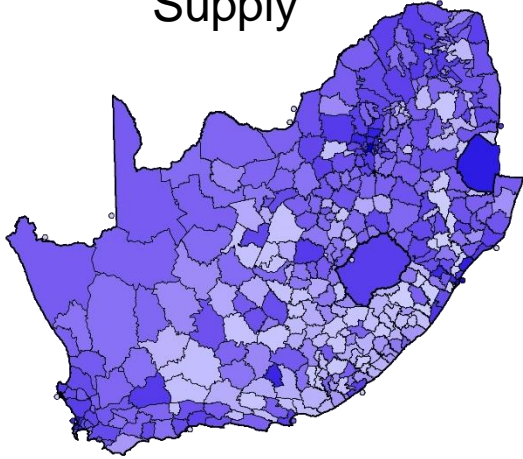


Freight flows

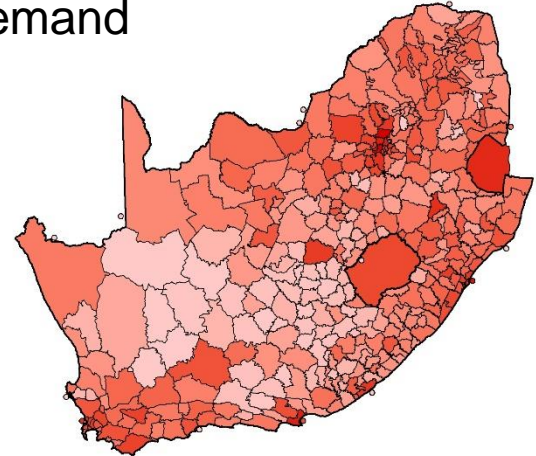


# Model OD flows from Supply and Demand South African example – Processed foods

Supply



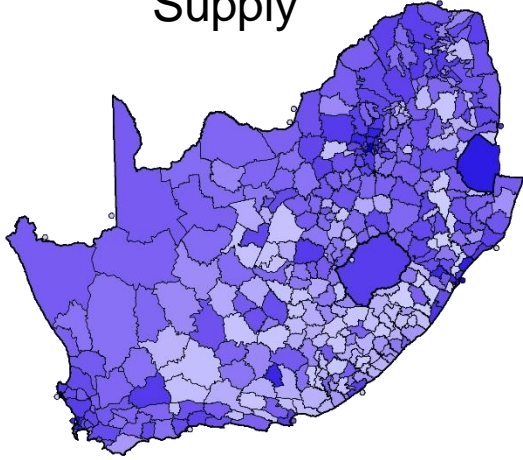
Demand



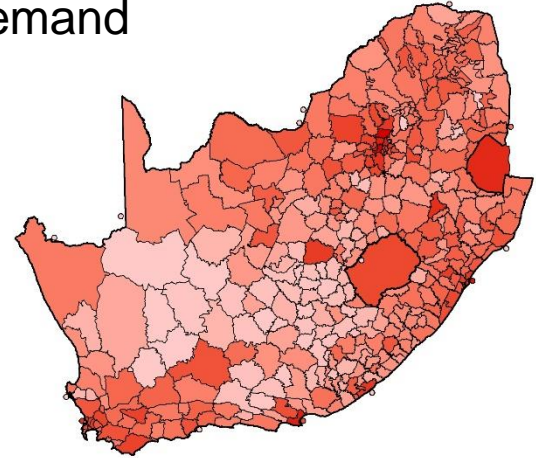
# Model OD flows from Supply and Demand

## South African example – Processed foods

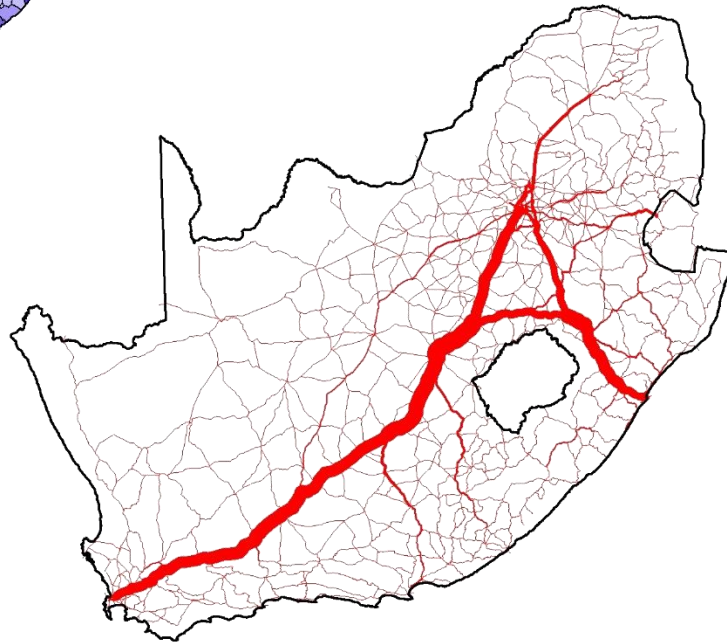
Supply



Demand



Freight flows

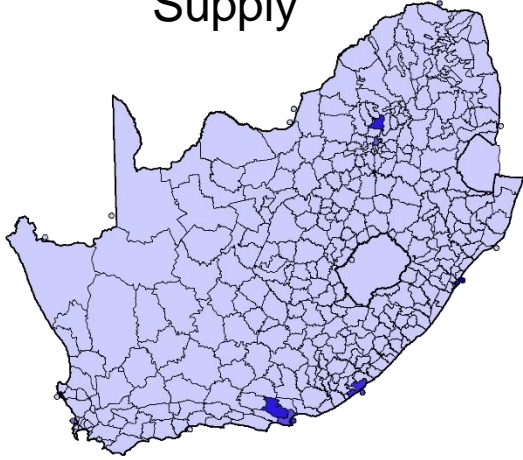




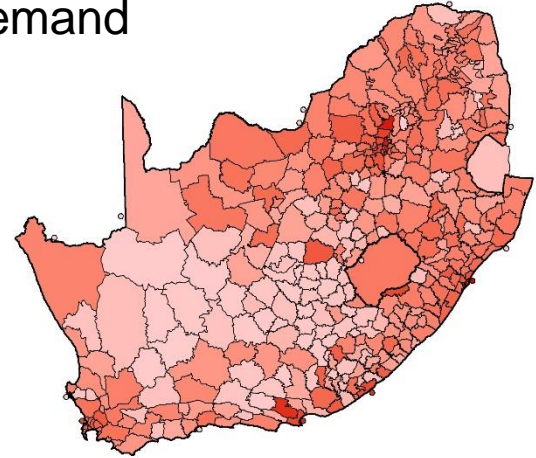
# Model OD flows from Supply and Demand

## South African example – Motor vehicles

Supply



Demand

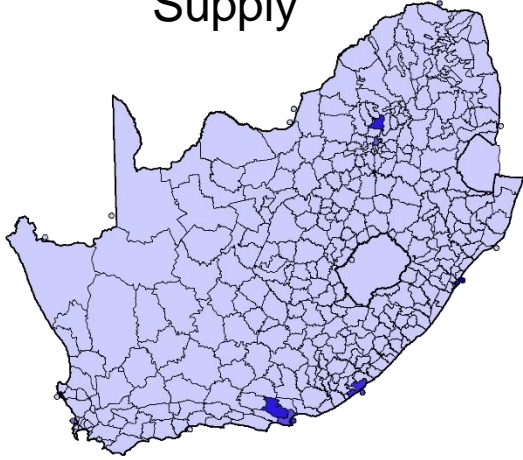




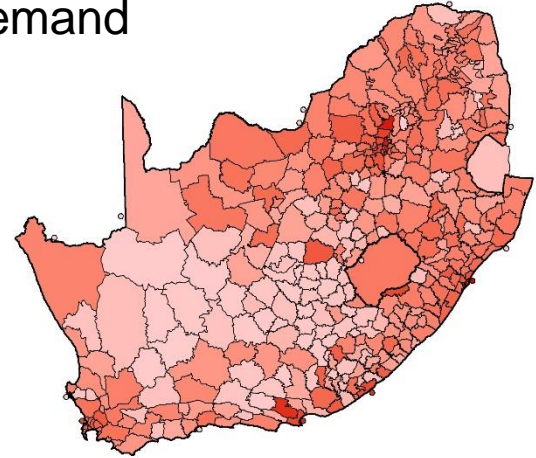
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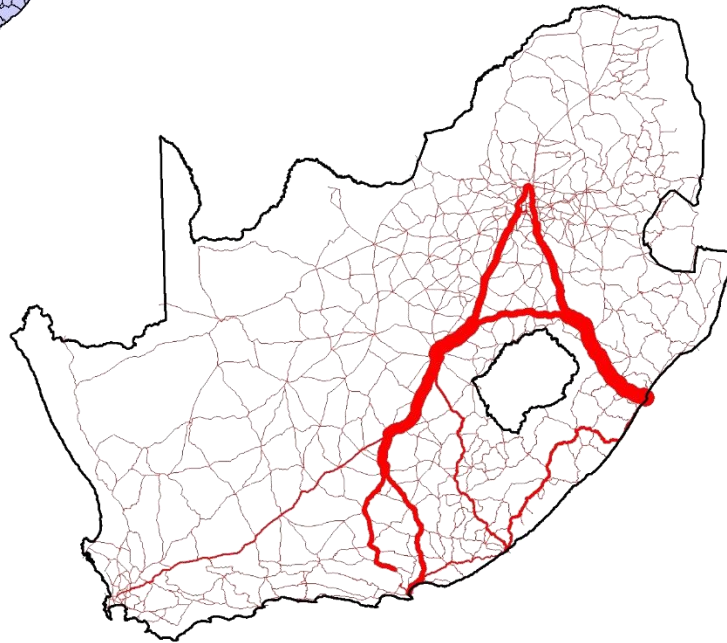
Supply



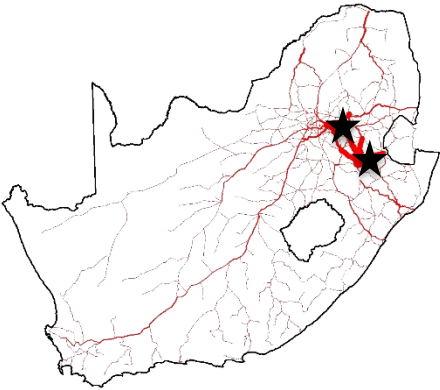
Demand



Freight flows



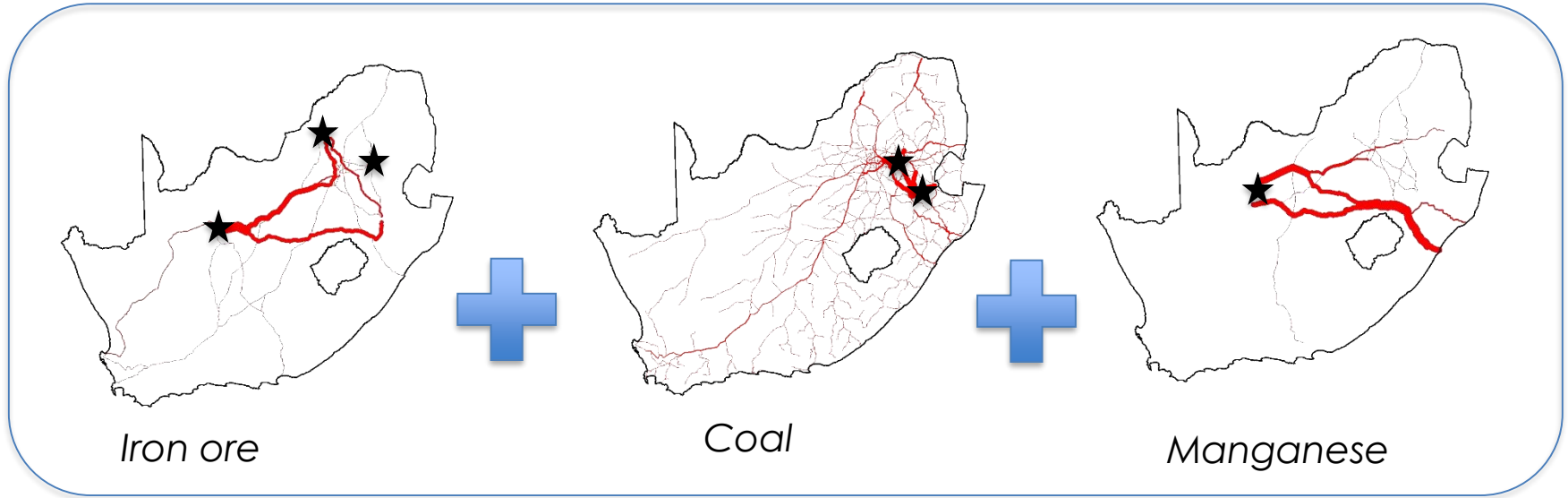
# Supply chain view example from South Africa



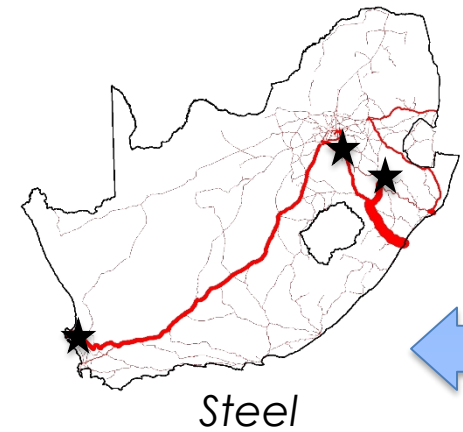
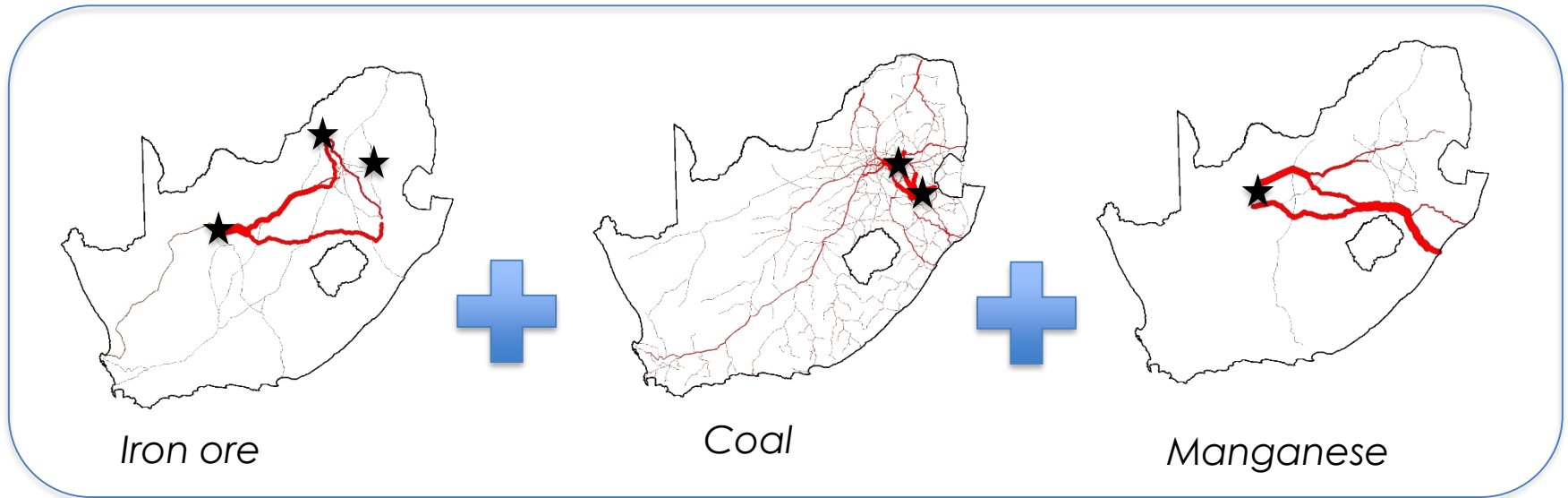
Coal



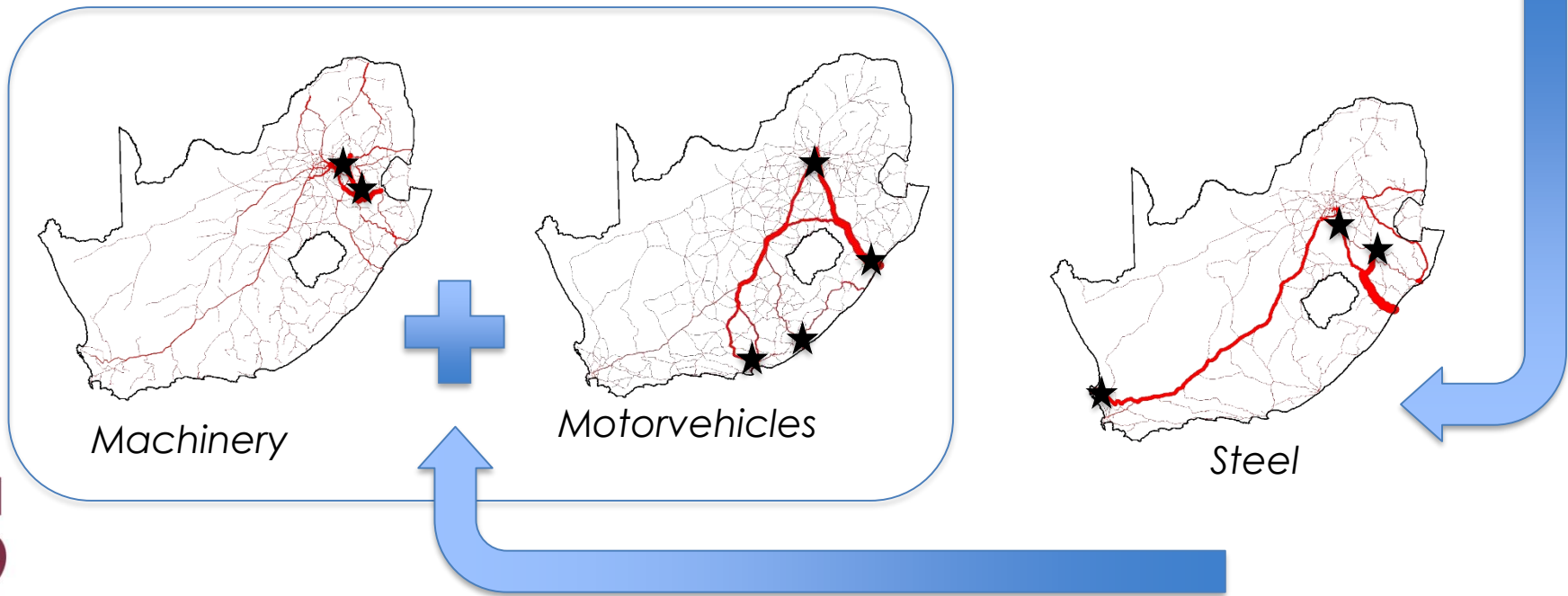
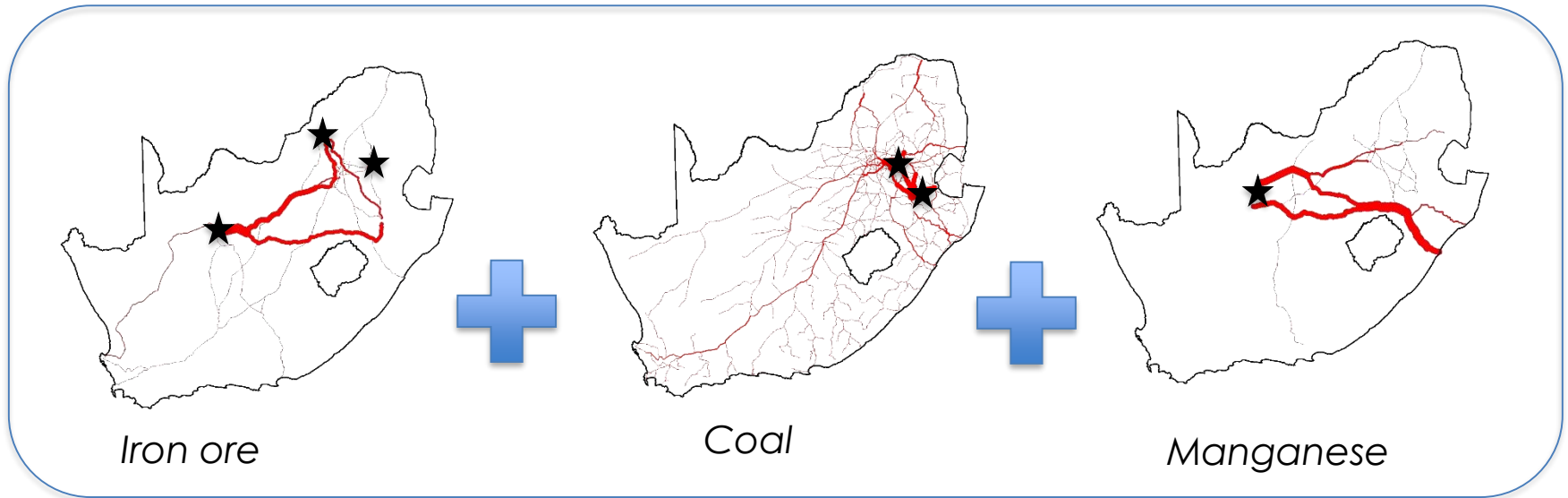
# Supply chain view example from South Africa



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# Discussion points

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Examples of Macrologistics in practice

Planning for the future



# Freight flow modeling have a specific objective

That is all value chains of all commodities added together

That will assist us to make policy/infrastructure/cluster decisions better

Much the same way in which macroeconomics assist a nation

At the birth of logistics as a discipline, about four decades ago authors often referred to the macroelements of logistics

But the concepts were never developed further

We've seen functional measurements recently, but sporadic

**Flow modelling is not new, many models exist**

**But these are often not linked to a cost model to enable trade-offs with other production factors**

**And often just sporadically updated and not linked**



# Our objective

Is to create a **standard** model, meaning:

That even if it is improved it can be used by all planners and policymakers

The output is standardized, irrespective of various inputs

The output is **living**, meaning it can be continuously updated

The model should have disaggregated costs to enable

Trade-offs

Scenarios

Supply chain mapping

A model should be used to:

Map and cost specific supply chains

Suggest alternatives

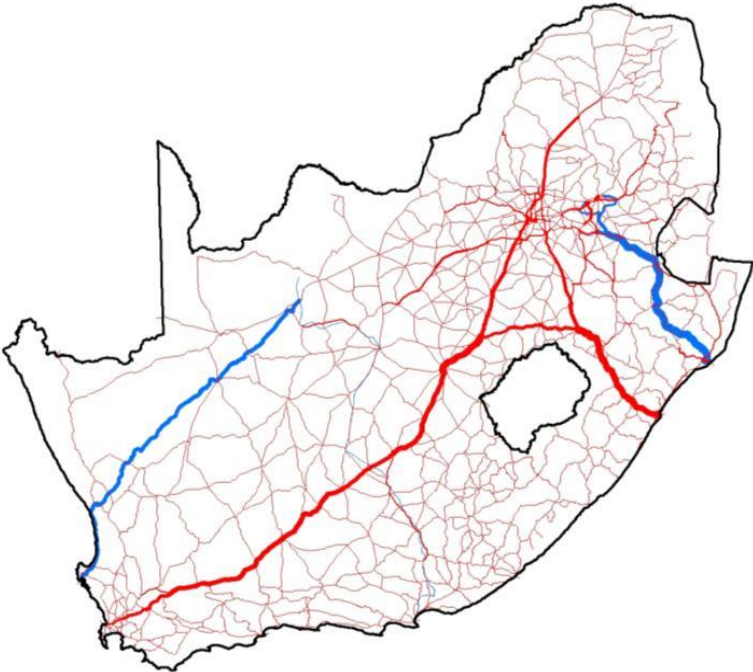
Develop results of given scenarios



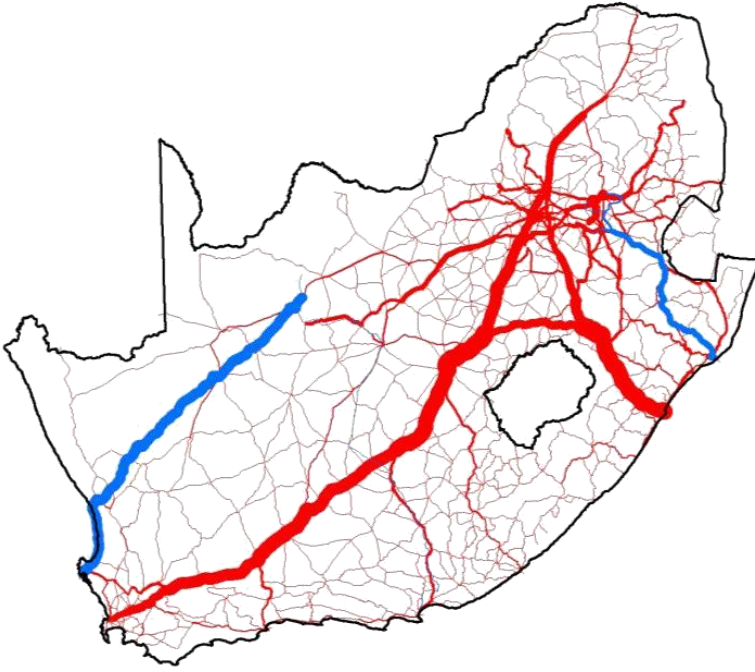


# With forecast component

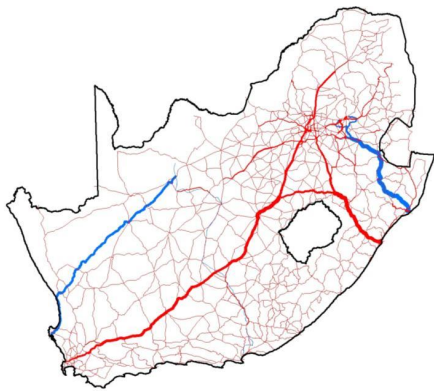
- Today



- Forecast for 2040



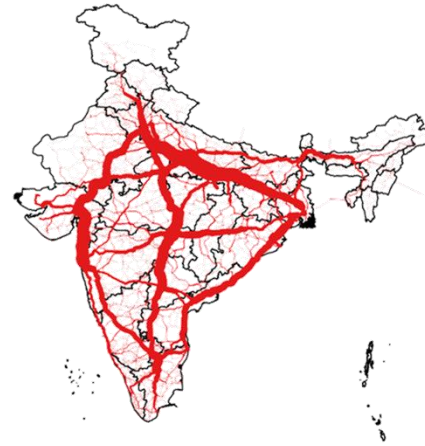
# Applied in more countries and regions



- **South Africa**



- **Sub-Sahara  
Africa**



- **India**



- **Vietnam  
in progress**



# Sample of BigCube data file

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
FDM_COM_Co	md_or	md_des	COMTYPE	COMMODITY	PACKAGING	SECTOR	CARGO_TYPE	INDUSTRY_G	impexpdom	Road_Tons	Rail_Tons	Rail_Tonkm	Total_Tons	Tons_in_TE	Bulk_Tons	DISTANCE	Road_tonkm	Total_tonk	
1	FDM30010	Moretele	Willowmore	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	4.0000	0.0000	0.0000	4.0000	0.0000	4.0000	1159.565	4638.2600	4638.2600
2	FDM30120	Moretele	Border Maseru	RECY	Recycled paper	Break Bulk	Manufacturing	Heavy break bulk	Other manufactured products	d	53.0000	0.0000	0.0000	53.0000	0.0000	53.0000	584.4586	30976.3058	30976.3058
3	FDM30210	Moretele	Lower Tugela	PHAR	Pharmaceutical Products	Break Bulk	Manufacturing	Palletized	FMCG	d	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	701.4699	701.4699	701.4699
4	FDM30120	Moretele	Nelspruit	RECY	Recycled paper	Break Bulk	Manufacturing	Heavy break bulk	Other manufactured products	d	277.0000	0.0000	0.0000	277.0000	0.0000	277.0000	333.4762	92372.9074	92372.9074
5	FDM30010	Moretele	Dannhauser	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	28.0000	0.0000	0.0000	28.0000	0.0000	28.0000	452.9245	12681.8860	12681.8860
6	FDM30010	Moretele	Potgietersrus	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	51.0000	0.0000	0.0000	51.0000	0.0000	51.0000	160.2061	8170.5111	8170.5111
7	FDM10200	Moretele	Pinetown	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	166.0000	0.0000	0.0000	166.0000	0.0000	166.0000	687.0805	114055.3630	114055.3630
8	FDM10200	Moretele	Randfontein	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	15.0000	0.0000	0.0000	15.0000	0.0000	15.0000	219.9687	3299.5305	3299.5305
9	FDM10080	Moretele	Hopetown	VEGT	Vegetables	Perishables	Agriculture	Refrigerated	Other agriculture	d	2.0000	0.0000	0.0000	2.0000	0.0000	2.0000	767.6536	1535.3072	1535.3072
10	FDM10080	Moretele	Phokwani	VEGT	Vegetables	Perishables	Agriculture	Refrigerated	Other agriculture	d	10.0000	0.0000	0.0000	10.0000	0.0000	10.0000	568.3688	5683.6880	5683.6880
11	FDM10030	Moretele	Waterberg	MAZE	Maize	Dry Bulk	Agriculture	Agricultural dry bulk	Grain	d	32.0000	0.0000	0.0000	32.0000	0.0000	32.0000	89.7732	2872.7424	2872.7424
12	FDM30210	Moretele	Fraserburg	PHAR	Pharmaceutical Products	Break Bulk	Manufacturing	Palletized	FMCG	d	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	1167.2050	1167.2050	1167.2050
13	FDM30020	Moretele	Mutali	MEAT	Slaughtered animal meat	Perishables	Manufacturing	Refrigerated	Other agriculture	d	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	476.1196	476.1196	476.1196
14	FDM10200	Moretele	Witsieshoek	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	23.0000	0.0000	0.0000	23.0000	0.0000	23.0000	453.4185	10428.6255	10428.6255
15	FDM10060	Moretele	Thabamooop	SBEA	Soya beans	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	202.8048	202.8048	202.8048
16	FDM10170	Mpofu	Albany	MILK	Milk (bulk)	Liquid Bulk	Agriculture	Liquid bulk	Other agriculture	d	2.0000	0.0000	0.0000	2.0000	0.0000	2.0000	115.5536	231.1072	231.1072
17	FDM30010	Mpofu	Moretele	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	30.0000	0.0000	0.0000	30.0000	0.0000	30.0000	1025.217	30756.5100	30756.5100
18	FDM10170	Mpofu	Polela	MILK	Milk (bulk)	Liquid Bulk	Agriculture	Liquid bulk	Other agriculture	d	5.0000	0.0000	0.0000	5.0000	0.0000	5.0000	609.268	3046.3400	3046.3400
19	FDM20220	Mpofu	Sterkstroom	STON	Stone	Dry Bulk	Mining	Open skip bulk	Construction	d	2.0000	0.0000	0.0000	2.0000	0.0000	2.0000	144.8846	289.7692	289.7692
20	FDM30010	Mpofu	Krugerdsorp	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	99.0000	0.0000	0.0000	99.0000	0.0000	99.0000	874.4694	86572.4706	86572.4706
21	FDM30010	Mpofu	Kenhardt	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	7.0000	0.0000	0.0000	7.0000	0.0000	7.0000	793.9852	5557.8964	5557.8964
22	FDM30010	Mpofu	Potgietersrus	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	25.0000	0.0000	0.0000	25.0000	0.0000	25.0000	1114.146	27853.6500	27853.6500
23	FDM10170	Mpofu	Randburg	MILK	Milk (bulk)	Liquid Bulk	Agriculture	Liquid bulk	Other agriculture	d	20.0000	0.0000	0.0000	20.0000	0.0000	20.0000	875.2262	17504.5240	17504.5240
24	FDM10200	Mpofu	Gordonia	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	5.0000	0.0000	0.0000	5.0000	0.0000	5.0000	853.5121	4267.5605	4267.5605
25	FDM10200	Mpofu	Piet Retief	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	64.0000	0.0000	0.0000	64.0000	0.0000	64.0000	966.1413	61833.0432	61833.0432
26	FDM30010	Mpofu	Hoopstad	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	5.0000	0.0000	0.0000	5.0000	0.0000	5.0000	618.2285	3091.1425	3091.1425
27	FDM10170	Mpofu	Mount Ayliff	MILK	Milk (bulk)	Liquid Bulk	Agriculture	Liquid bulk	Other agriculture	d	3.0000	0.0000	0.0000	3.0000	0.0000	3.0000	438.8493	1316.5479	1316.5479
28	FDM10170	Mpofu	Seshego	MILK	Milk (bulk)	Liquid Bulk	Agriculture	Liquid bulk	Other agriculture	d	14.0000	0.0000	0.0000	14.0000	0.0000	14.0000	1210.107	16941.4980	16941.4980
29	FDM10090	Frankfort	Ficksburg	POTA	Potatoes	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	20.0000	0.0000	0.0000	20.0000	0.0000	20.0000	207.7701	4155.4020	4155.4020
30	FDM30010	Somerset East	Marquard	FOOD	Processed Foods	Break Bulk	Manufacturing	Palletized	FMCG	d	5.0000	0.0000	0.0000	5.0000	0.0000	5.0000	597.6669	2988.3345	2988.3345
31	FDM30020	Somerset East	Williston	MEAT	Slaughtered animal meat	Perishables	Manufacturing	Refrigerated	Other agriculture	d	3.0000	0.0000	0.0000	3.0000	0.0000	3.0000	569.9789	1709.9367	1709.9367
32	FDM30020	Somerset East	Graaff-Reinet	MEAT	Slaughtered animal meat	Perishables	Manufacturing	Refrigerated	Other agriculture	d	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	121.8783	121.8783	121.8783
33	FDM30280	Somerset East	Somerset East	METL	Metal products, machinery and electronic equipment	Break Bulk	Manufacturing	Heavy break bulk	Other manufactured products	d	13.0000	0.0000	0.0000	13.0000	0.0000	13.0000	24.29	315.7700	315.7700
34	FDM10200	Somerset East	Wolmaransstad	OAGR	Other Agriculture	Dry Bulk	Agriculture	Agricultural dry bulk	Other agriculture	d	10.0000	0.0000	0.0000	10.0000	0.0000	10.0000	750.8657	7508.6570	7508.6570
35	FDM30020	Somerset East	Fouriesburg	REITZ	Slaughtered animal meat	Perishables	Manufacturing	Refrigerated	Other agriculture	d	2.0000	0.0000	0.0000	2.0000	0.0000	2.0000	102.4085	204.8170	204.8170
36	FDM30280	Somerset East	Richmond	METL	Metal products, machinery and electronic equipment	Break Bulk	Manufacturing	Heavy break bulk	Other manufactured products	d	4.0000	0.0000	0.0000	4.0000	0.0000	4.0000	731.5018	2926.0072	2926.0072



# Sample of BigCube data file

R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	
Road_tonkm	Total_tonk	corridor		ORIGINNEWG	DESTINATIO	ORIGINDEST	Economic_C	Economic_1	Rail_Frien	Distance1P	Distance2P	or_density	des_densit	DBP	Distance_C	T_Class	GFB
1	4638.2600	4638.2600	Gauteng North	-Graaff-Reinet & surrounds	Gauteng North	Graaff-Reinet & surrounds	M_GT	CR_GT_MB	SouthCor - South Bound	0.0680	0.9320	Low	Low	DD	500+	T5d	GFB
2	30976.3058	30976.3058	Gauteng North	-Lesotho	Gauteng North	Lesotho	M_GT	R_FS	blank	0.2288	0.7712	Low	High	DB	500+	T3a	GFB
3	701.4699	701.4699	Gauteng North	-Durban North Coast	Gauteng North	Durban North Coast	CR_GT_DBN	R_KZN	NatCor - SouthEast Bound	0.7119	0.2881	Low	High	DD	500+	T4b	GFB
4	92372.9074	92372.9074	Gauteng North	-Nelspruit	Gauteng North	Nelspruit	CR_GT_NEL	blank	EastCor - East Bound	1.0000	0.0000	Low	Low	DD	150-500	T5c	GFB
5	12681.8860	12681.8860	Gauteng North	-Newcastle-Dundee	Gauteng North	Newcastle-Dundee	M_GT	CR_GT_DBN	NatCor - SouthEast Bound	0.2787	0.7213	Low	Low	DD	150-500	T5d	GFB
6	8170.5111	8170.5111	Gauteng North	-Mokopane	Gauteng North	Mokopane	CR_GT_PLK	blank	blank	1.0000	0.0000	Low	Low	DD	150-500	T5d	GFB
7	114055.3630	114055.3630	Gauteng North	-Durban & surrounds	Gauteng North	Durban & surrounds	M_GT	CR_GT_DBN	NatCor - SouthEast Bound	0.1618	0.8382	Low	High	DD	500+	T6a	GFB
8	3299.5305	3299.5305	Gauteng North	-Gauteng West	Gauteng North	Gauteng West	M_GT	blank	blank	1.0000	0.0000	Low	High	DD	150-500	T6a	GFB
9	1535.3072	1535.3072	Gauteng North	-Kimberley	Gauteng North	Kimberley	CR_GT_CPT	blank	CapeCor - South Bound	1.0000	0.0000	Low	Low	DD	500+	T6d	GFB
10	5683.6880	5683.6880	Gauteng North	-Mafikeng	Gauteng North	Mafikeng	CR_GT_LOB	blank	blank	1.0000	0.0000	Low	Low	DD	500+	T6d	GFB
11	2872.7424	2872.7424	Gauteng North	-Waterberg	Gauteng North	Waterberg	R_LP	blank	blank	1.0000	0.0000	Low	Low	DD	50-149	T6d	GFB
12	1167.2050	1167.2050	Gauteng North	-Williston & surrounds	Gauteng North	Williston & surrounds	CR_GT_CPT	R_NC	blank	0.4867	0.5133	Low	Low	DD	500+	T5d	GFB
13	476.1196	476.1196	Gauteng North	-Makhado	Gauteng North	Makhado	CR_GT_BB	R_LP	NorthCor - North Bound	0.7048	0.2952	Low	Low	DD	150-500	T5d	GFB
14	10428.6255	10428.6255	Gauteng North	-Harrismith/Frankfort	Gauteng North	Harrismith/Frankfort	M_GT	CR_GT_DBN	blank	0.2939	0.7061	Low	Low	DD	150-500	T5d	GFB
15	202.8048	202.8048	Gauteng North	-Polokwane	Gauteng North	Polokwane	CR_GT_PLK	blank	NorthCor - North Bound	1.0000	0.0000	Low	Low	DD	150-500	T6d	GFB
16	231.1072	231.1072	King William - Grahamstown	-King William - Grahamstown	King William - Grahamstown	King William - Grahamstown	R_EC	blank	blank	1.0000	0.0000	Low	Low	DD	50-149	T6d	GFB
17	30756.5100	30756.5100	King William - Grahamstown	-Gauteng North	King William - Grahamstown	Gauteng North	CR_EL_GT	M_GT	SouthEast Corridor - North Bound	0.8904	0.1096	Low	Low	DD	500+	T5d	GFB
18	3046.3400	3046.3400	King William - Grahamstown	-KZN Midlands	King William - Grahamstown	KZN Midlands	CR_EL_DBN	R_KZN	blank	1.0000	0.0000	Low	Low	DD	500+	T6d	GFB
19	289.7692	289.7692	King William - Grahamstown	-Stormberge & surrounds	King William - Grahamstown	Stormberge & surrounds	R_EC	blank	blank	1.0000	0.0000	Low	Low	DD	50-149	T0b	GFB
20	86572.4706	86572.4706	King William - Grahamstown	-Gauteng West	King William - Grahamstown	Gauteng West	CR_EL_GT	blank	SouthEast Corridor - North Bound	1.0000	0.0000	Low	High	DD	500+	T4b	GFB
21	5557.8964	5557.8964	King William - Grahamstown	-Upington	King William - Grahamstown	Upington	R_NC	R_EC	blank	0.4266	0.5734	Low	Low	DD	500+	T5d	GFB
22	27853.6500	27853.6500	King William - Grahamstown	-Mokopane	King William - Grahamstown	Mokopane	CR_EL_GT	CR_GT_PLK	blank	0.7031	0.2969	Low	Low	DD	500+	T5d	GFB
23	17504.5240	17504.5240	King William - Grahamstown	-Gauteng Central	King William - Grahamstown	Gauteng Central	CR_EL_GT	blank	SouthEast Corridor - North Bound	1.0000	0.0000	Low	High	DD	500+	T6a	GFB
24	4267.5605	4267.5605	King William - Grahamstown	-Upington	King William - Grahamstown	Upington	R_NC	R_EC	blank	0.4266	0.5734	Low	Low	DD	500+	T6d	GFB
25	61833.0432	61833.0432	King William - Grahamstown	-Ermeilo	King William - Grahamstown	Ermeilo	CR_EL_DBN	CR_DBN_GT	blank	0.5446	0.4554	Low	Low	DD	500+	T6d	GFB
26	3091.1425	3091.1425	King William - Grahamstown	-Kroonstad/Welkom	King William - Grahamstown	Kroonstad/Welkom	CR_EL_GT	blank	blank	1.0000	0.0000	Low	Low	DD	500+	T5d	GFB
27	1316.5479	1316.5479	King William - Grahamstown	-Mthatha	King William - Grahamstown	Mthatha	R_EC	blank	blank	1.0000	0.0000	Low	Low	DD	150-500	T6d	GFB
28	16941.4980	16941.4980	King William - Grahamstown	-Polokwane	King William - Grahamstown	Polokwane	CR_EL_GT	CR_GT_PLK	blank	0.7049	0.2951	Low	Low	DD	500+	T6d	GFB
29	4155.4020	4155.4020	Harrismith/Frankfort	-Ventersburg-Botshabelo	Harrismith/Frankfort	Ventersburg-Botshabelo	R_FS	blank	blank	1.0000	0.0000	Low	Low	DD	150-500	T6d	GFB
30	2988.3345	2988.3345	Somerset East & Surrounds	-Ventersburg-Botshabelo	Somerset East & Surrounds	Ventersburg-Botshabelo	CR_PE_GT	R_FS	blank	0.5909	0.4091	Low	Low	DD	500+	T5d	GFB
31	1709.9367	1709.9367	Somerset East & Surrounds	-Williston & surrounds	Somerset East & Surrounds	Williston & surrounds	R_NC	R_EC	blank	0.4724	0.5276	Low	Low	DD	500+	T5d	GFB
32	121.8783	121.8783	Somerset East & Surrounds	-Graaff-Reinet & surrounds	Somerset East & Surrounds	Graaff-Reinet & surrounds	R_EC	blank	blank	1.0000	0.0000	Low	Low	DD	50-149	T5d	GFB
33	315.7700	315.7700	Somerset East & Surrounds	-Somerset East & Surrounds	Somerset East & Surrounds	Somerset East & Surrounds	R_EC	blank	blank	1.0000	0.0000	Low	Low	DD	<50	T5d	GFB
34	7508.6570	7508.6570	Somerset East & Surrounds	-Vryburg	Somerset East & Surrounds	Vryburg	CR_PE_GT	R_NC	blank	0.4776	0.5224	Low	Low	DD	500+	T6d	GFB
35	204.8170	204.8170	Ventersburg-Botshabelo	-Harrismith/Frankfort	Ventersburg-Botshabelo	Harrismith/Frankfort	R_FS	blank	blank	1.0000	0.0000	Low	Low	DD	50-149	T5d	GFB
36	2926.0072	2926.0072	Somerset East & Surrounds	-KZN Midlands	Somerset East & Surrounds	KZN Midlands	CR_EL_DBN	CR_PE_EL	blank	0.3082	0.6918	Low	Low	DD	500+	T5d	GFB



# Discussion points

Methodology

Rationale

Logistics performance measurement

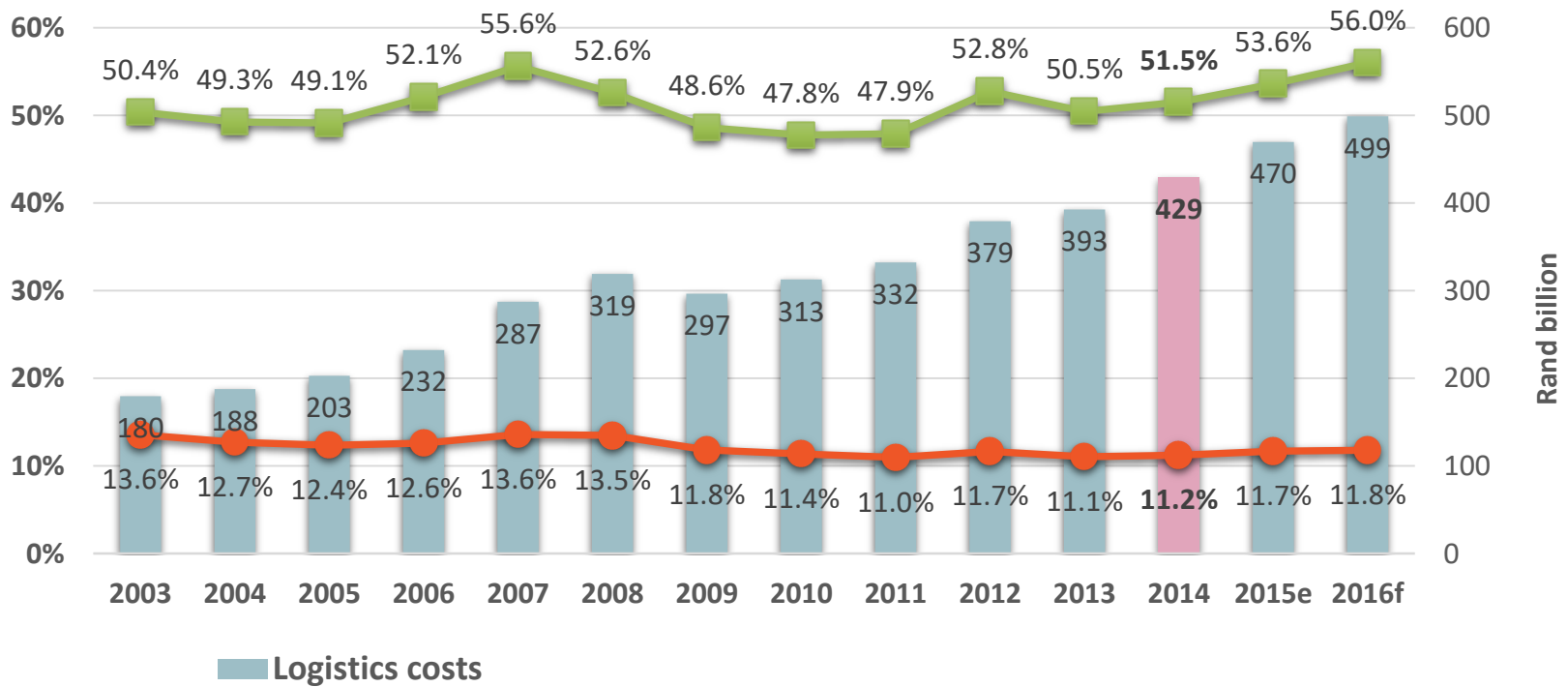
Macrologistics – decision making enablement

Examples of Macrologistics in practice

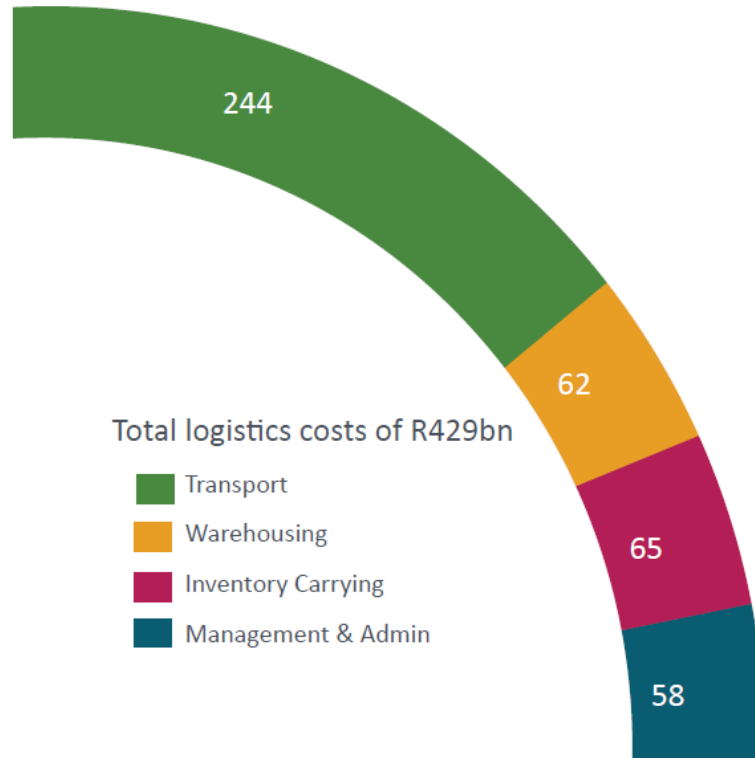
The future of logistics



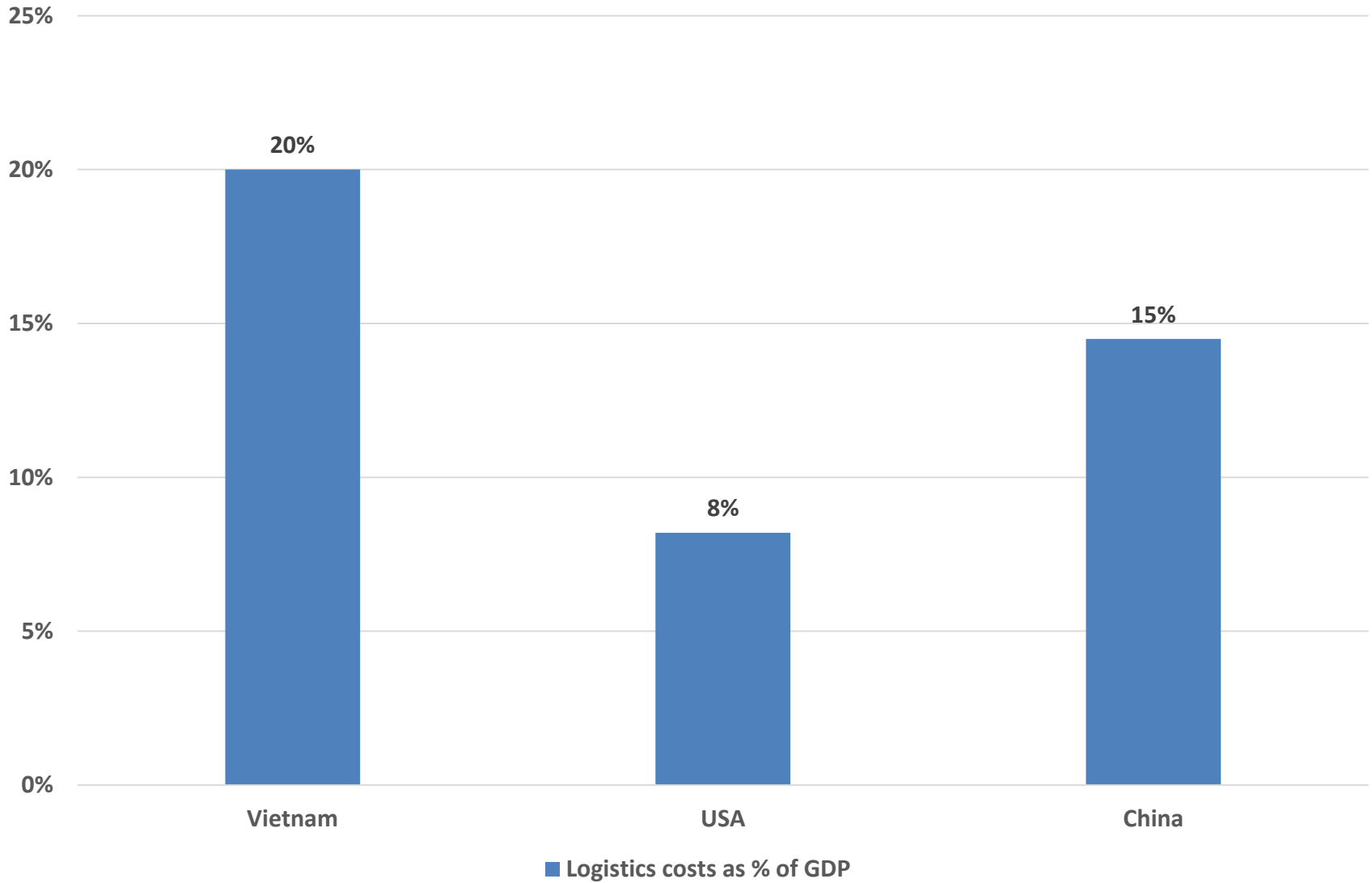
# Logistics costs for South Africa



# Transport costs is still the biggest contributor



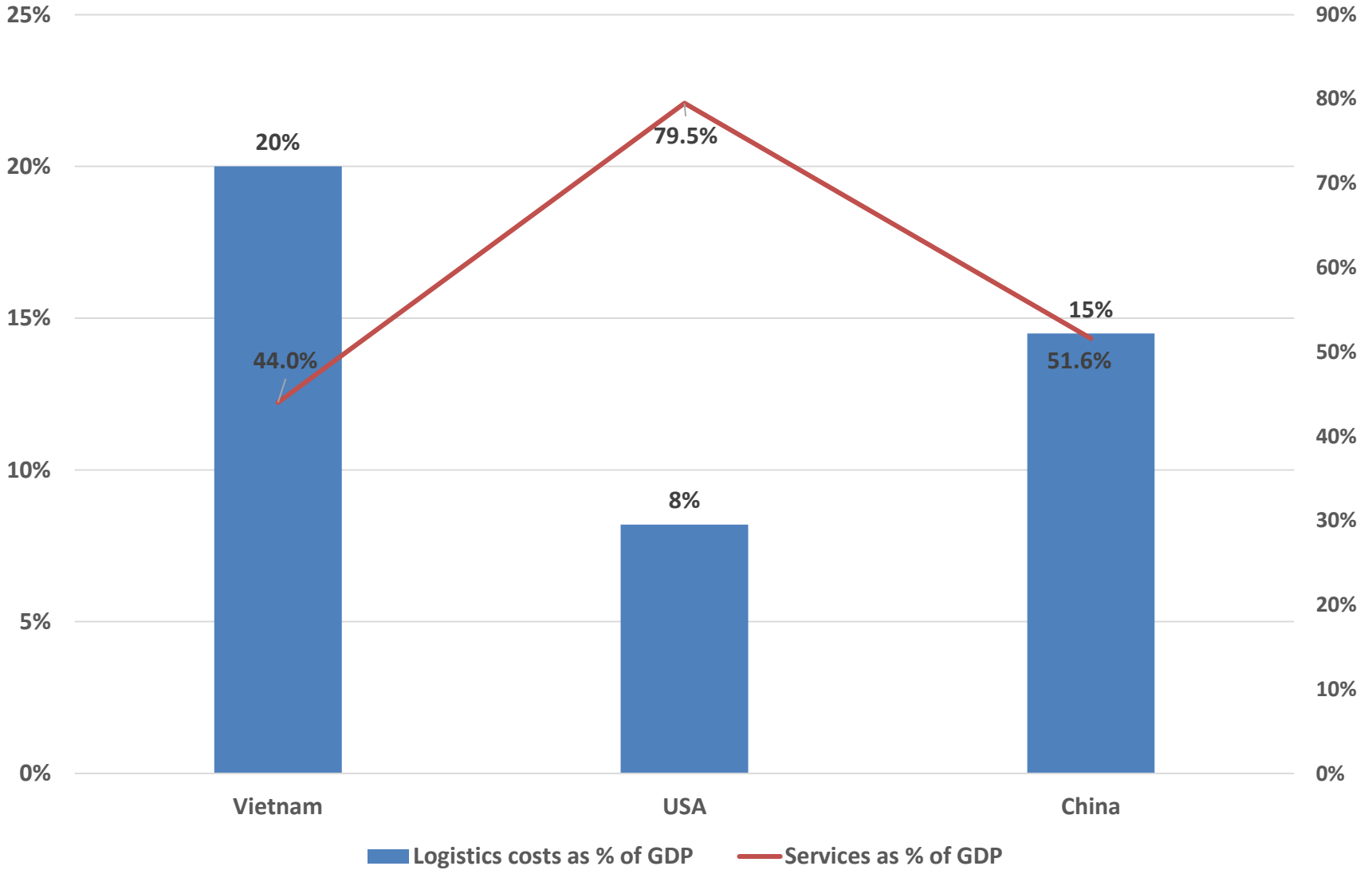
# National logistics costs and GDP



Source: [Armstrong & Associates, Inc.](#) Global 3PL market size estimates



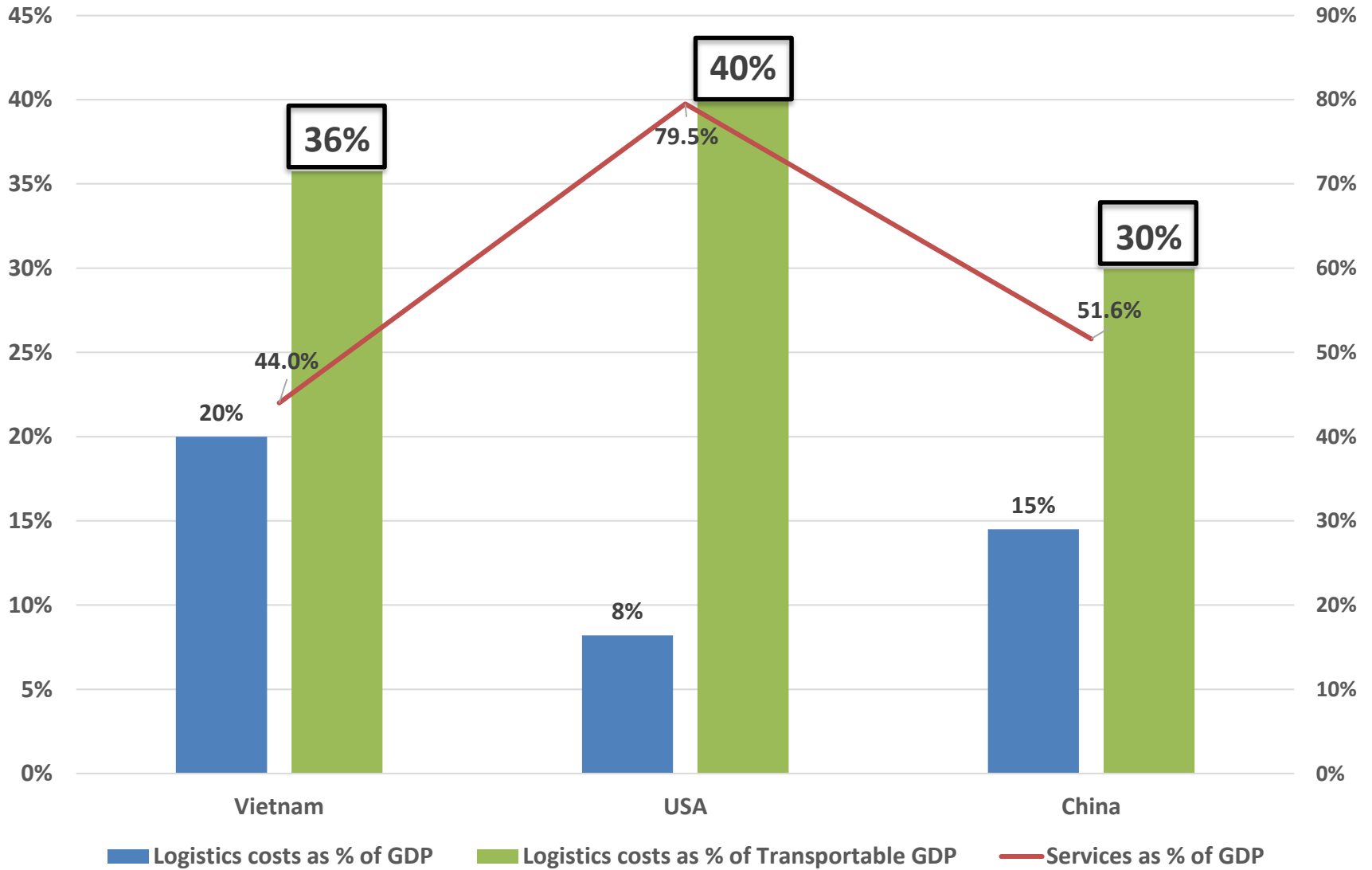
# National logistics costs and GDP



Source: Armstrong & Associates, Inc. Global 3PL market size estimates  
Central Intelligence Agency, World Factbook



# National logistics costs and GDP



Logistics costs as % of GDP

Logistics costs as % of Transportable GDP

Services as % of GDP



Source: Armstrong & Associates, Inc. Global 3PL market size estimates  
Central Intelligence Agency, World Factbook

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Planning for the future



# National cost measurement shouldn't exist statically: It should support decision making continuously

- Logistics have a functional view
  - Transport and storage and related management and inventory holding costs
- A systemic integrative view
  - Trade-offs between these functions
- A supply chain view
  - Lowest total cost of ownership
- Macrologistics developed a functional view (although very few people call it that)
  - USA, South Africa, Finland and some other countries sporadically
- The integrative view requires instrumentation
  - Did not exist up to now
- The supply chain view
  - Determining the lowest cost of ownership to the economy. What we are dealing with now



# Discussion points

Methodology

Rationale

Logistics performance measurement

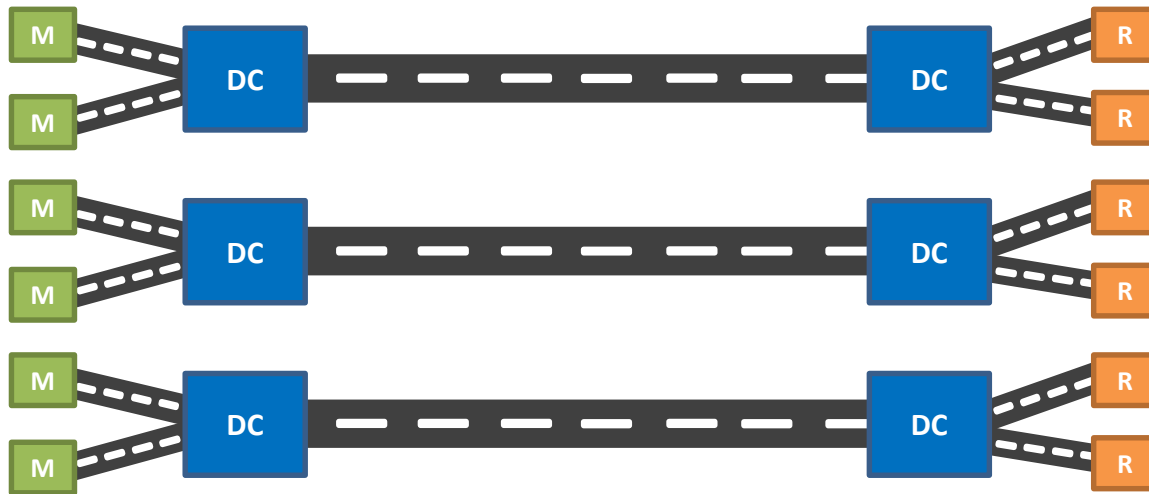
Macrologistics – decision making enablement

Examples of Macrologistics in practice

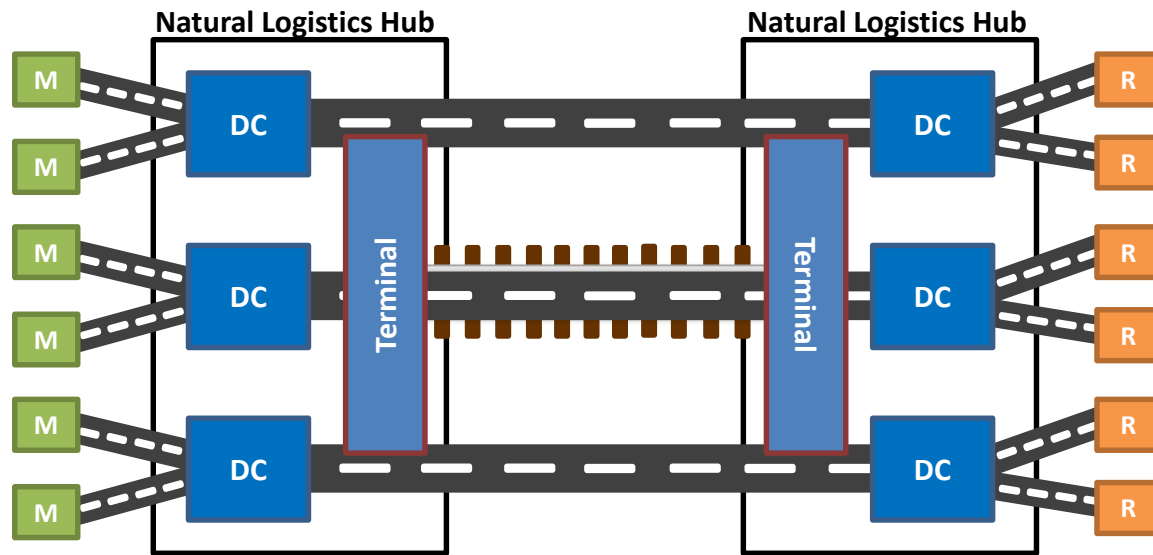
Planning for the future



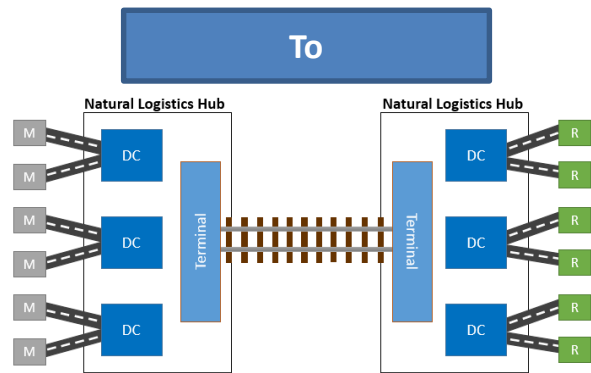
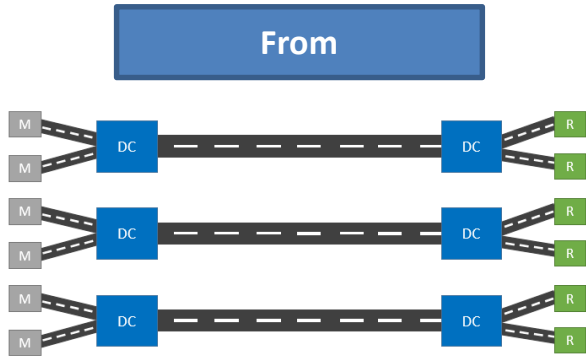
The typical FMCG long distance supply chain has natural “catchment” areas...



# ...and logistics hubs should form



# ...and logistics hubs should form



## Volumes and Savings

	South Africa	Corridors	2 corridors only
<b>Volumes</b>	Tons (million)	50	20
	Tonkilometers (billions)	30	13
	Costs (Billion R)	7	4
<b>Savings</b>			400
Emmissions ('000 tons)			

400



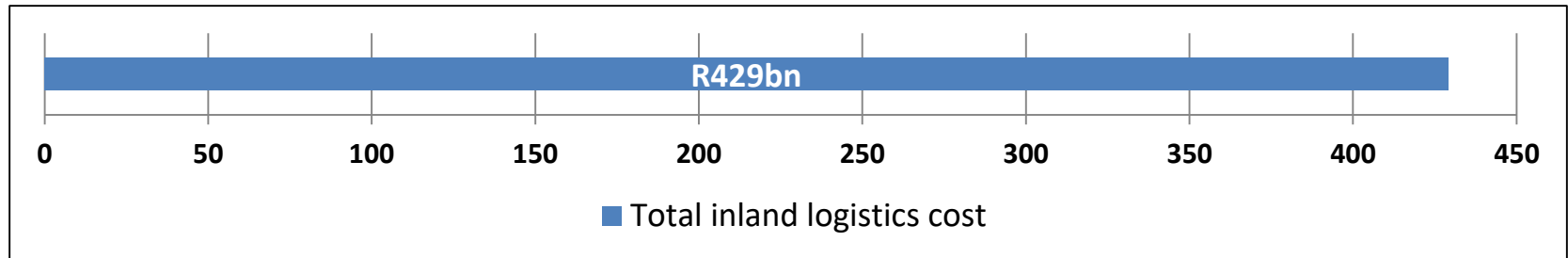


# Considering a vehicle fleet – for a major corridor in South Africa (Natcor)

	Current fleet	Trips per day (laden)
Current	3 500	2 000
30 year scenario: Aggressive rail	8 000	4 500
30 year scenario: Current rail	11 000	6 500
30 year scenario: Stagnated rail	14 000	8 000



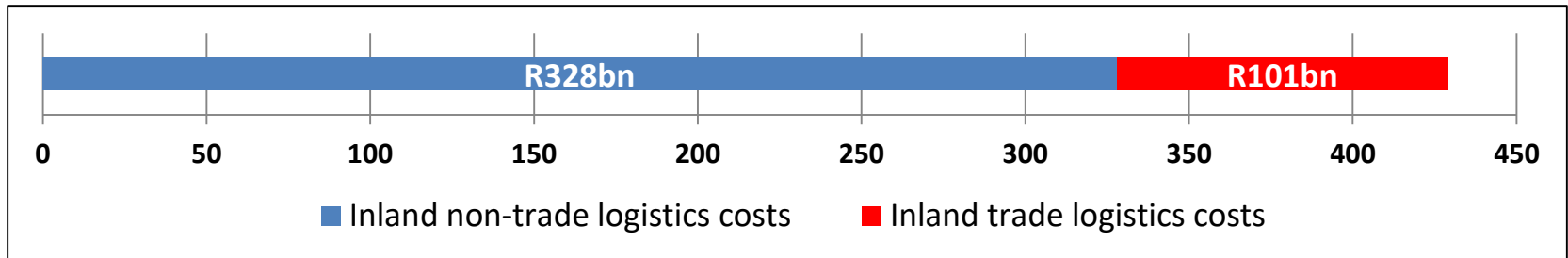
# South Africa's logistics costs for 2014 were R429 billion



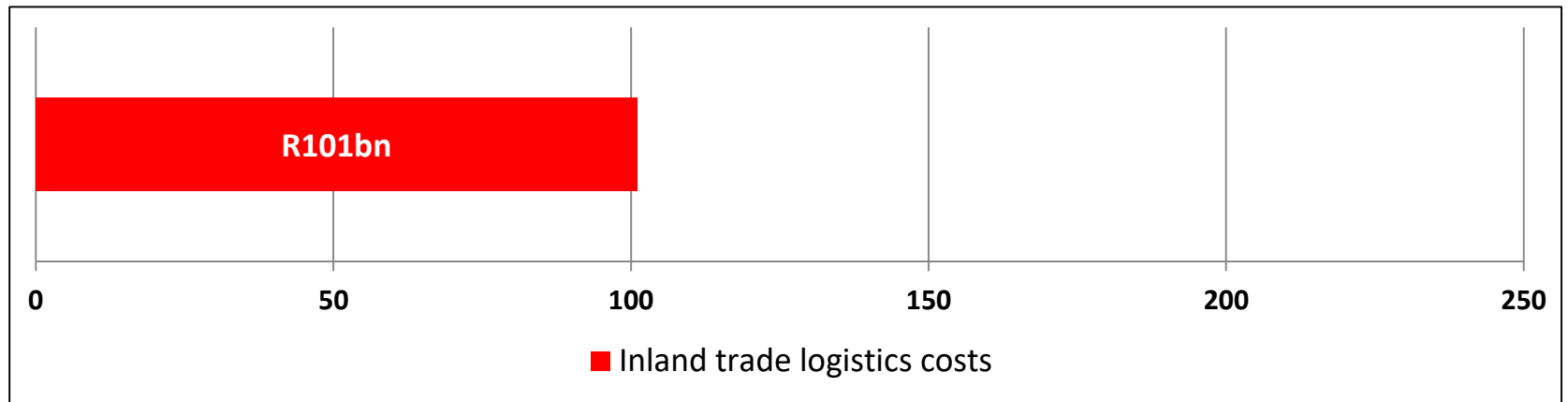
This includes costs up to the quay wall, but excludes the port and liner costs



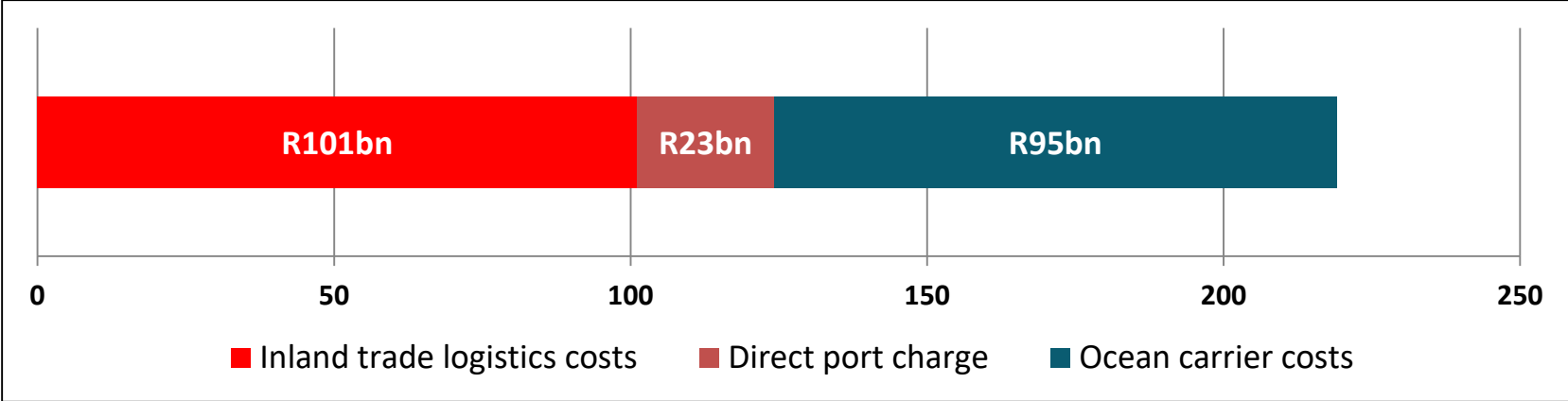
# Of the R429 billion, R101 billion were inland trade logistics costs



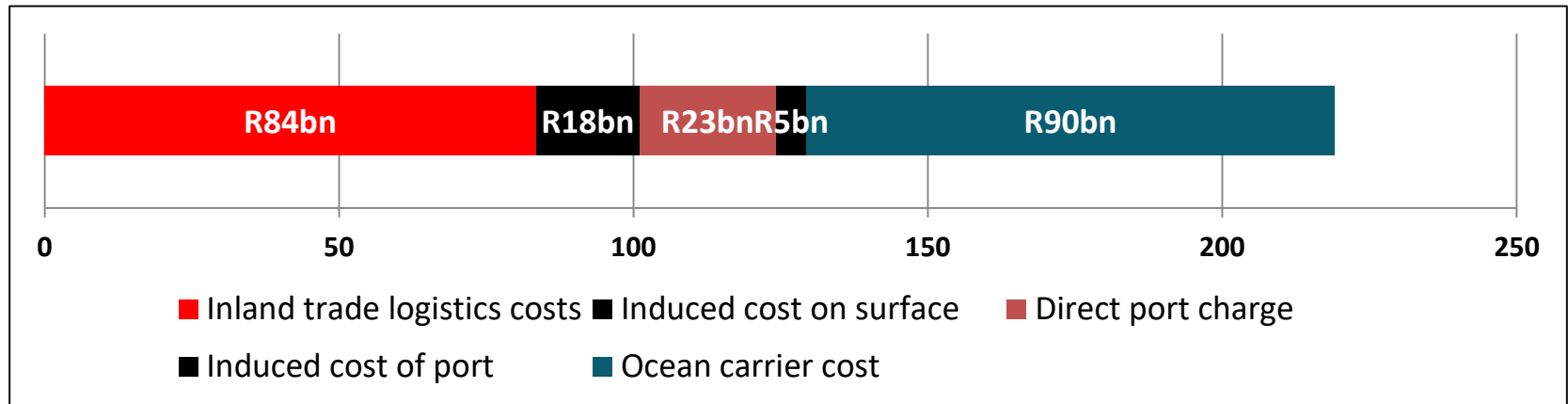
# Of the R429 billion, R101 billion were inland trade logistics costs



# Trade logistics costs



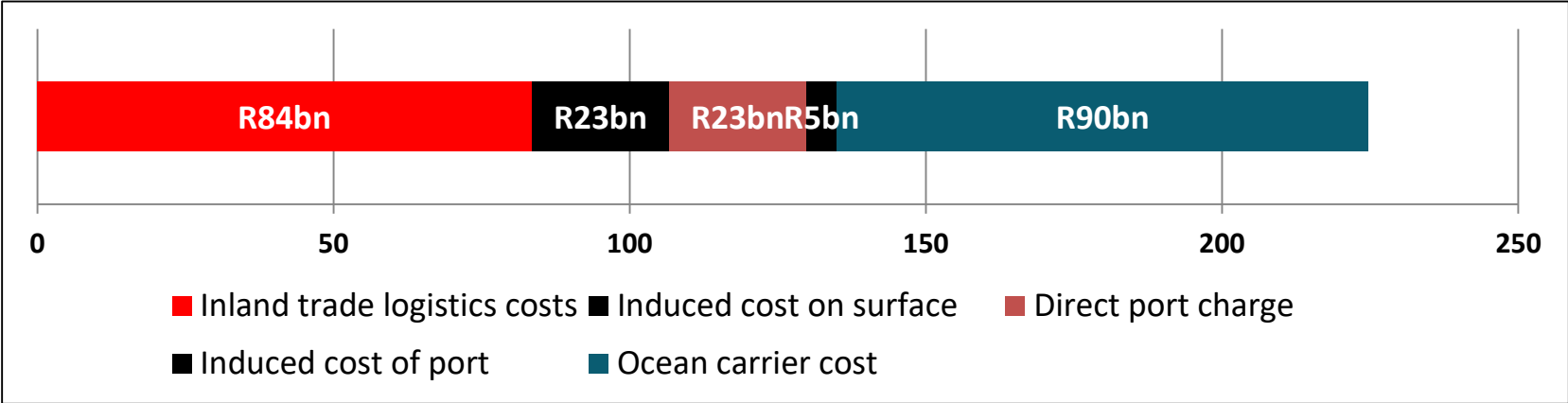
**But R23 billion of this costs is “induced”.**  
**It is overspend or waste, due to the nature of trade supply chains**



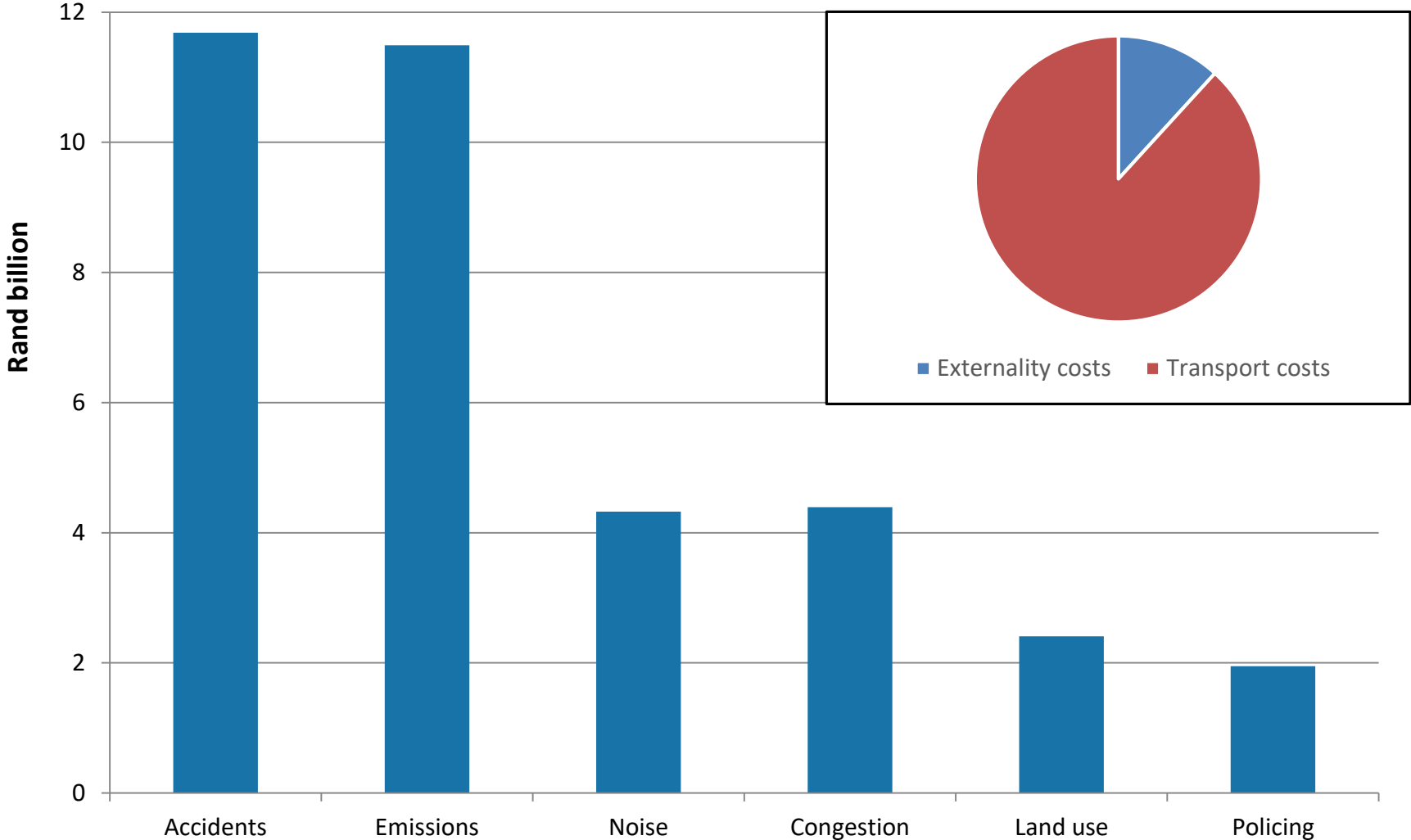
**Induced costs total R23 billion**



# This figure could be as high as R28 billion

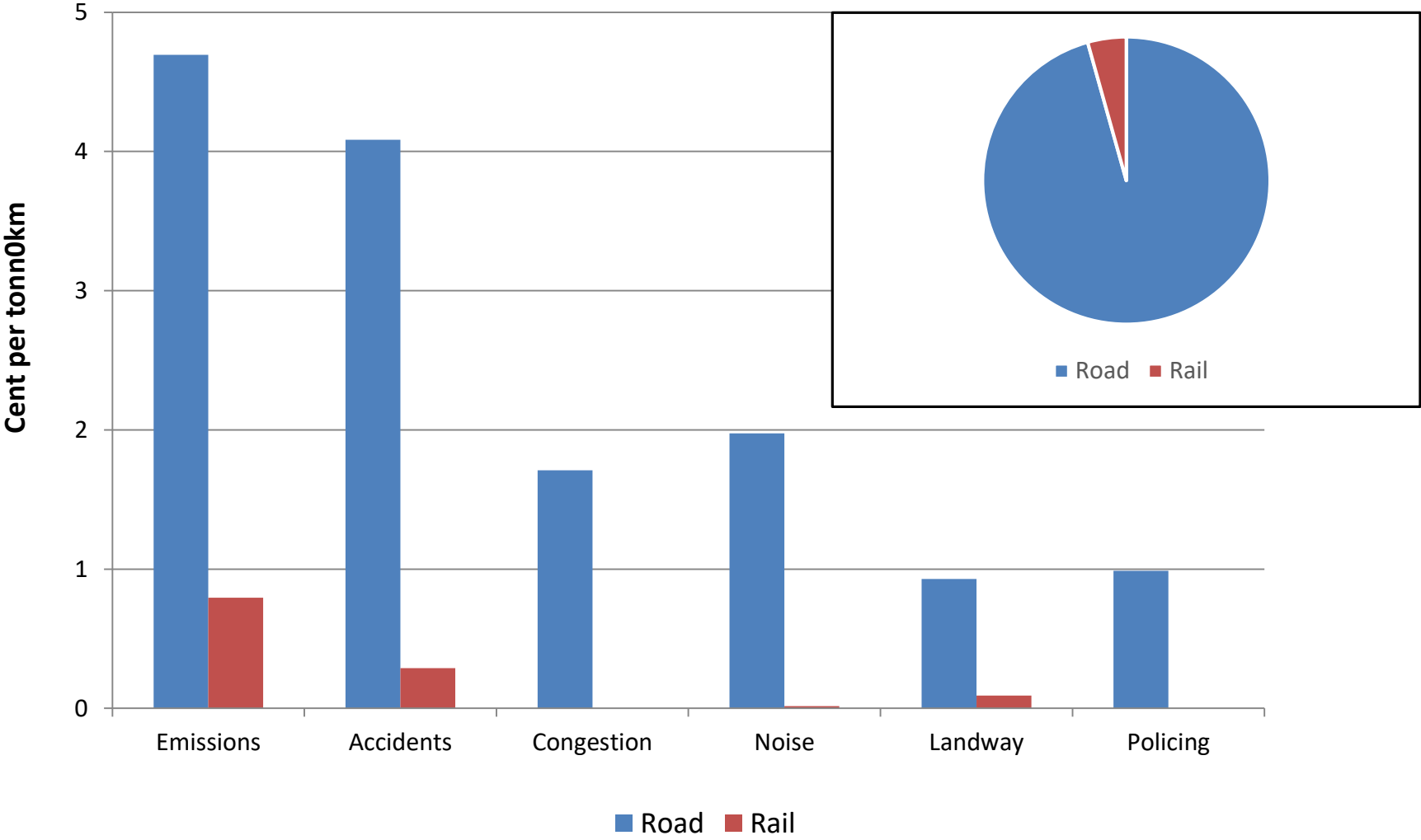


# Externality costs in South Africa

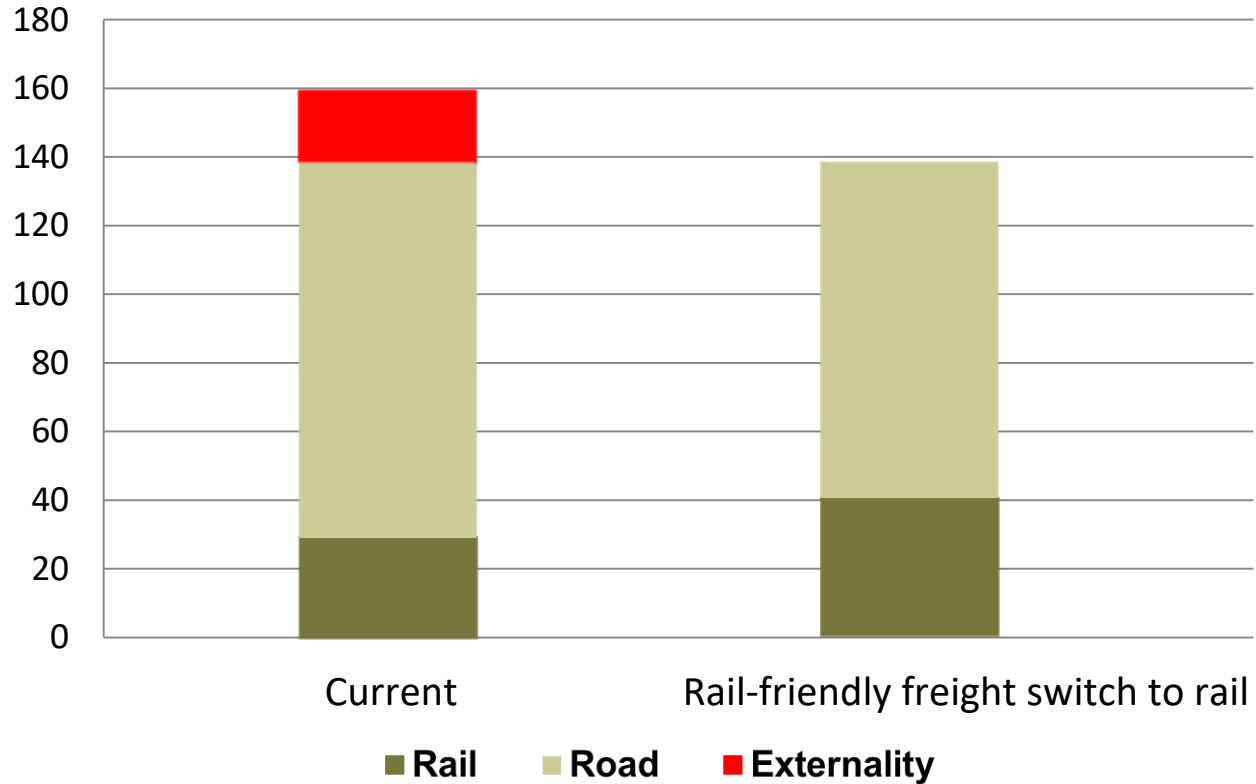




# Externality costs in South Africa – rates per mode



# The full results of internalising South Africa's freight externalities for corridor freight



# Discussion points

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# What causes high logistics costs?

High demand for logistics relative to value added

- Spatial
- Lack of beneficiation
- Excessive choice

Expensive or inefficient supply

- Modal choice
- Routing and scheduling
- Double handling
- Empty haul
- Load factors
- Driver behaviour
- Inefficient drivetrains



# Our modeling approach can continuously...

On the **demand side** suggest and develop cost benefit analysis for alternative:

- Nodes
- Industrialization
- Demand management

On the **supply side** suggest and develop cost benefit analysis for alternative:

- Modes
- Technologies
- Routes



**Thank You**

