‘A comparison of road vs rail investment options on the Gauteng-Durban Corridor’

Road Pavements Forum, Gateway Centre
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This presentation is in five parts:

The Durban Gauteng corridor in context and in numbers

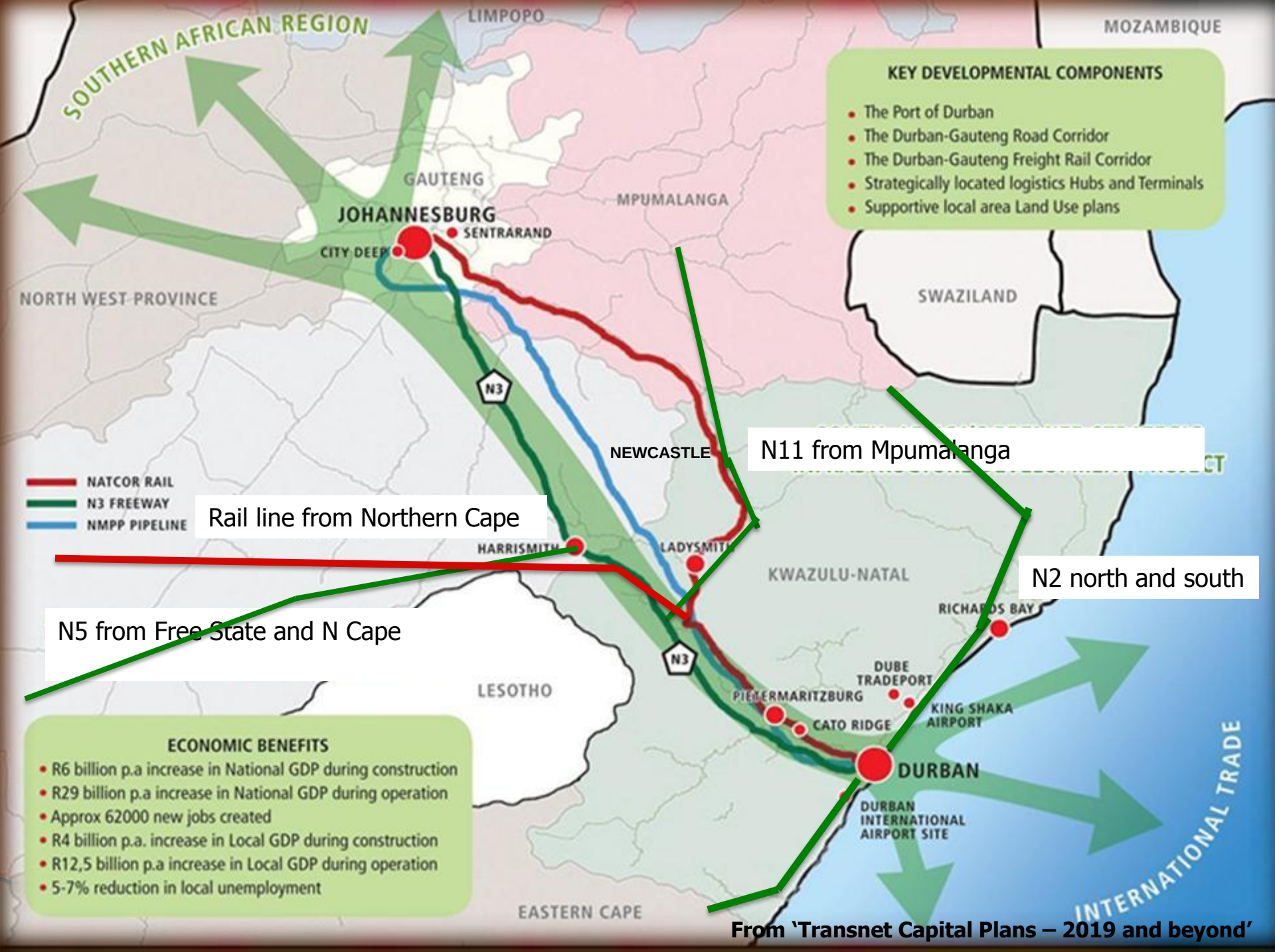
Demand projections for the corridor

Introducing the three options and their costs and benefits

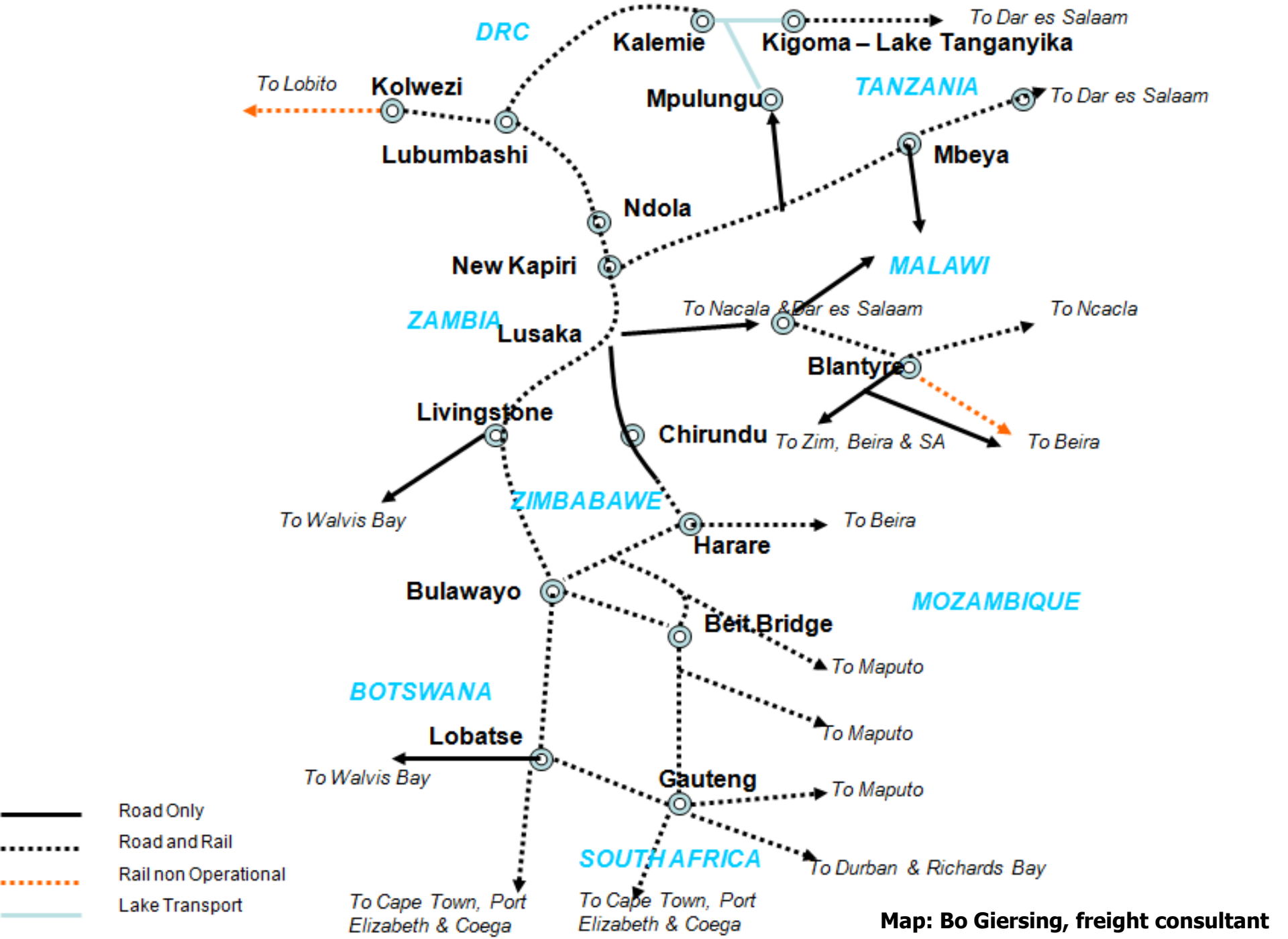
Funding issues – what is possible? What is likely?

Implementation issues – likely scenarios in practice

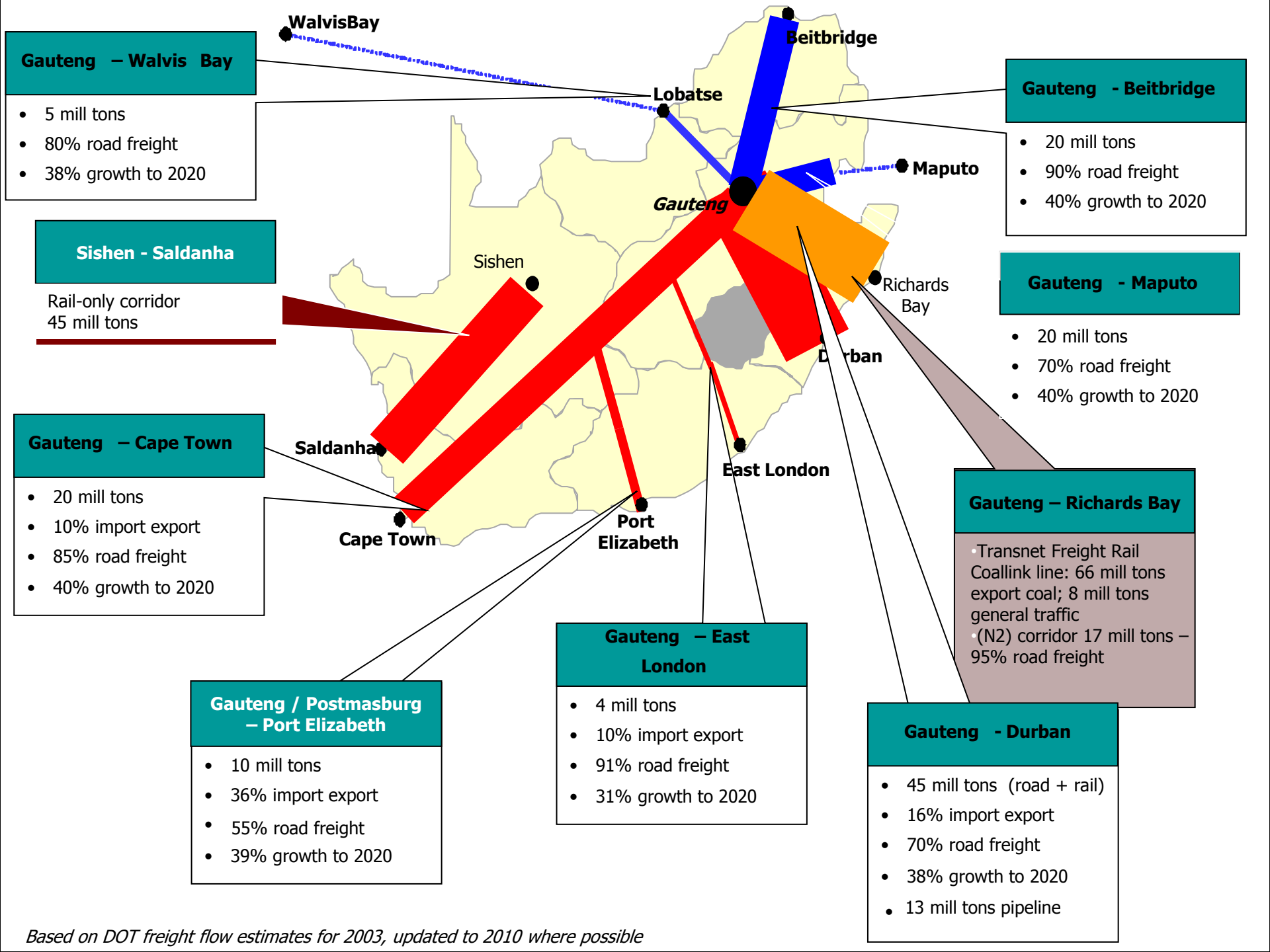
The corridor in context and in numbers



From 'Transnet Capital Plans – 2019 and beyond'



Map: Bo Giersing, freight consultant



Based on DOT freight flow estimates for 2003, updated to 2010 where possible

Current freight volumes and categories

Rail and road freight volumes on Durban Gauteng corridor, 2010, (,000tpa)						
Cargo category	Rail*			Road**		TOTAL
	Volumes using part of corridor	% use of corridor	Moderated for % use of corridor	Gross corridor tonnage (categories)	Payload corridor tonnage	Moderated road + rail tonnage
Containers	2,500	95%	2,375	4,000	3,000	**5,375**
Cars / parts	500	90%	450	1,000	1,000	**1,450**
Dry bulk	13,000	55%	7,150	9,000	6,000	**13,150**
Liquid bulk	2,000	75%	1,500	3,000	2,000	**3,500**
Other	4,000	80%	3,200	26,000	18,000	**21,200**
TOTAL	22,000		**14,675**	43,000	**30,000**	**44,675**

* Based on DOT and Transnet sources. % use of corridor based on origins of principle products – e.g. manganese and (some) iron ore joins corridor at Harrismith and so uses 50% of the corridor.
** Based on N3TC Weigh in Motion (WIM) tonnages taken at three locations (Harrismith, van Reenens and Hidcote) and then weighted to obtain an average tonnage using the whole corridor.
*** Rail cargo categories are summarized from detailed, but dated - 2007/08 - DOT survey data. Road cargo categories are Consultant's estimates based on general freight knowledge and typical commodities by vehicle type, this because the N3TC road data is recorded by vehicle type only.

What about the pipeline?

The existing pipeline carries about 16bn litres / year or 13 mtpa*. Capacity limit has led to fuels going by rail and road

The new pipeline (NMPP) has just started pumping and will have a capacity of about 25bn litres / year or 20 mtpa*

Further investment in pumping and control systems, will see this increase to some 50 mtpa over the next 30 years

This will mitigate growth of liquid bulks carried by road and rail. N3TC says that liquid bulk volumes declining already

* Calculation of fuel tonnage is based on the average specific gravities of petrol (0.7) and diesel (0.85)

Summary of current corridor freight

Durban Gauteng corridor market share – rail, road and pipeline, 2010			
Rail	**Road**	**Pipeline**	**Total**
15mt	30mt	13mt	58mt
26%	52%	22%	100%
Rail and road only			
15mt	30mt	-	45mt
33%	67%	-	100%

Demand projections for the corridor

Factors to consider

General economic growth as the driver of freight growth

Impact of new multi products pipeline capacity

The mix of commodities within the total freight volume

Desire to remove 'rail friendly' goods from roads

Impact of different infrastructure investment scenarios

Freight growth implications (1)

Western model economies have very long term economic growth of 2.5% p.a.; higher rates require different model

Freight growth tends to be higher than this where new economic activities are being generated by road transport

But higher than GDP rates of freight growth tend to decline over time, and will approximate long term GDP growth rate

Proposed long term (30 year) growth rate for freight on the Durban Gauteng corridor is therefore 3% p.a. in aggregate

Freight growth implications (2)

NMPP adds huge liquid bulk capacity leading to lower, but not zero, growth rates for this category: 1% p.a. average

Bulk lines provision will slow dry bulk growth but market segmentation means demand still there: 2.5% p.a. average

Container and autos growth will be driven by logistics demand and freight terminal development: 4.5% & 3.5%

'Other' goods category includes machinery, consumer goods etc., driven by industry & consumer demand: 3.3%

Freight growth projection – road + rail

Rail and road freight projections on Durban Gauteng corridor, 2010, (,000tpa)					
Cargo category	Estimated 2010 RAIL volume moderated for use of whole D-G route	Estimated 2010 ROAD volume moderated for use of whole D-G route	Estimated TOTAL corridor volume 2010 - all modes	Average annual growth factor	2040 corridor volume
Containers	2,375	3,000	5,375	4.5%	20,131
Cars / parts	450	1,000	1,450	3.5%	4,070
Dry bulk	7,150	6,000	13,150	2.5%	27,583
Liquid bulk	1,500	2,000	3,500	1.0%	4,717
Other	3,200	18,000	21,200	3.3%	56,149
TOTAL	**14,675**	**30,000**	**44,675**	**+/- 3%**	**112,651**

Accommodating growth - 3 scenarios

Scenario 1 (base): 'Transnet Upgrade' aspiration for the Durban Gauteng corridor + 'N3TC^{+}' 30 year programme

Scenario 2 (i): New standard gauge, 2-stack railway + 'N3TC^{+}' 30 year programme + Transnet 'Do Minimum'

Scenario 2 (ii): New standard gauge, 2-stack railway line + 'N3TC^{+}' 30 year programme of highway development

Scenario 3: Separate freight highway (including mainly passenger existing N3 highway) + Transnet 'Do Minimum'

Accommodating growth – mode share

Critical issue in assessing scenarios is how much of total trade will be attracted by the respective modes

Considerations include: Global and SA historic trends as reviewed in the 1986 de Villiers report and DOT (2008):

- Long term trend away from rail because of road flexibility
- Recovery of market share is usually at very high cost / subsidy
- Major successes (e.g. USA) involve radical restructuring, very long distances, large unified market and consequent low costs

Implication is that investment in rail is likely to achieve less than the desired mode transfer from road – or higher cost

Mode share by scenario – over 30 years

	Scenario 1		Scenario 2 (i)		
	'Transnet Upgrade'	N3	Standard Gauge 2 – stack railway	N3	'Transnet Do Minimum'
Mode share	50%	50%	40%	30%	30%
Tonnage by mode in 2040	57 mt	56 mt	45 mt	34 mt	34 mt
Average annual tonnage 2011-40	40 mt	40 mt	33 mt	23 mt	23 mt
	Scenario 2 (ii)		**Scenario 3**		
	Standard Gauge 2 – stack railway	N3	Freight Highway	N3 (pax)	'Transnet Do Minimum'
Mode share	55%	45%	70%	-	30%
Tonnage by mode in 2040	62 mt	51 mt	79 mt	-	34 mt
Average annual tonnage 2011-40	43 mt	36 mt	56 mt	-	23 mt

Note: 2010 tonnage = 45 mt; 2040 tonnage = 113 mt; average annual tonnage = 79 mt

Note: Separate scenarios provide the mode split by the 5 main categories

Costing of the scenarios – over 30 years

Descriptions + K, O & M costs (30 year) are provided for each element of each scenario. The costed options are:

- Transnet Upgrade – preferred / aspirational scenario
- Transnet 'Do Minimum' rail option (used mainly for bulks)
- Standard gauge 2-stack (standalone or with Transnet 'Do Minimum')
- Freight Highway (including existing N3 for passenger vehicles)
- N3 highway, tolled & non-tolled elements (three options)

Environmental externalities of road are costed; safety benefits also, via op' cost benefits of segregating freight & passengers

‘Transnet Upgrade’ – on the corridor

5a. NATCOR: Durban to Gauteng Rail Corridor

Project Description:
Rail infrastructure capacity improvements to provide for freight demand growth and a significant increase in rail market share in the container and automotive sectors.

Project Scope:

Short term:
- Junction modifications to segregate PRASA from TFR services
- Additional block signals to allow for more trains
- Electrical supply (3 kV DC) and transformer upgrades

Medium Term:
- Relieving of gradients and curves
- Additional 26 t/axle passing loops
- Upgrade of Johannesburg to Newcastle section to heavy haul

Long Term:
- Converting Johannesburg to Newcastle section to 25 kV AC
- Migration to CBA (in cab) train control systems
- Cato Ridge to Durban (Booth) new bypass line (R 13 bn)

Project Schedule:
- Integrated concept and pre-feasibility studies already completed
- Short Term construction to commence in 2012/13
- Medium Term construction to commence in 2019/20
- Long Term construction to commence in 2024/25

Project cost to completion:
- Approx. R 43 bn up to 2050
- Rail expenditure to 2019 is R 435 m (excluding rolling stock)

‘Transnet Upgrade’ – Gauteng terminals

5b. Gauteng Terminals

Project Description:

- Upgrading of current intermodal terminals and the construction of new super terminals within the Gauteng area in order to complement the development of an efficient freight gateway between Gauteng - Durban.

Project Scope:

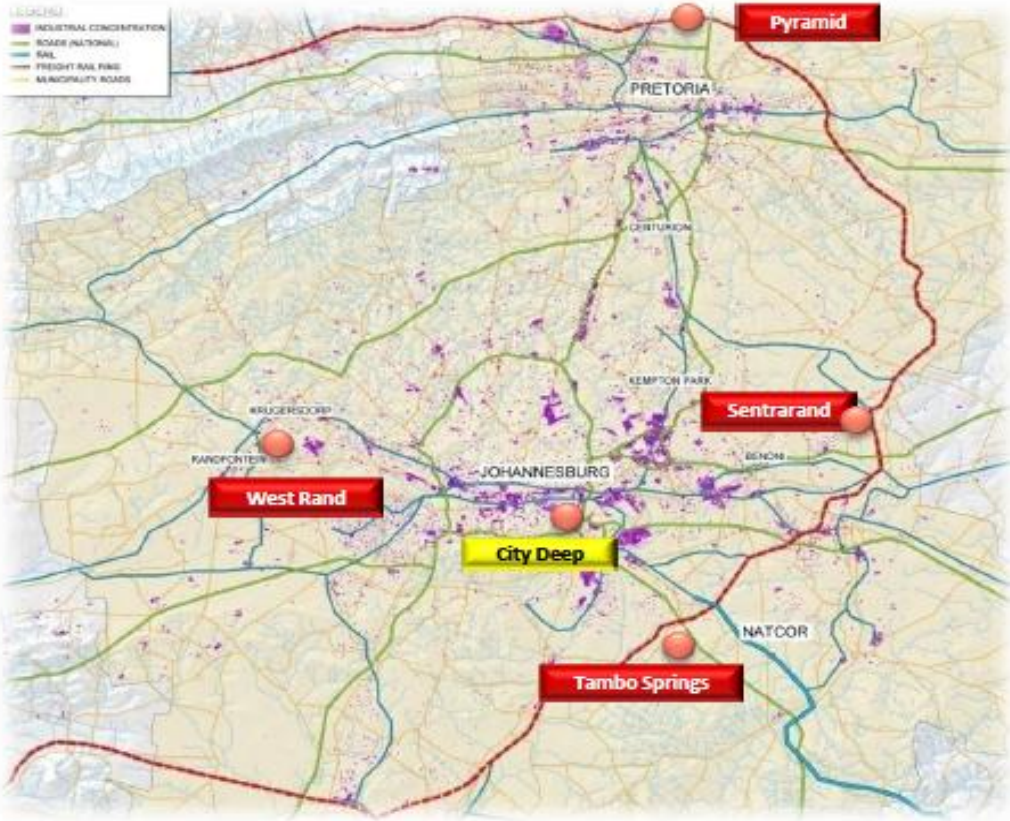
- Upgrading existing intermodal terminals and the development of new intermodal terminals within area of Gauteng

Project Schedule:

- City Deep rail access improvement to commence in 2013
- Super Intermodal Terminal Construction:
  - Pyramid (2012 – 2032)
  - Tambo Springs (2013 – 2029)
  - Sentrarand (2016 – 2039)

Project cost to completion: (order of magnitude)

- Approx. R 11 bn (Rail) + R 23 bn (Private Operators):
  - R 1,0 bn (City Deep rail component)
  - R 2,9 bn (Tambo Springs rail component)
  - R 5,7 bn (Sentrarand rail component)
  - R 1,7 bn (Pyramid rail component)



‘Transnet Upgrade’ – Durban terminals

5b. Durban Terminals

Project Description:
- The upgrading of current intermodal terminals as well as the construction of new super intermodal terminals within the Durban area in order to complement the development of an efficient freight gateway between Gauteng - Durban.

Project Scope:
- Upgrading existing intermodal terminals and the development of new intermodal terminals within area of Durban

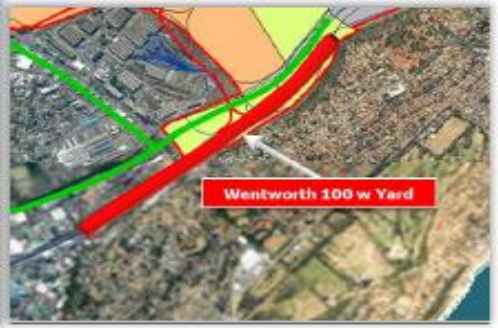
Project Schedule:
- Super Intermodal Terminal construction at Kings Rest
- Partial expansion of Bayhead yard into 100 wagon yard
- Bayhead yard buffer stack
- 100 Wagons yards at Race Course and Wentworth

Project cost to completion (order of magnitude):

Approx. R 3,6 bn
- R 1,6 bn (Kings Rest container terminal rail component)
- R 0,7 bn (Bayhead yard rail component)
- R 0,6 bn (Race Course yard rail component)
- R 0,7 bn (Wentworth yard rail component)
- No significant expenditure committed to in next 7 years
- Expenditure to date +- R 20 m (Studies)

Race Course yard

Wentworth yard



'Transnet Upgrade' – 30 year costing

30 year costs of 'Transnet Upgrade' element of Scenario 1 (Rbn)				
	Expansion	**Sustaining**	**Operation**	**Total**
Rail corridor	37	29	360	**426**
Gauteng terminals	34	23	45	**102**
Durban terminals	4	3	30	**37**
TOTAL	**75**	**55**	**435**	**565**
Annualised total	**2.5**	**1.8**	**14.5**	**19**

Notes:

- Transnet rail corridor expansion cost to 2050 (from Transnet 2019 Plan) x 0.85
- Transnet costing indicates that *sustaining* capital spend is 40 / 60 to expansion spend (noted in Transnet 2019 Plan)
- Gauteng terminals: Transnet assume that 67% of cost will come from private sector
- Operation costs are based on 2010 Transnet operating costs of +/- R21bn of which two thirds is freight rail and of which, again, two thirds is General Freight; and of which 60% is for this rail corridor. This yields R6bn for 2010. This has then been increased in proportion to freight volume increasing from 15 mtpa to 40 mtpa (average); thus from R6bn to, say, R16 bn / year but then allowing a 25% productivity improvement = R12bn = R360bn for 30 years. The terminal operating costs are additional.

'Transnet Do Minimum' – 30 year costing

30 year costs of 'Transnet Do Minimum' element of Scenarios 2 (i) and 3 (Rbn)				
	Expansion	**Sustaining**	**Operation**	**Total**
Rail corridor	20	13	180	**213**
Gauteng terminals	10	6	14	**30**
Durban terminals	2	1	10	**13**
TOTAL	**32**	**20**	**204**	**256**
Annualised total	**1.1**	**0.7**	**6.8**	**8.5**

Notes:

- Rail corridor cost less than half of Transnet Upgrade because not aiming for containers
- Sustaining capital spend is 40 / 60 to expansion spend, (Transnet 2019 Plan)
- Operation costs are based on Transnet Upgrade costs but reduced in line with the lower volumes and the lower operating costs of the mainly bulk commodities. With freight volume increasing from 15 mtpa to just 24 mtpa (average), the R6bn 2010 op costs might rise to, say, R10 bn / year abut this would in practice be reduced by about 40% to allow for the lower unit costs of handling bulks; in other words, back to R6bn / year x 30 years = R180bn for 30 years; (bulk) terminal operating costs are commensurately lower.

Standard gauge 2-stack – 30 year costing

30 year costs of a optimised, standard gauge, 2-stack railway Scenarios 2 (i) and 2 (ii), (Rbn)			
	Capital (including rolling stock)	Operation	Total
Rail corridor	47	270	**317**
Gauteng terminals	34	34	**68**
Durban terminals	4	23	**27**
TOTAL	**84**	**327**	**412**
Annualised total	**2.8**	**10.9**	**13.7**

Notes:

- Capital cost: Drawing on the following costed freight rail projects: Nigeria (China Rail Construction Co., 2006); Tanzania (Burlington Northern Santa Fe, 2009), and South Africa (Transnet's Swaziland link line, 2012) for a unit cost of R86m/km giving a total cost of R47bn for a 550km line.

- Operating costs: Net of rolling stock procurement, as typically with Transnet. With Transnet operating line and terminals, as in Scenario 2 (i), costs may be slightly lower than for conventional rail; 0.9 x Transnet Upgrade, adjusted downwards for the lower tonnage on the line compared to the Scenario with Transnet Upgrade: the total factor is therefore: 0.9 x (33/40 mtpa) = 0.75.

  For a privately operated line and terminals, as in Scenario 2 (ii), substantial operating efficiencies should be possible and 0.7 x Transnet Upgrade, adjusted upwards for the higher tonnage assumed in the Scenario, thus: 0.7 x (43/40 mtpa) = (0.75) [Only coincidentally the same as Scenario 2 (i)]

- Terminals: Capital costs as for Transnet Upgrade capital costs but operating costs lower by a factor of 0.75 as for rail operating costs.

Note: Long distance, high volume, double stack container rail offers greatest economic value if both operations and infrastructure are fully commercialised and also commercially integrated with freight hubs at either end of a corridor

N3TC + SANRAL - 30 year costing

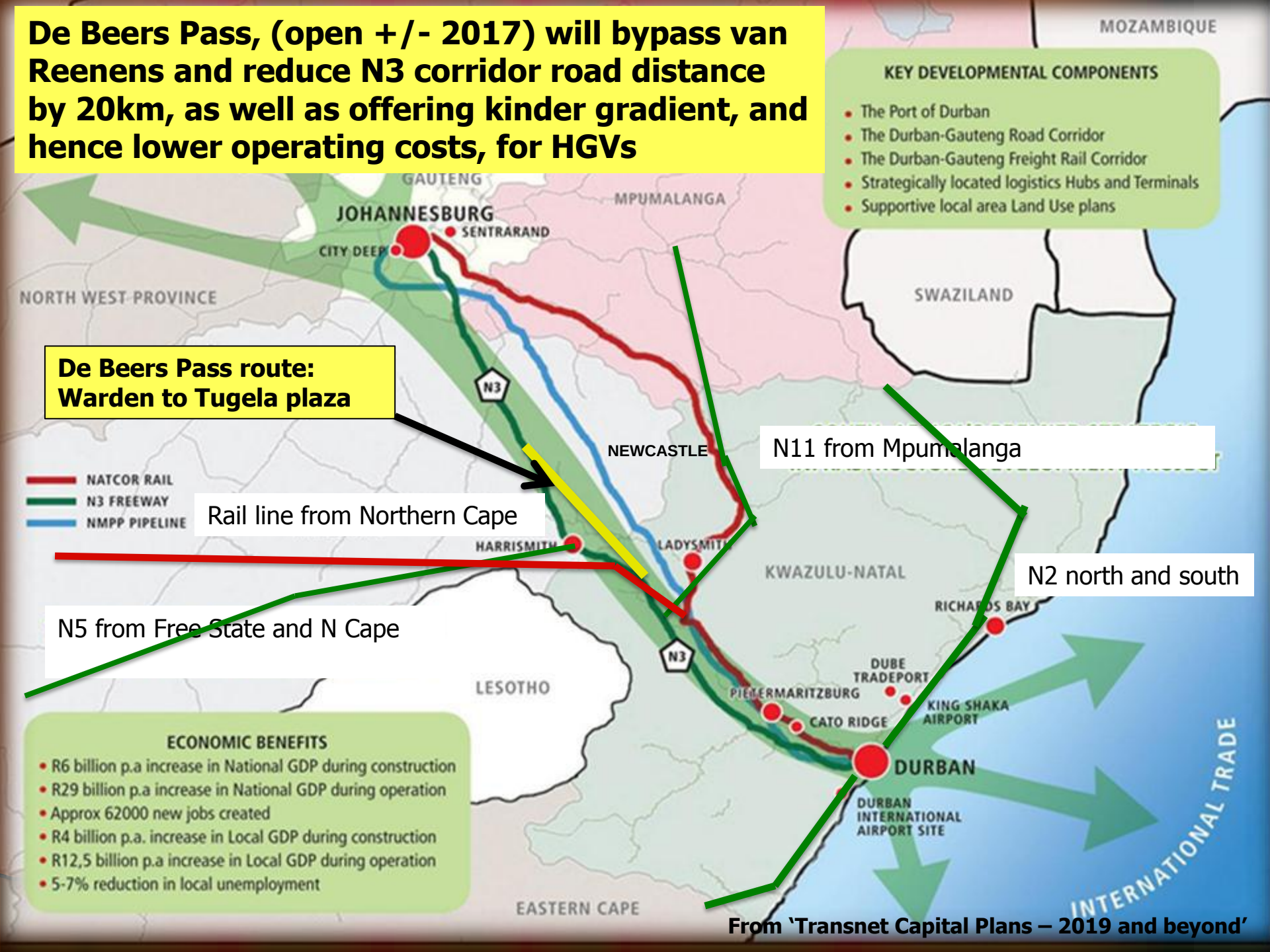
30 year cost of 'N3TC + rest of N3' element of Scenarios 1, 2 (i), and 2 (ii), (Rbn)									
	Capital: upgrade / heavy maintenance		Routine maint'nce	Vehicle operating costs by Scenario / average road tonnages			Total		
	Sc 1 + Sc 2 ii	Sc 2 i	All scenarios	Sc 1 40mt	Sc 2 i 23mt	Sc 2ii 36mt	Sc 1 40mt	Sc 2 i 23mt	Sc 2 ii 36mt
N3TC Heidelberg to Cedara (420km) including De Beer's Pass	25	16	1.7	455	262	410	**490.3**	**286.3**	**445.3**
SANRAL's two sections, 130km	8	6	0.6						
Add 10% for distribution which rail includes in tariff	3.3	2.6	0.2	46	26	41	**49.3**	**28.6**	**44.5**
Add 10% to op' cost for road's environmental externalities				46	26	41	**46**	**26**	**41**
Toll (at 2012 toll rates) using average of typical freight vehicle classes				27	16	24	**27**	**16**	**24**
TOTAL	36.3	24.6	2.5	574	330	516	**613**	**357**	**555**
Annualised total	**1.2**	**0.8**	**0.1**	**19.1**	**11**	**17.2**	**20.4**	**11.9**	**18.5**

Notes:

- Capital and maintenance costs are as discussed with N3TC and SANRAL. N3TC capital cost includes R10 bn for upgrades after 2029, (when the concession ends). Lower capital costs are assumed for Scenario 2 (i) in which De Beers Pass would not be required.

- VOCs from 'Fleetwatch Market Related Operating Costs' Feb 2012 for a basket of vehicle types representing current N3 freight traffic. Costs assume return payload only 50% of the time. VOCs are then calculated as: average cost per ton km (R0.69) x average annual tonnage (40mt / 23mt / 36mt) for the N3 corridor in the respective scenarios, x 550km x 30 years.

De Beers Pass, (open +/- 2017) will bypass van Reenens and reduce N3 corridor road distance by 20km, as well as offering kinder gradient, and hence lower operating costs, for HGVs



From 'Transnet Capital Plans – 2019 and beyond'

Freight Highway - 30 year costing

30 year costs of Freight Highway (+ passenger N3), Scenario 3 (Rbn)				
	Capital	Maintenance & Operation	Vehicle Operation	Total
Freight highway	33	15	527	**575**
Gauteng terminals	15	20	25	**60**
Durban terminals	5	7	15	**27**
N3 – mainly passenger vehicles	10	1	-	**11**
The 10% added in N3 options for 'distribution' is excluded as proxy for VOC savings from segregation	-	-	-	**-**
5% (only) added to op' costs for environment –lower because segregation reduces all emissions			26.3	**26.3**
TOTAL	**63**	**43**	**593.3**	**699.3**
Annualised total	**2.1**	**1.4**	**19.8**	**23.3**

Notes:

- Capital cost as discussed with SANRAL and checked with N3TC's De Beers Pass costing: R60m / km to cover land, pavement and junctions = R33bn. Terminals included because this option functions similarly to an optimised railway, but infrastructure is not as expensive as for rail.
- Maintenance and operation: assumed to be similar to current N3
- Capital and operating/maintenance costs for passenger N3 estimated from N3TC costs
- VOCs as for N3 options but reduced by 15% because of optimized highway design and scope for higher payload vehicles. Costs still assume return payload only 50% of the time. VOCs calculated as: average cost per ton km (R0.57) x average annual tonnage of 56 mt x 550km x 30 years

The freight highway concept . .

Just as BRT combines the flexibility of road with the efficiency of rail, a freight highway may operate as 'Truck Rapid Transit':

- Scheduling reliability and distributional flexibility
- Enhanced road safety from segregation of traffics
- Optimisation of vehicle design and payload performance

A freight highway would be linked directly into terminals either end of the corridor in the same way as a rail link

New Jersey Turnpike, dual-dual section

Projects Under Study

- Trans Texas Corridor
- Metro Atlanta
- SR 60 in Southern CA
- I-4/Crosstown Connector – Tampa
- I-710 Truckway – LA
- I-81 in VA
- Dallas

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Assembling the scenarios

For each scenario the following data is now assembled:

- Freight share per mode for each of the main cargo categories
- Average annual tonnage by mode (noted briefly already)
- 30 year total, and average annual cost by modes in the scenario
- 30 year total, and average annual cost for the full scenario

Subsequent slides will summarise the cost data by scenario but adding fundability from commercially chargeable tariffs

Comments are then made on implementation feasibility and whether any alternative scenario might be easier to realise

Scenario 1 – structure and costs

Scenario 1: share by freight category, average annual tonnage (,000tpa) and cost, (Rbn)				
Cargo category	**Corridor freight volume, 2010**	**Corridor freight volume, 2040**	**'Transnet Upgrade'**	**N3 '40mtpa'**
Containers	5,375	20,131	60%	40%
Cars / parts	1,450	4,070	60%	40%
Dry bulk	13,150	27,583	70%	30%
Liquid bulk	3,500	4,717	70%	30%
Other	21,200	56,149	35%	65%
TOTAL	**44,675**	**112,651**	**50%**	**50%**
Share of 2040 tonnage by mode			**56,325**	**56,325**
Average annual tonnage by mode			**40,000**	**40,000**
30 year & average annual cost by mode			**R565bn / R19bn**	**R613bn / R20bn**
30 year & average annual Scenario cost			**R1,178bn / R39bn**	

Notes:

- In this scenario Transnet aspires to maximize its share of the higher value categories but, because it is 'retrofitting' higher quality onto an existing railway carrying mixed products, its can achieve success only very inefficiently; having to mix high value and low value operational models.

Scenario 2 (i) – structure and costs

Scenario 2 (i): share by freight category, average annual tonnage (,000tpa) and cost, (Rbn)

Cargo category	Corridor freight volume, 2010	Corridor freight volume, 2040	Standard gauge 2-stack railway	N3 '23mtpa'*	Transnet 'Do Minimum'
Containers	5,375	20,131	60%	40%	0%
Cars / parts	1,450	4,070	60%	40%	0%
Dry bulk	13,150	27,583	0%	5%	95%
Liquid bulk	3,500	4,717	0%	5%	95%
Other	21,200	56,149	55%	40%	5%
TOTAL	**44,675**	**112,651**	**40%**	**30%**	**30%**
Share of 2040 tonnage by mode			**45,000**	**34,000**	**34,000**
Average annual tonnage by mode			**33,000**	**23,000**	**23,000**
30 year & average annual cost by mode			**R412bn / R13.7bn**	**R357bn / R11.0bn**	**R256bn / R8.5bn**
30 year & average annual Scenario cost			**R1,025bn / R33.2bn**		

Notes:

- In this scenario, the 2-stack railway focuses exclusively on containerised and other high value categories and road actually loses market share. This scenario may be compared to the Freight Highway option in its impact on freight segregation on the corridor. The benefit is not as great but does lead to operating cost reductions on the N3 as a proxy for associated benefits.
- This scenario retains the existing Transnet line but this becomes an almost exclusively bulk commodities railway, taking most of the bulks currently going by road on the corridor.

Scenario 2 (ii) – structure and costs

Scenario 2 (ii): share by freight category, average annual tonnage (,000tpa) and cost, (Rbn)				
Cargo category	**Corridor freight volume, 2010**	**Corridor freight volume, 2040**	**Standard gauge 2-stack railway***	**N3 '36mtpa'**
Containers	5,375	20,131	70%	30%
Cars / parts	1,450	4,070	80%	20%
Dry bulk	13,150	27,583	70%	30%
Liquid bulk	3,500	4,717	60%	40%
Other	21,200	56,149	40%	60%
TOTAL	**44,675**	**112,651**	**55%**	**45%**
Share of 2040 tonnage by mode			**62,000**	**51,000**
Average annual tonnage by mode			**43,000**	**36,000**
30 year & average annual cost by mode			**R412bn / R13.7bn**	**R555bn / R18.5bn**
30 year & average annual Scenario cost			**R967bn / R32.2bn**	

Notes:

- Although the cost of the 2-stack railway is the same here as for Scenario 2 (i), it is a very different operation. In 2 (i), it is a containers / high value products line; here it is a mixed railway, having to also handle much of the bulk material currently using either the existing railway or the N3.

Scenario 3 – structure and costs

Scenario 3: share by freight category, average annual tonnage (,000tpa) and cost, (Rbn)				
Cargo category	**Corridor freight volume, 2010**	**Corridor freight volume, 2040**	**Freight Highway***	**Transnet 'Do Minimum'**
Containers	5,375	20,131	85%	15%
Cars / parts	1,450	4,070	85%	15%
Dry bulk	13,150	27,583	15%	85%
Liquid bulk	3,500	4,717	15%	85%
Other	21,200	56,149	95%	5%
TOTAL	**44,675**	**112,651**	**70%**	**30%**
Share of 2040 tonnage by mode			**79,000**	**34,000**
Average annual tonnage by mode			**56,000**	**23,000**
30 year & average annual cost by mode			**R699.3bn / R23.3bn**	**R256bn / R9bn**
30 year & average annual Scenario cost			**R955.3bn / R32.3bn**	

Notes:

- The Freight Highway costings incorporate the costs of the now mainly passenger N3 highway.
- Though rail has a (slightly) lower total market share than at present, its absolute tonnage is still more than double the current levels. The main difference is its almost exclusive focus on bulk commodities

Scenarios compared by cost alone

Each scenario has an associated 30 year total cost as well as an annualised cost including K, O & M. They rank as follows:

1. Scenario 3: 'Freight highway' **R955bn / R31bn p.a.**
2. Scenario 2 (ii): 'Mixed freight 2-stack' **R967bn / R32bn p.a.**
3. Scenario 2 (i): 'High value 2-stack' **R1,025bn / R33bn p.a.**
4. Scenario 1: 'Transnet Upgrade' **R1,178bn / R39bn p.a.**

Total cost of very different scenarios is remarkably similar for the top 3; but Sc' 1 - 'Transnet Upgrade' is significantly higher

'Transnet Do Minimum' cost in Scenarios 3 and 2 (i) is the key sensitivity; where +R100bn yields R34bn p.a. and R36bn p.a.

Scenarios compared on fundability - 1

Each mode option will be able to cover its costs to a different degree, with road able to command higher tariffs than rail

Tariffs here are set at operating cost coverage + commercial margin for road and, for rail, at a level consistent with full achievement of rail's service level improvement aspirations:

- Conventional (i.e. N3) road: Allow VOCs + 20% = R0.85 / tkm
- Freight highway: Allow +/- 20% lower below N3 = R0.70 / tkm
- 2-stack rail: mainly high value goods = R0.65 / tkm
- 2-stack rail: mixed freight + bulks = R0.55 / tkm
- Transnet Upgrade: as above but less efficient = R0.50 / tkm
- Transnet Do Minimum: mainly bulks = R0.40 / tkm

Scenario 1 fundability ratio

Scenario 1: 30 year revenue capability, (Rbn)		
	Mode elements of this scenario	
	'Transnet Upgrade'	N3 '40mtpa'
Average annual freight volume, 2010 -2040	40,000,000 tonnes	40,000,000 tonnes
Average tariff chargeable	R0.50 / tonne km	R0.85 / tonne km
Average distance transported per tonne	600 km	550 km
Aggregate revenue per mode in the scenario	R360bn	R561bn
Total 30 year revenue for the scenario	R921bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R921bn / R1,178bn = 0.78	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 2 (i) fundability ratio

Scenario 2 (i): Revenue capability, (Rbn)			
	Mode elements of this scenario		
	Standard gauge 2-stack railway (high value freight)	N3 '23mtpa'	Transnet 'Do Minimum'
Average annual freight volume, 2010 -2040	33,000,000 tonnes	23,000,000 tonnes	23,000,000 tonnes
Average tariff chargeable	R0.65 / tonne km	R0.85 / tonne km	R0.40 / tonne km
Average distance transported per tonne	550 km	550 km	600 km
Aggregate revenue per mode in the scenario	R354bn	R323bn	R166bn
Total 30 year revenue for the scenario	R843bn		
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R843bn / R1,025bn = 0.82		

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 2 (ii) fundability ratio

Scenario 2 (ii): Revenue capability, (Rbn)		
	Mode elements of this scenario	
	Standard gauge 2-stack railway (mixed freight)	N3 '36mtpa'
Average annual freight volume, 2010 -2040	43,000,000 tonnes	36,000,000 tonnes
Average tariff chargeable	R0.55 / tonne km	R0.85 / tonne km
Average distance transported per tonne	550 km	550 km
Aggregate revenue per mode in the scenario	R390bn	R505bn
Total 30 year revenue for the scenario	R895bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ration'	R895bn / R967bn = 0.93	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 3 fundability ratio

Scenario 3: Revenue capability, (Rbn)		
	Mode elements of this scenario	
	Freight Highway	Transnet 'Do Minimum'
Average annual freight volume, 2010 -2040	56,000,000 tonnes	23,000,000 tonnes
Average tariff chargeable	R0.70 / tonne km	R0.40 / tonne km
Average distance transported per tonne	550 km	600 km
Aggregate revenue per mode in the scenario	R647bn	R166bn
Total 30 year revenue for the scenario	R813bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R813bn / R955bn = 0.85	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario ranking by fundability ratio

This analysis again shows the options remarkably close in terms of apparent ability to fund themselves from direct revenues.

The fundability ranking is slightly different to costs ranking with the mixed freight 2-stack railway with the best fundability ratio

Ratios calculated as 30 year Scenario cost / 30 year revenue:

1.	Scenario 2 (ii):	'Mixed freight 2-stack'	**0.93**
2.	Scenario 3:	'Freight highway'	**0.85**
3.	Scenario 2 (i):	'High value 2-stack'	**0.82**
4.	Scenario 1:	'Transnet Upgrade'	**0.78**

Mode option ranking by fundability ratio

Analysis by modes within scenarios gives a clearer ranking:

- The 2-stack mixed freight railway covers **95%** of its costs - higher volumes outweigh lower tariffs and there are congestion savings
- A separate highway for trucks could cover up to **94%** of its costs but note that this includes environmental and congestion savings
- The N3 highway covers **90%** of its costs in all options / scenarios but note: costs include 10% for 'distribution' + 10% environment
- A 2-stack railway for mainly containers could cover only **86%** of its costs: the higher container tariff does not outweigh lower volumes
- Transnet Upgrade and Do Minimum options cover +/-**65%** of costs

Fundability by modes within the scenarios

	Scenario 1		Scenario 2 (i)		
	'Transnet Upgrade'	N3	Standard Gauge 2 – stack railway (high value freight)	N3	'Transnet Do Minimum'
30 year cost	R565bn	R613bn	R412bn	R357bn	R256bn
30 year revenue	R360bn	R561bn	R354bn	R323bn	R166bn
Fundability ratio	64%	92%	86%	90%	65%

A separate highway for trucks

	Scenario 2 (ii)		Scenario 3	
	Standard Gauge 2 – stack (mixed freight)	N3	Freight Highway (includes R11bn capital cost of passenger N3)	'Transnet Do Minimum'
30 year cost	R412bn	R555bn	R699bn	R256bn
30 year revenue	R390bn	R505bn	R647bn	R152bn
Fundability ratio	95%	91%	93% [94% without N3]	65%

Caveats re rail freight - 1

Spoornet (2004)[1] estimated the theoretical capacity of the D-G rail link at 147 mtpa (vs. current traffic of +/- 15 mt)

Morton, Visser, Horak (CSIR, 2006)[2] estimated the N3 road capacity at 44 mtpa – vs. current freight of about 30 mtpa

Rail's challenge is not capacity as such but what it can do to attract business to take up currently available capacity

Current Transnet aspirations for increased market share may be far too optimistic given efficiency of road options

1. Based on running full freight trains at the maximum numbers allowed for by the signaling system, for 360 days per year, in both directions (= coal line volumes both ways)
2. Maximum freight capacity of the road is assumed to occur when heavy vehicles exceed 33% of total traffic; at this point N3TC is committed to building the De Beers Pass bypass of van Reenens

Caveats re rail freight - 2

Rail has been losing market freight share slowly from about 1930 and then catastrophically from the late 1980s

The reasons are not simply poor management or lack of investment; decline commenced before investment slowed

Road transport has created new transport demand by offering services rail cannot - or only at very high cost

De Villiers (DOT, 1986) said that rail needs to learn what it is able to do well and then invest, or disinvest, accordingly

Caveats re rail freight - 3

The result of de Villiers was the removal of rail's statutory protection and the commercialisation of rail and ports

Initially Transnet lost much business to road and has had to focus far more on bulks and other high volume goods

But Transnet has used cross subsidisation from the ports to fund an increasingly ambitious rail investment programme

This presentation uses Transnet's own assumptions as far as possible and may overstate the value of their options

Caveats re rail freight - 4

Transnet cannot fund rail investment apart from reliance on the ports. This is written into loan contracts with banks

Increasingly effective ports regulation is leading to a rail funding crisis: Transnet acknowledges it cannot 'go alone'

Yet much of Transnet's investment is 'programme driven' and may lead to creation of capacity that cannot be 'sold'

A minimum requirement should be independent market checking of demand forecasts and costing assumptions

Implications of rail caveats for funding

The following tariffs, obtained direct from freight logistics operators, reflect the supply chain realities of road and rail:

- Conventional road (N3) : Allow VOCs + 40% = R1.00 / tkm*
- Freight highway: Tariff 15% lower than N3 = R0.85 / tkm
- 2-stack rail: mainly high value goods = R0.65 / tkm
- 2-stack rail: mixed freight + bulks = R0.50 / tkm
- Transnet Upgrade: as above but less efficient = R0.40 / tkm**
- Transnet Do Minimum: good market for bulks = R0.50 / tkm

*These road AND rail tariffs are exactly as reflected in current container transport charges between Durban and Joburg: Rail = R4,300; Road = R11,000. In other words, rail has to 'buy' market share
[all costs are mid-2012]

Scenario fundability ranking– market based

'Supply chain reality' level tariffs show Scenario 3, the Freight Highway, to be best, followed by the 2-stack railway Scenarios

Scenario 1, based on 'Transnet Upgrade', remains weakest

Scenario fundability is estimated as:
30 year Scenario cost / 30 year revenue:

1. Scenario 3: 'Freight Highway' **0.93**
2. Scenario 2 (ii): '2-stack mixed freight' **0.85**
3. Scenario 2 (i): '2-stack high value' **0.82**
4. Scenario 1: 'Transnet Upgrade' **0.78**

Option fundability ranking – market based

Economic analysis by the modes within the scenarios gives a clearer ranking:

- A separate highway for trucks could cover up to **114%** of its costs –but this includes environmental and congestion savings
- N3 highway options cover up to **108%** of their costs even though they include 10% for 'distribution' + 10% for environment
- 2-stack options cover **86%** of costs – the mixed freight option because of higher volumes; the other because of higher tariffs
- The 'Transnet Do Minimum' (bulks) option covers **80%** of its costs
- 'Transnet Upgrade' covers only **51%** of its costs because supply chain deficits require a low tariff - as proxy for low mode share

Implications for funding - 1

The 10% 'road distribution cost' was added at Transnet's request. In practice road operators cover this separately.

Even with this, all N3 options are likely to be fully fundable.

A Freight Highway may not be fully fundable, but the N3TC provides a base for a potentially more fundable freight road solution. And the economic benefits warrant public support.

There is less risk to road's mode share than to rail's. This analysis takes no account of supply chain cost externalities of rail. Transnet aspirations have been broadly accepted.

Implications for funding - 2

To be competitive the 2-stack rail options need a regulatory framework giving 100% private control of all operations

The Transnet 'Do Minimum' option is far more fundable than the major upgrade because there will be demand for bulks

For the 'Transnet Upgrade' option to be competitive with road, a subsidy of up to 50% will be required in the future

Even if Transnet's *sought* mode share is realised, a subsidy of 35% will be required. The risk is that it will be more . .

Implications for funding - 3

Although Transnet's infrastructure and operations plans are bold they carry too much inherited cost to ever prove viable

The discourse of 'non-viability because of underinvestment' is wrong. Few freight railways are viable without subsidy

Subsidy is not warranted economically except where market demand or substantial environmental benefits are evident

From this analysis the scenario most warranting any subsidy is the 'Freight Highway / N3' + Transnet 'Do Minimum' rail

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Fundability by modes – market based

	Scenario 1		Scenario 2 (i)		
	'Transnet Upgrade'	N3	Standard Gauge 2 – stack railway (high value freight)	N3	'Transnet Do Minimum'
30 year cost	R565bn	R613bn	R412bn	R357bn	R256bn
30 year revenue	R288bn	R660bn	R354bn	R380bn	R207bn
Fundability ratio	51%	108%	86%	106%	81%

	Scenario 2 (ii)		Scenario 3	
	Standard Gauge 2 – stack (mixed freight)	N3	Freight Highway (includes R11bn capital cost of passenger N3)	'Transnet Do Minimum'
30 year cost	R412bn	R555bn	R699bn	R256bn
30 year revenue	R355bn	R594bn	R785bn	R207bn
Fundability ratio	86%	107%	112% [114% without N3]	81%

Scenario 1 fundability ratio

Scenario 1: 30 year revenue capability, (Rbn)		
	Mode elements of this scenario	
	'Transnet Upgrade'	N3 '40mtpa'
Average annual freight volume, 2010 -2040	40,000,000 tonnes	40,000,000 tonnes
Average tariff chargeable	R0.40 / tonne km	R1.00 / tonne km
Average distance transported per tonne	600 km	550 km
Aggregate revenue per mode in the scenario	R288bn	R660bn
Total 30 year revenue for the scenario	R948bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R948bn / R1,178bn = 0.80	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 2 (i) fundability ratio

Scenario 2 (i): Revenue capability, (Rbn)			
	Mode elements of this scenario		
	Standard gauge 2-stack railway (high value freight)	N3 '23mtpa'	Transnet 'Do Minimum'
Average annual freight volume, 2010 -2040	33,000,000 tonnes	23,000,000 tonnes	23,000,000 tonnes
Average tariff chargeable	R0.65 / tonne km	R1.00 / tonne km	R0.50 / tonne km
Average distance transported per tonne	550 km	550 km	600 km
Aggregate revenue per mode in the scenario	R354bn	R380bn	R207bn
Total 30 year revenue for the scenario	R941bn		
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R941bn / R1,025bn = 0.92		

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 2 (ii) fundability ratio

Scenario 2 (ii): Revenue capability, (Rbn)		
	Mode elements of this scenario	
	Standard gauge 2-stack railway (mixed freight)	N3 '36mtpa'
Average annual freight volume, 2010 -2040	43,000,000 tonnes	36,000,000 tonnes
Average tariff chargeable	R0.50 / tonne km	R1.00 / tonne km
Average distance transported per tonne	550 km	550 km
Aggregate revenue per mode in the scenario	R355bn	R594bn
Total 30 year revenue for the scenario	R949bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ration'	R949bn / R967bn = 0.98	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years

Scenario 3 fundability ratio

Scenario 3: Revenue capability, (Rbn)		
	Mode elements of this scenario	
	Freight Highway	Transnet 'Do Minimum'
Average annual freight volume, 2010 -2040	56,000,000 tonnes	23,000,000 tonnes
Average tariff chargeable	R0.85 / tonne km	R0.50 / tonne km
Average distance transported per tonne	550 km	600 km
Aggregate revenue per mode in the scenario	R785bn	R207bn
Total 30 year revenue for the scenario	R992bn	
Total 30 year revenue / 30 year cost = proxy 'fundability ratio'	R992bn / R955bn = 1.00	

Note:

- Calculation of aggregate revenue is: annual average freight x average tariff x distance x 30 years