


# Intermodal Terminals and their networks

- Rail perspectives -  
Sydney as a case study

  
define  
tomorrow  
today

# Overview

- History and background
- Map
- Targets, trends and determinants
- Demand
- Urban systems and capacities
  - *Port interface, IMT's, empty containers*
- Value chain perspectives
  - *Activity costs, transactions, and non-financial perspectives*

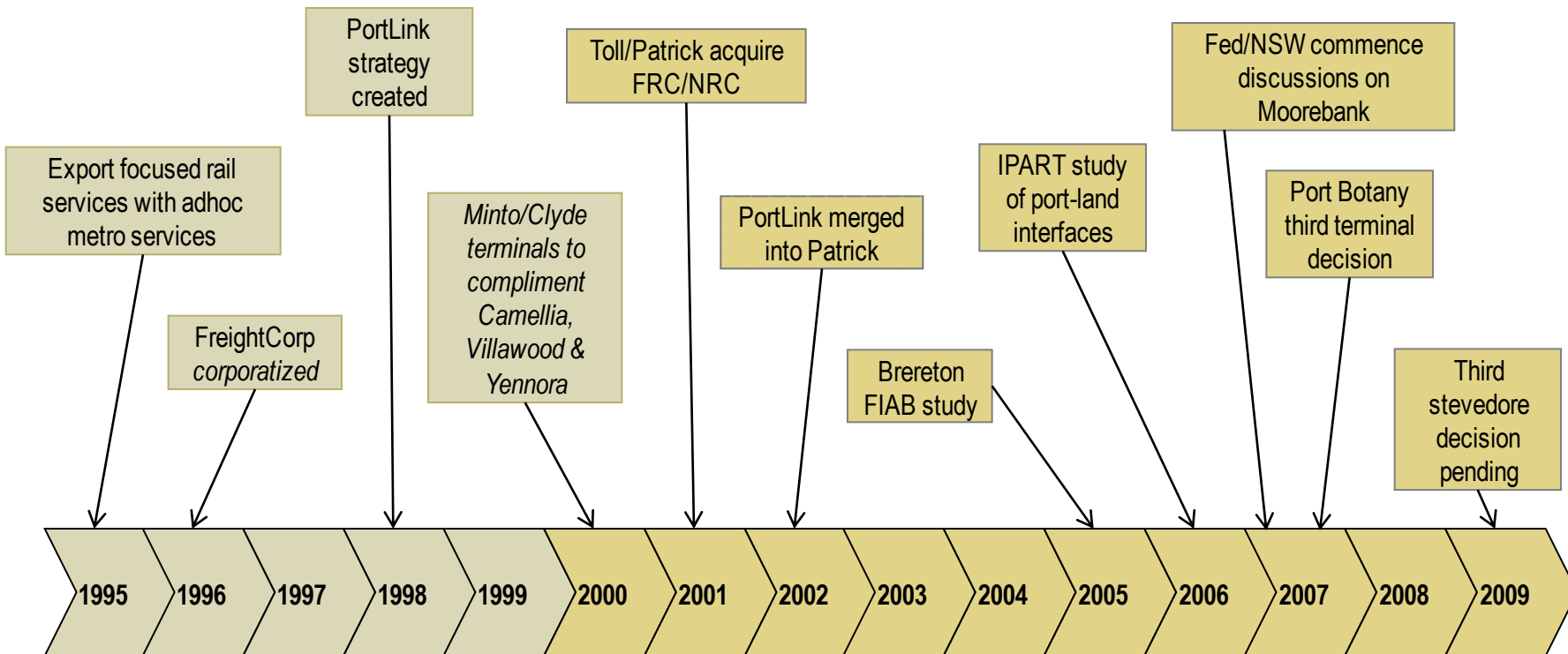
# Experience

- Managed road fleets and warehouses for Linfox, PGA Logistics, ICI and Allied Pickfords
- General Manager Freight Services, FreightCorp
  - *Architect for PortLink*
- Consultant
  - *Strategic, economic and operational advice in port-land systems – all states*
  - *Freight Infrastructure Advisory Board (NSW)*
  - *Input into Freight Futures, Port @L strategy and*

# Key proposition

- Developing and implementing intermodal operations to service port-metro demand is hard
- The debate and analysis tends to be oversimplified by government and operators
- Running the train is only part of the task
- Some value chain intermediaries are not willing to commit due to threat to their business models
- The environmental and community benefits of getting it right are worth the effort

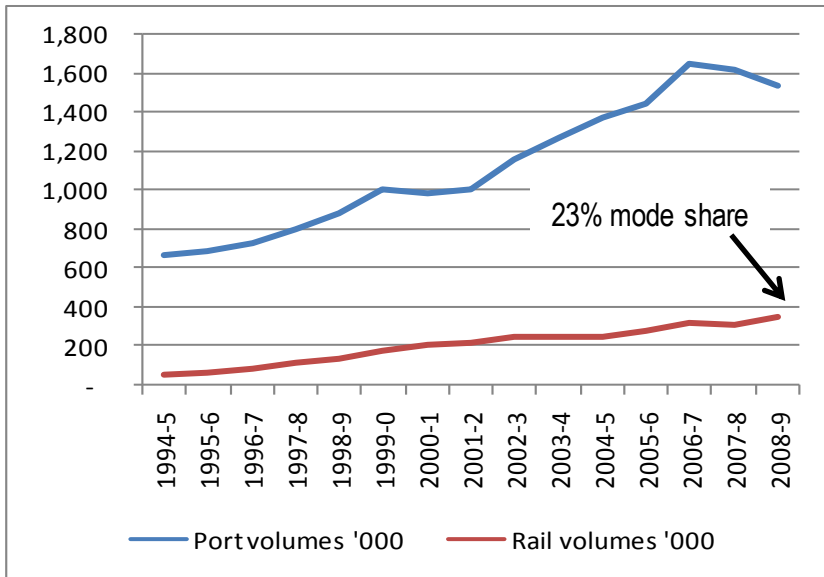
# Timeline – Port metro rail developments in Sydney



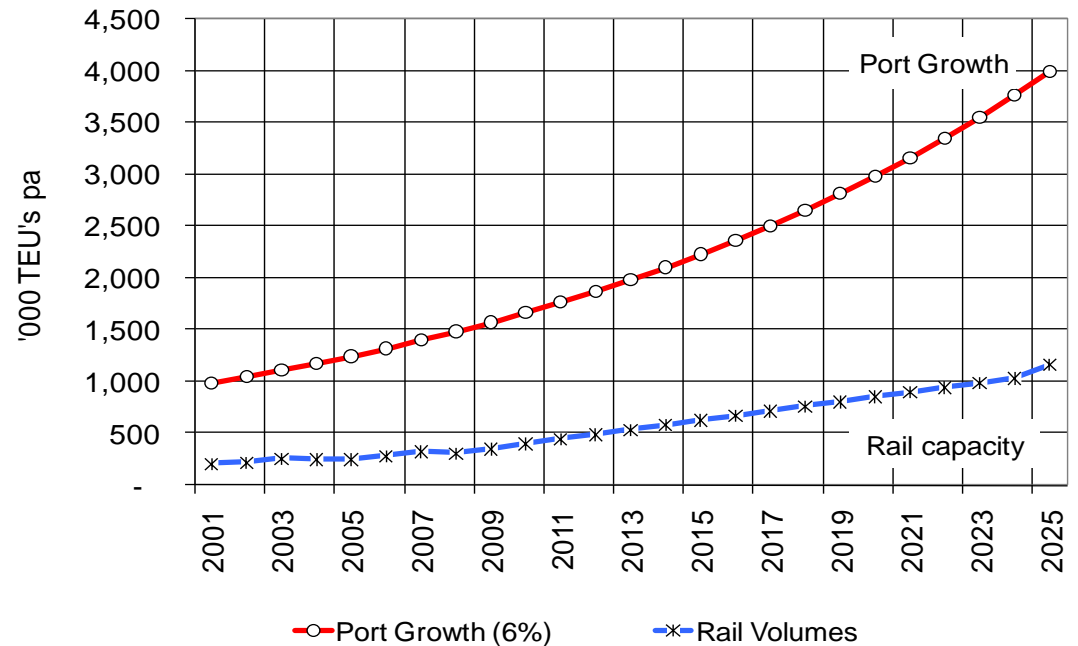
	1994-5	1995-6	1996-7	1997-8	1998-9	1999-0	2000-1	2001-2	2002-3	2003-4	2004-5	2005-6	2006-7	2007-8	2008-9
Port volumes '000	666	689	730	798	878	1,010	989	1,009	1,160	1,270	1,375	1,445	1,652	1,620	1,540
Rail volumes '000	60	70	90	120	145	185	210	220	255	250	251	280	324	309	353
% rail share	9%	10%	12%	15%	17%	18%	21%	22%	22%	20%	18%	21%	20%	19%	23%

# Port growth and rail mode share - Sydney

Port and rail growth since 1994-5



Sydney Port forecast throughput at 6% CAGR and potential rail share

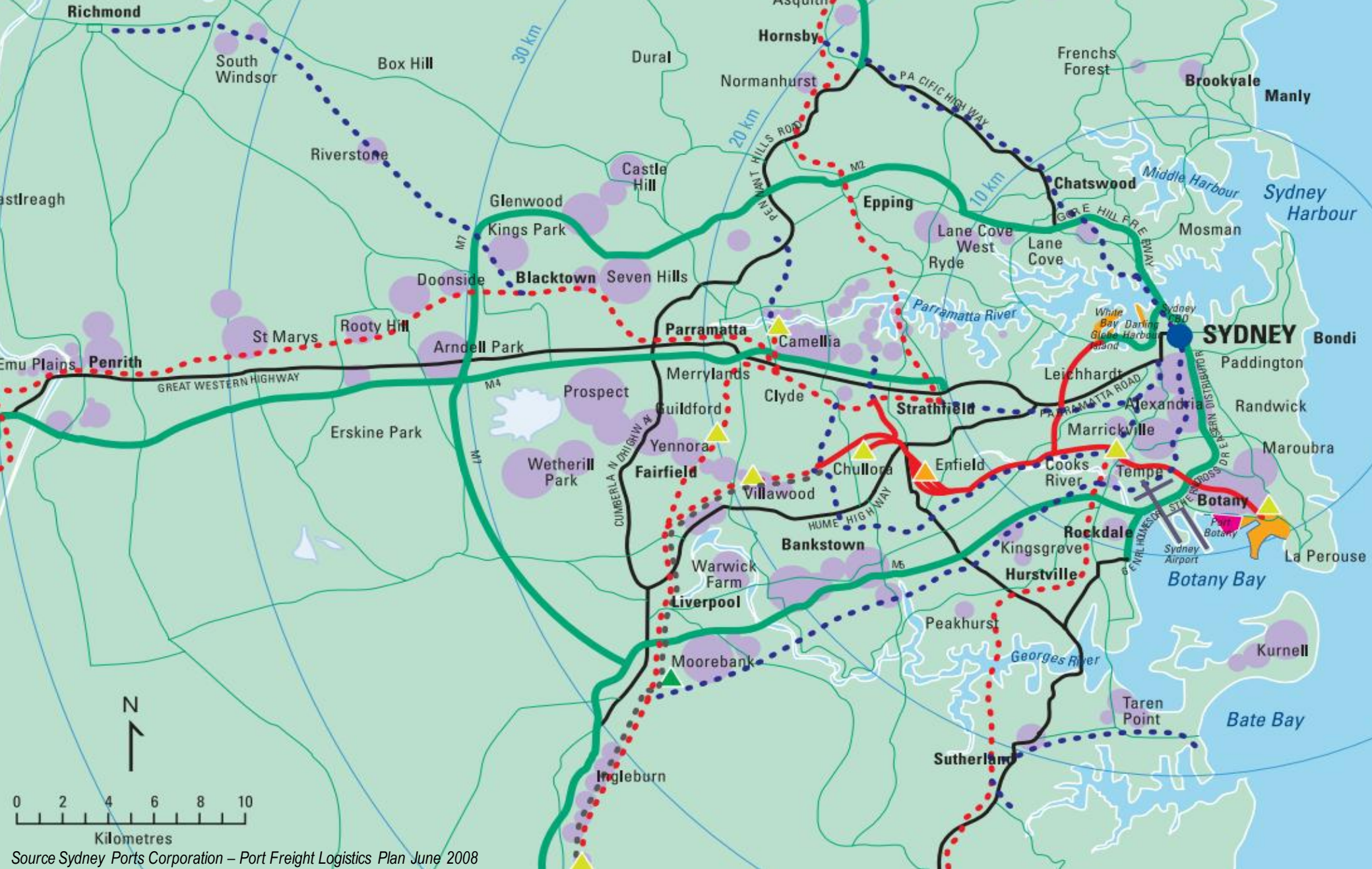


# Overview of FreightCorp Strategy 1997-2001

- Identified opportunity to increase modal share in a growing market
- Need to create links between customer and train
  - *port interface dynamics had to be addressed*
- Affiliations with Port Corporation and trucking industry needed to be developed
- Sought alignment with state government policy aspirations
- Commercial and operational strategy formulated
- Terminal developments as joint operating and investment alliances
- E-Business (IBIS/Rail hub)
- Stevedore relationships
- Growth from 65,000 TEU's to 180,000 TEU's over 4 years

# Sydney's IMT network

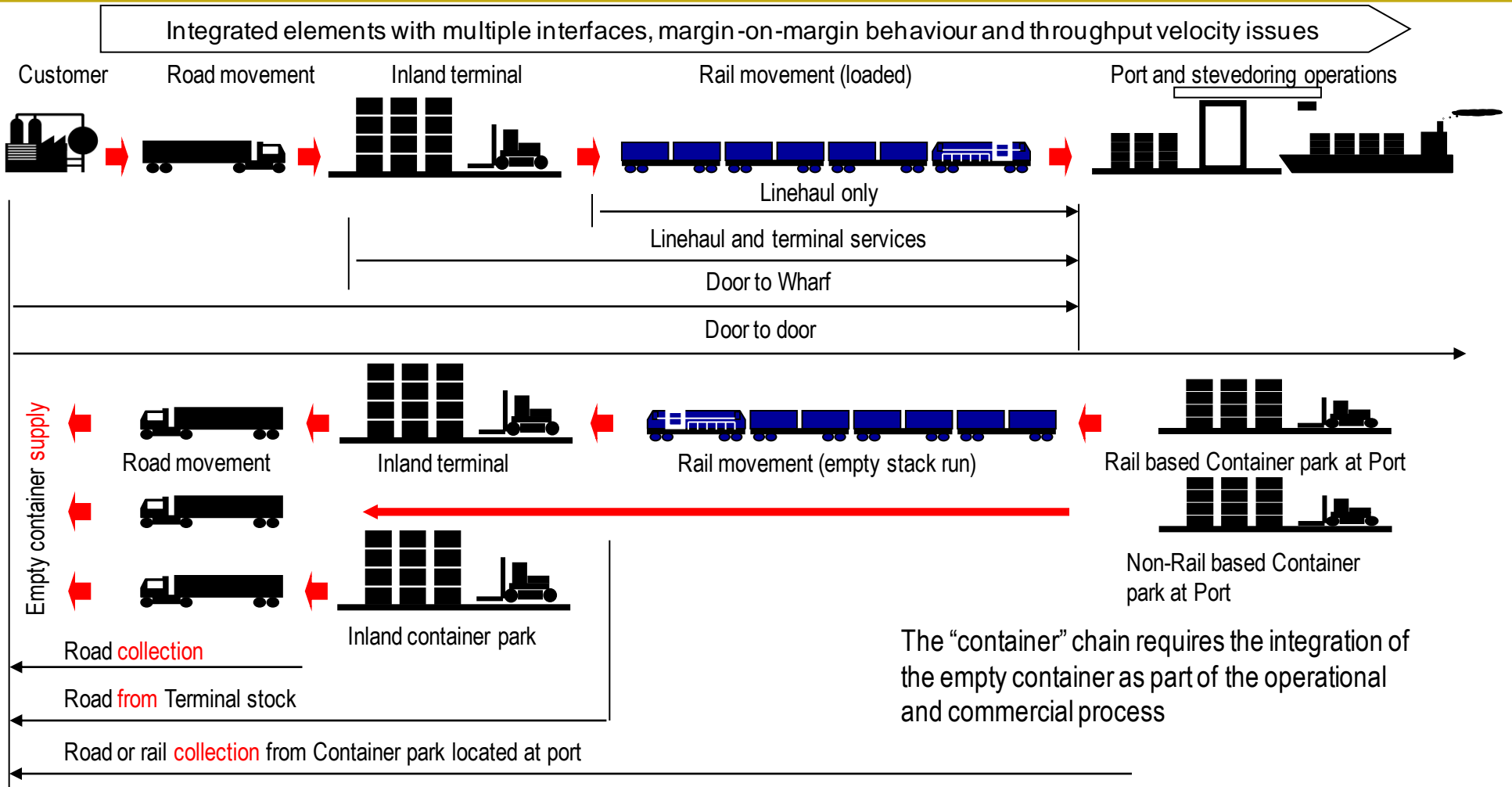
- Current
  - *Minto, Cooks River, Villawood, Camellia and Yennora*
- Emerging / Proposed
  - *Enfield and Moorebank*
- Missing terminals
  - *Eastern Creek*
  - *No IMTs west of Cumberland Highway*



Source Sydney Ports Corporation – Port Freight Logistics Plan June 2008

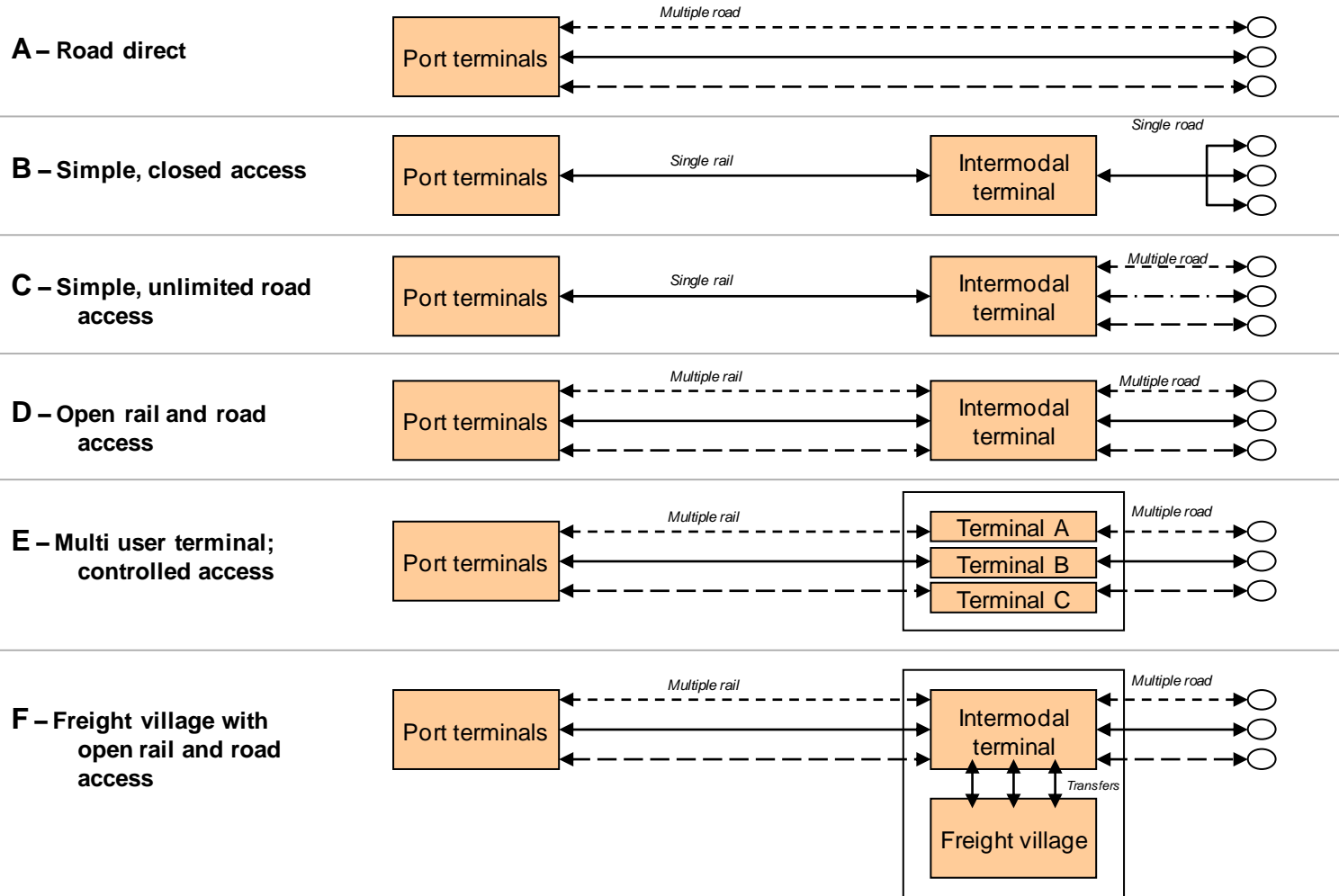
- Motorways
- Main roads
- Dedicated freight rail line
- Industrial zones
- ▲ Port facilities
- - - Shared passenger/freight rail lines
- - - Dedicated passenger rail lines
- - - Southern Sydney Freight Line (planned)
- ▲ Enfield Intermodal Logistics Centre (planned)
- ▲ Moorebank Intermodal Terminal (proposed)
- ▼ Port Botany development area

# Supply Chain elements ... export by rail



# Form follows function

## Supply chain models depend on business models

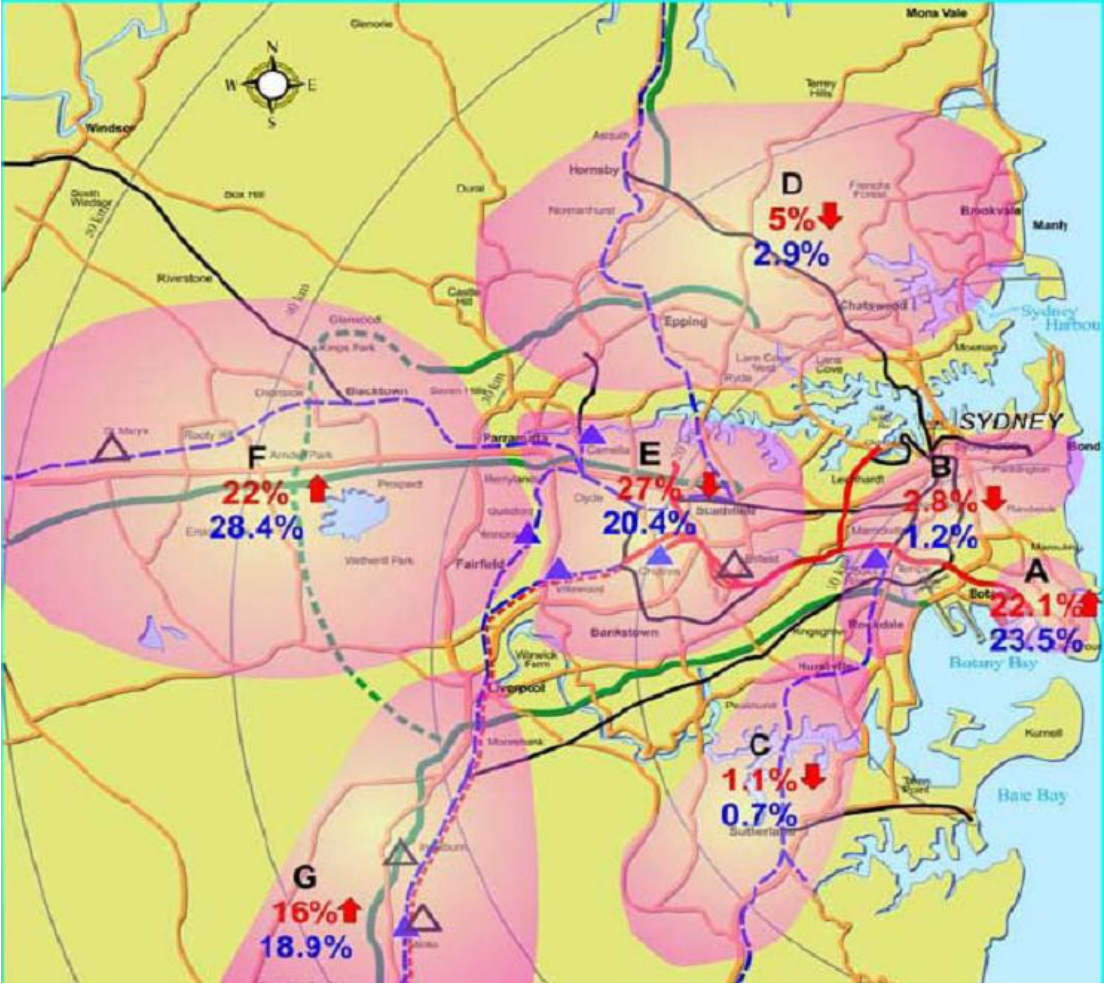


- Demand; growth / trends
- 40% aspirational target
- Determinants and implications

# Task and growth trends since 1990

- Imports growth: 7.7% growth pa
  - *Full TEU's growth at 8%, whereas MT imports declining*
- Exports growth: 8.9% growth pa
  - *Full TEU's growth at 5.1%, however empty TEU's growing at 15%*
- The differential between demand for 40' imports and 20' exports is widening
- The system is import driven
  - *Empty exports = 50% of total exports*
  - *Every import becomes an empty container at some stage!*
- TEU to container ratio is 1.4 and rising
  - *Expect to be 1.6 by 2025*
- Peak month = 9% of annual throughput
  - *Whilst some "smoothing of demand has occurred, seasonality remains a significant issue.*

# Forecast shifts in container movement sources and destinations



# Achieving 40% modal share by rail will depend on a number of inter-related issues

- **Performance of the rail sector**
  - *Perception by the market on reliability*
  - *Separation of freight and passenger rail systems*
- **Port-rail interface**
  - *Achieve higher throughput performance and operational certainty*
  - *By 2025, Port Botany will need to handle 55-60 trains a day, and process a train every 1.6 hours*
- **Inland terminals in proximity to the “local” market**
  - *Existing terminals must continue and Enfield has a viable market*
  - *Greatest demand will be in outer west (Wetherill Park-Blacktown)*
- **Location of empty container parks to be integrated with the inland intermodal terminals**
  - *From an urban freight perspective, it is no longer acceptable to move significant volumes of empty container across Sydney by road, when the demand for import and export containers is highest in the Outer West*
- **More efficient coordination of the empty container task**
  - *Need for smarter price signals by shipping lines and to recognise the location of their market*

# Demand and capacity determinants

- Demand
  - *Key determinant is growth within key areas in Sydney metro and Regional NSW*
  - *Differentials in import and export growth of trade*
- Capacity
  - *Key determinant of modal share:*
    - Capacity & location of intermodal terminals
    - Performance of rail-port interface
    - Significance of the road task
  - *Assuming port-rail issues are addressed, the long term rail capacity is limited by Enfield-Port rail corridor*
    - Between 1.2 and 1.4 million TEUs pa is sufficient to achieve more than 40% of rail share to 2020

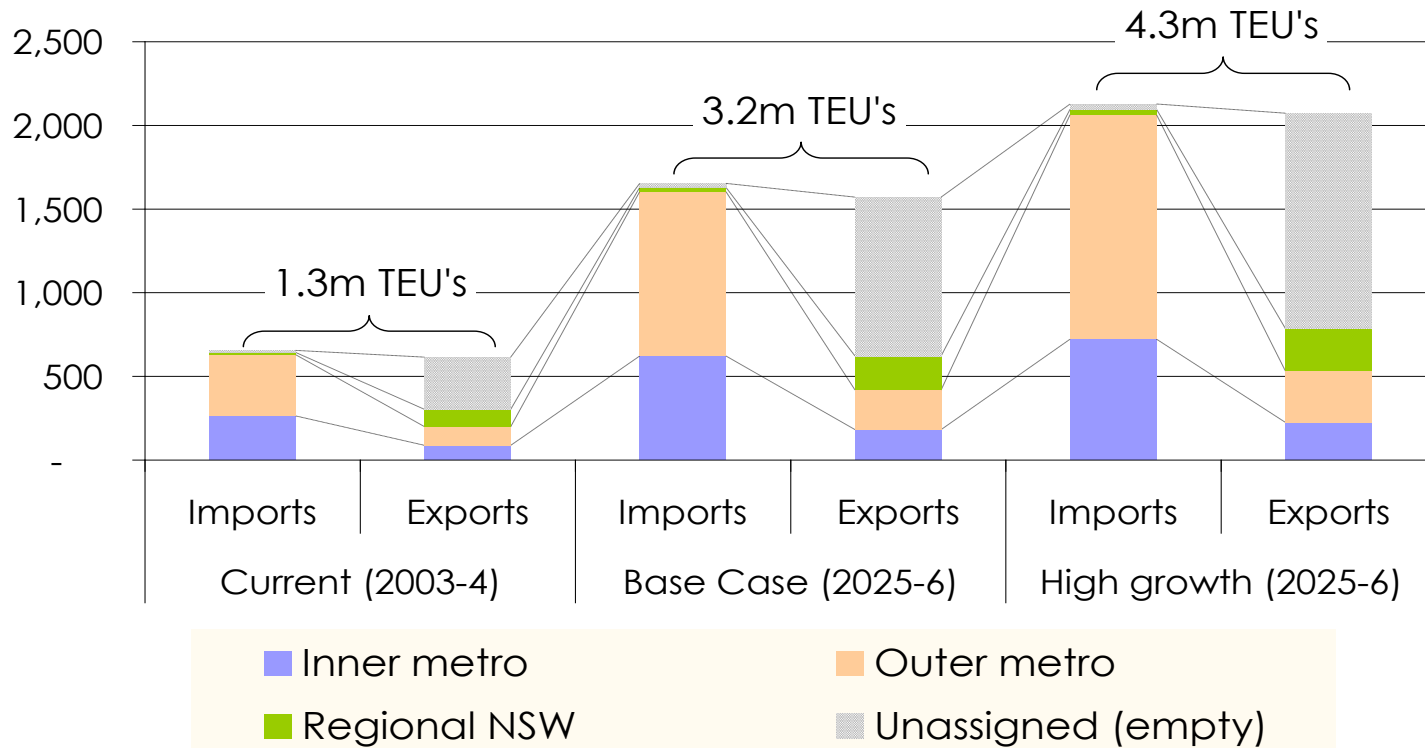
# Composition of Freight Flows

		2004			2025 (Base Case)		
		Imports	Exports	Total	Imports	Exports	Total
		<i>Mteus</i>	<i>Mteus</i>	<i>Mteus</i>	<i>Mteus</i>	<i>Mteus</i>	<i>Mteus</i>
<b>Full containers</b>	<i>Metro</i>	0.60	0.23	0.83	1.48	0.45	1.93
	<i>Rural</i>	0.03	0.12	0.15	0.07	0.25	0.32
	<i>Total</i>	0.63	0.35	0.98	1.55	0.70	2.25
<b>Empty containers</b>	<i>All</i>	0.02	0.30	0.32	0.05	0.90	0.95
<b>Totals</b>	<i>All</i>	0.65	0.65	1.30	1.60	1.60	3.20
<b>% Full</b>		97%	54%	75%	97%	44%	70%
<b>% Empty</b>		3%	46%	25%	3%	56%	30%

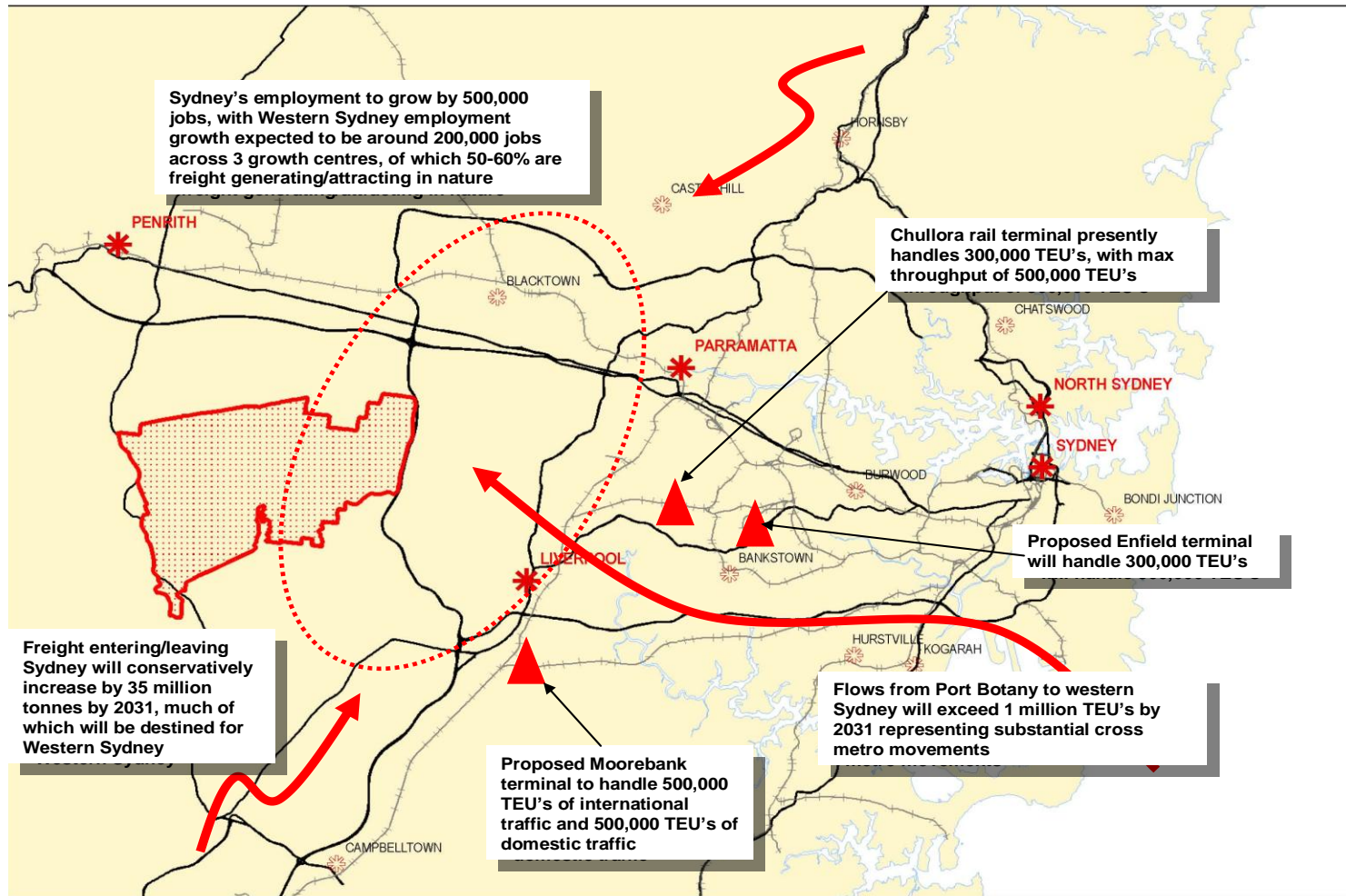
Flow imbalances act as a major impediment to an efficient rail/road service capability, limiting rail to no more than 40-50% market share

# Implications of future demand

- Import volumes will focus on Sydney metro region, with a significant increase occurring in the Outer Western areas
- The export of empty containers will continue to dominate export logistics processes



# Sydney's key challenge is the burgeoning freight precinct in the western suburbs



# Systems and elements

- Port interfaces
- Rail economies
- Terminal capacity
- Empty containers
- Comparative costs

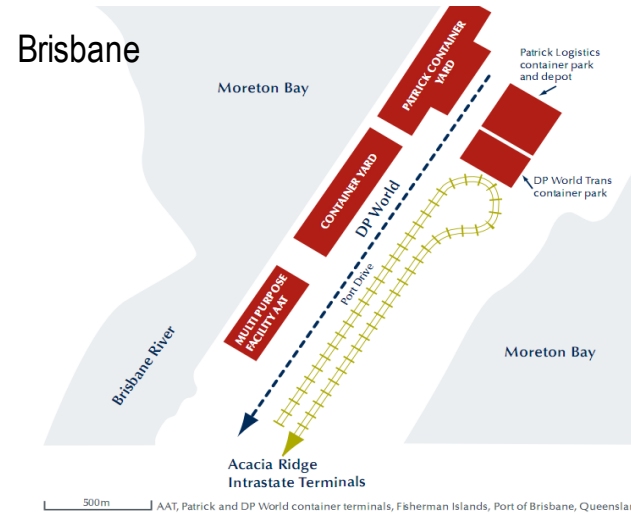
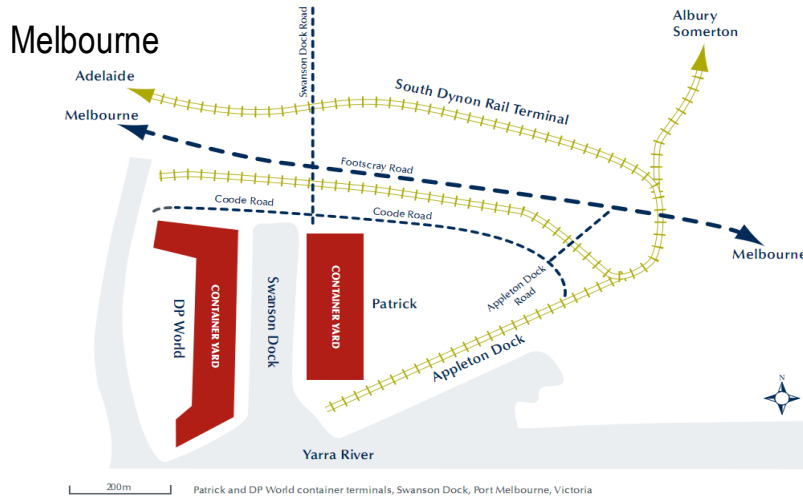
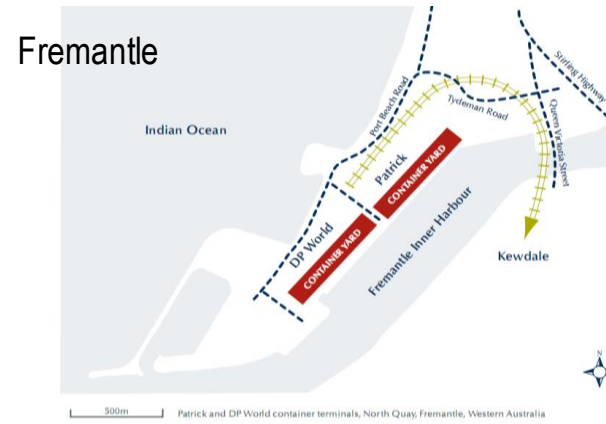
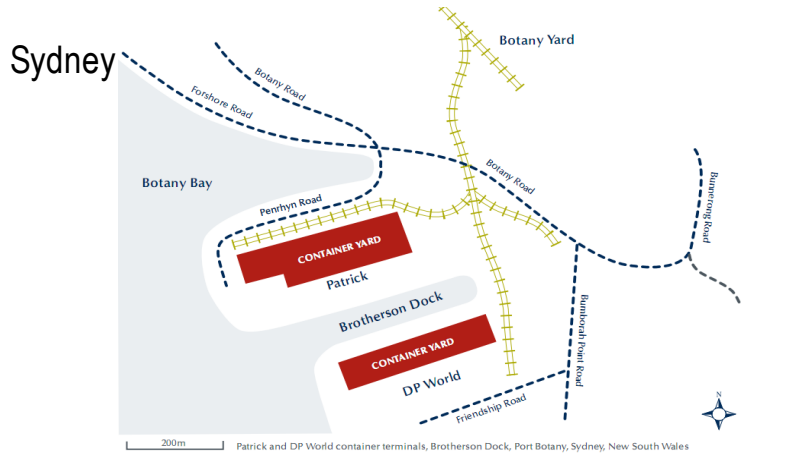
# Urban intermodal systems

- Seen as 3 key elements
  - *Port/land interface*
  - *Road and rail networks*
  - *Inland terminals and freight clusters*
- Critical future metrics for Sydney (2025)
  - *Road movements, cross metropolitan range 3,500 to 4,500 trucks per day; 500-600 trucks in the morning peak*
  - *Rail movements 55-60 trains per day*
  - *Terminal and container storage “footprint” totals 150 hectares*

# The port interface ... issues and dynamics

- Conflicting agendas amongst some key stakeholders
  - *Vertical integration*
  - *Cost shifting*
- Past unfettered open access for rail enhanced tactical competition however (arguably) reduced port-rail effectiveness
- ‘Historic’ focus/sequence was ship → road → rail
  - *Rail “third” amongst equals.*
- Port “real estate” is at a premium in terms of cost and supply.
- Opportunity for enhanced land transport linkages facilitates increased port capacity for existing infrastructure.
- Rail infrastructure alone does not facilitate efficient train operations

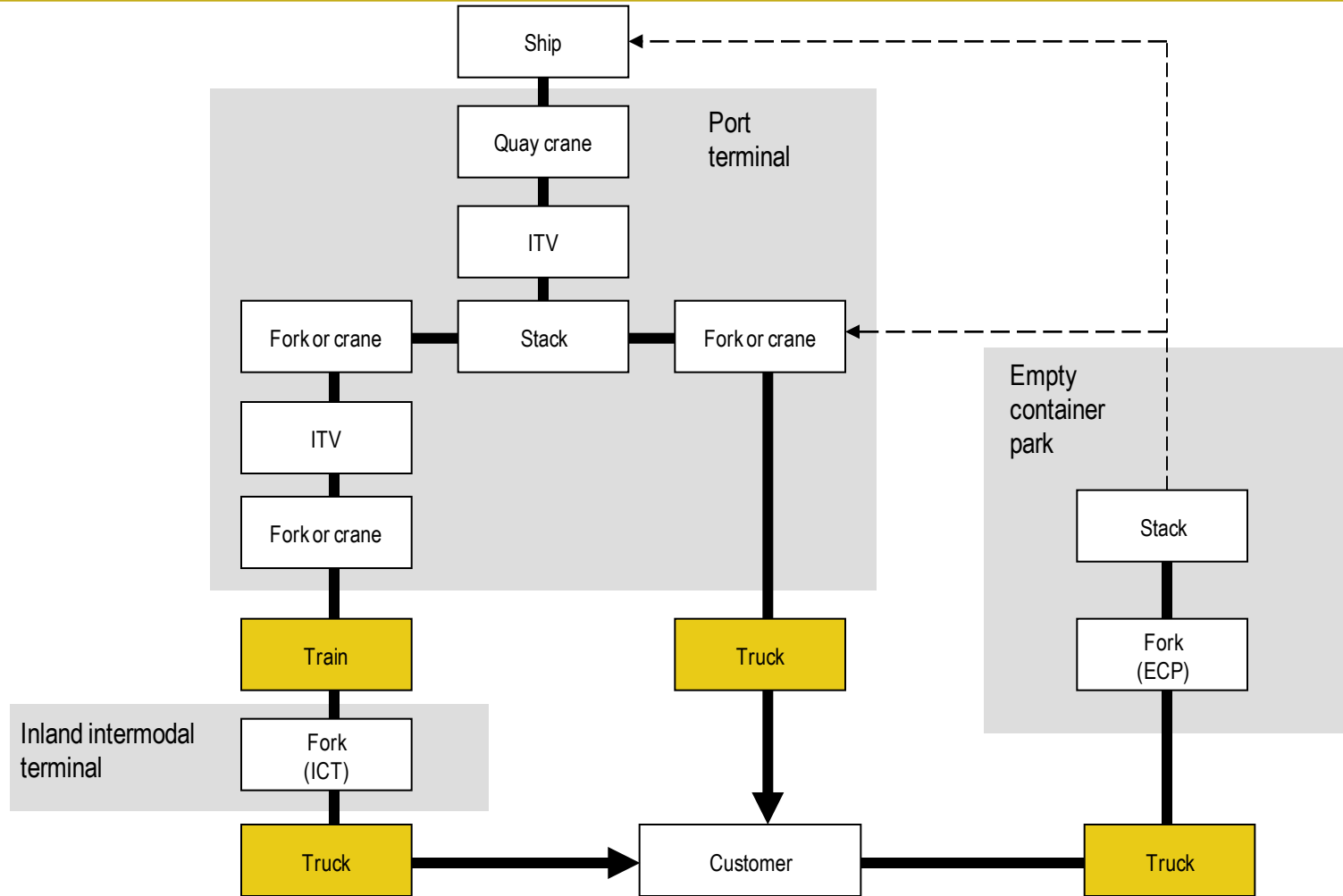
# Port precinct layouts



Source Waterline 44, 2008

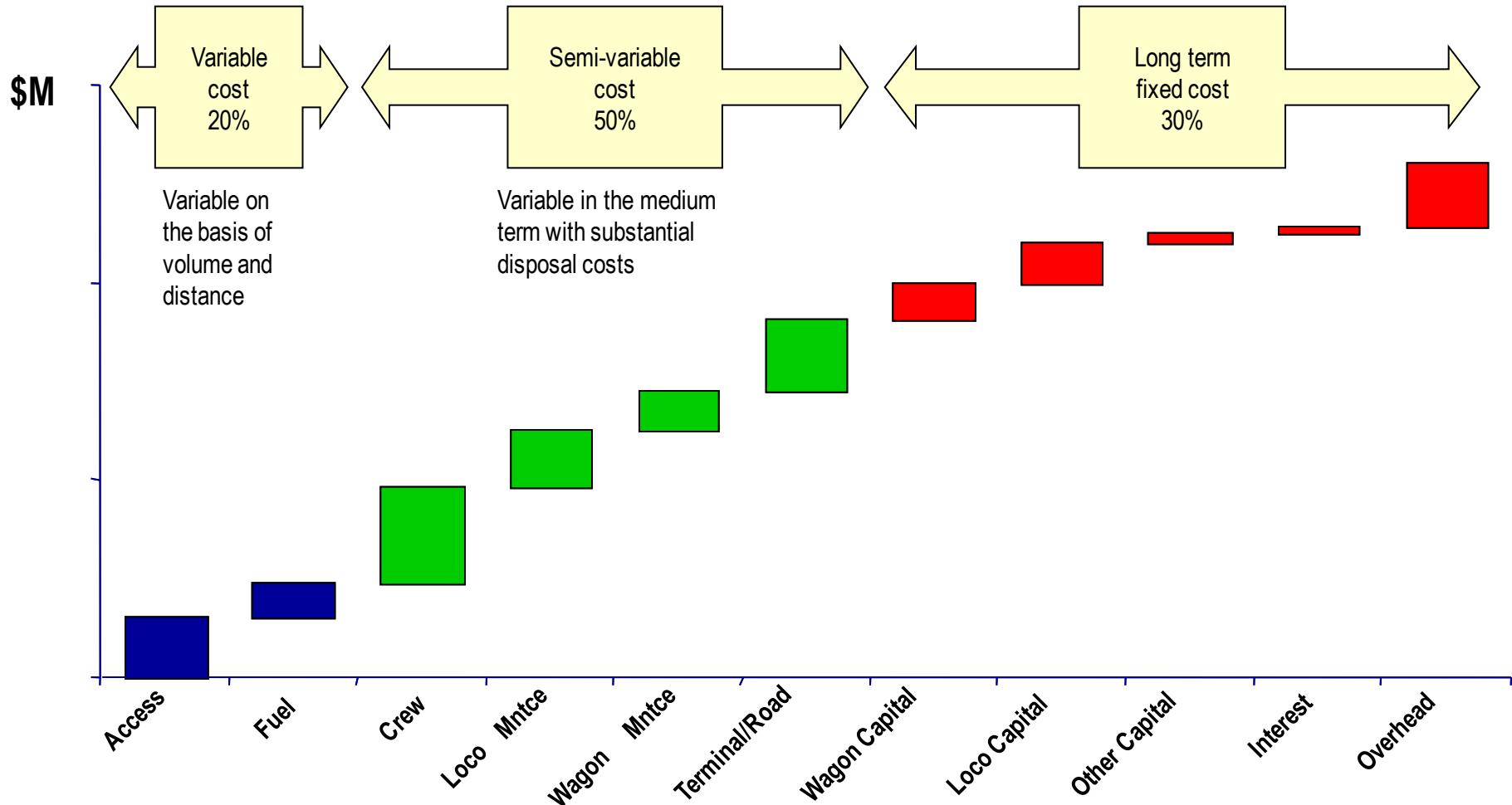
# Structure of flows – import movement

## The stevedore has more work to do to service rail interface



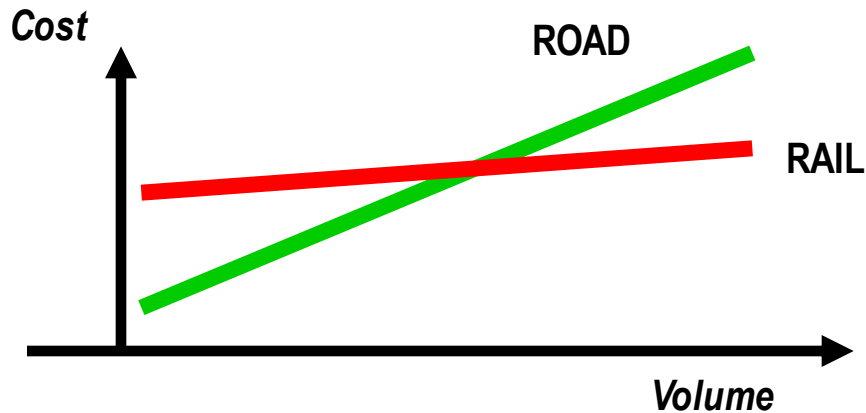
# Rail economics

## Fixed, semi-variable and variable cost



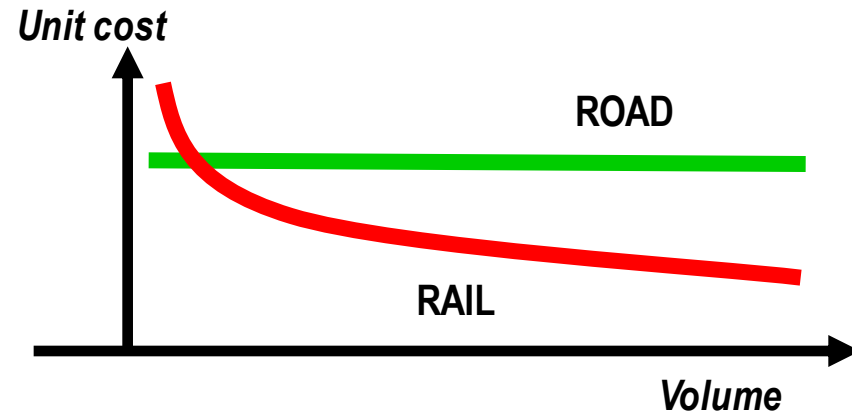
# Increasing volume for rail will provide significant cost advantages within a single network

Road cost profiles have greater direct relationship between volume and cost



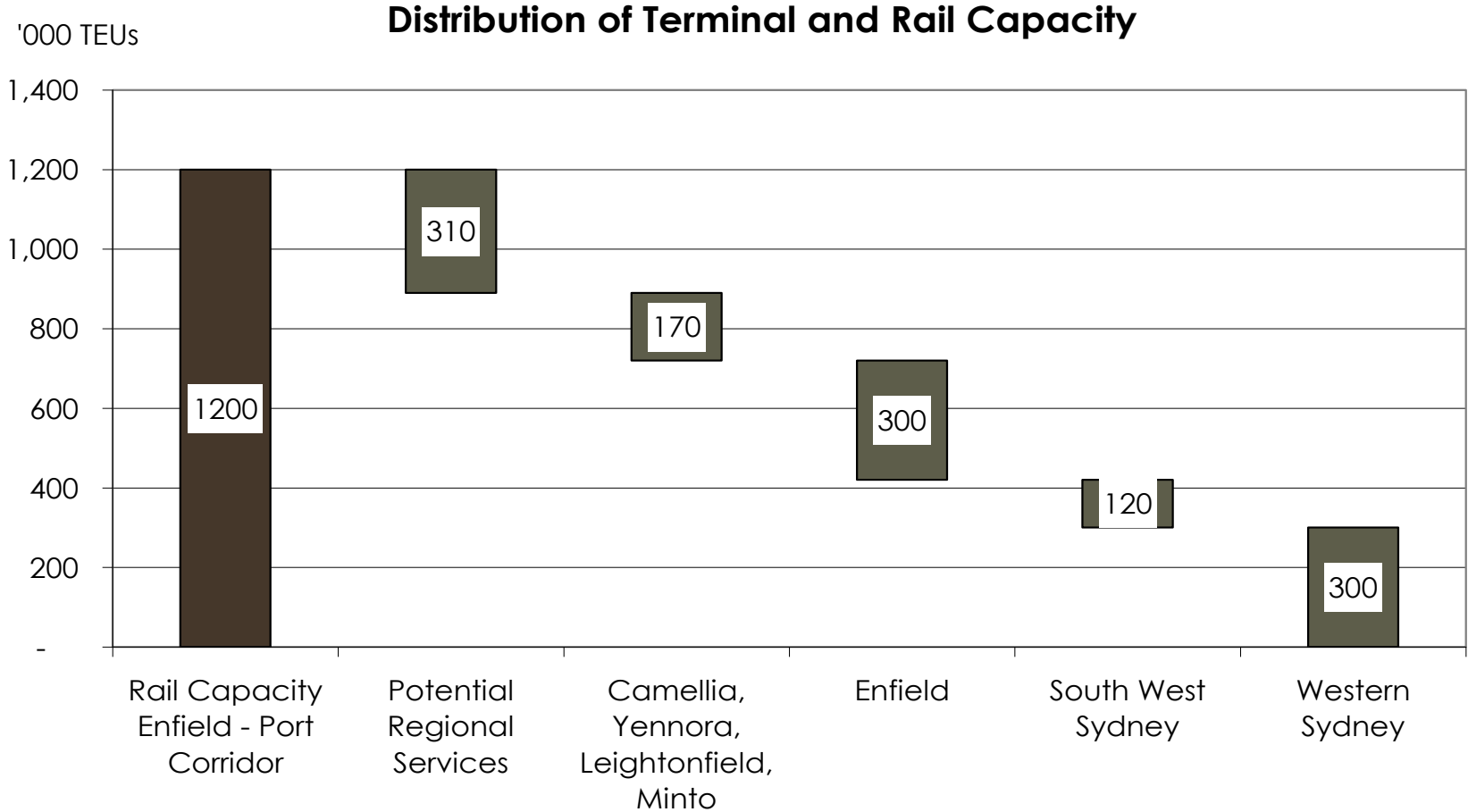
Rail operations have high fixed costs and low marginal costs

Road units costs do not vary significantly with volume

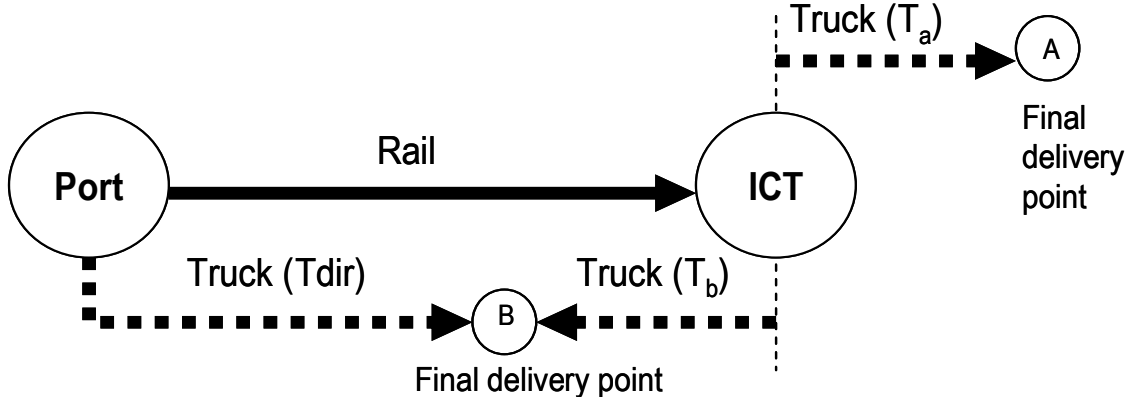


Rail provides for a lower unit cost with increasing volume

# Given a finite capacity on Botany to Enfield rail corridor is 1.2-1.4 m TEU's, what is the best distribution of terminal demand across rail line capacity in 2025?



# There is a need to understand spatial relationships amongst chain elements and the relative distances of road and rail journeys



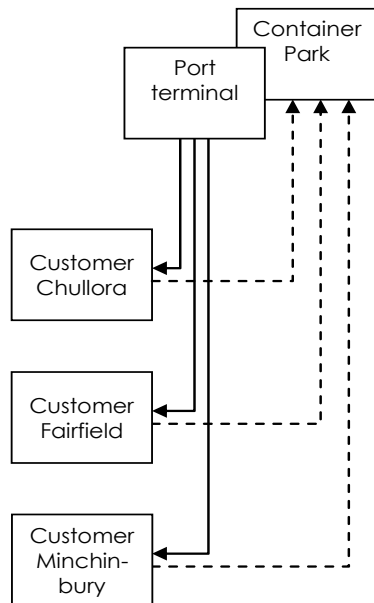
Rail Journey (distance)	Associated Road Journey (distance)		
	Short (0-10 kms)	Medium (10-50 kms)	Long (>50 kms)
Short (25-50 kms)	Ideal where consignee (A) is located further away from the port precinct, that is T <sub>a</sub> relative to the rail movement. For (B) T <sub>dir</sub> may eventuate where service demands require speed to market	Rail not competitive and economics dictates that road may best placed to complete the entire journey. For example, Enfield.	Rail is not competitive with road
Medium (50-150 kms)	Ideal, however in some regions the prevailing road market rates work against rail, eg back-loading – typical for Newcastle and Port Kembla	Ideal where consignee is located further away from the port as per T <sub>a</sub> , otherwise T <sub>dir</sub> will occur if T <sub>b</sub> excessive relative to rail	Also depend on the prevailing road prices, train service frequency and product type
Long (>150 kms)	Ideal, for (A) & (B), and less affected by back-loading influences	Ideal where consignee is located further away from the port, as above	Ideal where consignee is located further away from the port, however freight densities may provide efficient under T <sub>b</sub> scenarios

Within a rail industry context, the literal interpretation of a “long rail journey” would be considered Sydney to Perth, and a short journey would be Sydney to Brisbane, however the parameters used here are relative to a typical road journey for intrastate freight movements

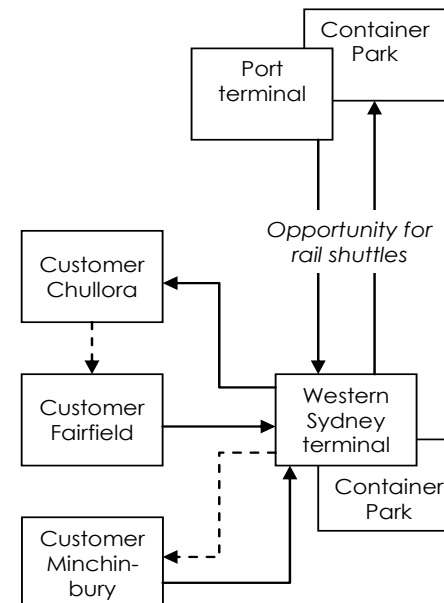
# There is need to think differently about managing empty containers

- *Does land at Port Botany have higher strategic importance and value than storing empty containers?*
- *How can empty container transport in Sydney be made more efficient?*

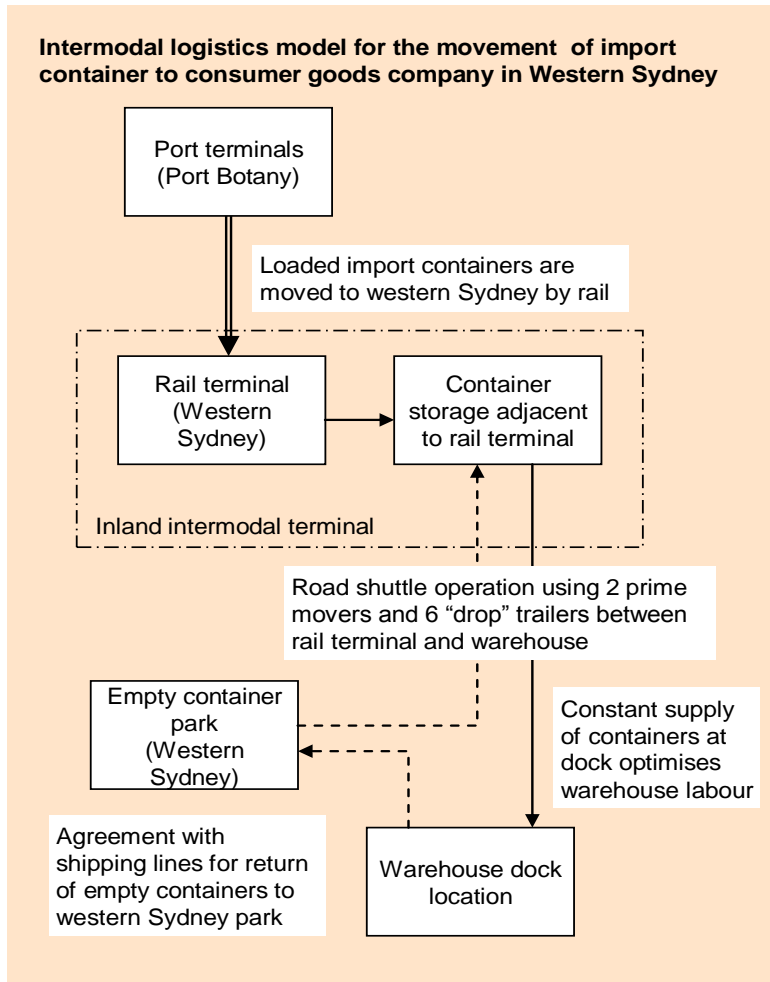
Road dominated system with empty containers sourced and returned from Port Botany



Road/rail system which holds empty containers nearer to market and returns any surpluses by rail to port

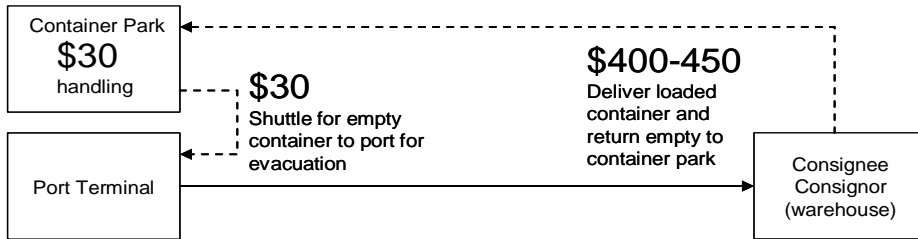


# FMCG supply chain in western Sydney

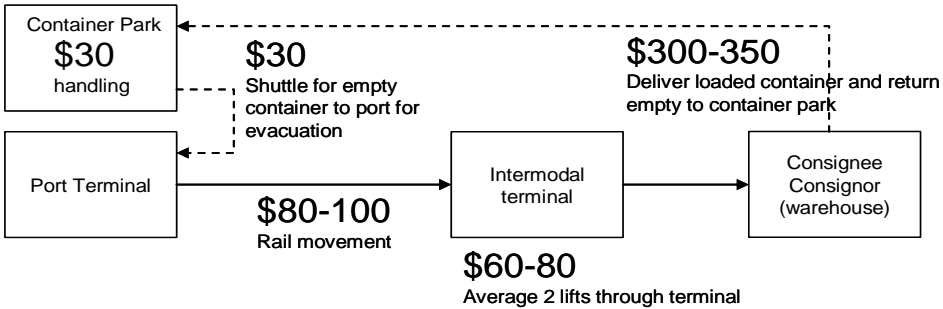


- Empty container park is integrated into IMT operation
- Excessive MT containers are evacuated back to the port by rail
- Road shuttles and warehousing operations complimented by IMT

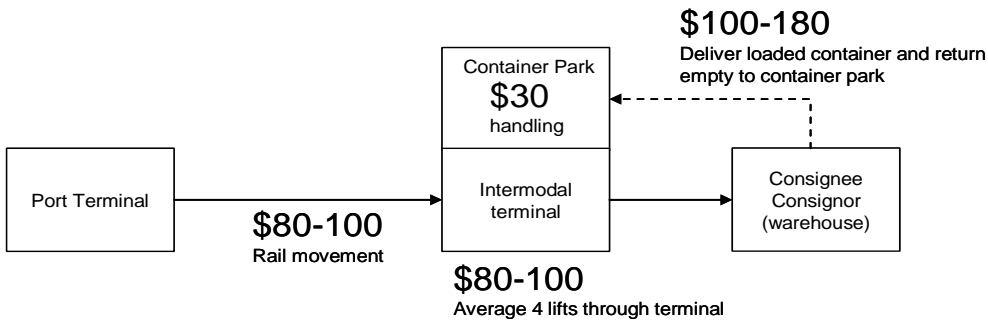
# Activity costs in port-land container cartage



Typical road movement to/from port with MT container returned to port precinct  
 Cost - \$460-510 per TEU



Intermodal movement with MT container returned to port  
 Cost - \$500-590 per TEU



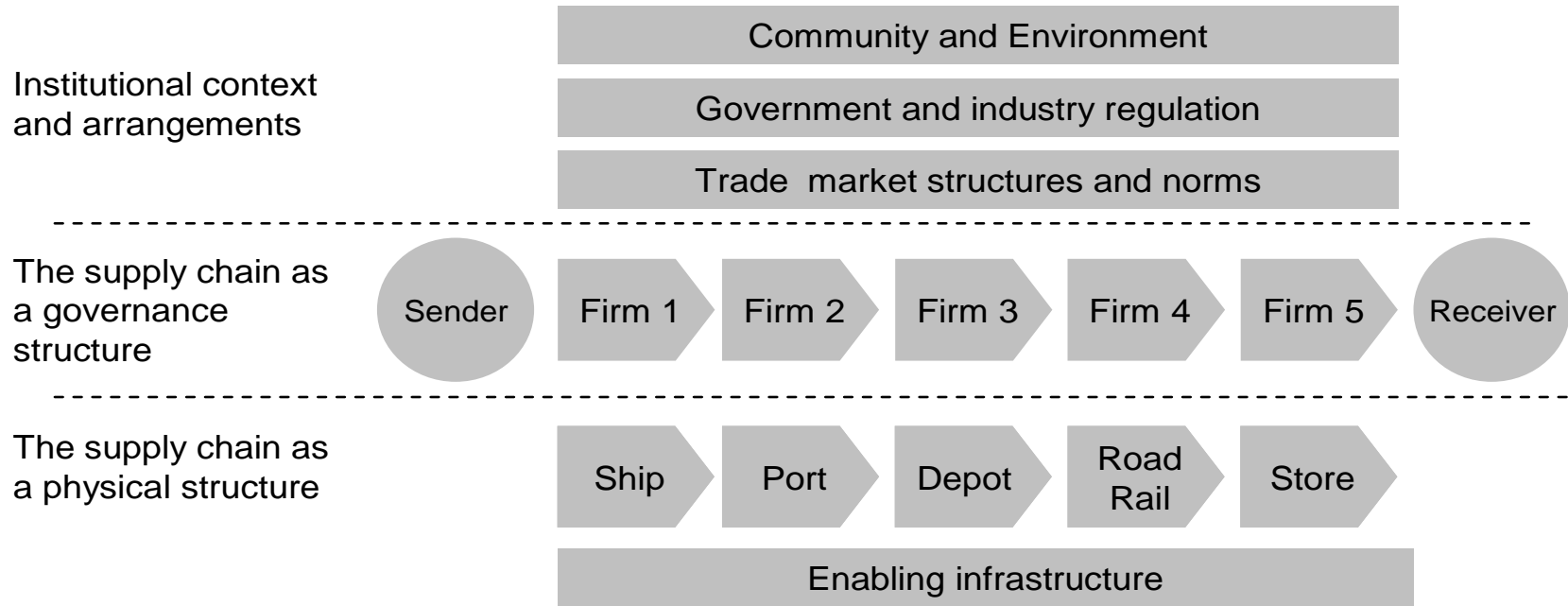
Intermodal movement with integrated container park  
 Cost - \$290-410 per TEU

- Value chains
- Business Models
- Power and control

# Is infrastructure the only impediment?

- Business models of the past are not suitable for future intermodal systems
- Key questions
  - *Who invests in and controls the chain?*
  - *What are the terminal and port access arrangements?*
  - *Who provides leadership and what is the role of government?*
  - *What is industry's capacity and willingness for change*
- Implications of “do nothing”

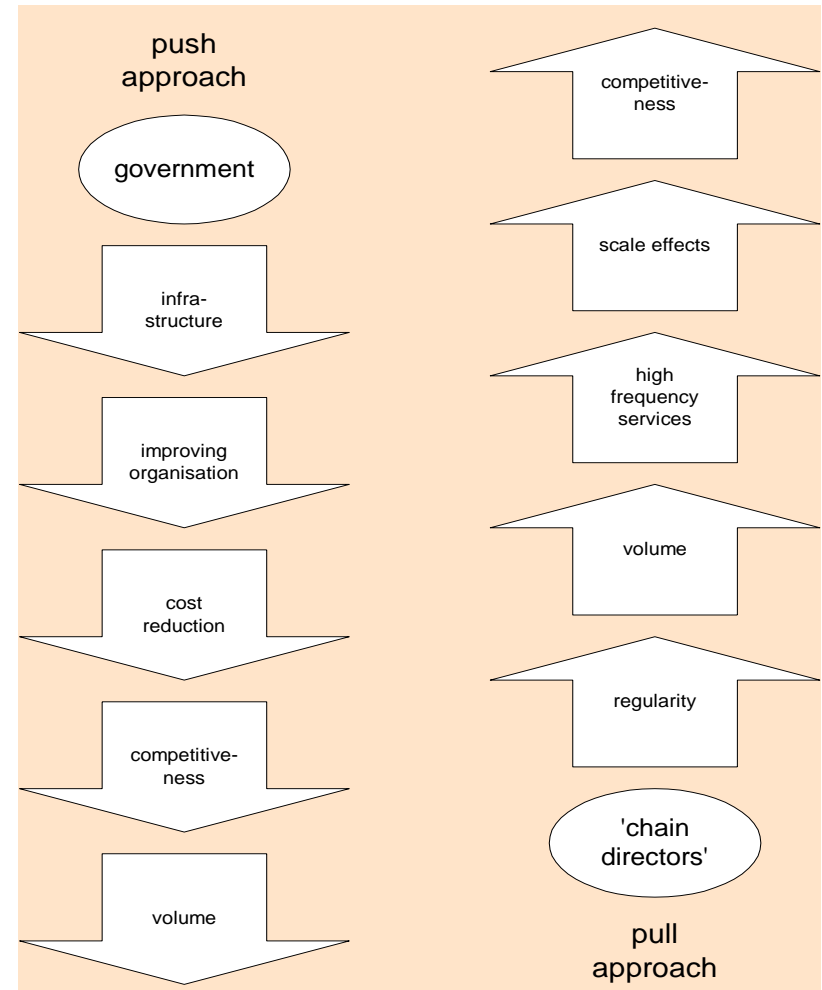
# Infrastructure is only one element



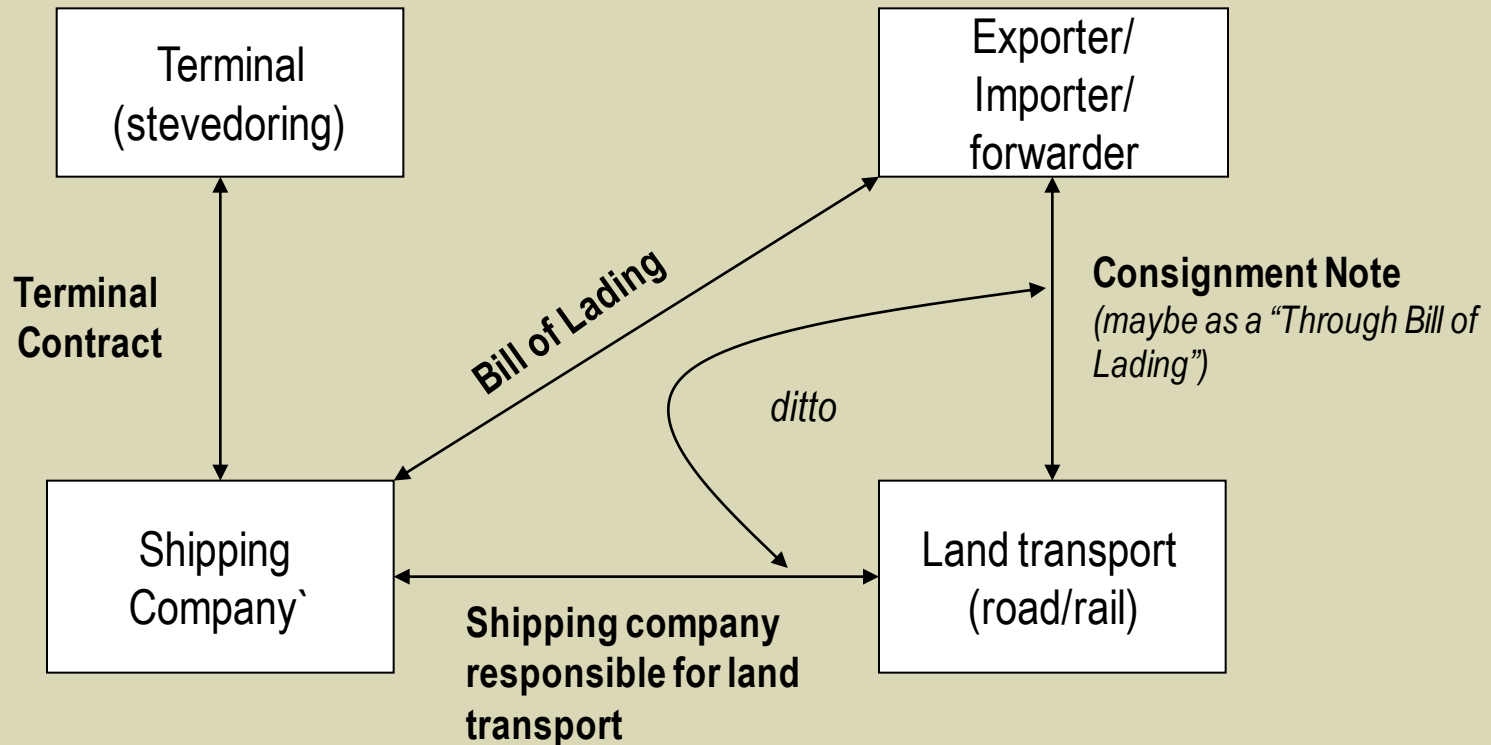
# There are differing motivations which drive the development of intermodal chains, and who/when the players invest

- Is government interested in investing when industry is adopting a wait and see approach
- Industry will only invest when there is a proven concept and is competitive

Henstra, D., & Woxenius, J. 1999. Intermodal Transport in Europe. Chalmers University of Technology;

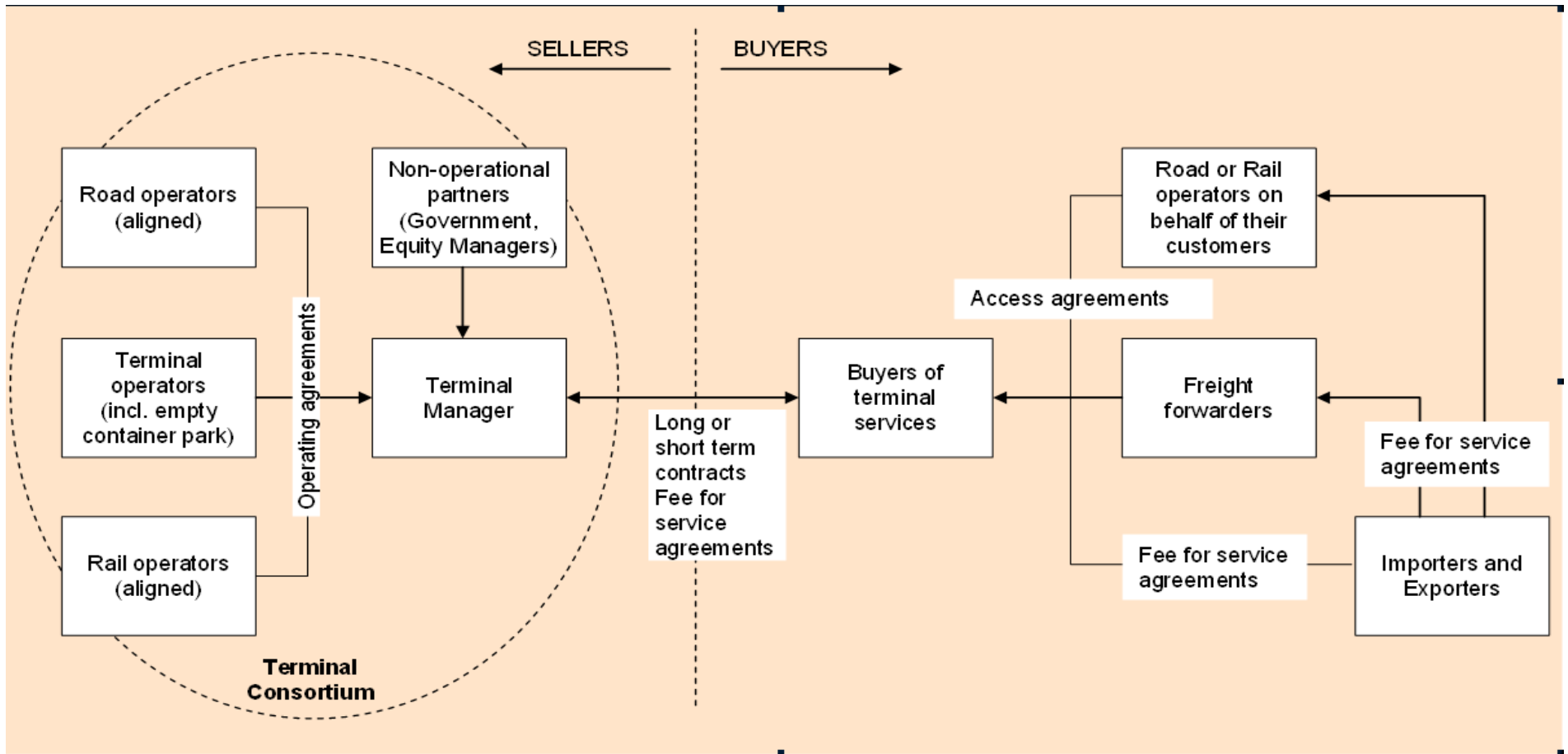


# Relationships have been commercially focused rather than “chain focused”



Commercial mechanisms required to define risk and responsibility have the effectively segment the chain, when viewed from a logistical perspective

# Generic buyer – supplier relationships



# Variations in commercial and service delivery arrangements

Type	Structure	Description	Key considerations
<b>A</b> <b>One-stop shop and bundled services</b>	<pre> graph LR     subgraph Terminal_services [Terminal services]         RRS[Rail and Road Services (aligned)]         TS[Terminal Services]         RRS --&gt; TS     end     C[Customer] --&gt; TS     </pre>	<p>The customer contracts directly with the terminal manager for the provision of terminal and intermodal transport services, and is charged a bundled all inclusive price against an agreed service contract</p>	<p>This model is the “one-stop-shop” option for customers; it is likely to operate for on-site tenants of a “freight village”, or where seamless flows are important service outcomes</p>
<b>B</b> <b>Subcontractor services</b>	<pre> graph LR     C[Customer] --&gt; RRS[Rail and Road Services (aligned or non-aligned)]     RRS --&gt; TS[Terminal Services]     </pre>	<p>The customer contracts with a transport company, which in turn contracts with the terminal manager for access; the transport company maybe aligned within the consortium or non-aligned merely seeking access</p>	<p>The customer is likely to have an historic relationship with the transport company which suggests using the terminal as an alternate pathway. Customer may or may not be onsite in the “freight village”</p>
<b>C</b> <b>Unbundled services</b>	<pre> graph LR     C[Customer] --&gt; TS[Terminal Services]     C --&gt; RRS[Rail and Road Services (non-aligned)]     </pre>	<p>Customer contracts separately with transport and terminal providers</p>	<p>Customer seeks to have transparency in pricing of individual activities and to be in “control” of supply chain activities; is likely to have substantial demand (and power) over other service providers</p>

# More reading ...

- Papers at [www.strategicdesign.com.au](http://www.strategicdesign.com.au)
- Regional Intermodal Terminals
- Sydney's Intermodal Systems (Parts 1 & 2)
- NSW Landside Infrastructure Capability:  
International Containers