



Planning and Transport Research Centre (PATREC)

EXECUTIVE SUMMARY

Understanding Freight in Perth

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THE UNIVERSITY OF
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Introductory

The principle aim of this study is to produce a comprehensive, high level, overview of the nature of road freight activity in metropolitan Perth. The lack of generally available data on the usage of road freight vehicles makes freight a difficult area to research. However, it is possible to derive some information from economic activity data series such as business enterprise counts, Census data and land use data, augmented with observations from the field in order to develop a qualitative and quantitative assessment of the major patterns of freight usage across the metropolitan Perth geographical area.

Aside from establishing these basic patterns, it is also the aim of this study to estimate the role played by freight cost and convenience considerations for individual businesses of various types in their decisions regarding location of their premises.

This aspect is particularly important for planners in the design of future industrial land releases, especially in the context of decisions regarding the development and support of new intermodal terminals in some outer suburban areas, to cater for road and rail freight needs of a larger city in future decades.

This study has been undertaken in parallel with another project involving the preparation for and design of a forthcoming Commercial Vehicle Survey to be undertaken by ARRB Group, for Main Roads WA as part of an MRWA project to build new commercial and household vehicle models for use in road planning. The research undertaken for each project has been of some use to the outcomes of both. We are grateful for the agreement of all parties to share research resources and outcomes.

Data availability and usage

Data on road freight activity at the micro-level is almost non-existent, due to the absence of any central reporting requirement on this activity. In future, in-cab GPS-based monitoring systems will potentially be used to collect a large range of data on freight trips for monitoring and revenue collection purposes, but these developments are some years off. In the meantime, it is necessary to use peripheral data sources to generate estimates of freight activity.

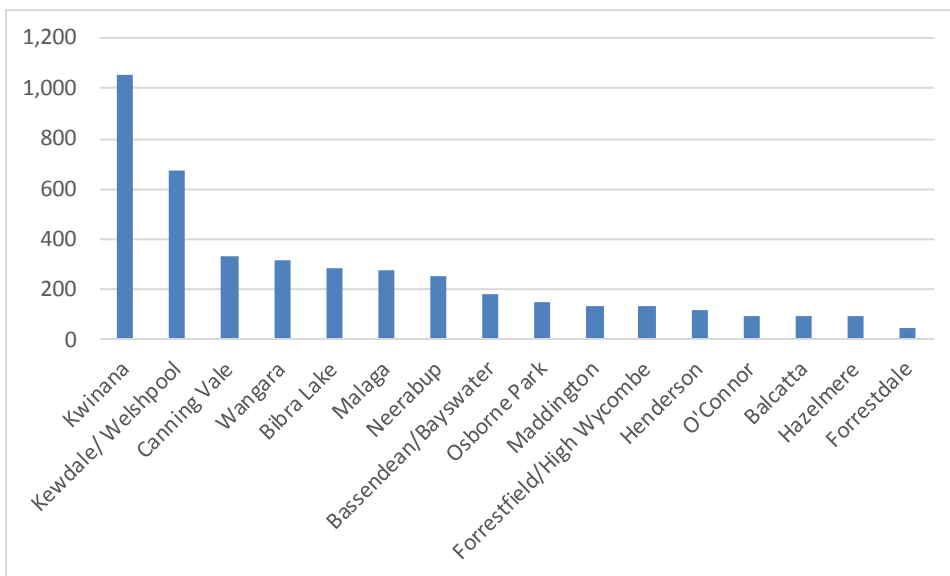
After experimentation with the use of ABS business enterprise counts and a commercially produced enterprise database (from Dun and Bradstreet), it was decided that these data sets were compromised by a bias towards company HQ addresses, rather than operational addresses (which are most relevant when examining freight usage). Census data on workplace, classified by ANZSIC industry type provides the best proxy measure of industrial activity by type in each of the Perth industrial areas.

This data, combined with information from the WA Department of Planning's commercial and industrial land lot records has been used to derive an overview of the make-up of each of the industrial areas.

Industrial area overview

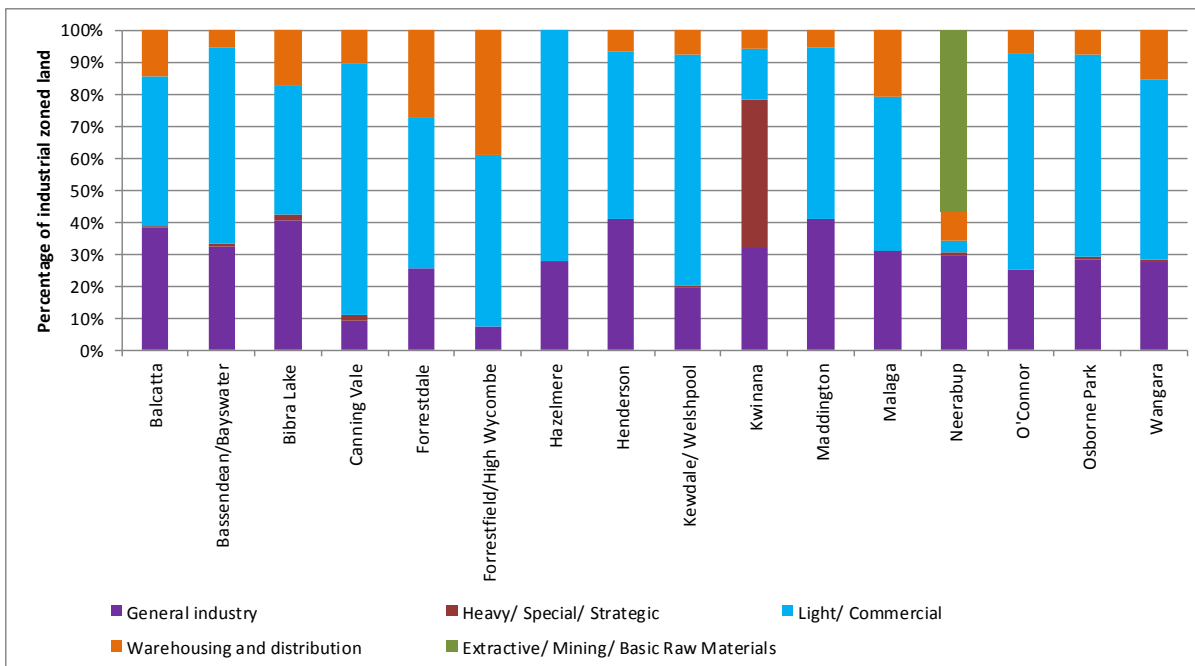
The dimensions and broad constitution of each major industrial area are summarised in the figures below:

Size of metropolitan industrial zoned areas (ha)



Source – Dept of Planning – ECONOMIC AND Employment Land Dynamics database

Caption – Composition of activity in industrial zoned land in metropolitan Perth



Source – Dept of Planning - data from Economic & Employment Land Dynamics database

A summary of the industrial make-up of each major industrial area is presented in the tables below. The data is derived from ABS Community Profiles data for the Statistical Areas (SA2) in which each industrial area lies, and the Workplace data from the 2011 Census respondents. (Similar data from the 2016 Census will be available by the end of 2017).

The ANZSIC 1-digit categories considered most associated with freight activity are highlighted in pink. Activity categories with over 10% of total employment in each SA2 are further highlighted.

ABS Community Profile and 2011 Census Workplace data (Northern metro Perth industrial areas) – proportion of total workplace location in each 1-digit ANZSIC category.

SA2	Madeley - Darch - Landsdale	Malaga	Osborne Park Industrial	Balcatta - Hamersley	Bassendean - Eden Hill - Ashfield	Bayswater - Embleton - Bedford	Hazelmere - South Guildford
Industrial area	Wangara	Malaga	Osborne Park	Balcatta	Bassendean	Bayswater	Hazelmere
Total Residential Population	18,979	14	6	14,975	14,405	21,210	3,636
Area (sq km)	20.4	6.4	3.4	10.4	10.3	13.8	17.0
pop density (persons/sq km)	933	2	2	1,445	1,393	1,536	214
industrial area (sq km)	6.3	6.0	3.4	2.2	1.9	1.9	3.9
industrial area / total area (%)	31.0%	93.7%	98.7%	21.2%	18.3%	13.9%	22.9%
Census 2011 Employment							
ANZSIC - 1 Digit Level							
Agriculture, Forestry and Fishing	0.4%	0.1%	0.8%	0.3%	0.2%	0.1%	0.3%
Mining	2.1%	2.1%	1.6%	1.3%	1.2%	0.8%	11.7%
Manufacturing	27.3%	32.3%	10.5%	15.8%	32.1%	23.0%	12.2%
Electricity, Gas, Water and Waste Services	0.5%	2.1%	0.2%	5.1%	0.8%	1.3%	0.5%
Construction	19.8%	14.9%	15.9%	14.8%	6.4%	14.0%	13.1%
Wholesale Trade	7.4%	12.8%	9.4%	10.0%	7.5%	7.0%	13.5%
Retail Trade	11.4%	8.8%	12.7%	10.1%	5.9%	5.9%	1.1%
Accommodation and Food Services	2.8%	1.8%	1.3%	3.6%	3.8%	3.1%	0.9%
Transport, Postal and Warehousing	4.3%	3.4%	1.6%	1.6%	5.1%	3.8%	21.6%
Information Media and Telecommunications	0.4%	0.8%	5.4%	0.7%	0.5%	0.8%	0.1%
Financial and Insurance Services	0.7%	0.8%	3.1%	3.7%	4.0%	0.6%	0.6%
Rental, Hiring and Real Estate Services	1.5%	1.1%	1.1%	0.7%	3.0%	2.3%	2.2%
Professional, Scientific and Technical Services	3.5%	5.2%	8.5%	9.4%	3.7%	4.1%	1.1%
Administrative and Support Services	1.5%	2.2%	3.0%	4.7%	3.6%	2.4%	1.1%
Public Administration and Safety	0.9%	1.0%	6.0%	2.2%	2.1%	2.4%	0.8%
Education and Training	4.2%	0.9%	2.4%	4.2%	7.3%	6.9%	0.2%
Health Care and Social Assistance	2.8%	1.0%	8.0%	5.0%	8.2%	10.1%	0.4%
Arts and Recreation Services	0.5%	0.5%	2.6%	0.5%	0.7%	1.5%	0.5%
Other Services	6.5%	6.2%	4.9%	4.8%	2.5%	8.0%	16.6%
Inadequately described	1.5%	2.0%	1.0%	1.4%	1.3%	1.8%	1.2%
Not stated	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%
Not applicable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total employment	13,636	15,422	20,977	10,826	5,697	7,384	4,659
Freight sensitive employment total	8,364	10,440	8,209	5,260	3,020	3,686	3,386
Freight-sensitive category % of total	61.3%	67.7%	39.1%	48.6%	53.0%	49.9%	72.7%

ABS Community Profile and 2011 Census Workplace data (Eastern metro Perth industrial areas) – proportion of total workplace location in each 1-digit ANZSIC category.

SA2	Forrestfield - Wattle Grove	Perth Airport	Kewdale Commercial	Welshpool	Canning Vale Commercial	Maddington - Orange Grove - Martin	Jandakot Airport
Industrial area	Forrestfield	Perth Airport	Kewdale	Welshpool	Canning Vale	Maddington	Jandakot Airport
Total Residential Population	15,936	51	-	18	-	11,797	222
Area (sq km)	26.9	20.4	4.8	8.3	6.6	53.3	7.5
pop density (persons/sq km)	593	3	-	2	-	221	30
industrial area (sq km)	2.6	2.0	4.7	8.2	6.5	5.0	2.6
industrial area / total area (%)	9.7%	9.8%	98.3%	98.5%	98.0%	9.4%	34.7%
Census 2011 Employment							
ANZSIC - 1 Digit Level							
Agriculture, Forestry and Fishing	1.0%	0.0%	0.1%	0.2%	0.3%	0.6%	0.3%
Mining	3.9%	7.5%	2.4%	4.5%	3.4%	1.8%	0.6%
Manufacturing	20.3%	4.3%	27.5%	27.3%	25.7%	19.3%	15.0%
Electricity, Gas, Water and Waste Services	2.1%	0.7%	3.4%	1.8%	2.0%	0.9%	0.6%
Construction	6.9%	1.1%	7.4%	7.3%	10.8%	14.5%	3.0%
Wholesale Trade	4.8%	4.4%	15.3%	14.8%	23.3%	3.9%	7.9%
Retail Trade	8.0%	9.4%	6.7%	6.8%	7.0%	13.8%	5.5%
Accommodation and Food Services	4.2%	6.0%	1.4%	0.9%	1.0%	3.5%	1.1%
Transport, Postal and Warehousing	24.6%	47.0%	20.9%	16.1%	6.7%	5.2%	13.9%
Information Media and Telecommunications	0.2%	0.1%	2.4%	0.5%	0.4%	0.2%	0.0%
Financial and Insurance Services	0.4%	0.5%	0.9%	1.2%	0.9%	1.1%	0.0%
Rental, Hiring and Real Estate Services	1.8%	1.2%	1.2%	2.6%	1.2%	1.4%	1.2%
Professional, Scientific and Technical Services	1.9%	4.0%	2.3%	2.9%	6.6%	5.5%	10.8%
Administrative and Support Services	2.3%	2.1%	2.3%	2.6%	1.5%	2.2%	2.0%
Public Administration and Safety	2.9%	8.7%	0.1%	1.4%	2.0%	6.7%	4.5%
Education and Training	5.9%	0.4%	0.2%	0.4%	0.5%	4.9%	18.6%
Health Care and Social Assistance	4.1%	0.3%	0.9%	1.3%	1.6%	5.7%	12.4%
Arts and Recreation Services	0.3%	0.0%	0.0%	0.5%	0.2%	0.4%	0.0%
Other Services	3.5%	1.6%	3.1%	5.1%	3.2%	6.4%	1.5%
Inadequately described	0.9%	0.7%	1.4%	1.7%	1.7%	1.9%	1.0%
Not stated	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%
Not applicable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total employment	6,306	10,004	7,499	17,947	14,764	8,355	1,150
Freight sensitive employment total	3,948	6,499	5,769	12,884	10,618	3,812	472
Freight-sensitive category % of total	62.6%	65.0%	76.9%	71.8%	71.9%	45.6%	41.0%

ABS Community Profile and 2011 Census Workplace data (Southern metro Perth industrial areas) – proportion of total workplace location in each 1-digit ANZSIC category.

SA2	Bibra Industrial	Henderson	Fremantle	O'Connor	Kwinana Industrial	Rockingham
Industrial area	Bibra Lake	Henderson	Fremantle	O'Connor	Kwinana	Rockingham
Total Residential Population	16	14	13,245	3	11	14,826
Area (sq km)	6.5	8.7	29.2	1.7	16.7	35.7
pop density (persons/sq km)	2	2	453	2	1	415
industrial area (sq km)	6.4	8.0	7.0	1.6	16.6	8.3
industrial area / total area (%)	97.8%	91.5%	24.0%	95.9%	99.3%	23.2%
Census 2011 Employment						
ANZSIC - 1 Digit Level						
Agriculture, Forestry and Fishing	0.5%	0.0%	0.4%	0.4%	0.1%	0.2%
Mining	1.9%	4.8%	0.6%	2.1%	5.9%	0.6%
Manufacturing	32.4%	50.0%	6.0%	35.1%	49.1%	9.3%
Electricity, Gas, Water and Waste Services	1.8%	1.3%	0.3%	0.9%	4.6%	0.2%
Construction	16.3%	16.3%	2.9%	10.7%	17.6%	5.3%
Wholesale Trade	12.0%	4.1%	2.4%	11.8%	3.4%	2.0%
Retail Trade	5.7%	1.5%	8.9%	14.2%	1.9%	17.4%
Accommodation and Food Services	0.9%	0.5%	10.5%	1.9%	0.5%	7.0%
Transport, Postal and Warehousing	7.2%	4.9%	11.0%	4.6%	6.3%	3.2%
Information Media and Telecommunications	0.3%	0.1%	0.9%	0.3%	0.0%	1.1%
Financial and Insurance Services	0.2%	0.3%	1.7%	0.3%	0.2%	2.0%
Rental, Hiring and Real Estate Services	0.9%	0.9%	1.7%	1.5%	1.9%	2.1%
Professional, Scientific and Technical Services	5.2%	7.8%	6.2%	3.3%	2.7%	2.8%
Administrative and Support Services	3.5%	1.3%	2.2%	1.0%	1.9%	2.6%
Public Administration and Safety	1.4%	1.2%	7.7%	0.8%	0.5%	24.6%
Education and Training	1.3%	0.8%	7.2%	0.6%	0.2%	5.8%
Health Care and Social Assistance	0.3%	0.1%	23.8%	3.8%	0.2%	7.7%
Arts and Recreation Services	1.6%	0.0%	2.4%	0.7%	0.0%	0.9%
Other Services	4.3%	1.4%	2.2%	4.7%	1.5%	4.2%
Inadequately described	2.4%	2.7%	1.1%	1.4%	1.4%	0.8%
Not stated	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Not applicable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total employment	7,222	4,396	17,574	4,094	7,219	11,990
Freight sensitive employment total	5,174	3,578	4,053	2,669	6,279	2,475
Freight-sensitive category % of total	71.6%	81.4%	23.1%	65.2%	87.0%	20.6%

A comparison of the make-up of each area from these tables shows that there is a broad similarity in the nature of most industrial areas. The exceptions are:

The sole heavy industry designated area in Kwinana, which consists of port and maritime trades, chemical, fuel and fertiliser plant and steel fabrication. (Much of the freight task in this area is conducted by sea and by rail.)

The concentration of logistics, transport and warehousing activity in the eastern areas, taking advantage of the metropolitan and regional highway network, proximity of rail yards and availability of large lot sizes.

The majority of activity on industrial land in other areas is relatively ubiquitous – largely focused on the importation and distribution of goods from overseas (via Fremantle) and from interstate (via the railyards). Such manufacturing activity as there is, is generally best described as secondary – is more associated with assembly, rather than cradle-to-grave primary manufacturing. Most primary manufactured goods are ‘imported’ into Perth from elsewhere.

Freight Streams

Perth therefore exhibits a fairly narrow range of supply chain types, relative to other major cities. The major freight activities observed arising from these supply chains have been aggregated into a small number of ‘streams’, with some definition and indicative freight volume estimates in the following table.

Major freight streams observed in Perth metropolitan economy

Stream	Description	Origins	Destinations	Annual Volume (tonnes)	Truck type
Imported goods	Goods from overseas and interstate into DCs and smaller storage units for distribution to stores and households. Includes small volumes to east coast. Includes groceries, consumer goods, furnishings, industrial equipment etc	Port of Fremantle container berths; Rail terminals	DCs – Forrestfield, Hazelmere Distributors – all areas Stores – all areas Households – all areas Railyards – to east coast	Fremantle – 3.5m Railyards - 1.5m	Semi-trailers with containers (sea freight and domestic);
Rural exports	Grains, livestock, timber products, mineral sands to port via intermediate staging or processing.	Wheatbelt, South-west, Great Southern, Pilbara,	Grain – CBH Forrestfield & Inner Harbour packers; Livestock – Wellard, Hazelmere & Inner Harbour; Timber – forests to Inner Harbour Wool – farm to Bibra Lake stores & Inner Harbour Mineral sands – mines to warehouses Henderson & Inner Harbour	Grain – 200,000 Livestock – 100,000 Timber – 65,000 Wool – 100,000 Mineral Sands – 650,000	Grain – bulk tippers to CBH and packers, then semi-trailers and B-Doubles with containers to port; Livestock carriers; Timber – specialist log carriers Wool – vans to stores, then container trucks Mineral sands – B-doubles with specialist containers
Fresh produce	Fruit and vegetables into Markets, retail stores and DC Milk and bakery products	Pemberton, Gascoyne, Gin Gin areas Dairy – SW and Balcatta processors Bakeries – wheatbelt via flour mills (Northam, Fremantle) and bakeries (Bentley, Malaga)	Perth Markets, retailer DCs, then to retail outlets thru WA Supermarkets (direct) and other retail outlets	Perth Market – 243,000 Milk – Bread -	Semi-trailers and large vans into Markets and DCs, vans to retailers Milk – tankers to processors, then rigid vans to stores Bread – bulk tippers to flour mills, rigid vans to bakeries and then to stores

Stream	Description	Origins	Destinations	Annual Volume (tonnes)	Truck type
Mining inputs, project cargo	Equipment, chemicals, grinding media, groceries etc	Fremantle, Railyards via transport depots	Goldfields, Pilbara mines and camps	Pilbara 350,000 Goldfields 100,000	Container carriers, then B-Doubles and road trains
Steel products	Slab, bar, coil, sheet product etc from eastern state and Asian mills	Railyards, Fremantle	Manufacturers in southern and eastern Perth, then construction, industrial sectors	Steel products 0.5m	Semi-trailers
Construction materials	Bricks, sand, concrete from quarries to processors and consumers	Quarries etc in outer metro fringe,	Processors in Swan Valley, Cockburn, depots and batching plants throughout Perth	Bricks 750,000 Cement 1,000,000	Bulk tippers, specialist vehicles
Building products	Timber, glass, aluminium manufactures for construction sector	Port, railyards, local suppliers	Manufacturers, assemblers thru Perth, to construction sites	N/A	Semi-trailers and rigid vans
Waste	Municipal, construction, industrial waste collection, recycling, disposal	Households, businesses, construction sites	Transfers stations, landfills, recycling centres, Fremantle	MSW 1.2m C&I 1.2m C&D 3.0m	Compactors and specialist vehicles
Fuel	Import, refining, distribution	Kwinana, Kewdale	Retail stations, mines, farms thru WA	4.5m	Tankers, B-Doubles
Chemicals, fertilisers	Import, refining, distribution	Kwinana	Kwinana processors, then industrial and WA regional consumers	N/A	Tankers, semi-trailers, vans
Small freight	Mail, parcels, small consignments	General, airport, railyards	General, airport, railyards	N/A	Large and small vans
Removals	Household goods, office contents	Railyards, general thru WA, Fremantle	Railyards, general thru WA, Fremantle	N/A	Large vans, containers

Some overview analysis of each of these 'Streams' is provided here, but more detailed work will be necessary to more accurately estimate the volumes involved and to document the geographical spread of freight activity. It is hoped that the MRWA Commercial Vehicle Survey to be undertaken in 2018 and 2019 will provide a large amount of data to support this future analysis.

Industrial location and intermodal terminal considerations

The literature survey undertaken for this study has accumulated a large number of case studies from the academic literature which correlate industry type with freight usage patterns and characteristics. These case studies are useful in the determination of the algorithms used in this study to estimate freight vehicle activity associated with various ANZSIC classes of industry in the Perth metropolitan area.

There is little or no evidence in the literature of any significant attempts in Australia to determine the relationships between land use type and freight activity. There have been numerous attempts at surveys of transport operators, generally conducted by responsible government agencies (state transport and main roads departments) in line with the development of traffic models for road planning purposes. However, there is no evidence of any successful attempts at 'establishment surveys' which would relate freight activity to the nature of economic activities at premises with identified geographic identification (geo-codes or physical addresses).

Businesses focusing on the assembly, storage and distribution of imported goods do not have need to aggregate in clusters according to the nature of their products, in the way that some retailers do. Car sales yards, for instance, often co-locate along stretches of a main road to facilitate consumer attention. Restaurants aggregate in local strips to develop some scale and crowd interest that benefits them all. No such advantages arise in relation to location of wholesale and distribution businesses in Perth. They all require reasonable access to their suppliers and outlets, which is offered by the relatively efficient road transport network available across Perth. Higher transport costs in more crowded cities such as Sydney and Melbourne are probably greater drivers of economic clustering behaviour among certain types of industry.

Intermodal customers are attracted to this type of logistics system if:

- They have significant volumes of goods to import. Many customers appreciate the convenience of leaving the transport and documentation of several containers worth of goods to the intermodal operator, rather than monitoring the collection of containers from the port via individual trucking contracts.
- Costs are comparable or better than competing road-only chains.
- Service is reliable and frequent, so that there is no disadvantage in timeliness for using it.

From the point of view of the service operator, it is desirable (though not essential) to have access to one or more baseload customers, providing steady volumes for the regular train service. Train operational costs include very high fixed cost proportions (capital cost, train crew, fuel, track access charges etc), so high utilisation rates are critical to success.

It is also important that double handling costs at each end of the service are kept low. This can be achieved at the inland intermodal terminal, since the operator has the incentive to set up and manage all aspects of the operation on its own property. It is more problematic at the port end of the system, where the terminal operators (often the stevedoring firms) have less (or nil) incentive to support rail efficiency.