



Australian Government

Department of Infrastructure and Regional Development

Bureau of Infrastructure, Transport and Regional Economics



Freightline I – Australian freight transport overview

Introduction

Governments play a significant role in planning, funding, building and managing Australian transport networks, so reliable and up-to-date information about current and projected future use of the network is essential for efficient planning and management of the network.

However, because of the breadth and diversity of freight, detailed freight data is generally costly to collect, and even where data is collected, commercial confidentiality can limit the availability of more detailed information required to inform planning. The *Freightline* series is intended to partly fill this gap in knowledge about the size and scope of the Australian freight task, providing a series of information sheets covering different aspects of the Australian freight task. Over forthcoming issues the series will focus on different commodities and/or sectors, outlining the size and location of major freight movements, the major supply chains and the key infrastructure components involved. Commodity/sector-specific tasks to be covered include:

- Iron ore
- Coal
- LPG
- Metallic minerals
- Grains (wheat, coarse grains & pulses)
- Cotton and rice
- Sugar
- Fertilisers
- Livestock and meat
- Other agricultural products
- International container movements
- Intercapital freight

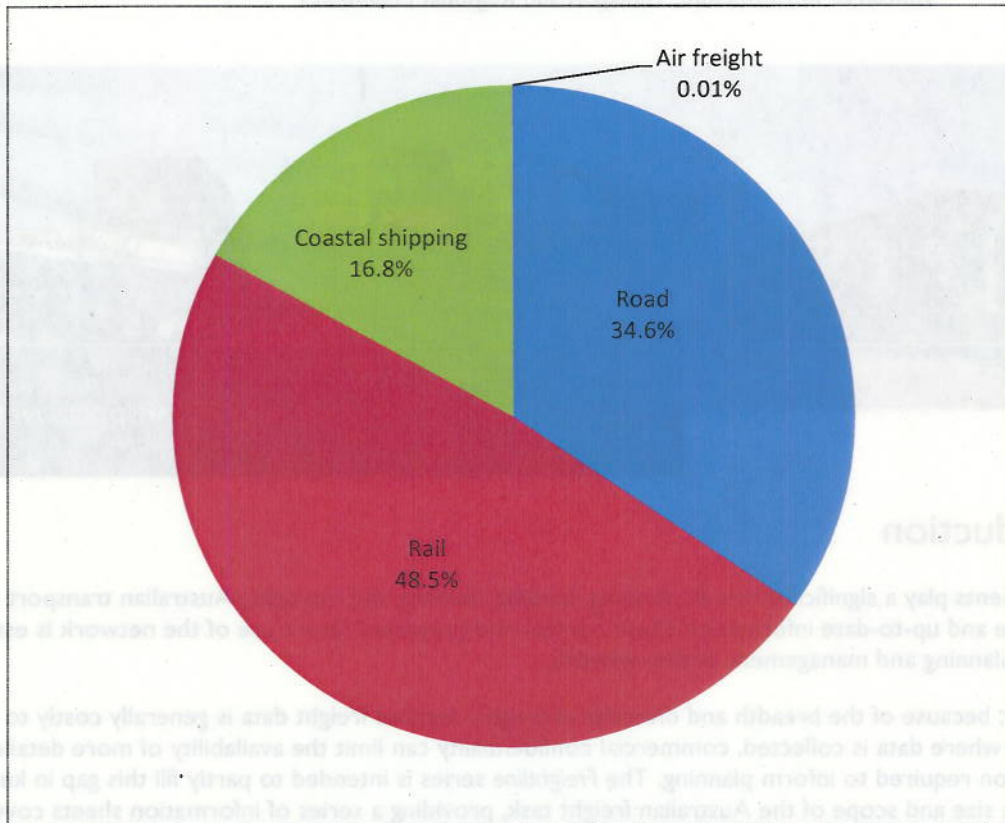
This first issue provides a general overview of the size and scope of the Australian freight task, highlighting some of the more significant commodity flows and providing projections of the potential future freight task.

Overview of the Australian domestic freight transport task

In 2011–12, the domestic freight task totalled almost 600 billion tonne kilometres¹ that is equivalent to about 26 000 tonne kilometres of freight moved for every person in Australia. Rail transport accounts for approximately 49 per cent of total domestic freight, with iron ore and coal exports accounting for over 80 per cent of this, road freight about 35 per cent of total freight and coastal sea freight 17 per cent. Air freight comprises less than 0.01 per cent of total freight by weight (see Figure 1).

1. One tonne kilometre is equivalent to one tonne moved one kilometre.

Figure 1: Domestic freight share, 2011–12



Sources: ABS (2011), ARA (2012), BITRE (2013a) coastal shipping database and BITRE estimates.

Table 1: Australian freight volumes by transport mode, 2000–01 to 2011–12

Year	Road	Rail	Sea	Air	Total
	<i>(billion tonne kilometres)</i>				
2000–01	139.4	136.9	104.5	na	380.8
2001–02	146.1	150.5	110.4	na	407.1
2002–03	151.0	159.8	114.8	na	425.9
2003–04	156.8	168.0	117.0	na	441.9
2004–05	166.3	183.0	114.0	na	463.5
2005–06	173.3	189.0	122.0	0.4	484.7
2006–07	182.4	198.7	126.2	0.4	507.5
2007–08	191.5	203.5	124.5	0.4	519.2
2008–09	191.9	237.2	107.4	0.3	535.8
2009–10	192.1	258.6	114.7	0.3	565.7
2010–11	197.3	261.4	110.9	0.3	570.0
2011–12	207.5	290.6	100.9	0.3	599.2

na not available.

Source: BITRE (2013a, Table 2.1), ARA (2012) and BITRE estimates.

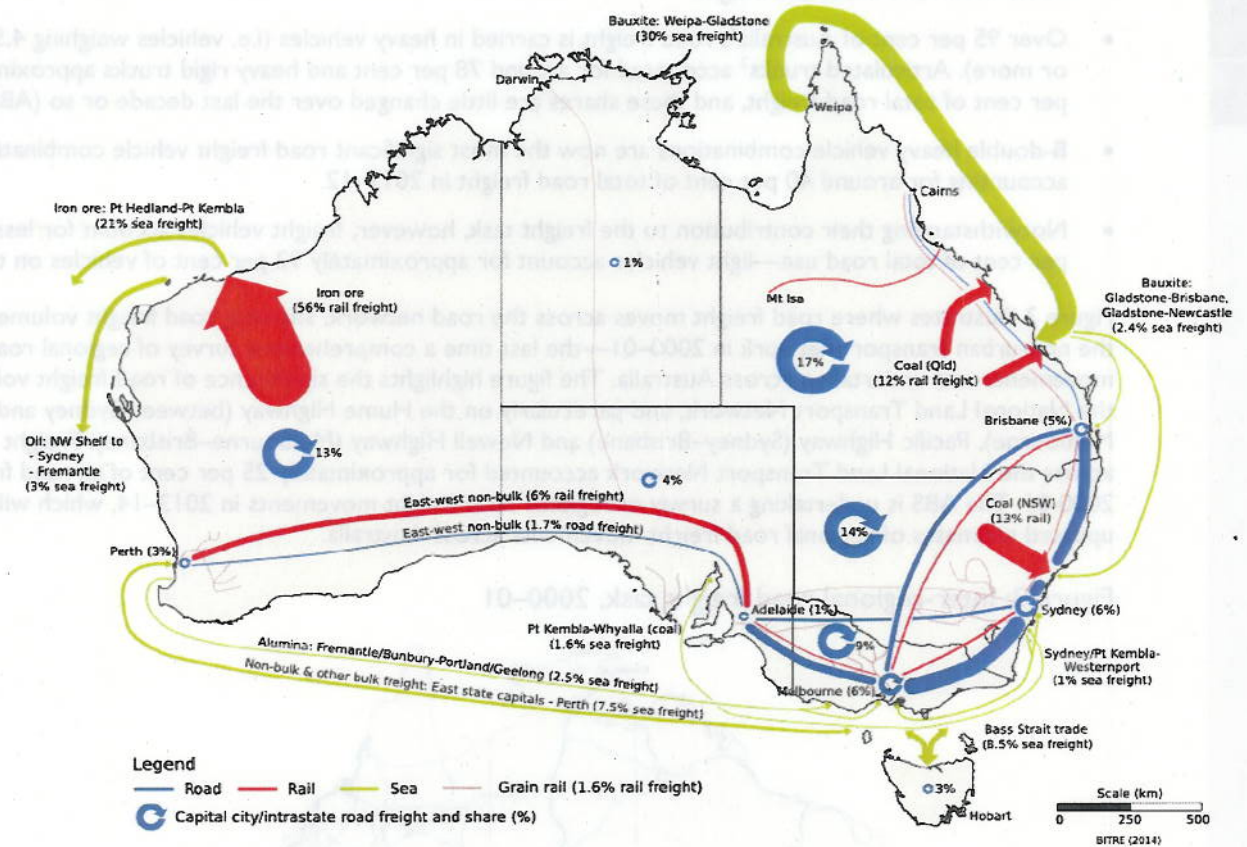
Total freight volumes have quadrupled over the past four decades, predominantly due to significant growth in road freight and, more recently, strong growth in mining-related rail freight volumes. However, Australian coastal shipping freight volumes grew very little over that period, and more recently have declined due principally to lower volumes of domestic petroleum and iron ore. Table 1 provides estimates of modal and total Australian freight movements over the decade to 2011–12.

These statistics do not include the significant volumes of oil and gas moved via pipelines from gas fields, both inland and offshore, to domestic markets and ports for export, nor products (predominantly mineral ores) moved over shorter distances by conveyors or pipelines. (The transport task of pipelines and conveyors will be considered in a later Freightline issue.)

Where does freight move in Australia

The Australian freight task is diverse, and encompasses the movement of bulk export commodities, such as iron ore, coal, liquefied natural gas (LNG) and grains, the transport of imported motor vehicles, machinery and other manufactured goods, and the transport of finished products for household consumption through distribution centres to retail outlets. Figure 2 provides a stylistic representation of the major elements of Australian freight movements in 2011–12. Several of the more notable aspects of the freight task are described below.

Figure 2: Major freight flows in Australia, 2011–12



Note: Line widths show relative freight volume (tonnes). Share estimates related to freight tonne kilometres.
Source: ABS (2013), ARA (2013), BITRE (2010b, 2013a, 2013b) and BITRE estimates.

Rail freight

Rail is dominated by transport of bulk freight over longer distances and plays a significant role in transporting grains, rice, cotton and sugar for processing and/or export:

- Iron ore and coal together account for over 80 per cent (in tonne kilometre terms) of all rail freight.
- Grains, sugar, fertilisers and other bulk products account for a further 8 per cent of all rail freight.
- Non-bulk rail freight, which comprises around 8 per cent of total rail freight, is most significant on the long Eastern states–Perth corridor, where it accounts for the majority of intercapital origin–destination non-bulk freight, and the Melbourne–Brisbane corridor, where it has roughly about 30 per cent share of intercapital non-bulk freight. On other corridors, rail carries a much smaller share of intercapital non-bulk freight.

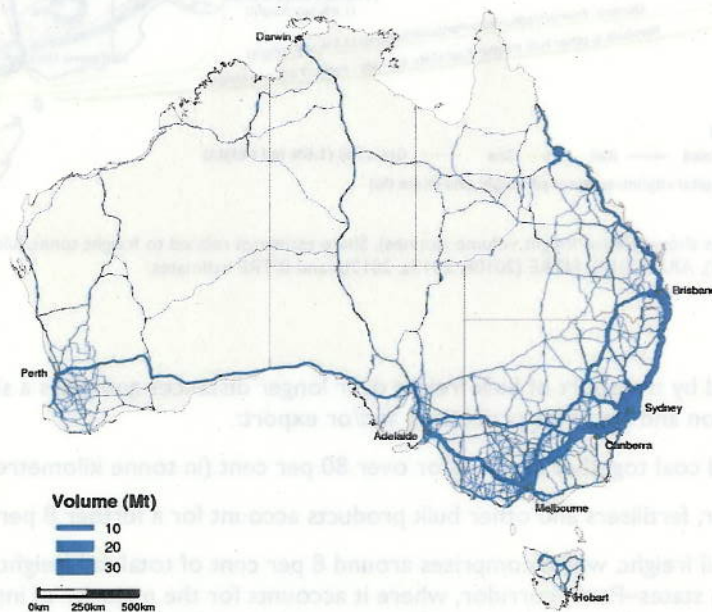
Road freight

While rail carries a larger volume of freight overall, road transport is the main mode of transport for the majority of commodities produced and/or consumed in Australia. Among the notable facts about road freight in Australia:

- Road freight in capital cities accounted for over one fifth of total road freight in Australia 2011–12, with road freight in other urban areas outside capital cities comprising a further 10 per cent. Intercapital road freight accounts for an approximately 18–19 per cent of total road freight movements. The remaining, approximately 50 per cent, comprises freight transported between capital cities and regional areas and other inter- and intrastate freight.
- Over 95 per cent of Australia's road freight is carried in heavy vehicles (i.e. vehicles weighing 4.5 tonnes or more). Articulated trucks² accounted for around 78 per cent and heavy rigid trucks approximately 18 per cent of total road freight, and these shares are little changed over the last decade or so (ABS 2013).
- B-double heavy vehicle combinations are now the most significant road freight vehicle combination, accounting for around 40 per cent of total road freight in 2011–12.
- Notwithstanding their contribution to the freight task, however, freight vehicles account for less than 10 per cent of total road use—light vehicles account for approximately 92 per cent of vehicles on the road.

Figure 3 illustrates where road freight moves across the road network, showing road freight volumes across the non-urban transport network in 2000–01—the last time a comprehensive survey of regional road freight movements was undertaken across Australia. The figure highlights the significance of road freight volumes on the National Land Transport Network, and particularly on the Hume Highway (between Sydney and Melbourne), Pacific Highway (Sydney–Brisbane) and Newell Highway (Melbourne–Brisbane). Freight volumes across the National Land Transport Network accounted for approximately 25 per cent of all road freight in 2000–01. The ABS is undertaking a survey of regional road freight movements in 2013–14, which will provide updated estimates of regional road freight movements across Australia.

Figure 3: Inter-regional road freight task, 2000–01



Source: ABS (2002) and BITRE estimates.

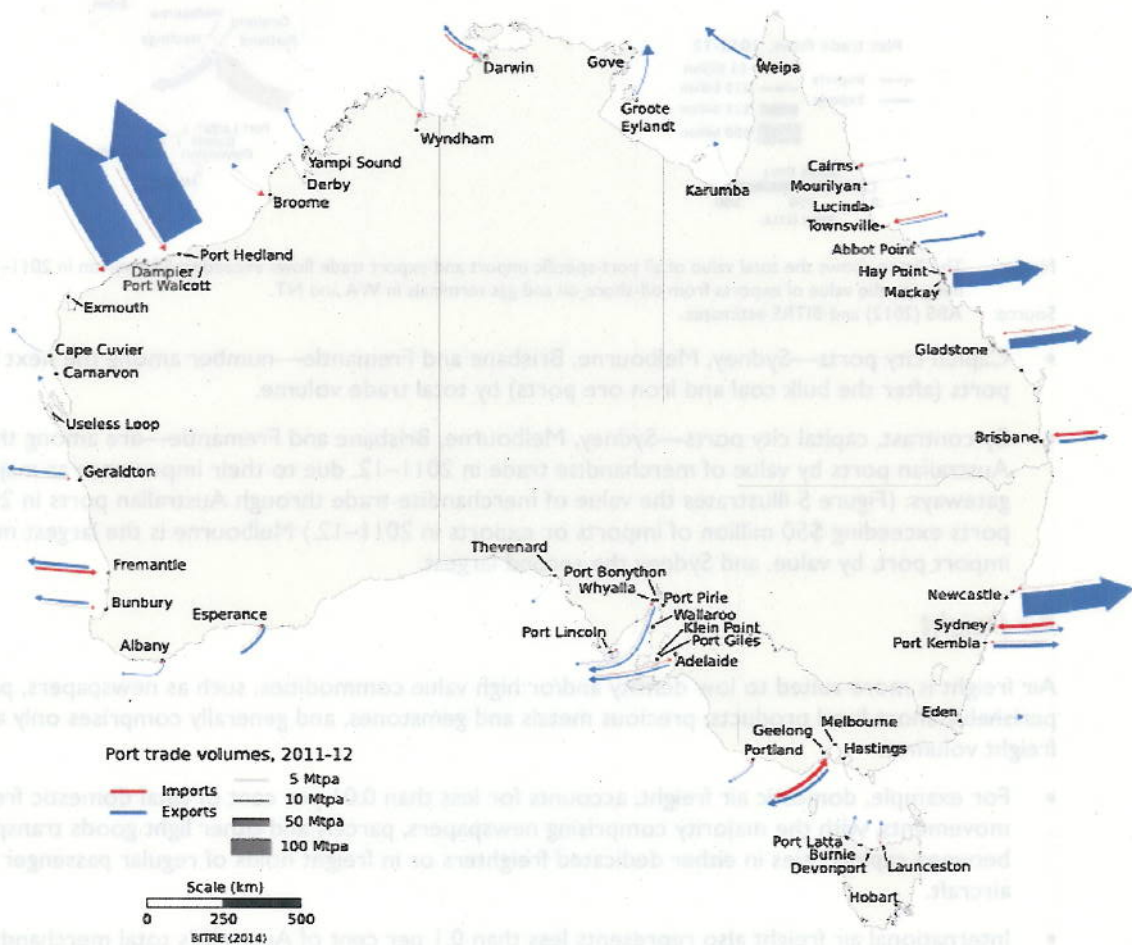
2. Articulated trucks are trucks comprising a prime mover towing one or more trailers attached by a turntable.

Sea freight

Shipping and ports are an important interface with the land freight task, transporting Australian-made goods and raw materials between major domestic centres and gateways for international trade.

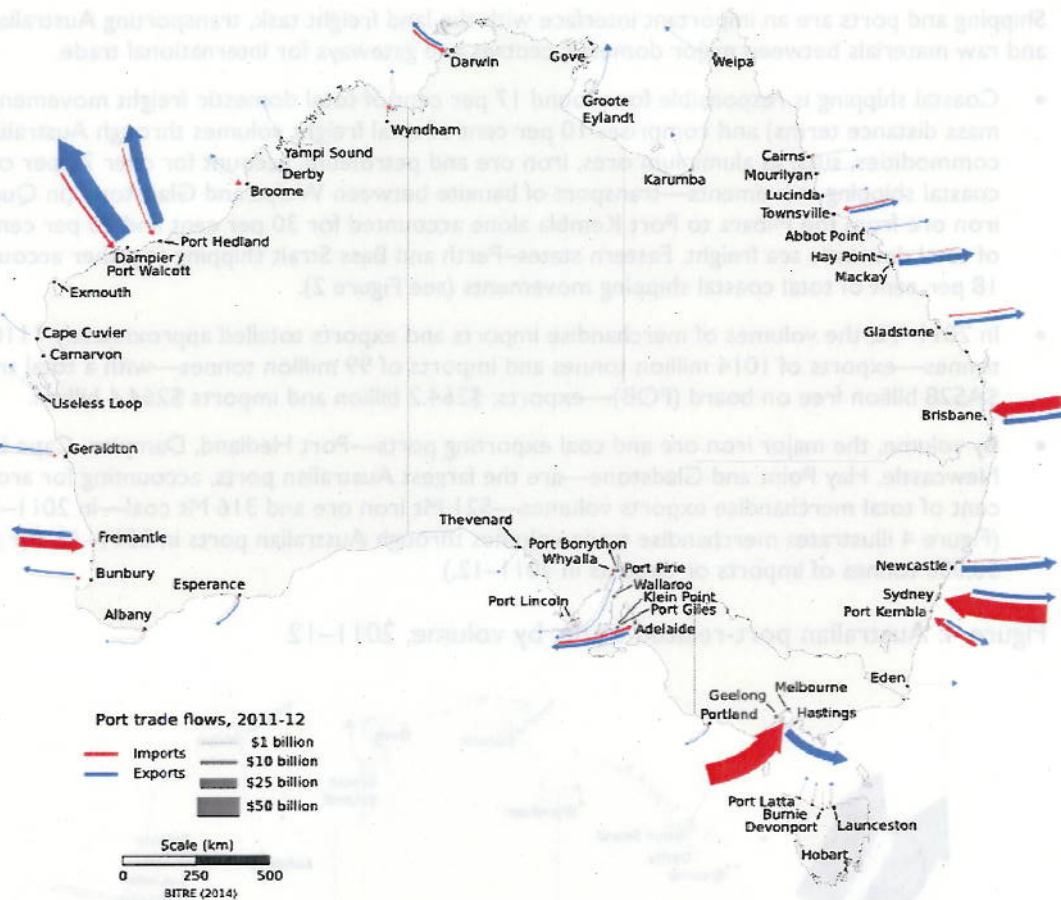
- Coastal shipping is responsible for around 17 per cent of total domestic freight movements (measured in mass distance terms) and comprises 10 per cent of total freight volumes through Australian ports. Bulk commodities, such as aluminium ores, iron ore and petroleum, account for over 70 per cent of domestic coastal shipping movements—transport of bauxite between Weipa and Gladstone (in Queensland) and iron ore from the Pilbara to Port Kembla alone accounted for 30 per cent and 20 per cent, respectively, of total domestic sea freight. Eastern states—Perth and Bass Strait shipping together account for over 18 per cent of total coastal shipping movements (see Figure 2).
- In 2011–12, the volumes of merchandise imports and exports totalled approximately 1110 million tonnes—exports of 1014 million tonnes and imports of 99 million tonnes—with a total trade value of \$A528 billion free on board (FOB)—exports: \$264.2 billion and imports \$264.4 billion.
- By volume, the major iron ore and coal exporting ports—Port Hedland, Dampier, Cape Lambert, Newcastle, Hay Point and Gladstone—are the largest Australian ports, accounting for around 80 per cent of total merchandise exports volumes—521 Mt iron ore and 316 Mt coal—in 2011–12 (ABS 2012). (Figure 4 illustrates merchandise trade volumes through Australian ports in 2011–12, for ports exceeding 50,000 tonnes of imports or exports in 2011–12.)

Figure 4: Australian port-related trade, by volume, 2011–12



Notes: The figure shows the total volume of all port-specific import and export trade flows exceeding 50,000 tonnes in 2011–12. Not shown here are the volume of exports from off-shore oil and gas terminals in WA and NT.
Source: ABS (2012) and BITRE estimates.

Figure 5: Australian port-related trade flows, by value, 2011–12



Notes: The figure shows the total value of all port-specific import and export trade flows exceeding \$50 million in 2011–12. Not shown here are the value of exports from off-shore oil and gas terminals in WA and NT.

Source: ABS (2012) and BITRE estimates.

- Capital city ports—Sydney, Melbourne, Brisbane and Fremantle—number among the next five largest ports (after the bulk coal and iron ore ports) by total trade volume.
- By contrast, capital city ports—Sydney, Melbourne, Brisbane and Fremantle—are among the five largest Australian ports by value of merchandise trade in 2011–12, due to their importance as major import gateways. (Figure 5 illustrates the value of merchandise trade through Australian ports in 2011–12, for ports exceeding \$50 million of imports or exports in 2011–12.) Melbourne is the largest merchandise import port, by value, and Sydney the second largest.

Air freight

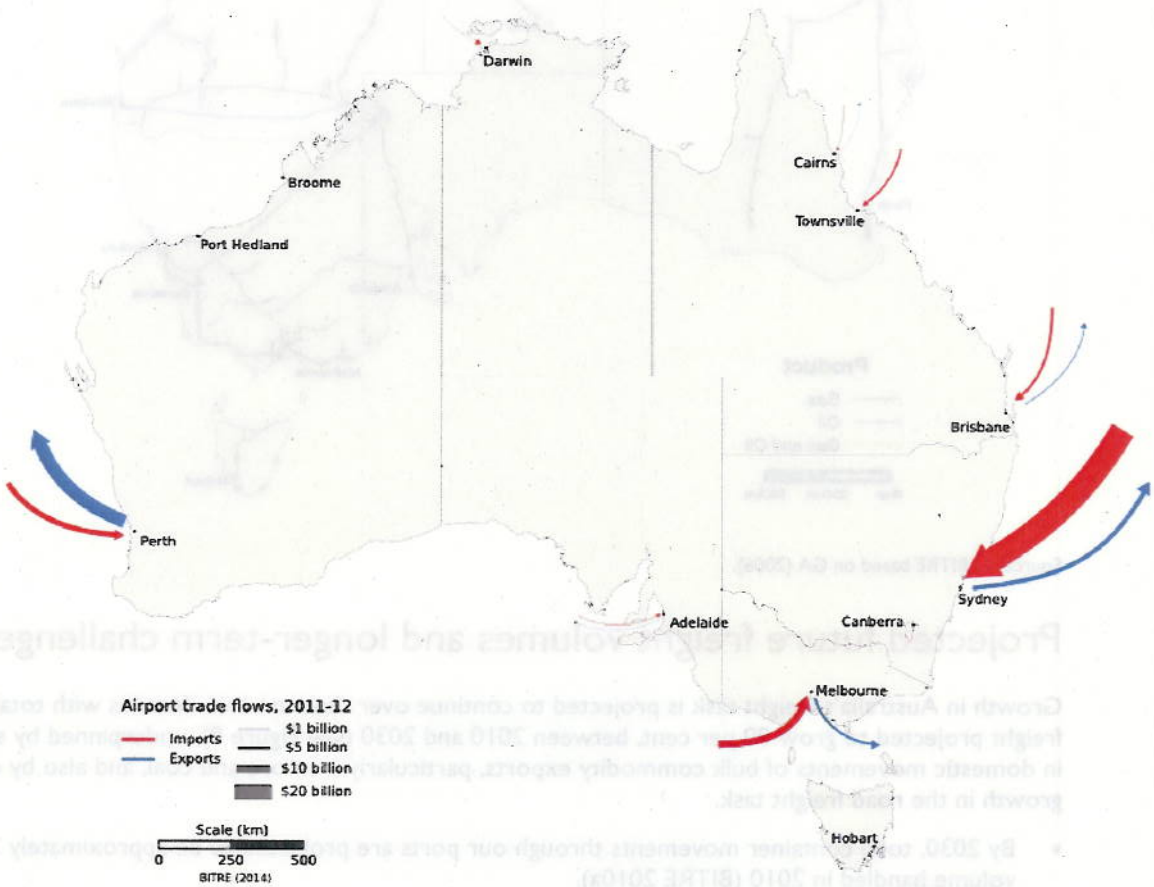
Air freight is more suited to low density and/or high value commodities, such as newspapers, parcels, perishable/short-lived products, precious metals and gemstones, and generally comprises only a small share of freight volumes:

- For example, domestic air freight, accounts for less than 0.01 per cent of total domestic freight movements, with the majority comprising newspapers, parcels and other light goods transported between capital cities in either dedicated freighters or in freight holds of regular passenger service aircraft.
- International air freight also represents less than 0.1 per cent of Australia's total merchandise trade, by volume, but makes up over 21 per cent of total trade by value (17 per cent of total exports and 26 per

cent of total imports), and was worth over \$110 billion in 2011–12.³ (Figure 6 illustrates the value of merchandise trade through Australian airports in 2011–12.)

- Sydney is the largest air import/export airport, by combined trade value, and accounted for more than half of total Australian merchandise air imports in 2011–12. The three largest commodity groups—pharmaceuticals, mobile phones and computer equipment—together accounted for over 30 per cent of total air imports, by value, in 2011–12. Medicinal and pharmaceutical products are the largest air export commodities.
- Perth is the largest Australian export airport by value—gold being by far the largest export commodity by value. (Fish and meat are the largest air export commodities by mass.) Melbourne is the second largest Australian import airport by value—again, pharmaceuticals and computer equipment are among the largest import commodities by value.

Figure 6: Australian airport-related trade flows, by value, 2011–12



Note: Figure shows value of airport-specific import and export trade flows for volumes exceeding \$100 million in 2011–12. Excludes the value of non-merchandise trade flows, re-exports and ship stores and bunkers.

Source: ABS (2012) and BITRE estimates.

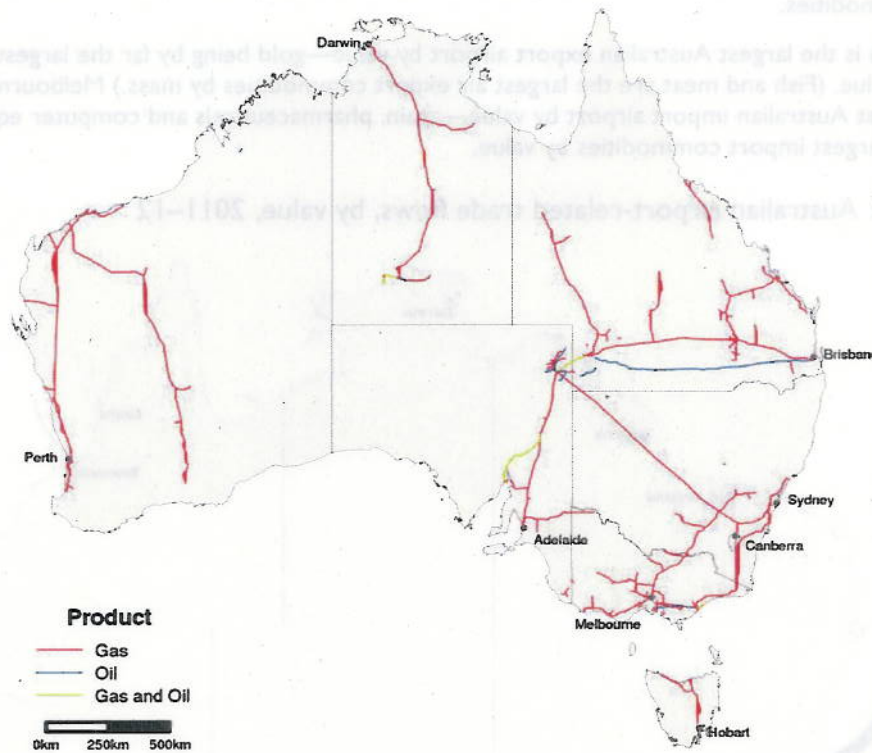
Pipelines and conveyors

Pipelines and conveyors also provide essential transport services for particular commodities that would otherwise rely on conventional transport modes. Pipelines, for example, are particularly important for transport of oil and natural gas over long distances from oil and gas fields to domestic markets and ports for export, but are also responsible for supplying the vast majority of Australians with potable drinking water and sewage services. Figure 7 illustrates the major oil and gas pipeline infrastructure in Australia, circa 2006. The pipeline network will have increased in size since then, most particularly in areas servicing new gas projects.

3. These estimates exclude ship stores and bunker fuels carried on international trading vessels and aircraft.

Conveyors are typically used to move minerals short distances either directly between mines and mineral processing plants, and power stations in the case of coal, or to nearby terminals to transport over longer distances. Pipeline and conveyor freight task estimates are not provided here, but will feature in future Freightline issues where relevant.

Figure 7: Australian major gas and oil pipeline network infrastructure, circa 2006



Source: BITRE based on GA (2006).

Projected future freight volumes and longer-term challenges

Growth in Australia's freight task is projected to continue over the next two decades with total domestic freight projected to grow 80 per cent, between 2010 and 2030 (see Figure 8), underpinned by strong growth in domestic movements of bulk commodity exports, particularly iron ore and coal, and also by continuing growth in the road freight task.

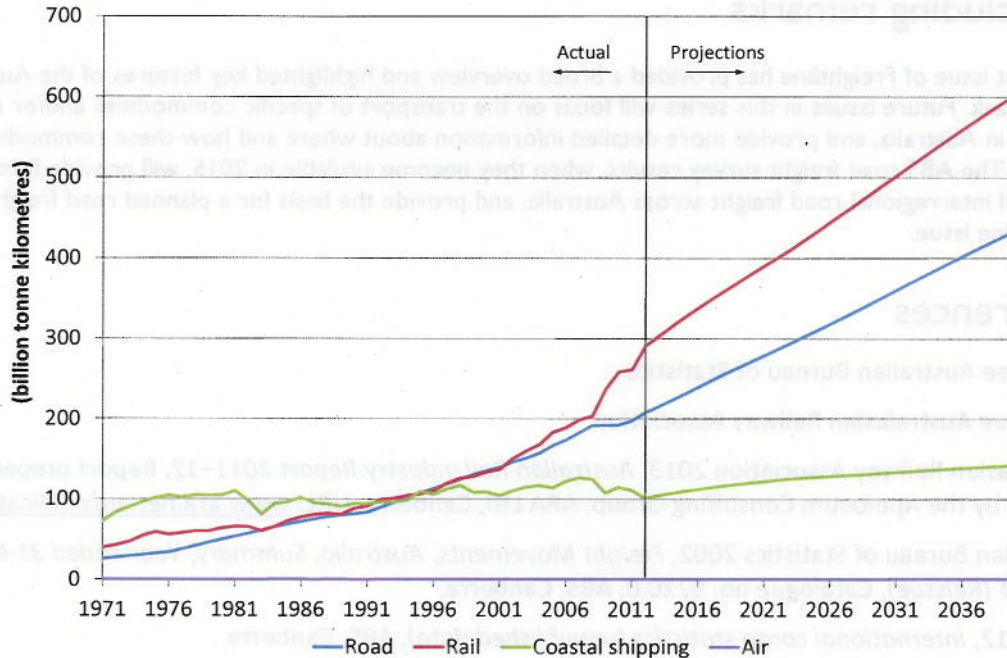
- By 2030, total container movements through our ports are projected to be approximately 2.5 times the volume handled in 2010 (BITRE 2010a).
- By 2030, the total national road freight task is projected to be 1.8 times its 2010 level.
- By 2030, the total national rail freight task is project to be more than 1.9 times its 2010 level, predominantly due to continued growth in iron ore exports.
- However, domestic coastal shipping movements are projected to grow only 15 per cent, over 2010 levels, but this outcome is highly dependent on growth in other coastal freight to offset likely continuing declines in domestic coastal petroleum and to a lesser extent, iron ore movements.

Factors contributing to continued growth in the domestic freight task include:

- GDP and domestic population growth—the projected increase in total freight volumes is in line with projected growth in GDP, but much faster than forecast population growth over the same period.

- Growth in Asia, which will increase the demand for Australian commodities, particularly resources—BREE (2012), for example, projected that demand for iron ore, coal and LPG exports could grow by between 100 and 160 per cent, in mass terms, between 2010 and 2025.

Figure 8: Actual and projected domestic freight task, by mode, 1972–2040



Source: BITRE (2013a) and BITRE estimates.

Long-term challenges

There are a range of local and global factors that, longer term, will directly influence or impinge on domestic freight operations, including:

- **Potentially increasing, and increasingly volatile, oil prices** present both short term business risks and long term energy sourcing challenges.⁴ Australia's land transport sector is heavily dependent on crude oil-based energy, with limited alternative energy sources available in the immediate term (SCOTI 2012, p. 10).
- **Changing climatic conditions** are projected to result in an average 1°C higher surface temperatures in Australia (IPCC 2013, Annex I, p. 1382) and a 20–40 per cent increase in extreme weather days (i.e. above 35°C) by 2030 under certain future warming scenarios⁵. Long-term effects of climate change are arguably already being experienced, and can hinder or halt the movement of freight (and passengers) by compromising critical infrastructure (e.g. urban passenger rail networks during extremely hot weather), and may affect the location of domestic production activities, particularly in agriculture, altering the volume and pattern of freight, and infrastructure priorities (SCOTI 2012, p. 10).
- **Community concerns about environmental externalities** will also impact the sector. Transport's heavy reliance on carbon intensive sources poses difficulties for the sector to decarbonise and meet community concerns (and governments' international obligations) (SCOTI 2012, p. 10).
- **Australia's growing population** is estimated to reach almost 30 million by 2030 (The Treasury 2010). While this will increase the demand for freight through consumer goods, the rise in passenger vehicles will also affect the efficiency of freight movements as heavy vehicles share increasingly congested roads and freight rail may compete with passenger rail for use of infrastructure (SCOTI 2012, p. 10).

4. IEA (2013), for example, considers three alternative potential scenarios for global oil supply, under which global oil prices could range between US\$80 (low price scenario) to US\$128 per barrel by 2035, over US\$110 per barrel in 2010.

5. BITRE estimates derived from CSIRO (2007, Table 5.1, p. 61).

- **More broadly, global economic conditions** are changing the structure of the Australian economy, with manufacturing declining as a share of GDP relative to services, and increased manufactured imports (ABS 2012). This directly affects the demand for freight transport services, with reduced demand from former manufacturing centres and greater reliance on port-based services.

Concluding remarks

This first issue of Freightline has provided a broad overview and highlighted key features of the Australian freight task. Future issues in this series will focus on the transport of specific commodities and/or industry sectors in Australia, and provide more detailed information about where and how these commodities are moved. The ABS road freight survey results, when they become available in 2015, will provide further detail about all interregional road freight across Australia, and provide the basis for a planned road freight-focused Freightline issue.

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