Shore-Based Shipping Costs: Transport and Handling of Bulk Cargo

Information Paper

This Paper presents some factual analysis and information on shore-based shipping operations as they apply to bulk cargoes and with the primary aim of assessing the impact of these operations on imports and exports.

Bureau of transport and communications economics

Information Paper 26

Shore-based Shipping Costs: Transport and Handling of Bulk Cargo

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE, CANBERRA 1988

ISSN 0158-104X
ISBN 0 644 07590 2

Printed in Australia by Union Offset Co. Pty Ltd, Canberra

FOREWORD

For some time, the Bureau of Transport and Communications Economics has been involved in the analysis of shore-based shipping operations with the primary aim of assessing the impact of these operations on imports and exports.

This Paper presents some factual information on these operations as they apply to bulk cargoes. The shore-based movement of bulk cargoes in Australia tends to be characterised by a high degree of mechanisation, occurring at relatively few locations and (at least for some commodities) organised and operated by private companies. To the extent that these operations are undertaken by private enterprise, information about them can be difficult to obtain. This Paper represents an attempt to document some of the major characteristics of the shore-based shipping chains used for moving the main bulk cargoes.

Although various officers have been associated with this work over a period, this Paper was prepared in its current form by Ms F. Spencer under the supervision of Mr B. O'Gallagher.

J. W. MOLL
Assistant Director
Planning and Technology Branch

Bureau of Transport and Communications Economics
Canberra
February 1988

CONTENTS

TABLES

FIGURES

SUMMARY

In 1985-86, Australia's total exports were valued at $32 270 million, of which almost $17 000 million represented bulk commodities. These bulk exports amounted to some 228 million tonnes in 1985-86 with coal, iron ore and grain being the major commodities in terms of tonnage. Australia's bulk imports in 1985-86 were valued at $5841 million and amounted to some 13.5 million tonnes. In terms of tonnage, Australia's major bulk import commodities were petroleum and crude fertilisers.

Total Australian shore-based shipping costs in 1985-86 for bulk exports are estimated to have been in the vicinity of $3000 million representing about 18 per cent of the free on board (fob) value. For bulk imports, total Australian shore-based shipping costs in 1985-86 are estimated to have been approximately $120 million, representing slightly more than 2 per cent of their fob value.

Of the $3000 million shore-based shipping cost estimated for Australia's bulk exports in 1985-86, some $1330 million was associated with the export of coal. A further $940 million was associated with the export of wheat and other grains, and about $340 million with the export of iron ore.

Land transport costs were the largest component of total shore-based shipping costs for Australia's bulk exports in 1985-86, accounting for 63 per cent. Storage and handling accounted for 27 per cent and port and related costs a further 10 per cent.

CHAPTER 1 INTRODUCTION

Bulk cargo is a significant component of Australia's trading economy. In value terms, bulk cargo accounted for almost half of Australia's total exports in 1985-86. Shore-based shipping costs form a large proportion of the value of Australia's bulk exports. In a highly competitive world market for the supply of bulk commodities, it is in the national interest to reduce costs by ensuring efficiency in the shore-based shipping industry.

Any assessment of this efficiency requires an understanding of the shore-based transport and handling activities associated with Australia's bulk trades. This Paper describes these activities for the major bulk trades, and where possible, provides some indicative estimates of the cost of each activity.

Chapter 2 gives an overview of Australia's bulk trades and looks at the significance of their associated shore-based shipping costs. The major bulk shipping exports in terms of both quantity and value are coal, iron ore and grain. The shore-based activities associated with each of these commodities is described in Chapters 3, 4 and 5 respectively. Chapter 6 gives a brief description of the shore-based activities associated with some other Australian bulk exports. In terms of quantity and value, Australian bulk exports easily exceed bulk imports. The major Australian bulk imports are petroleum products and crude fertilisers. A brief description of the shore-based transport and handling activities associated with these commodities is given in Chapter 7. Estimates of total shore-based shipping costs for the various bulk commodities and a discussion of their associated component costs are given in Chapter 8.

CHAPTER 2 AUSTRALIA'S INTERNATIONAL BULK SHIPPING TASK

Australia is a major trading nation for a number of bulk commodities. This chapter presents recent data describing the characteristics of the Australian bulk trade and assesses the significance of shore-based shipping costs for this trade.

THE NATURE OF AUSTRALIA'S BULK TRADE

Bulk shipping plays an important part in the Australian economy. In 1985-86, Australia's total exports were valued at $32 270 million, of which almost $17 000 million represented bulk commodities. Total imports were valued at $34 496 million of which $5841 million represented bulk commodities. Table 2.1 shows that over the period 1980-81 to 1985-86, bulk exports exceeded bulk imports in both quantity and value terms.

Data given in Tables 2.1 and 2.2 were derived by adding statistics for cargo carried in bulk carriers and tankers. These do not include bulk cargo moved by other vessels or by air, for which a total was not available.

Table 2.2 shows origins and destinations of Australia's bulk imports and exports. Japan and North Asia accounted for 54 per cent of the tonnage of bulk exports (almost 125 million tonnes) in 1985-86. Western Europe was the second major trade area, taking a further 12 per cent of exports in 1985-86, with East Asia being ranked third. The greatest tonnage of bulk imports arrived from the Middle East Gulf (mainly crude oil and refined petroleum products). North America, South-East Asia, Japan and North Asia were also major sources of bulk imports.

Bulk exports from Australia are largely unprocessed products with coal, grain and iron ore being the most significant in terms of quantity and value. Exports of petroleum include aviation fuel and other petroleum products used by international airlines. The amount of petroleum exported through shipping ports in 1985-86 was 5.8

TABLE 2.1 AUSTRALIAN BULK IMPORTS AND EXPORTS, 1980-81 TO 1985-86

	Exports		*Imports*	
Year	*Gross weight ('000 tonnes)*	*Value ($m)*	*Gross weight ('000 tonnes)*	*Value ($m)*
1980-81	169 477	8 935	20 066	a
1981-82	167 609	9 367	19 156	a
1982-83	157 509	9 895	17 781	5 113
1983-84	195 664	12 205	16 140	5 286
1984-85	230 091	16 318	15 571	6 018
1985-86	227 577	16 902	13 541	5 841

a. The Australian Bureau of Statistics started collecting values for bulk imports in 1982-83.

Note Figures were derived by adding the amounts of foreign trade moved by tankers and bulk carriers.

Source Australian Bureau of Statistics (1982 and 1987a).

million tonnes (Federal Department of Transport 1987). Bulk imports are mainly commodities of a higher unit value than bulk exports, and include commodities such as crude oil, refined petroleum and chemicals. Tables 2.3 and 2.4 show the quantities and value of major Australian bulk exports and imports in 1985-86.

Shore-based shipping costs form a larger proportion of total transport costs on shorter routes due to lower at-sea costs. Hence, any change in shore-based shipping costs may have a greater impact on trade with Japan and other Asian countries than with European countries, depending on elasticities of demand and the availability of alternative supplies.

GENERAL CHARACTERISTICS OF SHORE-BASED MOVEMENTS

Shore-based shipping costs are defined in this Paper as the transport and handling costs incurred from the point of production until the cargo is on board a vessel for export, and from the vessel to the consignee for import. This corresponds with the goods being exported or imported under a fob contract. Port and related charges have also been included as these are set by Australian authorities and can affect the levels of foreign trade. This is consistent with the approach taken in the study of shore-based shipping costs of non-bulk

TABLE 2.2 TRADE AREAS FOR AUSTRALIAN BULK CARGO, 1985-86

	Exports		*Imports*	
Trade area	*Gross weight ('000 tonnes)*	*Value ($m)*	*Gross weight ('000 tonnes)*	*Value ($m)*
Japan & North Asia	124 242	6 879	1 937	2 056
Europe - Atlantic	27 452	1 591	448	496
East Asia	24 528	1 588	218	86
Europe - Mediterranean - Western	9 296	409	137	55
North America - West Coast	4 620	895	1 973	849
Middle East Gulf	4 244	760	3 545	787
North America - East Coast	3 072	619	1 055	484
South East Asia	4 035	724	2 000	510
Red Sea & Mediterranean Middle East	4 225	648	378	112
Europe - Baltic - Eastern	2 664	488	-	-
Africa - Mediterranean	2 424	407	-	-
West India	3 875	405	-	1
Europe - Mediterranean - Eastern	1 901	134	-	-
New Zealand	1 286	376	594	217
South America - East Coast	1 321	133	71	63
South & East Africa	446	95	23	11
Papua New Guinea & Solomon Is.	950	145	25	6
East India	342	30	-	-
Pacific Islands & other countries	687	142	976	66
Europe - Baltic - Western	1 203	66	16	29
South America - West Coast	244	19	13	2
Central America & Caribbean	117	19	3	2
West Africa	176	26	129	9
Other	4 226	304	-	-
Total	227 577	16 902	13 541	5 841

- Nil or rounded to zero.

Notes 1. Figures may not add to totals due to rounding.
2. Figures were derived by adding the amounts of foreign trade moved by tankers and bulk carriers.

Source Australian Bureau of Statistics (1987a).

TABLE 2.3 MAJOR AUSTRALIAN BULK EXPORTS, 1985-86

Commodity	*Gross weight ('000 tonnes)*	*Value ($ million)*
Coal	90 407	5 212
Iron ore	85 864	1 936
Grain[a]	21 432	3 656
Petroleum[b]	7 291	2 255
Alumina	7 472	1 380
Bauxite	5 152	na
Salt	4 988	94
Woodchips	4 730	249
Sugar	2 740	613

a. Wheat, barley, sorghum and oats.
b. Petroleum, petroleum products and related materials. Includes fuel supplied to foreign owned vessels and aircraft prior to departure overseas.
na Not available.

Note Some non-bulk exports may be included where separate data for bulk and non-bulk exports of a commodity were unavailable.

Sources Australian Bureau of Statistics (1987b). Federal Department of Transport (1987).

TABLE 2.4 MAJOR AUSTRALIAN BULK IMPORTS, 1985-86

Commodity	*Gross weight ('000 tonnes)*	*Value ($ million)*
Petroleum[a]	7 719	1 835
Crude fertilisers	1 922	108
Limestone and cement	1 157	19

a. Petroleum, petroleum products, and related materials.

Note Some non-bulk imports may be included where separate data for bulk and non-bulk imports of a commodity were unavailable.

Sources Australian Bureau of Statistics (1987c). Federal Department of Transport (1987).

cargo (BTE 1986). Hence, for bulk goods, the shore-based shipping costs covered in this Paper generally include the following component costs:

- land transport
- storage and handling
- loading or unloading of vessel
- port and related charges.

This Paper presents costs of shore-based activities to exporters or importers of bulk commodities. The costs given represent charges made to the shipper by providers of shore-based services, and are not resource costs. These charges may include tax components or cross-subsidies. Where a shore-based service is provided by the shipper, the cost presented is an estimate of the cost to the shipper of providing that service. Costs of providing shore-based shipping services are often commercially sensitive and not readily available.

Land transport for bulk export commodities is generally carried out by rail. Rail facilities are owned and operated mostly by government authorities. Exceptions include some of the railways in Western Australia which are owned and operated by iron ore companies and the tramways in Queensland which are owned and operated by sugar milling companies. Road transport is also used, sometimes in combination with rail. For example, wheat may be transported to a country storage point by road, and then transported by rail to the port. Bulk imports are generally destined for locations close to the port for further processing or use in manufacturing, and hence incur relatively low land transport and storage and handling costs.

Bulk export commodities are generally produced to meet long-term contracts or forecast demand. Seasonal factors also affect production of commodities such as wheat. As a result, stockpiles of the major bulk commodities can be substantial, together with the cost of providing such facilities. Storage facilities at ports generally decrease a vessel's time in port since the loading rate from a stockpile is generally much faster than that direct from the transport modes. Hence, most stockpiles are located at the port. Storage and loading facilities are often owned and operated by the company producing the bulk commodity.

Ports used for bulk goods are operated by government authorities or companies producing the bulk goods. Charges are levied on the vessel for entering and berthing at the port, and on cargo loaded and

unloaded. Charges are also levied for the use of port facilities such as electricity, telephones, water and garbage disposal.

Shore-based shipping costs for the major bulk commodities are discussed separately in the following chapters. The component costs are identified where available.

CHAPTER 3 COAL

Coal is Australia's largest bulk export in value and weight. In 1985-86, Australia exported 90.4 million tonnes of coal with an fob value of $5212 million. Table 3.1 shows the major coal exporting countries of the world, with their total exports in the calendar years 1982 to 1985. Australia is the largest exporter, and the major coal supplier to Japan, the world's largest coal importer. In 1985 Australia and the United States each exported around twice as much coal as the next largest exporter, South Africa. Australia's share of the world market grew from 19 per cent in 1982 to 26 per cent in 1985. Exports of steaming coal have risen faster than exports of coking coal, and now represent 43 per cent of Australia's coal exports. Over the same period, the United States' share of the world market dropped from 36 per cent to 25 per cent.

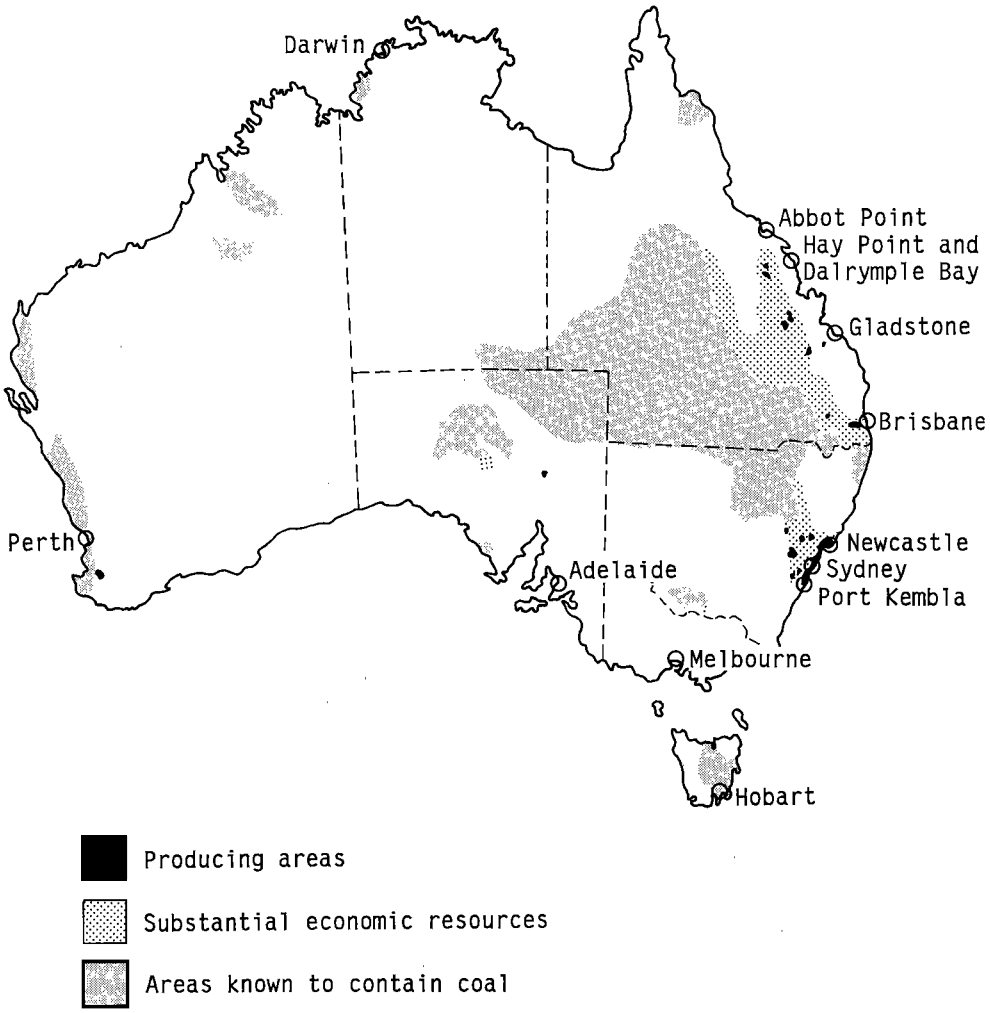
THE COAL INDUSTRY

Australia's deposits of export coal are located principally in the Bowen Basin of Queensland and the Sydney Basin of New South Wales. Other deposits of black coal are located in Western Australia, Tasmania and South Australia, though these only account for a small proportion of the economically recoverable resources. Figure 3.1 shows Australia's black coal producing regions and the export ports.

Brown coal deposits are principally located in Victoria. These are predominantly mined by the State Electricity Commission of Victoria for use in the Commission's power stations. A small amount is processed to obtain char and briquettes. In 1986, 55 600 tonnes of char worth $8.9 million, and 52 500 tonnes of briquettes worth $3.2 million were exported. Brown coal exports, therefore, comprise a very small proportion of total exports. The remainder of this chapter relates to black coal only.

Black Coal Production

Table 3.2 shows Australian saleable black coal production by State from 1981-82 to 1985-86. Saleable coal production is the raw coal



Source Joint Coal Board (1986).

Figure 3.1 Location map, Australian coal industry

production less washery rejects. It also includes an allowance for unexplained stock adjustments. In 1985-86, saleable black coal production for Australia was 82 per cent of the raw black coal production.

In 1985-86 New South Wales and Queensland produced similar quantities of saleable black coal, and accounted for 95 per cent of total Australian output. Production levels for Australia increased by 47

TABLE 3.1 MAJOR COAL EXPORTING COUNTRIES, 1982 TO 1985

(million tonnes)

	Coal exports											
	1982			*1983*			*1984*			*1985*[p]		
Country	*Coking*	*Steaming*	*Total*	*Coking*	*Steaming*	*Total*	*Coking*	*Steaming*	*Total*	*Coking*	*Steaming*	*Total*
Australia	37.0	12.8	49.8	42.1	18.4	60.5	47.0	28.8	75.9	49.8	38.1	87.9
United States	58.6	37.8	96.4	45.5	25.1	70.6	51.7	22.2	73.9	54.7	29.3	84.0
South Africa	3.4	24.1	27.5	3.0	26.2	29.2	4.8	33.3	38.1	4.8	37.7	42.5
Poland	7.3	21.0	28.3	9.7	25.4	35.1	10.5	32.6	43.1	10.3	25.8	36.1
Canada	13.9	2.1	16.0	14.5	2.5	17.0	21.1	4.1	25.2	22.8	5.0	27.8
USSR	10.2	11.5	21.7	7.7	13.0	20.7	9.8	13.9	23.7	10.6	13.3	23.9
West Germany	6.6	3.0	9.6	6.7	3.6	10.3	6.9	2.7	9.6	5.9	2.7	8.6
Others	3.5	15.9	19.4	6.1	16.5	22.6	5.6	13.9	19.4	6.4	17.7	24.1
Total	140.5	128.2	268.7	135.3	130.7	266.0	157.4	151.5	308.9	165.3	169.6	334.9

p Preliminary.

Source Joint Coal Board (1986).

TABLE 3.2 AUSTRALIAN SALEABLE BLACK COAL PRODUCTION BY STATE, 1981-82 TO 1985-86

('000 tonnes)

	Year				
State	*1981-82*	*1982-83*[a]	*1983-84*	*1984-85*	*1985-86*
New South Wales	51 701	58 035	55 984	58 253	64 081
Queensland	34 276	35 812	44 036	54 288	63 997
South Australia	1 436	1 451	1 328	1 745	2 167
Western Australia	3 415	3 962	3 925	3 654	3 750
Tasmania	249	329	280	321	310
Total	91 077	99 589	105 553	118 261	134 305

a. 53-week year.

Source Joint Coal Board (1986).

per cent from 1981-82 to 1985-86, due mainly to expanded export sales. The greatest growth during this period occurred in Queensland where production increased by 87 per cent. Over the same period, saleable black coal produced from open cut mines increased by 88 per cent, while that from underground mines increased by only 3 per cent.

There are several major companies involved in production of coal for export, as well as a number of smaller ones. In Queensland there were 19 companies operating 30 open cut and 19 underground mines at June 1986. Three companies own almost one-third of the mines and produced more than half of Queensland's coal in 1985-86. In New South Wales there were 27 companies operating 21 open cut and 67 underground mines at June 1986. Four major companies produced half of the raw coal for New South Wales in 1985-86.

Consumption and export

Black coal consumption in Australia for 1985-86 was 42.6 million tonnes. Of this, 74 per cent was used in electricity generation, and 14.6 per cent by the iron and steel industry. South Australia, Victoria and Tasmania imported a total of 1.3 million tonnes of black coal from New South Wales and Queensland. Western Australia satisfies its demand for black coal with its own production and stockpiles. New South Wales exported 61 per cent of its saleable production in 1985-86, and Queensland 79 per cent.

Australian coal exports have increased, with a record of just over 90 million tonnes exported in 1985-86. Figure 3.2 shows the proportion by weight of Australian black coal exported to each major destination. Australian coal exports to Japan comprised 47 per cent of Japan's total coal imports. Exports are expected to continue to increase, especially of steaming coal. However, the market share will 'depend upon price competitiveness and reliability of suppliers and other inducements to importers' (International Energy Agency 1986).

It is notable that while Australia is currently the largest exporter of coal, it produced only about 3.6 per cent of total world coal production in 1985. In comparison, the leading coal producers, China, the USA and the USSR, export a relatively small proportion of their production. Figure 3.3 shows the proportion of coal production that is exported by the major coal producing countries.

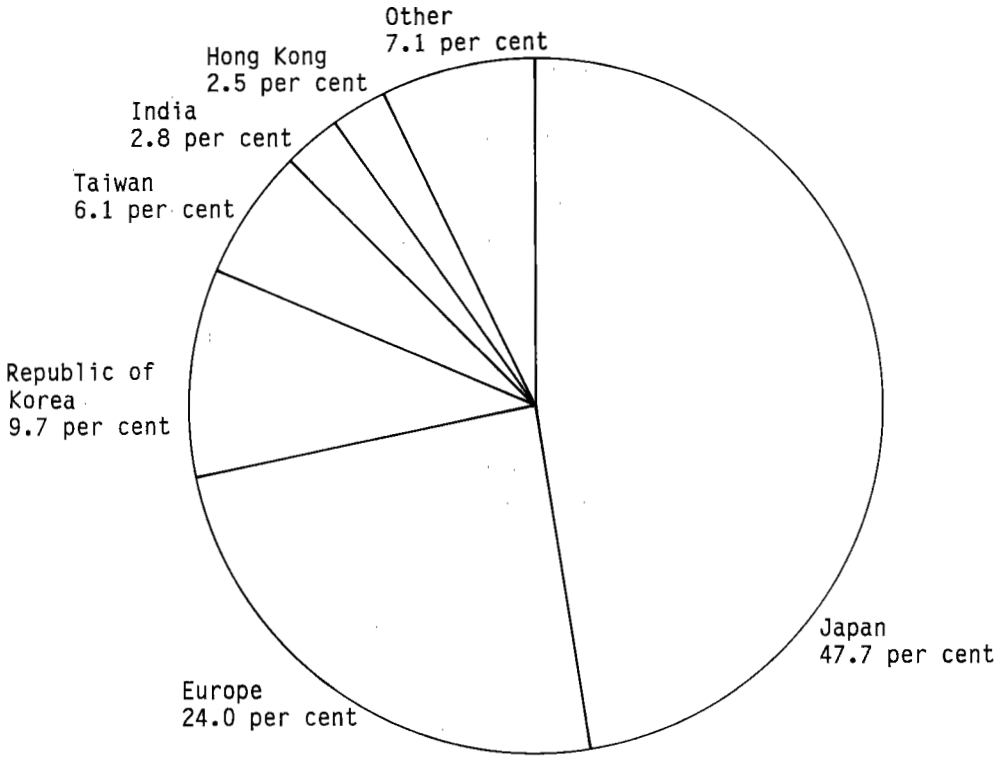
SHORE-BASED SHIPPING COSTS

The shore-based costs involved in exporting coal cover transport costs from mine to ship including stockpiling costs, ship loading and port charges. All of these costs vary considerably, depending on factors such as type of coal and distance from mine to port.

Total shore-based shipping costs for Australia's black coal are estimated to have averaged about $15 per tonne or about $1330 million in 1985-86. This represents around 25 per cent of the average fob value, noting that coal prices vary with type and quality.

Most of Australia's export coal is transported from mine to port by rail. Rail freight rates vary from under $4 per tonne to over $16 per tonne in some cases. Average charges are estimated to have been around $10 per tonne, or around 7 cents per tonne-kilometre. Rail charges in Australia are higher than in other coal producing countries on a tonne-kilometre basis, particularly in Queensland where the charges include a State revenue-earning tax. In fact, revenue from the carriage of coal represented 67 per cent of Queensland Railways total revenue for 1985-86 (Galligan 1987). Rail freight is the largest component of shore-based shipping costs for coal, totalling around $930 million in 1985-86. Transport from mine to ship and the nature of port operations are discussed in more detail later in this chapter.

Stockpiling and loading the coal onto a ship is the major cost incurred at the port. This varies from port to port and with the facilities used. Charges per tonne in New South Wales from 1 January 1986 were $4.98 at Newcastle, $3.81 at Balmain and $5.08 at Port



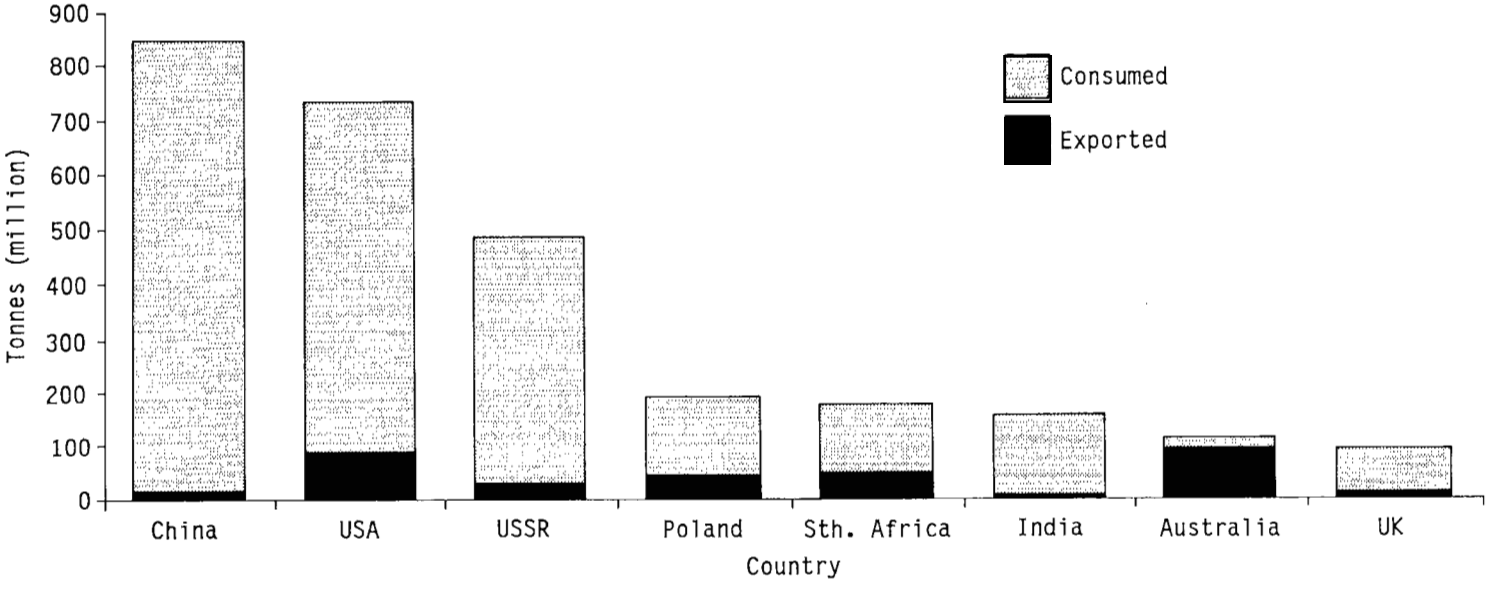
Notes 1. Percentages are based on the weight of exports.
2. Percentages may not total to 100 due to rounding.

Source Joint Coal Board (1986).

Figure 3.2 Exports of Australian black coal by destination, 1985-86

Kembla *(Australian Coal Report* 1986). Although not readily available, industry sources have indicated that such charges are considerably lower in Queensland. For example, the Gladstone Harbour Board received an average of $1.50 per tonne in cargo handling charges in 1985-86 for the 12.8 million tonnes of coal exported through Clinton Estate and Auckland Point. The amounts paid by each of the companies exporting coal through Gladstone varied depending on the original capital contributed towards the development of the port facilities and the agreed contracts (Gladstone Harbour Board, pers. comm.). Costs are unavailable for the privately operated port facilities in Queensland.

Port charges in early 1987 averaged about $1.80 per tonne in total, again varying from port to port, and also with ship size. These include Commonwealth and State light dues, berthage, wharfage, towage,



Note Production statistics used in deriving this figure are estimates by the International Energy Agency secretariat.

Source International Energy Agency (1986).

Figure 3.3 World production of black coal by country, 1985

pilotage and other costs. Ship demurrage costs can add considerably to this total when industrial disputes interrupt loading.

Transport to ship

Most of Australia's export coal is moved to the ports on government-owned and operated railways. In New South Wales, a significant proportion arrives at the export ports by road (19.2 per cent in 1985-86). Port Kembla receives the majority of coal arriving by road, due to the proximity of mines in that area. In 1985-86 it received 5.1 million tonnes by road. The port of Newcastle also receives some coal by road, and the Balls Head loader in Sydney receives a small amount of coal by sea from Newcastle.

Table 3.3 shows selected rail charges for coal in the first half of 1987. As can be seen, there is a wide range in both the total charge, and the charge per tonne-kilometre. Stones (1986) states that rail

TABLE 3.3 SELECTED RAIL CHARGES FOR COAL, 1987

Origin	*Destination*	*Distance (km)*	*Charge per tonne*[a] *($)*	*Charge per tonne-km*[a] *($)*
New South Wales				
Ulan	Newcastle	277	16.11	0.058
Baal Bone	Port Kembla	273	13.54	0.050
Baal Bone	Balmain	206	13.54	0.066
Tahmoor	Port Kembla	172	10.72	0.062
Tahmoor	Balmain	129	9.46	0.073
Muswellbrook	Newcastle	129	11.02	0.085
Singleton	Newcastle	84	8.46	0.101
Coal Cliff	Port Kembla	30	3.51	0.117
Queensland				
West Moreton	Brisbane	58	5.15	0.089
Bowen Basin[b]	Various	235	12.93	0.055

a. Rebates to these charges are not included. Rebates apply in New South Wales when super category A rapid loading facilities are used, and certain other criteria are met. The maximum rebate is $2 per tonne of coal railed from Ulan to Newcastle.
b. Average for five mines.

Sources Business Review Weekly (1985). New South Wales Coal Association (pers. comm.). Queensland Coal Association (pers. comm.).

freight rates for coal per tonne-kilometre in Australia are four to five times higher than those in competing countries. For example, South African coal producers rail their coal nearly 600 kilometres at an average cost of $8 per tonne which equates to 1.3 cents per tonne-kilometre (Balderstone 1986). In comparing the cost per tonne-kilometre, it must be remembered that the rail haul distances are much greater in South Africa than in Australia. These systems are therefore able to spread their fixed costs, such as capital and wagon loading costs, over greater haulage distances. Hence, their tonne-kilometre costs, and thus charges, can be reduced.

Factors hindering greater efficiency in New South Wales rail transport include difficult terrain, inadequate stockpile facilities at the ports, lines shared with other freight and passenger services and low train loading rates. Difficult terrain restricts train sizes and hence reduces the achievable economies of scale. Trains operating over the mountains are restricted to 3100 tonnes, whereas, in the flatter Hunter Valley, trains of up to 6300 tonnes are operated (*Australian Financial Review* 1987).

Inadequate stockpile capacity increases the dependency on the responsiveness of the rail system and makes it difficult to cater for shipping peaks. This is caused by the lack of space available for stockpiles at the ports, and the number of different blends of coal. A certain amount of clear space is needed to segregate blends. Often for a given cargo, loading of the ship has commenced prior to the completion of rail deliveries. Balmain, particularly, relies almost entirely on direct rail to ship deliveries. Further, panamax size vessels can only depart Balmain on a high tide, so failure to complete loading on time could delay a ship's departure until the next high tide.

Coal train schedules are further complicated by restrictions on operating coal trains during the passenger service peak hours. These restrictions can make it difficult to cater for shipping peaks. To cater for the peaks in rail service demands, at least 20 per cent more rolling stock is required for the Newcastle system, and about 40 per cent more for the systems servicing Port Kembla and Balmain (Hill 1986). Relatively low rates of loading for trains and small train sizes also effect rail transport operations.

Rail freight rates are a major issue of concern to the Australian coal industry. The National Energy Advisory Committee (1984) states that Queensland Government rail charges for coal are generally acknowledged to be 'well in excess of actual costs'. Balderstone (1986), referring

to rail charges for coal, states 'The industry itself estimates that in some cases the profit - or tax - element represents considerably more than half the total freight costs'. In addition to paying rail freight charges, coal producers in Queensland contribute directly to the financial cost of infrastructure such as new rail construction, rail upgrading, new rolling stock and port developments. In 1984-85, five companies spent over $200 million on road, rail and port facilities, with other companies spending smaller amounts. This large investment does not occur every year and it was reported that the same five companies spent, in fact, only $15 million on road, rail and port facilities in 1985-86 (Queensland Coal Board 1986).

The National Energy Advisory Committee examined the shore-based transport and handling of Australia's coal exports in some detail (National Energy Advisory Committee 1984). They concluded:

> There are no major impediments to ensuring adequate *rail capacity* in Queensland to meet presently forecast demand to 1990 ... In New South Wales, the State Rail Authority has embarked on a major upgrading program aimed at longer trains and general track and rolling stock improvements, and selective electrification. The successful implementation of this program is necessary to remove a potential constraint on achievement of projected demands.

Hill (1986) reports that the State Rail Authority has committed more than $800 million to coal-related infrastructure and rolling stock since 1976-77.

Port operations

Export coal is generally transported to the closest convenient port. Table 3.4 shows Australian black coal exports by port of loading in the financial years 1983-84 to 1985-86. From this table it can be seen that in 1985-86, Newcastle was the major port for coal exports in New South Wales handling 67 per cent of the State's coal exports. In Queensland, Hay Point is the largest coal export port handling 33 per cent of the State's coal exports in 1985-86.

The limited ability of Australian ports to handle very large bulk vessels is a concern to all bulk commodity interests. The size of vessels serving the Australian coal trade has been increasing in past years and this trend is expected to continue in the future. This is due to the economies of scale available to larger ships and the growth

TABLE 3.4 AUSTRALIAN BLACK COAL EXPORTS BY PORT OF LOADING, 1983-84 TO 1985-86

('000 tonnes)

Port	*1983-84*	*1984-85*	*1985-86*
New South Wales			
Sydney	4 634	4 111	4 773
Newcastle	20 460	24 683	26 210
Port Kembla	8 333	9 502	8 104
Total	33 427	38 296	39 087
Queensland			
Brisbane	804	1 376	1 460
Abbot Point	480	4 361	5 073
Dalrymple Bay	4 141	11 258	13 503
Gladstone	12 015	12 823	14 247
Hay Point	15 655	15 685	16 515
Total	33 095	45 503	50 798
Total	66 522	83 799	89 885

Source Joint Coal Board (1986).

in the number of ports capable of handling such vessels. In fact, Australia's ability to compete in some trades may depend on its capacity to ship coal in large vessels.

While work has been done recently to deepen several coal ports, ship sizes are still limited at others. Table 3.5 characterises the facilities at Australian coal export ports in 1986. Several ports in Queensland could be reasonably easily dredged to accept vessels up to 250 000 dwt. Such operations in New South Wales however, could be much more expensive. The National Energy Advisory Committee (1984) has proposed the possibility of offshore berths at Newcastle or Port Kembla or both.

Coal export ports vary both in management structure and in facilities. The Abbot Point Coal Facility was built to ship coal from Collinsville and Newlands and has an annual throughput capacity of 6.5 million tonnes. The coal facility is owned and administered by the Harbours Corporation of Queensland and the day to day management, operation and

TABLE 3.5 AUSTRALIAN COAL PORT FACILITIES, 1986

Port and berth	*Nominal loading rate (tonnes per hour)*	*Berth depth (metres)*	*Maximum ship size[a] (dwt)*
Queensland			
Gladstone			
Barney Point	2 000	15.0	70 000
Auckland Point	1 600	11.3	60 000
Clinton Estate	4 000	17.2	140 000
Hay Point			
No. 1 berth	4 000	16.8	150 000
No. 2 berth	6 000	17.1	160 000
Dalrymple Bay (Stage 1)	6 600	20.0	200 000
Abbot Point (Stage 1)	4 600	19.3	165 000
Brisbane			
Fisherman's Island	2 200	13.0	80 000
New South Wales			
Newcastle			
Carrington Basin	2 000	11.6	70 000
Port Waratah			
No. 4 berth	5 000[b]	16.0	120 000
No. 5 berth	5 000[b]	15.7	na
Kooragang Island (Stage 1)	10 500	16.2	120 000
Sydney			
Balmain	1 250	11.6	60 000
Balls Head	2 000	11.0	35 000
Port Kembla			
No. 1 berth	2 500	11.6	na
No. 2 berth	5 000	16.2	110 000

a. Approximate size of larger vessels which can be fully loaded at the facility.
b. Port Waratah has three shiploaders each with a nominal loading rate of 2500 tonnes per hour servicing the two coal loading berths. There is one loader dedicated to each berth, and a further loader which is capable of servicing either berth.
na Not available.

Sources Australian Chamber of Shipping (1987). Joint Coal Board (1986).

maintenance is undertaken by Abbot Point Bulkcoal Pty Ltd, a wholly owned subsidiary of MIM Holdings Ltd.

Hay Point is one of the largest coal ports in the world, with an annual throughput capacity of 25 million tonnes. It has two offshore berths where ships may be loaded simultaneously. The coal terminal is owned by Central Queensland Coal Associates and operated by its subsidiary Hay Point Services Pty Ltd. Coal is railed from the Central Queensland Coal Associates' mines in the Mackay district.

The Dalrymple Bay Coal Terminal in the port of Hay Point was developed for the export of coal produced by four companies. These are Capricorn Coal Management Pty Ltd, Oaky Creek Coal Pty Ltd, Thiess Dampier Mitsui Coal Pty Ltd and Blair Athol Coal Pty Ltd. As with the Abbot Point loader, it is owned and administered by the Harbours Corporation of Queensland. It is operated on behalf of the Harbours Corporation by Dalrymple Bay Coal Terminal Pty Ltd, a company formed for this purpose by the four committed coal exporters.

Gladstone has three coal terminals, which handle coal from mines in the Blackwater and Moura areas. Barney Point is operated by Thiess Dampier Mitsui Coal Pty Ltd. Auckland Point and Clinton Estate are controlled by the Gladstone Harbour Board.

The Coal Export Facility at Fisherman Islands, Brisbane, known as QBH (Queensland Bulk Handling Pty Ltd), is a joint venture between Surrey Properties Pty Ltd and TNT Shipping & Development. Brisbane is unique among Australian coal ports in that it receives some coal by river barge. This has 'proven to be a successful mode of transport for coal from the West Moreton Coalfield and is expected to increase' (Queensland Coal Board 1986).

In New South Wales ownership of the coal loaders is divided between the coal companies and the Maritime Services Board of New South Wales. The coal companies have contributed to the cost of the loaders. In particular, the Kooragang loader in Newcastle is largely owned by coal companies and the Port Waratah loader, also in Newcastle, is entirely privately owned. The newest facility is the Kooragang Coal Loader representing the first stage of a three stage program which would give the coal loader an annual capacity of 50 million tonnes.

While coal loading operations are largely under the control of the coal companies, other services at the ports are provided by the port authorities. Two aspects of this which particularly concern the coal companies are the level of port charges and the depths of harbours.

The National Bulk Commodities Group has expressed concern over the level of port charges in Australia for bulk exports in general, as have other organisations. In his address to the 1986 Australian Coal Conference, William Stones of China Light and Power Ltd (a company importing Australian coal to Hong Kong), observed that costs at Australian ports were much higher than those at overseas ports (Stones 1986).

Australian port charges vary among individual ports and according to ship size. Table 3.6 gives examples of port charges in 1987 for a 135 000 deadweight tonne (dwt) coal carrier at ports in New South Wales and Queensland. The much higher charges at Abbot Point, Dalrymple Bay and Gladstone are attributable to special harbour dues, which are levied on the cargo. At Abbot Point and Dalrymple Bay, these are to recover capital expenditure in developing the off-shore berths and will cease in 1999. At Gladstone, the charge is to recover costs of dredging and is expected to cease by about 1997.

INDUSTRIAL CONCERNS

The ability to provide a continuous and reliable supply of export coal is essential to Australia's trading performance given the highly competitive nature of the world coal trade. The effect of industrial disputes on the continuity of coal supplies will vary with the period of the dispute and the sector of the coal industry in which the disputes occur.

Typically, stoppages in rail transport are very short, involving few employees and with little impact on the flow of exports. The disruptive impact of rail disputes on coal exports tends to occur where sustained bans or stoppages take place on tracks carrying coal exports. Such disruption has occurred both in New South Wales and Queensland, but to date has been more severe in New South Wales.

In the loading sector, Queensland coal ports have experienced only minor disruptions as there is excess loading capacity and sufficient stockpiles at the ports to guard against the likelihood of ships needing to queue before loading. By contrast, undercapacity of loading and stockpile facilities at New South Wales ports made coal exports susceptible to disruption even in the absence of disputes because of difficulties in coping with the volume of ships using the ports (Department of Employment and Industrial Relations 1986a). The shore-based shipping sectors of the coal industry will have to face a number of industrial issues in the future. Continued concern for employment prospects, pressures for rationalisation of transport systems and the large number of unions involved suggests that manning,

TABLE 3.6 SAMPLE PORT CHARGES FOR A 135 000 DWT COAL CARRIER, 1987
($)

Item	*Queensland*				*New South Wales*	
	Abbot Point	*Dalrymple Bay*	*Gladstone*	*Hay Point*	*Newcastle*	*Port Kembla*
Commonwealth dues[a]	28 400	28 400	28 400	28 400	28 400	28 400
State dues[a]	11 900	11 900	11 900	11 900	16 400	16 400
Berthage	1 500	1 500	15 900	1 500	7 900	11 900
Wharfage[b]	4 900	12 700	37 800	12 700	70 800	70 800
Special harbour dues[b]	264 100	320 100	148 800	..	..	..
Towage	33 000	25 000	34 500	24 000	21 100	36 700
Pilotage	7 100	7 100	7 100	7 100	5 600	5 600
Mooring and unmooring	1 000	3 000	1 100	1 000	2 100	2 000
Sundries	300	300	400	300	300	400
Total	352 200	410 100	286 000	87 000	152 600	172 100
Cost per tonne[b]	2.89	3.36	2.34	0.71	1.25	1.41

a. Commonwealth dues include Commonwealth light dues and the National Oil Pollution Levy. State dues include State light and harbour rates. These charges cover 3 months for Commonwealth dues; 6 months for New South Wales State dues; and 30 days for Queensland State dues. The ship is exempt from the charge during subsequent visits within the period.
b. Based on a cargo load of 122 000 tonnes.
.. Not applicable.

Note Figures may not add to totals due to rounding.

Sources BTCE estimates. National Bulk Commodities Group (1987).

redundancy and demarcation issues are likely to be a recurrent problem.

Developments in industrial consultative mechanisms such as the establishment of the Hunter Valley Coal Chain Council (HVCCC) may assist in addressing these industrial concerns. The HVCCC consists of:

- representatives of four major unions
- representatives from the employers
  - coal companies
  - State Rail Authority of NSW
  - Maritime Services Board
  - coal loaders
- State departments
  - Mineral Resources
  - Transport
  - Industrial Relations.

The HVCCC is chaired by the Joint Coal Board. The arrangement recognises the 'coal chain' concept and is intended to reduce the impact on coal exports of disputes in the chain, and to increase awareness of the interdependence of the links in the chain. This arrangement also recognises that circumstances can vary from region to region and hence the establishment of a regional rather than an industry-wide council.

The objectives of the HVCCC include:

- the protection and advancement of the well being of those employed in the coal chain and associated industries;
- the promotion and support of the stable development of the Hunter Valley's coal resources through consultative and consensus processes; and
- the consolidation and continuity of coal supplies to customers, both overseas and domestic.

The HVCCC has had success in resolving specific disputes and the Joint Coal Board is considering the further development of the 'coal chain consultative committee' concept on a regional basis.

CHAPTER 4 IRON ORE

Iron ore is one of Australia's major exports, with 85.9 million tonnes worth $A1936 million fob exported in 1985-86 (Australian Bureau of Statistics 1987b). Australia is the second largest world exporter of iron ore, behind Brazil. Other major exporters are the USSR, Canada and India.

Almost all exports of Australian iron ore originate in Western Australia, largely in the Pilbara region. South Australia also exports a small amount of iron ore and Tasmania exports iron ore pellets. Australia's iron ore mines and export ports are shown in Figure 4.1. Most of Australia's iron ore is exported to Japan. Figure 4.2 shows the proportion by weight of Australian iron ore exported to each major destination.

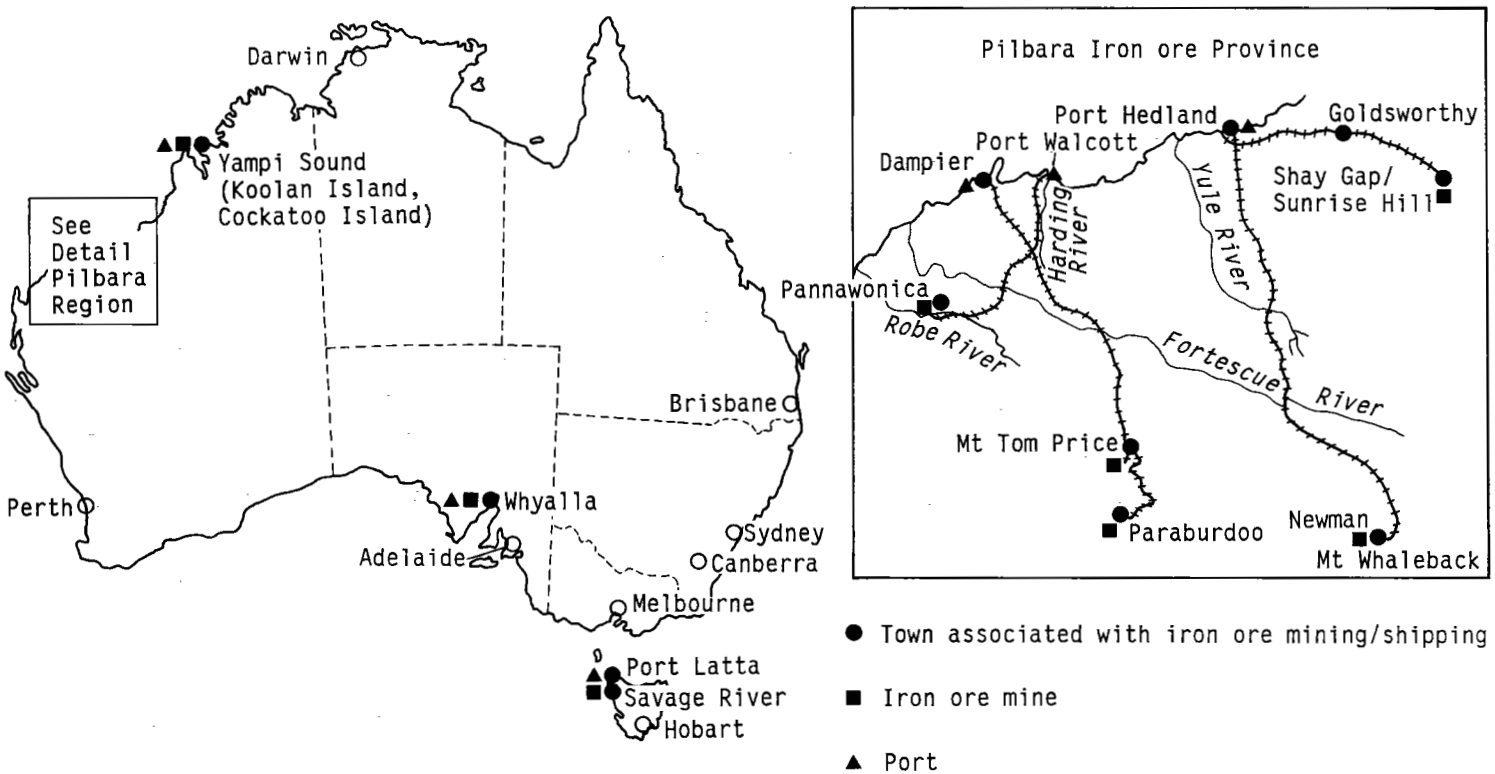
Production of Australian iron ore in the calendar year 1985 amounted to 98.6 million tonnes. Australia produced only about 11 per cent of world production in 1985, behind the USSR, China and Brazil (see Figure 4.3).

Most of Australia's iron ore is exported. The remainder is for domestic use or added to stockpiles. Domestic use in 1985 was just under 10 million tonnes. Ore for domestic use is largely from the Mount Newman area, and is shipped to the BHP steelworks at Newcastle and Port Kembla in New South Wales. BHP's steelworks at Whyalla process ore from the Middleback Range in South Australia. A flow chart of the Australian iron and steel industry is presented in Figure 4.4.

All iron ore mined in the Pilbara is transported to the port using dedicated railways. These lines, constructed in the 1960s and 1970s, are privately owned. In 1981 the Pilbara railways' fleet amounted to 129 diesel locomotives and nearly 6000 ore cars (BTE 1981).

There are four companies mining ore in the Pilbara:

- Robe River Iron Associates mine the East Deepdale ore deposits at Pannawonica. The ore is transported 169 kilometres to Cape

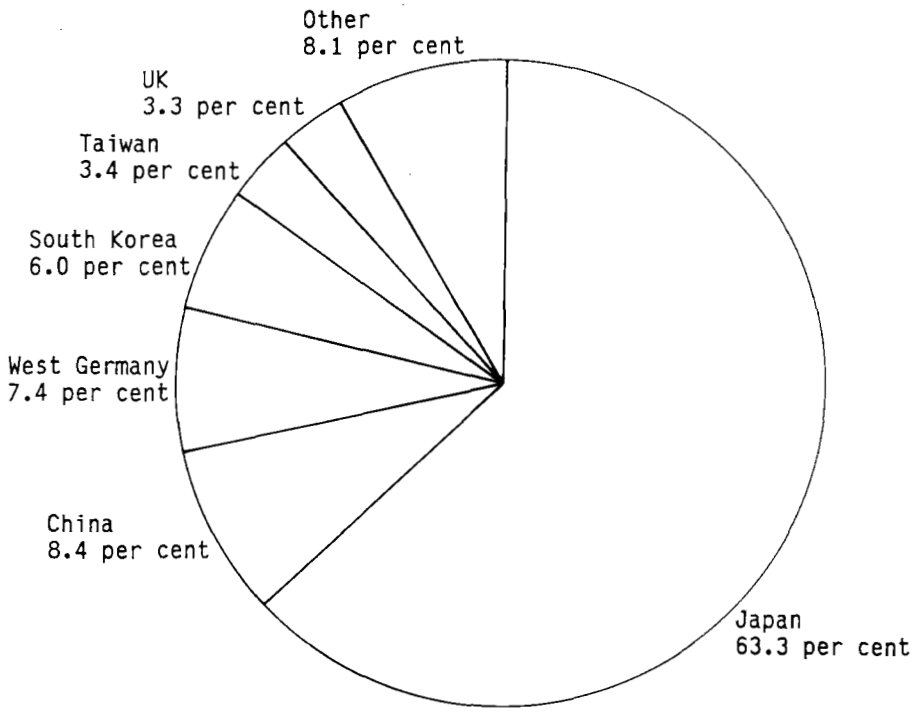


Source Department of Resources and Energy (1986).

Figure 4.1 Location map, Australian iron ore industry

Lambert (Port Walcott) where it is crushed and screened for export as fines.

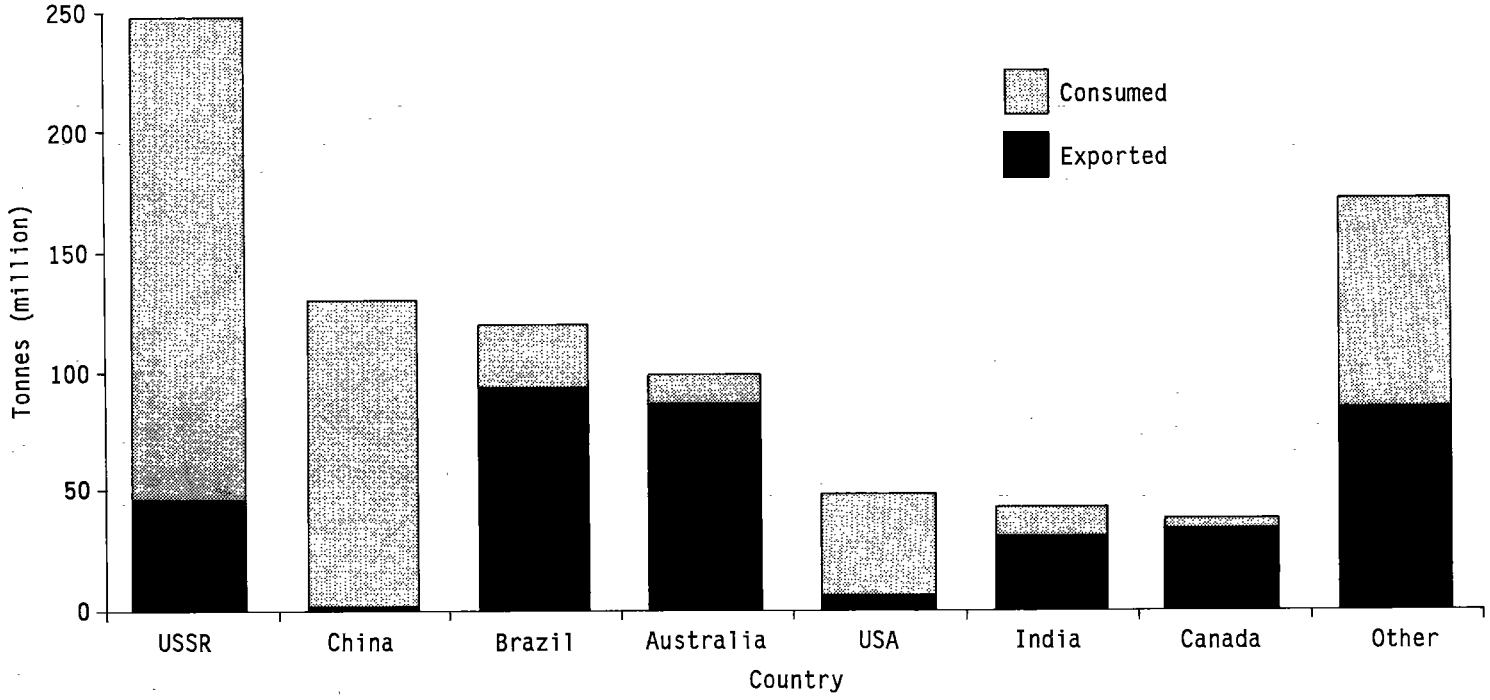
- Goldsworthy Mining Ltd operate mines at Shay Gap and at Sunrise Hill. Iron ore from Shay Gap is railed 182 kilometres to the port at Finucane Island, Port Hedland. Ore from Sunrise Hill is transported 9 kilometres by road to Shay Gap and then railed to the port.
- Hamersley Iron Pty Ltd, a wholly-owned subsidiary of CRA Ltd, have mines at Mount Tom Price and Paraburdoo. Their rail line runs 100 kilometres from Paraburdoo to Mount Tom Price, then a further 293 kilometres to Dampier.
- The Mount Newman Joint Venture, in which BHP has an 85 per cent share, transports iron ore 426 kilometres by rail from Mount Whaleback to Nelson Point at Port Hedland.



Notes 1. Percentages are based on the weight of exports.
2. Percentages may not total to 100 due to rounding.

Source Association of Iron Ore Exporting Countries (APES) (1986).

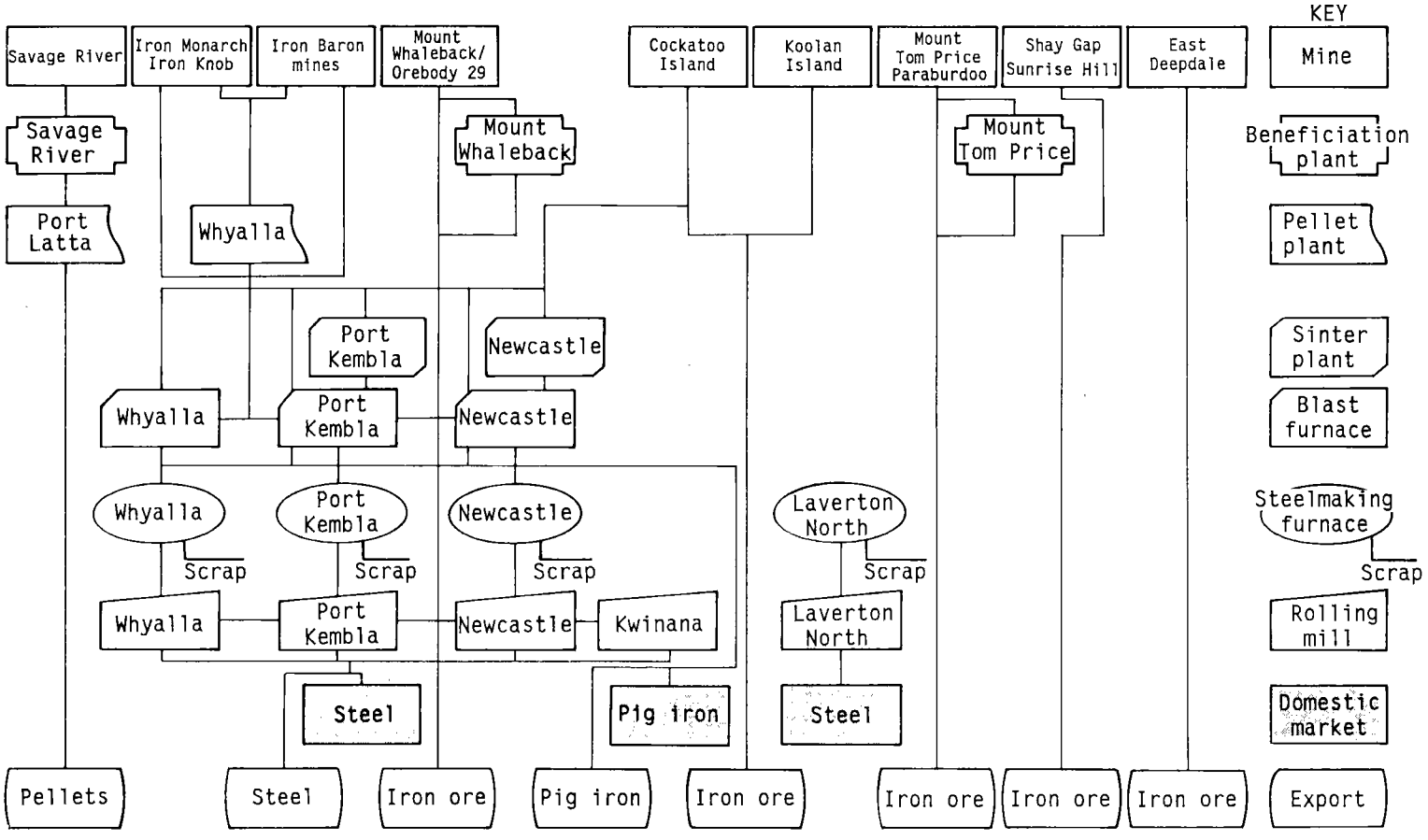
Figure 4.2 Exports of Australian iron ore by destination, 1985



Note Some of the data used in deriving this figure are preliminary data or estimates.

Source International Energy Agency (1986).

Figure 4.3 World production of iron ore by country, 1985



Source Bureau of Mineral Resources (1987).

Figure 4.4 Flow chart, Australian iron and steel industry, 1984

BHP Minerals Ltd operate a mine on Koolan Island in Yampi Sound. A second mine on Cockatoo Island closed in November 1984, although stockpiled ore continued to be shipped until late 1986.

Iron ore from Tasmania is crushed and treated in the concentrator at the Savage River mine before being pumped 85 kilometres through a slurry pipeline to Port Latta on Tasmania's North-West Coast. At the port the ore is dried and pelletised, and exported as pellets.

Ore from the Middleback Range in South Australia mined by BHP Steel International is railed 47 kilometres to Whyalla on a private railway. Much of the South Australian ore is used at the Whyalla steelworks. Small quantities are shipped to the steel works at Port Kembla and Newcastle.

Table 4.1 shows exports of iron ore by port for 1982-83 to 1985-86. As can be seen, some 80 million tonnes of iron ore was exported from the three Pilbara port complexes in 1985-86. A further 2.4 million tonnes was exported from Yampi Sound, 1.7 million tonnes from Port Latta and a small amount from Whyalla.

Iron ore is the major commodity exported through the ports at Dampier, Port Walcott, Port Hedland and Yampi Sound. (The only other export at these ports being salt from Dampier and Port Hedland.)

Details of port facilities are summarised in Table 4.2. Ownership and operation of these facilities varies from port to port, and are either by government authorities, the mining company concerned (or an associated company), or a combination of these two. At Dampier and Port Walcott all expansions and improvements to the ports have been carried out by the iron ore companies. Major work at other iron ore ports has also been undertaken by iron ore companies.

The Mount Newman Joint Venture recently spent almost $90 million on improvements at Port Hedland. This included deepening and lengthening the approach channel, among other improvements. The amount of ore that can be loaded on average tides increased from the previous 145 000 tonnes to 220 000 tonnes as a result. However, this does not mean that smaller ships will no longer be used, as the maximum ship size will depend upon port draught limitations at the overseas destinations.

SHORE-BASED SHIPPING COSTS

Data on shore-based shipping costs relating to the iron ore industry are difficult to obtain. This is mainly due to the commercial

sensitivity of such data resulting from the use of private facilities by the companies involved. However, based on the limited information supplied confidentially by the iron ore industry, the total Australian shore-based shipping cost of iron ore was estimated by the Bureau to be approximately $335 million in 1985-86. This assumes an average of about $3.20 per tonne to move iron ore to the ports, or about 1 cent per tonne-kilometre. Storage and shiploading costs average around $0.50 per tonne and port costs about $0.20 per tonne.

TABLE 4.1 AUSTRALIAN IRON ORE EXPORTS BY PORT OF LOADING, 1982-83 TO 1985-86

('000 tonnes)

Port	*1982-83*	*1983-84*	*1984-85*	*1985-86*
Western Australia				
Dampier	29 309	35 812	39 366	37 106
Port Hedland	25 302	28 598	30 102	28 581
Port Walcott	12 766	15 591	15 576	14 606
Yampi Sound	2 500	2 319	2 211	2 424
Total	69 877	82 320	87 255	82 717
Tasmania				
Port Latta	2 185	1 957	2 276	1 692
South Australia				
Whyalla	-	123	17	48
Total	72 062	84 400	89 548	84 457

\- Nil or rounded to zero.

Source Federal Department of Transport (1987).

TABLE 4.2 AUSTRALIAN IRON ORE PORT FACILITIES, 1986

Port and berth	*Loading rate (tonnes/hour)*	*Berth depth (m)*	*Maximum ship size (dwt)*[a]
Dampier			
Parker Point	5 500	17.2	140 000
East Intercourse Island	9 000	21.5	250 000
Port Walcott			
Cape Lambert			
No. 1 berth	8 000	18.5	225 000
No. 2 berth	8 000	19.5	275 000
Port Hedland			
Finucane Island	4 500	17.0	120 000
Nelson Point	16 000[b]	19.0	270 000
Yampi Sound			
Cockatoo Island	1 600	na	70 000
Koolan Island	3 000	15.8	145 000
Port Latta			
Savage River Jetty	2 700	15.5	100 000
Whyalla			
Ore Jetty	3 000	11.6	48 000

a. Tonnages which may be loaded will vary significantly according to tidal conditions. Figures shown are generally the upper limit.
b. Two loaders each with a loading rate of 8000 tonnes per hour service the two berths at Nelson Point. Both loaders can be used to load the same vessel if desired.
na Not available.

Sources Australian Chamber of Shipping (1987). Department of Resources and Energy (1986).

CHAPTER 5 WHEAT AND OTHER GRAINS

Grain is Australia's second largest bulk export in value, accounting for 21.7 per cent of the total fob value of all exports in 1985-86. It is Australia's third largest bulk export by weight. Wheat is the most significant grain export, followed by barley, oats and sorghum. Table 5.1 gives the tonnages of these four grains exported for the financial years 1980-81 to 1985-86.

In October 1986, the Royal Commission on Grain Storage, Handling and Transport was established. A submission prepared by the Bureau (BTE 1987a) included an overview of grain transport, related issues and economic considerations, and addressed the scope for increasing the performance of grain transport.

TABLE 5.1 BULK GRAIN EXPORTS FROM AUSTRALIA, 1980-81 TO 1985-86
(million tonnes)

	Year					
Grain	*1980-81*	*1981-82*	*1982-83*	*1983-84*	*1984-85*	*1985-86*
Wheat	10.50	10.79	8.12	10.49	15.52	15.88
Barley	1.31	1.16	0.63	2.77	4.99	4.14
Sorghum	0.46	1.27	0.44	0.77	1.59	1.23
Oats	0.19	0.14	0.07	0.28	0.38	0.17
Total	12.46	13.36	9.26	14.31	22.48	21.43

Note Figures may not add to totals due to rounding.

Sources Australian Bureau of Statistics (1986 and 1987b).

TOTAL COST OF SHORE-BASED OPERATIONS

The total Australian shore-based shipping cost of export wheat is estimated to have been $700 million or an average of some $44 per tonne in 1985-86. This was 24 per cent of the fob value of $2923 million. Total shore-based shipping costs for other grains are estimated to have been about $240 million or about 33 per cent of the export value in 1985-86.

Table 5.2 gives estimates of the total shore-based shipping costs per tonne for wheat in 1985-86 for each State. The major components of shore-based shipping costs are freight charges, storage and handling charges, cost of transporting wheat from the farm to silo, and wharfage and other port charges.

Other shore-based charges incurred by wheat growers in 1985-86 were:

- Two-port loading charges made by the Australian Wheat Board (AWB) to cover the additional costs incurred when a vessel cannot be fully loaded in one port due to draught restrictions, and must be topped up at another port.
- Carryover costs charged to the AWB by the bulk handling authorities for grain carried over from one season to the next. An average charge for each State is deducted from grower payments to cover these costs. This varied from $0.81 per tonne in New South Wales to $1.25 per tonne in Western Australia.
- Tolls collected by the bulk handling authorities in South Australia and Western Australia. These are co-operative companies owned by growers. The tolls are collected for investment in fixed assets, and are usually repayable, free of interest, after ten years. Charges were $0.735 per tonne in South Australia and $1.84 per tonne in Western Australia.

Tolls for other grains in Western Australia in 1985-86 were $2.17 per tonne for barley, linseed, rapeseed and triticale, $1.84 per tonne for sorghum and lupins and $2.76 per tonne for oats. In South Australia, the toll for barley was $0.88 per tonne.

Financial costs for each link in the grain transport chain are discussed in the following sections.

TRANSPORT FROM FARM TO COUNTRY STORAGE

In general, there is very little on-farm storage of grain. One reason for this is that growers are not generally paid for the grain until it is delivered to the silos of the grain handling authorities, although

TABLE 5.2 ESTIMATED TOTAL SHORE-BASED SHIPPING COSTS FOR WHEAT, 1985-86

($ per tonne)

	NSW	*Vic*	*Qld*	*SA*	*WA*
Farm to silo[a]	4.70	3.20	11.60	4.20	5.80
Storage and handling	16.70[b]	13.80[b]	19.00[c]	12.70[d]	14.90[d]
Freight[f]	24.60	22.50	15.80	11.20	16.00
Wharfage	1.70	0.90	c	1.10	0.50
Other port charges	1.20	1.20	1.10	1.30	1.10
Two-port loading	0.00	0.40	0.10	0.50	0.30
Carryover costs	0.80	1.00	0.80	1.00	1.30
Total	49.70	43.10	48.40	32.00	39.80

a. Average cost with no backload.
b. Basic rate.
c. Queensland wharfage costs are included in the storage and handling charge.
d. Includes bulk handling authority tolls.
f. Average.

Note Figures may not add to totals due to rounding.

Sources Australian Wheat Board (1986). BTCE estimates. Co-operative Bulk Handling (Western Australia) (1987). South Australian Co-operative Bulk Handling (1986).

compensation for deferred delivery is given in Victoria. A second reason for not storing grain on farms is that the central storage locations are more secure from insect infestation than on-farm storages. Australia has a good reputation world-wide for insect-free grain, and from a marketing viewpoint it is important to maintain this.

Most of the grain harvested is taken immediately to one of the receiving authority's silos. This movement is by road, either in the farmer's own vehicle or by contract carrier. The average distance between farm and silo in Australia is 17 kilometres. This is due to the many silos scattered throughout the grain growing districts (over 250 silos in some States). The national average cost of road transport of wheat from farm to silo is estimated to have been about $5.50 per tonne in 1985-86.

In some cases grain is delivered by growers direct to seaboard terminals. This is particularly the case in South Australia, largely due to the State's geographic characteristics. In 1985-86, 44 per cent of grain receivals in South Australia were made direct by growers to port terminals (South Australian Co-operative Bulk Handling 1986).

COUNTRY STORAGE

The farmers' responsibility for the grain ends when it is delivered to a silo of one of the grain handling authorities, whether at a seaboard terminal or inland. It is at this point that most grain is purchased from the growers by the relevant marketing authority.

Country storage facilities are owned and operated by the grain handling authorities. They are generally located on rail sidings, so that the silos and railways together form an integrated system for the collection and transport of grain to the ports. Delivery to the ports is continuous throughout the year, so that the country storage sites form a buffer between farms and ports.

Points of concern to the industry relating to the country storage system are the overall storage capacity, capacity to segregate different grades of the various grains, quality of loading equipment and the number of country storage sites. Costs of moving grain from country storage sites to port decrease as the number of small, dispersed storage sites reduce.

Storages are of several types. Permanent storage sites are either vertical silos or horizontal sheds. Generally the vertical silos are more efficient in their outloading rates and capacity to segregate grades, but are also more expensive to construct.

As well as permanent storage sites, temporary storage sites, or 'bunkers' can be constructed as required during the harvest. The advantage of bunkers is that they can be rapidly and cheaply constructed if it appears that extra storage will be needed. They are not as secure against pest infestation and the weather as permanent silos, nor as simple to empty. However, losses due to damage from bunkers have not been great so far.

The grain handling authorities recover costs of operating the country storages through a handling and storage charge. This charge also covers sea-board storage and handling costs. In the case of wheat and barley, the charge is made to the marketing authorities and that amount is subtracted from the payment to growers. Charges are calculated separately in each state. Table 5.3 gives the handling and storage charges for wheat, barley and oats for 1985-86.

TABLE 5.3 HANDLING AND STORAGE CHARGES FOR WHEAT, BARLEY AND OATS, 1985-86

($ per tonne)

	Commodity		
State	*Wheat*	*Barley*	*Oats*
New South Wales	16.70	16.50	19.20
Victoria[a]	13.80	15.30	15.30
Queensland	19.00[c]	19.00[d]	..
South Australia[b]	11.93	11.92	12.45
Western Australia[b]	13.05	15.46	15.46

a. Basic rate.
b. Excludes tolls.
c. Includes wharfage.
d. Rate charged for export barley by Bulk Grains Queensland to Queensland Barley Marketing Board. Rate charged for barley not moved to port by Bulk Grains Queensland is $13 per tonne.
.. Not applicable.

Sources Australian Wheat Board (1986). Bulk Grains Queensland (pers. comm). Co-operative Bulk Handling (Western Australia) (1987). Grain Elevators Board (Victoria) (1986, pers. comm.). Grain Handling Authority of New South Wales (1987). South Australian Co-operative Bulk Handling (1986).

The Grain Elevators Board in Victoria levied a discounted handling and storage charge for deferred deliveries of $12.30 per tonne for wheat and $13.80 per tonne for barley in 1985-86. A discount also applied for deliveries to 'Border Absorption Stations' to discourage growers from delivering across the border. In 1985-86, this discounted rate was $13.30 per tonne for wheat, and $14.80 per tonne for barley.

TRANSPORT FROM COUNTRY STORAGE TO PORT

Australian grain is transported an average distance of 360 kilometres from country storage sites to the ports. As previously mentioned, this is generally performed by rail. In fact, the railway system in Australia was largely developed to service the grain industry. The individual railway networks comprising the total rail system use several different gauges, so that there is little connection between the systems in adjacent States. In Western Australia there are in fact two different gauges in use in the grain growing district, necessitating the transfer of grain from one to the other at country

transfer depots. This double handling has obvious implications for the efficiency of transport of grains.

Major factors in the efficient transport of grain by rail to the ports include:

- the use of block trains;
- the use of high capacity wagons;
- the use of bottom-discharging wagons (as opposed to those which require the grain to be raked out by hand); and
- the provision of long crossing loops at the grain terminal (BTE 1987a).

The railways set charges for the transport of grain from each silo to the destination port. Charges are paid by the marketing authority, and then subtracted from the payment to the grower. Table 5.4 gives average freight charges for wheat in each State for the seasons 1984-85 to 1986-87. The average freight charge for Australian wheat in 1985-86 was $19.20 per tonne, or around 5 cents per tonne-kilometre.

ROAD TRANSPORT TO THE PORTS

A major issue in the transportation of grain is the extent to which road and rail are utilised. The proportion of grain transported by road to the ports varies from State to State.

TABLE 5.4 AVERAGE FREIGHT CHARGES FOR WHEAT, 1984-85 TO 1986-87
($ per tonne)

	Season		
State	*1984-85*	*1985-86*	*1986-87*
New South Wales	23.70	24.60	24.50
Victoria	21.20	22.50	22.10
Queensland	16.20	15.80	16.20
South Australia	10.50	11.20	11.10
Western Australia	16.50	16.00	16.00

Note Figures have been rounded to the nearest 10 cents.

Source Royal Commission into Grain Storage, Handling and Transport (1986).

In South Australia some 44 per cent of grain was delivered to port by road in 1985-86. This is due to the proximity of the grain growing areas to the ports. Also, the Spencer and St Vincent Gulfs divide the grain growing areas into three sections. The central region is the York Peninsula, the southern part of which is without rail facilities. Two of the State's seven grain terminals service this region, and all deliveries to these two are by road.

In New South Wales, no facilities exist for road receivals at the ports, although some are planned for Port Kembla and Newcastle. In Victoria, Queensland and Western Australia, State regulations limit road haulage of grain. One reason for this is the substantial road damage which can be caused by heavy trucks and the present lack of efficient mechanisms to recover the cost of this damage.

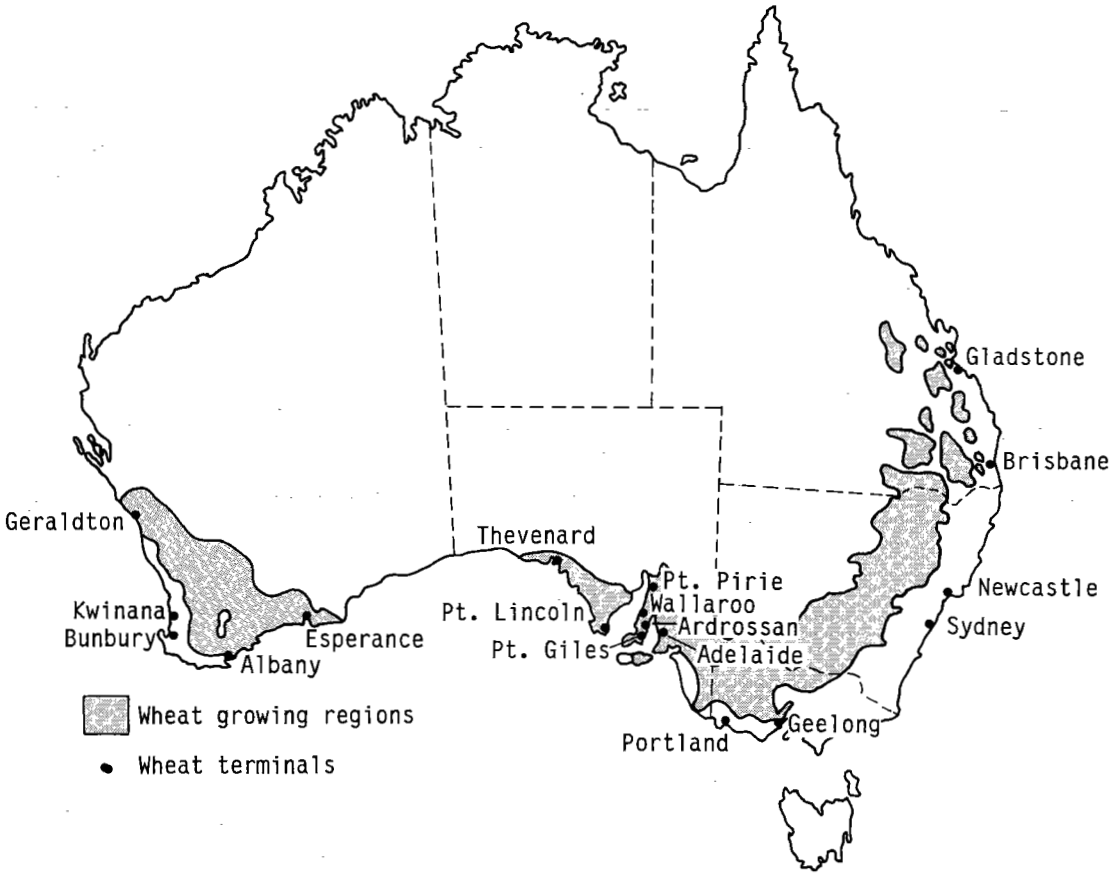
In South Australia there are no regulations which oblige growers to deliver to a local silo. However, once grain is delivered to a local silo, competition from road transport operators is effectively eliminated. Most of the country silos are situated near rail sidings, on land rented from the Australian National railway. Australian National has the right to impose a surcharge on all grain transported by road from such a silo to a seaboard terminal or other destination with rail access, and also sets the level of this surcharge. The result of this is that increasing numbers of growers are delivering grain by road direct to the seaboard terminals, rather than to country silos. While this is cheaper for the individual growers, it results in under-utilization of country storage facilities and greater pressure on port storage in South Australia.

The financial cost of transporting grain in a six-axle articulated truck in 1986 was estimated at 8.3 cents per tonne-kilometre, assuming no backload on the return journey (BTE 1987a). Costs of road transport and related issues are discussed further in BTE (1987a).

HANDLING AND STORAGE AT THE PORT

There are at present eighteen ports around Australia at which wheat is loaded for export in bulk ships. These ports are shown in Figure 5.1 which also illustrates wheat producing areas. Other grains are exported through the same ports as wheat, and also through Mackay in north Queensland. All but two of the ports are serviced by rail, as this is the prevalent mode of grain transport to the ports.

The grain is transferred from trucks or trains to storage facilities at the port, and from there to the ships. The quality of grain handling and storage facilities, and ship facilities varies from port



Source Adapted from Australian Bureau of Agricultural and Resource Economics (1987).

Figure 5.1 Location map, Australian wheat industry

to port. Total storage capacity for grain at the ports is just over 5 million tonnes. Throughput in any one year usually far exceeds this.

Improvements to grain handling and storage facilities at ports are being made continually. For example, recent developments in Queensland include upgrading of the Gladstone terminal and a new grain terminal in Brisbane. A new grain terminal, with road receival facilities, is planned at Port Kembla in New South Wales, and is due for completion in 1989.

The handling and storage charge to growers covers the cost of operating the grain handling authorities' facilities at both the country silos and seaboard terminals, together with stevedoring. Handling and storage charges for wheat, barley and oats in each State were previously given in Table 5.3, while Table 5.5 gives wharfage and two-port loading charges for wheat in each State. As previously mentioned two-port loading charges are made by the AWB to cover the additional costs incurred when a vessel must be topped up at a second port. Costs are attributed to the State where the wheat is initially loaded. The amount deducted from growers is an average for the State.

Draught restrictions at the ports are a major issue for the grain industry, as are loading rates. Related issues include the possible duplication of investment in ports located in adjoining States and the operation of a number of small ports within the same State (BTE 1987a).

TABLE 5.5 WHARFAGE AND TWO-PORT LOADING CHARGES FOR WHEAT, 1985-86
($ per tonne)

State	*Wharfage*	*Two-port loading*
New South Wales	1.70	0.00
Victoria	0.90	0.50
Queensland	a	0.10
South Australia	1.10	0.50
Western Australia	0.50	0.30

a. Wharfage charge for Queensland is not available as a separate item, however it is included in the storage and handling charge.

Note Figures have been rounded to the nearest 10 cents.

Source Australian Wheat Board (1986).

Other port costs include various charges against the ship such as harbour and light dues, towage, pilotage and berthage. These charges vary from port to port, and with ship size. They are included in the ocean freight rate, usually paid by the buyer, and hence affect the competitiveness of Australian wheat on the international market. The average total of the charges is estimated to have been about $1.20 per tonne in 1985-86.

INDUSTRIAL CONCERNS

For the grain export industry, particularly for the shore-based transport and handling sector, there are a number of industrial concerns which in the future could affect grain exports. These include concerns with rail transport, such as the effect on employment levels of the rationalisation of lines and new technology, especially since it is cheaper to transport grain by road rather than rail in many areas.

The manning and working arrangements of port handling and storage facilities may well be the principal industrial relations issue of the future. The Economic and Planning Advisory Council (as quoted by Department of Employment and Industrial Relations 1986b) has drawn attention to three sources of inefficiency of Australian grain handling facilities:

- manning levels are up to five times those of equivalent sized facilities in the United States;
- there is a multiplicity of trade unions; and
- the inability of management and unions to standardise starting and stopping times of shifts resulted in only 80 per cent of available time being effectively used.

CHAPTER 6 OTHER AUSTRALIAN BULK EXPORTS

Though coal, iron ore and wheat form the majority of Australia's bulk exports, significant amounts of other bulk commodities are exported. Among these are alumina and bauxite, petroleum, salt, woodchips and raw sugar. This chapter gives a brief outline of the shore-based transport and handling activities relating to the export of these commodities. Where available, the estimated costs of particular activities are given.

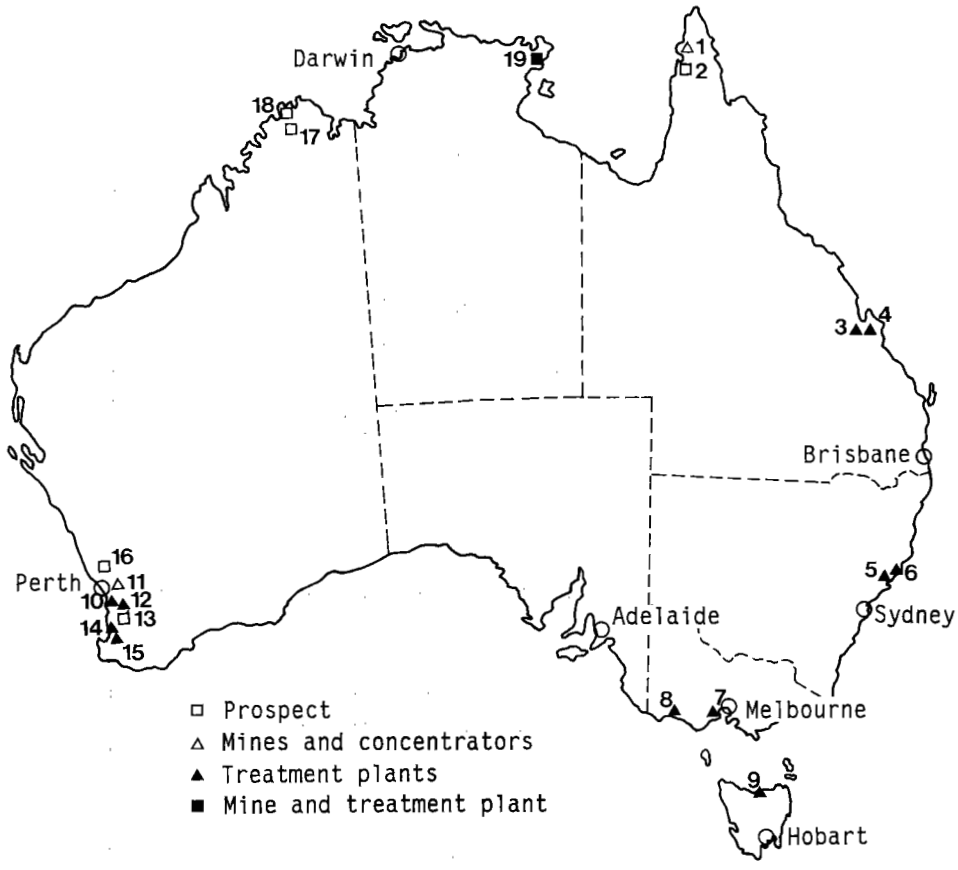
ALUMINA AND BAUXITE

Alumina and bauxite are used to produce aluminium. Bauxite ore is refined to produce alumina, which is smelted to produce aluminium. Small amounts of alumina are also used in the production of other commodities, especially glass. Australia exports substantial quantities of both alumina and bauxite in bulk. Table 6.1 shows Australia's exports of alumina and bauxite, by port, for the financial years 1982-83 to 1985-86 inclusive.

In 1984, 55 per cent of Australia's bauxite production was mined in the Darling Ranges of Western Australia, 28 per cent at Weipa in Queensland and the remaining 17 per cent at Gove in the Northern Territory (Bureau of Mineral Resources 1987). The location of the major bauxite mines, alumina refineries and aluminium smelters and the flow of the bauxite from each of the major mines is presented in Figures 6.1 and 6.2.

In general, refineries are located close to bauxite mines. The exception to this is in Queensland. Bauxite mined at Weipa is shipped to the refinery at Gladstone, or exported directly as bauxite.

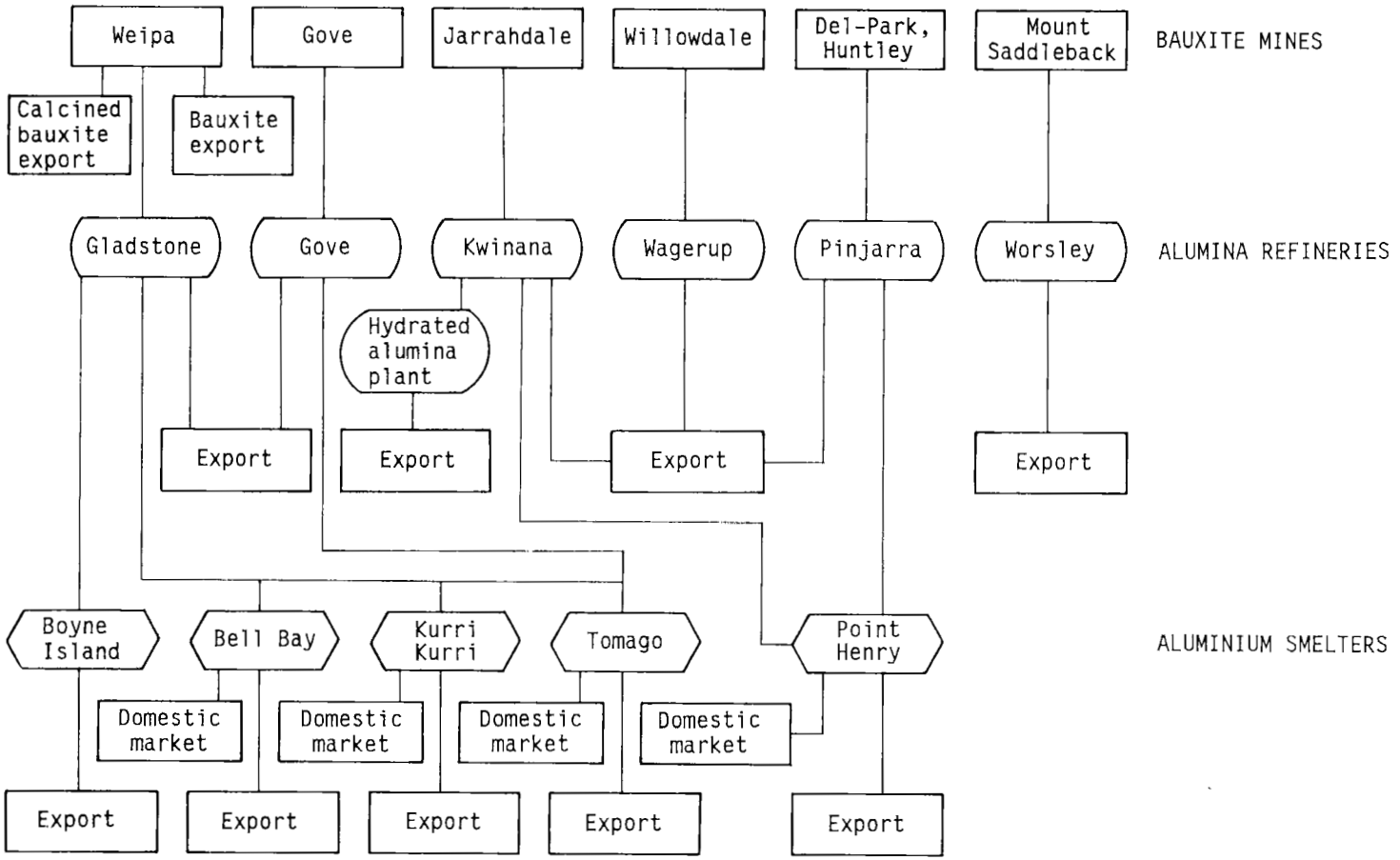
The ore from Gove is either exported as bauxite or refined locally and then exported as alumina.



1 Weipa
2 Aurukan
3 Gladstone (refinery)
4 Boyne Island (smelter)
5 Kurri Kurri (smelter)
6 Tomago (smelter)
7 Point Henry (smelter)
8 Portland (smelter under construction)
9 Bell Bay (smelter)
10 Kwinana (refinery)
11 Jarrahdale, Huntly, Del Park
12 Pinjarra (refinery)
13 Mount Saddleback
14 Wagerup (refinery)
15 Worsley (refinery)
16 Chittering
17 Mitchell Plateau
18 Cape Bougainville
19 Gove (mine and refinery)

Source Bureau of Mineral Resources (1987).

Figure 6.1 Location map, Australian aluminium industry



Source Bureau of Mineral Resources (1987).

Figure 6.2 Flow chart, Australian aluminium industry, 1984

TABLE 6.1 ALUMINA AND BAUXITE EXPORTS BY PORT, 1982-83 TO 1985-86
('000 tonnes)

	Year			
Commodity and port	*1982-83*	*1983-84*	*1984-85*	*1985-86*
Alumina				
Gladstone (Qld)	1 435	1 712	1 471	1 264
Fremantle (WA)	2 370	2 664	2 638	2 672
Bunbury (WA)	886	1 145	1 796	2 206
Gove (NT)	1 189	1 336	1 217	1 296
Total	5 880	6 857	7 122	7 438
Bauxite[a]				
Weipa (Qld)	2 590	2 850	3 680	2 758
Gove (NT)	1 929	2 385	2 605	2 395
Total	4 519	5 235	6 285	5 152

a. Includes other aluminium ores and concentrates.

Note Figures may not add to totals due to rounding.

Source Federal Department of Transport (1987).

All bauxite mined in Western Australia is refined to alumina within the State. Bauxite from the Del Park, Huntly and Willowdale mines is transported short distances by conveyor belt to the Pinjarra and Wagerup refineries. Ore from the Mount Saddleback mine is carried 51 kilometres by conveyor belt to the Worsley refinery and Jarrahdale bauxite is moved 50 kilometres to the Kwinana refinery on the State Government Railway.

The refineries in Queensland, the Northern Territory and at Kwinana in Western Australia are located close to the ports. Alumina from the refineries at Pinjarra, Wagerup and Worsley in Western Australia is railed to the ports over distances ranging from 57 to 109 kilometres (BTE 1987b).

In 1986, over 80 per cent of alumina production was exported. The majority of the remaining alumina is smelted at Kurri Kurri and Tomago in New South Wales, Point Henry and Portland in Victoria, Boyne Island in Queensland and Bell Bay in Tasmania. Boyne Island receives alumina

by conveyor belt from the refinery at Gladstone. The other smelters receive alumina from the refineries by ship; an average distance of around 1200 nautical miles.

The efficient land transport of bauxite and alumina is largely dependent on appropriate investment in private transport facilities. While there is some use of public road and rail facilities, transport is largely by conveyor belts linking mines, refineries and ports. Specialised loading facilities are used at the ports. Private companies have contributed significantly to the cost of these facilities, as well as contributing to some public facilities at some ports.

The long-term trend in Australia is to process a greater amount of bauxite ore in this country. In general, this will involve a greater transport and handling task than if the bauxite ore itself were exported. As the world market for aluminium has been depressed in recent years, it is expected that the existing transport facilities could accommodate an upturn in the production of bauxite, alumina and aluminium. It appears that adequate investment in transport facilities has been occurring in line with the investment in refineries and smelters.

PETROLEUM

Australia both exports and imports petroleum and petroleum products. Similar facilities are used for both imports and exports, and since imports of petroleum and petroleum products are greater, these facilities are described in Chapter 7 which examines bulk imports.

Exports of petroleum and petroleum products totalled 7.3 million tonnes in 1985-86. It is intended to export liquefied natural gas from the North West Shelf project in Western Australia to Japan. This will increase petroleum exports considerably. Six million tonnes a year will be sold to eight Japanese power and gas companies. Exports of liquefied natural gas are planned to commence in 1989 and will continue for 20 years (*Engineers Australia* 1985). Adequate transport facilities were being planned as part of the overall North West Shelf project.

SALT

In Australia, salt is generally produced by solar evaporation of sea water, although some operations involve evaporation of naturally occurring lake and delta brines. Salt exports are mainly destined for use by the chemical industry.

About 80 per cent of Australia's salt production occurs in Western Australia. Salt is also produced in Victoria, Queensland and South Australia. In 1984-85, about five million tonnes of salt were exported, representing more than 85 per cent of total Australian production.

Practically all of this export salt was produced in Western Australia and shipped through the ports of Carnarvon, Dampier and Port Hedland. The export salt fields are generally located close to a port, hence the shore-based transport task is not great.

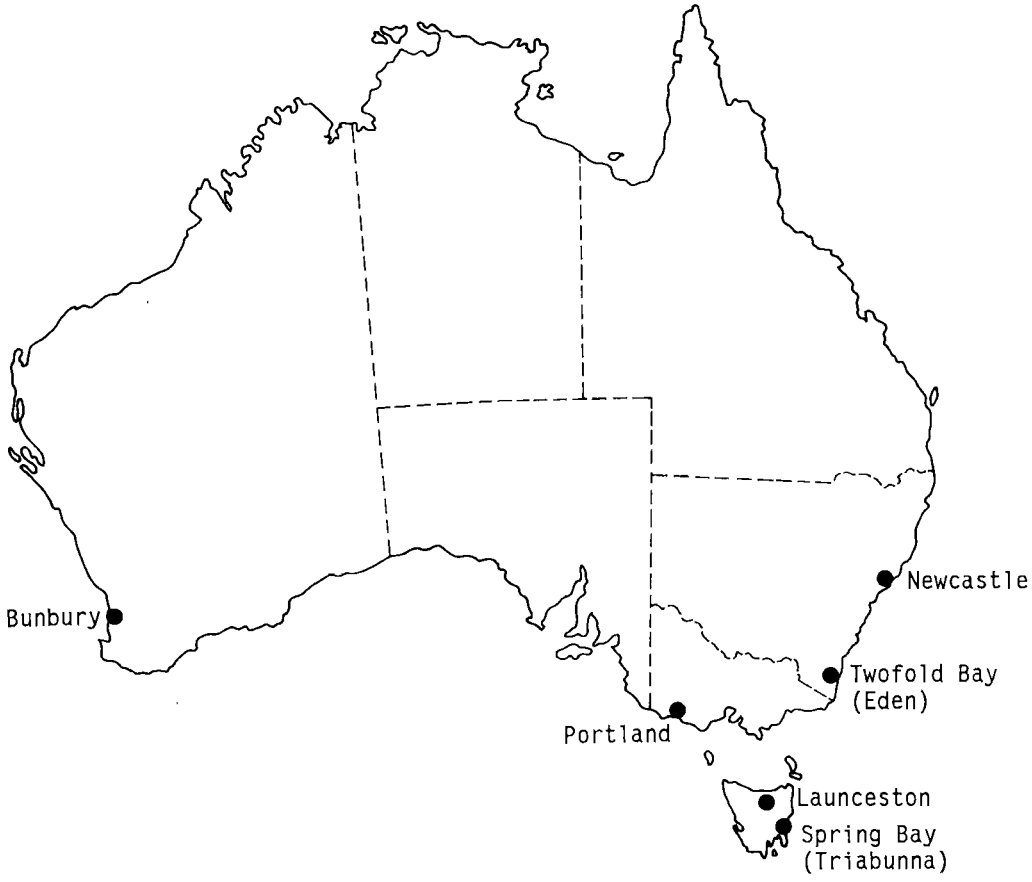
The demand for Australian salt has varied very little over the past few years. It is anticipated that the future growth will be in the vicinity of 2 or 3 per cent per year. No significant difficulties have been identified, or are likely to occur in relation to local shore-based transport of this commodity (Dampier Salt (Operations) Ltd, pers. comm.).

WOODCHIPS

Woodchips are exported from Launceston and Spring Bay (Triabunna) in Tasmania, Bunbury in Western Australia, Newcastle and Twofold Bay (Eden) in New South Wales and Portland in Victoria. Total woodchip exports in 1985-86 were 4.7 million tonnes worth $249 million (Australian Bureau of Statistics 1987b). About 61 per cent of this total was exported from Tasmania, 22 per cent from New South Wales and 15 per cent from Western Australia. The geographical location of the Australian woodchip industry is illustrated in Figure 6.3.

Chipmills are generally located close to ports. For the most part wood is transported to the mills as logs, though some is received as chips, often as a by-product from nearby sawmills.

Logs are transported either by road or rail to the chipmills. There is some concern about the environmental impact of transporting logs by road through residential areas and about damage caused to the roads. The woodchip companies in Tasmania pay municipal and State road tolls. In some cases, they also make additional payments to councils to upgrade or maintain roads, or agree to do this on behalf of the councils. Tolls are also paid to the Forestry Commission for roads that are provided for the industry. In other cases, roads may be constructed and maintained by the companies involved. The Tasmanian Woodchip Export Study Group (1985) discusses the issue of road subsidies and concludes that the export woodchip industry appears to be subsidising Tasmania's road system. The woodchip companies have also contributed towards construction costs of rail facilities.



Source Prepared by BTCE.

Figure 6.3 Location map, Australian woodchip industry

Transport of woodchips by Australian National in Tasmania in 1985-86 was 700 000 tonnes.

Woodchips are transported direct from stockpiles at the mills to ships via conveyor belts, owned and operated by the woodchip companies.

Ownership of wharves varies. Harris-Daishowa Pty Ltd in Eden (NSW) owns and operates its own wharf. In Tasmania, two wharves used by woodchip companies are owned and operated by the port authorities; a third was built by Forest Resources Ltd under an arrangement with the Port of Launceston Authority whereby the Port Authority gains ownership in 1987.

Whether the wharf is privately owned or not, the woodchip companies pay wharfage to the port authorities, varying from about 50 cents per tonne to nearly $1.00 per tonne, in 1984-85. Industry sources have indicated that they see no major issues in the shore-based transport and handling of woodchips.

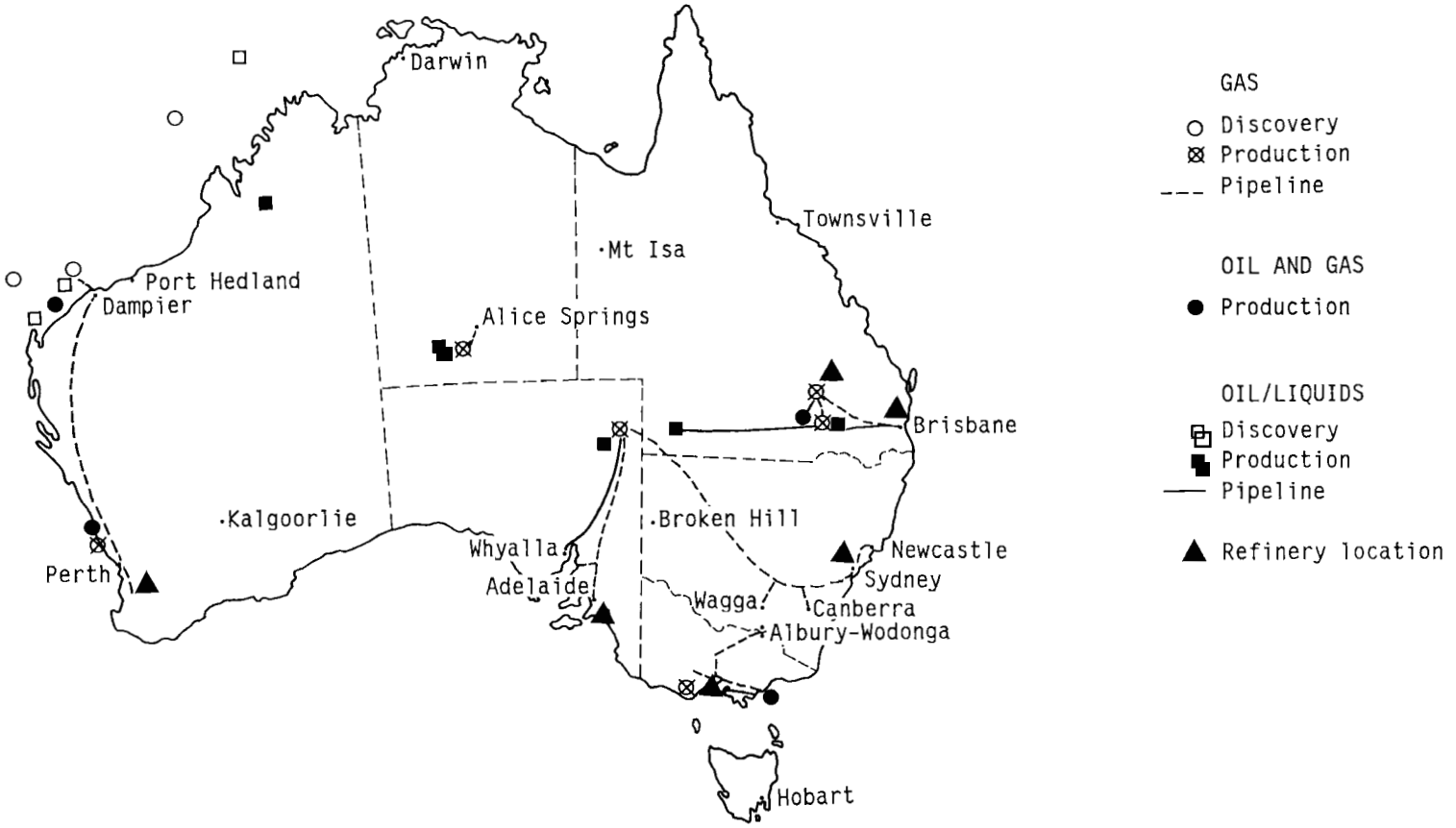
RAW SUGAR

Total Australian raw sugar production for 1986 was about 3.4 million tonnes. Exports in 1985-86 totalled 2.7 million tonnes worth $613 million (Australian Bureau of Statistics 1987b). Australia is among the largest exporters, with around a 9 per cent share of total world trade but only about 3 per cent of world consumption. Shore-based shipping costs in 1985-86 for raw sugar are estimated at $120 million.

Cane is grown in Queensland and northern New South Wales, generally within 50 kilometres of the coast. Raw sugar is exported from the ports of Bundaberg, Mackay, Townsville, Lucinda, Mourilyan and Cairns. Figure 6.4 shows the sources of Australian raw sugar.

Sugar cane is harvested between June and December each year. It is then transported mostly by rail to the mills for crushing to extract raw sugar. About 7 tonnes of cane are required to produce 1 tonne of sugar. The raw sugar is transported either by road or rail from the mills to the bulk terminal where it is stored before loading onto ships for export.

Transport from the farms to rail sidings or truck pick-up points is by a variety of machinery, ranging from tractor and trailer equipment to highly specialised vehicles. In the Mackay region, costs for such transport averaged around $2 per tonne of cane, or around $14 per tonne of raw sugar equivalent in 1983-84 (Bureau of Agricultural Economics 1986).



Source Bureau of Mineral Resources (1987).

Figure 7.1 Location map, Australian petroleum industry

Transport to the mills is generally along narrow gauge railways (tramways) owned and operated by the sugar mills, although New South Wales and some Queensland cane from more remote areas is hauled by road. It is not generally economically feasible to transport cane over long distances since the sugar content of the cane falls rapidly after harvest. Most cane is crushed within 16 hours of harvesting.

The mills are required by law to accept and process a specified amount of cane delivered from specified growers. The growers in turn may only deliver to their designated mill. As a result, some cane is transported over longer distances or by more expensive methods than would otherwise occur. It has been estimated that cane transport costs in the Mackay region could be reduced by 10 per cent by removal of these constraints (Bureau of Agricultural Economics 1986).

Further, the mills incur the costs of transporting the cane to the mill, and yet the mills are required to pay a set minimum price for the cane that does not depend on the transport cost from the particular farm. Hence, growers' decisions about where to grow cane do not reflect transport costs, and results in inefficient land use.

In the Mackay region in 1983-84, costs of transporting cane from sidings to the mills averaged around $1.20 per tonne of cane, or around $8.70 per tonne of raw sugar equivalent. Costs of transporting sugar from mills to the shipping terminal averaged $3.50 per tonne while storage, loading and port costs averaged a further $12.60 per tonne in 1983-84 (Bureau of Agricultural Economics 1986).

CHAPTER 7 BULK IMPORTS

While exports form the largest part of Australia's bulk trade, bulk imports are by no means insignificant. Bulk imports represented 26 per cent by value of Australia's overseas bulk trade in 1985-86 but only represented 6 per cent by weight. This reflects the higher unit value of bulk imports. The bulk import trade largely comprises petroleum products, with manufactured products such as fertilisers and chemicals of relatively high value per tonne forming the remainder. Table 7.1 shows the amounts of the major bulk commodities imported in the years 1981-82 to 1985-86. The general trend is that bulk imports are decreasing, though there was some increase in imports of the major commodities from 1983-84 to 1984-85. The 1985-86 values of each of the major bulk imports is given in Table 2.3.

Petroleum products, which include crude oil as well as refined petroleum, account for almost two-thirds of Australia's bulk imports. The major dry bulk imports are crude fertilisers such as phosphate and sulphur for use in agriculture and limestone and cement, used in the

TABLE 7.1 MAJOR BULK IMPORTS TO AUSTRALIA, 1981-82 TO 1985-86
('000 tonnes)

	Year				
Commodity	*1981-82*	*1982-83*	*1983-84*	*1984-85*	*1985-86*
Petroleum products	12 736	11 546	9 066	9 288	7 719
Crude fertilisers	2 624	2 315	1 920	2 119	1 922
Limestone and cement	1 186	900	931	1 165	1 157
Other	2 610	3 020	4 223	2 999	2 743
Total	19 156	17 781	16 140	15 571	13 541

Sources Australian Bureau of Statistics (1982, 1986, 1987a and 1987c). Federal Department of Transport (1987).

building industry. A brief description of the shore-based activities relating to handling of petroleum products, and crude fertilisers follows.

PETROLEUM PRODUCTS

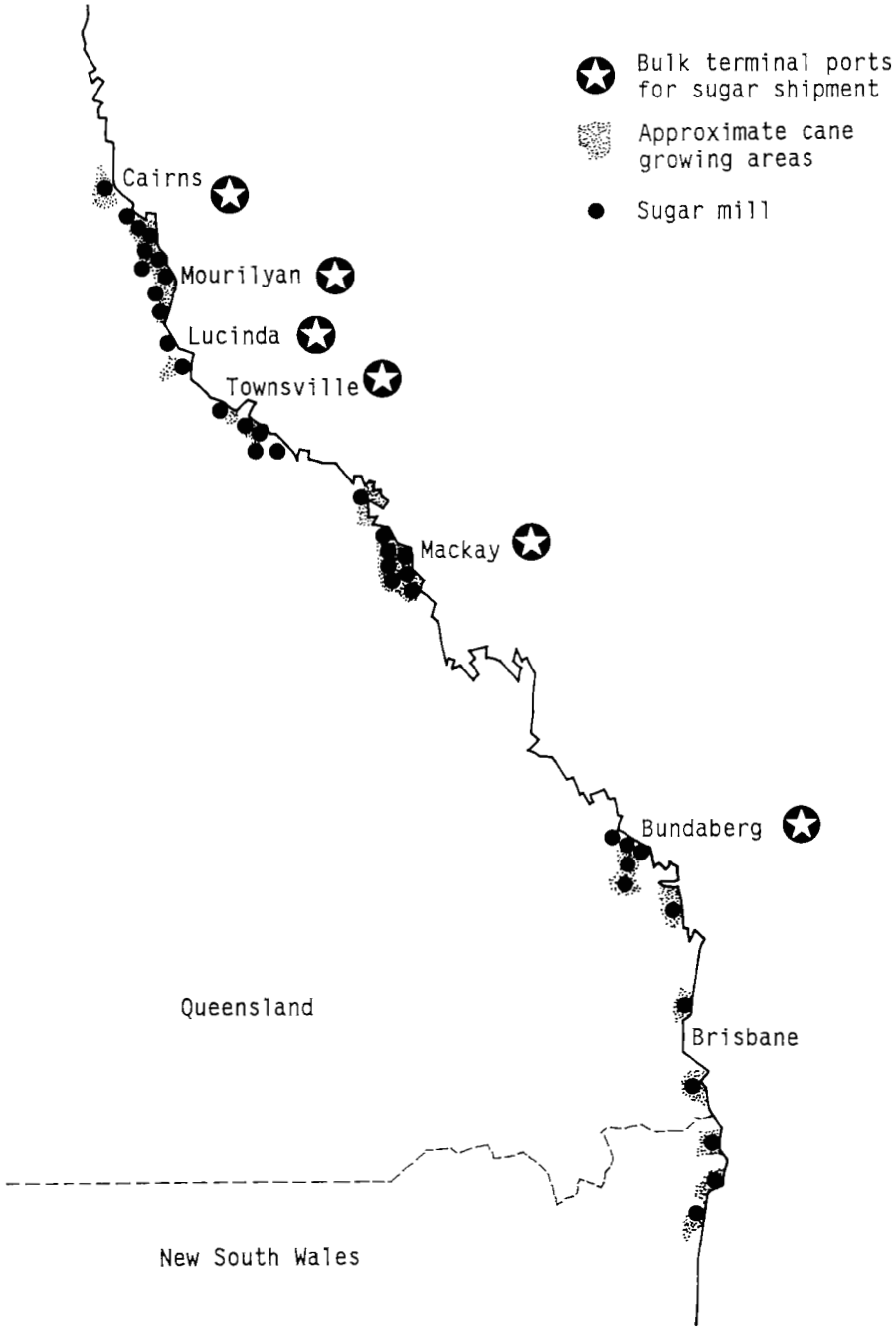
Crude oil and refined petroleum form the major part of Australia's bulk import trade. Much the same facilities are used for both imports and exports. Oil refineries are generally located close to the ports and transport between the port and the refinery is by pipeline. Figure 7.1 shows the location of oil refineries, pipelines and major ports used by the oil industry. Almost all product handling equipment is owned and operated by the oil companies, including pipelines, loading arms and fire fighting equipment. Operation of this equipment is part of the overall operation of the refinery, and separate costs are not published.

Costs involved at the port include loading and unloading costs, wharfage and charges to the ship such as port dues, tugs, pilots and mooring charges. The BP Marine International Bunker Schedule lists charges of around $5.50 per tonne to load bunker fuel in 1986 for Australian ports in areas where petroleum is imported and exported. It is estimated that the cost to load and unload petroleum exports and imports would be similar. Some members of the industry consider that port costs are unjustifiably high, in view of the fact that the industry provides virtually all of its own facilities. One industry source indicated wharfage costs of around $0.90 per tonne and port dues of around $1.20 per tonne. Industry sources also claim that there is little consultation between port authorities and the industry on the standard of services provided or on the level of charges.

CRUDE FERTILISERS

The Australian Phosphate Corporation Ltd (APCL) imports about 90 per cent of all fertiliser material imported to Australia in bulk. This company was established by the fertiliser industry in 1981 to purchase and distribute phosphate rock on behalf of the industry. While phosphate rock makes up about 70 per cent of APCL's imports, the company also purchases dry bulk sulphur and other materials on behalf of individual manufacturers as required.

The ports utilised by APCL are mostly ports whose major business stems from grain exports and fertiliser imports, with fertiliser materials often being imported in ships carrying grain out of Australia. For this reason many issues effecting grain exports also concern the fertiliser industry, particularly harbour facilities and port charges.



Source Bureau of Agricultural Economics (1986).

Figure 6.4 Location map, Australian raw sugar industry.

There is concern that port costs are continuing to increase with no corresponding improvement in services or facilities.

Costs of transferring bulk fertiliser materials on-shore from ship are between $8 and $10 per tonne, including wharfage (Australian Phosphate Corporation Ltd, pers. comm.). The on-shore transport task itself is generally very small. These materials are destined for factories situated close to the ports, for manufacture of the finished fertiliser product. Of the ports used by APCL, half are one kilometre or less from the factories. The rest are four to twelve kilometres distant. Transport from wharf to factory is largely by road, though conveyor systems are used in three cases where the distance is 500 metres or less. Rail transport is used in one case, over a distance of 1 kilometre. Road transport is generally by wharf hopper, in most cases provided by the fertiliser manufacturer (Australian Phosphate Corporation Ltd, pers. comm.).

Fertiliser produced at these factories is largely used by the grain industry, and it is distributed via the rail system used for transporting grain to the ports. While the volumes of grain being produced and exported are increasing, the volume of fertilisers used is, if anything, decreasing, as more concentrated fertilisers are produced. This difference in scale causes difficulties in organising the transport and storage system used for the two commodities.

CHAPTER 8 TOTAL SHORE-BASED SHIPPING COSTS

Shore-based shipping costs vary among the bulk commodities and in many cases among States and companies. The extent of government regulation and use of government operated infrastructure has a large impact on costs. Infrastructure plays an important role in the shore-based shipping task. Where new infrastructure is required, the companies involved often make significant contributions to the establishment of this infrastructure.

Land transport costs were the largest component of shore-based shipping costs accounting for 63 per cent of these costs for bulk exports in 1985-86. Storage, handling and loading accounted for 27 per cent, and port and related costs about 10 per cent of total shore-based shipping costs.

The majority of the land transport task is performed by rail. Costs per tonne-kilometre to rail coal and wheat on government operated railways were around 7 cents and 5 cents per tonne-kilometre respectively. In comparison, iron ore moved on private railways cost around 1 cent per tonne-kilometre.

Storage and handling costs are high for grains, at an average cost of $15.40 per tonne in 1985-86. This is due to special storage requirements and the need to keep grain free from insect infestation. Coal stockpiles require large amounts of land close to the port where land is often expensive. The average cost of stockpiling and loading coal in New South Wales was $4.86 per tonne in 1985-86, and is believed to be substantially lower at privately operated facilities in Queensland. Costs of storage and loading for iron ore are believed to have averaged around $0.50 per tonne.

Port costs vary greatly among the States, and among ports within a State. Costs ranged from about $0.20 per tonne for iron ore in Western Australia to $3.36 per tonne for coal at Dalrymple Bay in Queensland where an additional charge is made to pay for new facilities.

The ability of Australian ports to handle very large bulk vessels is a major issue due to the large economies of scale which are achievable in shipping costs. This issue is particularly relevant to wheat where ships are only part loaded in some ports, and must complete loading at deeper water ports. Vessel loading rates are also of importance in minimising vessel costs.

However, port improvements are very expensive. The cost of improvements varies greatly among ports, and hence investment analyses need to be made separately for each port concerned. The distribution of benefits also needs to be considered. For example, two-port loading of grain occurs primarily in South Australia where shore-based shipping costs of grain are the lowest in Australia.

Table 8.1 gives estimates of total shore-based shipping costs for each of the major commodities. The average cost per tonne of wheat and other grains is very high, although the cost as a percentage of the fob value is only slightly higher than that for coal.

Shore-based shipping costs for other bulk commodities are difficult to obtain in many cases. However, it is estimated that these costs would bring total shore-based shipping costs in 1985-86 for bulk exports to within the vicinity of $A3000 million (see Appendix I). This

TABLE 8.1 ESTIMATES OF TOTAL SHORE-BASED SHIPPING COSTS FOR THE MAJOR BULK EXPORTS, 1985-86

($ million)

Cost	*Coal*	*Wheat and other grains*	*Iron ore*
Land transport	930	530	280
Storage, handling and loading	260	360	40
Port and related	150	50	20
Total	1 330	940	340
Average cost per tonne ($)	15	44	4
Proportion of fob value (%)	25	26	17

Note Figures may not add to totals due to rounding.

Source BTCE estimates.

represented about $13 per tonne, or about 18 per cent of the fob value.[1] Hence these costs are a significant factor in Australia's ability to compete in international bulk commodity markets. For example, a 20 per cent change in shore-based shipping costs would represent just under 4 per cent of the fob value of Australia's bulk exports.

Two possible results of an increase in shore-based shipping costs are that they are either passed on to the consumer through higher prices, or passed back to the producer through lower returns. In the case of bulk exports, intense international competition results in high sensitivity to price, especially over time as established contracts expire and are renegotiated. Thus other nations with potential sources of supply may be in a position to expand their own exports if Australia's prices are set too high.

Total shore-based shipping costs in 1985-86 for bulk imports were estimated at approximately $A120 million, representing just over 2 per cent of the fob value. This reflects the much higher unit value of those bulk goods which are imported and the small size of the shore-based task involved. A 20 per cent increase in shore-based shipping costs would represent less than half a per cent of the fob value of Australia's bulk imports, and would have little affect on the quantity of bulk goods imported.

These estimates are based on direct costs. Indirect costs can be difficult to quantify, but can also have a significant impact on foreign trade. Overseas markets can be lost due to poor or unreliable service quality in the transport chain. Transport costs are also increased by demurrage and penalty storage charges, and by delays in the turn-around time of ships.

---

1. For comparative purposes, total shore-based costs in 1984-85 for non-bulk exports were estimated to be approximately $730 million representing some 6.5 per cent of the value of non-bulk exports (BTE 1986).

APPENDIX I SHORE-BASED SHIPPING COSTS FOR BULK EXPORTS, 1985-86: EXPLANATORY NOTES

COAL

Land transport

New South Wales
Average revenue received by the State Rail Authority per tonne of coal railed (SRA 1986) multiplied by the number of tonnes of coal exported from NSW (Joint Coal Board, 1986).

= 8.60 ($/tonne) x 39.1 (million tonne)
= $336 million.

Queensland
Average charge per tonne of coal railed (derived from pers. comm. with Queensland Coal Association) multiplied by the number of tonnes of coal exported from Queensland (Joint Coal Board, 1986)

= 11.60 ($/tonne) x 50.8 (million tonnes)
= $589 million.

Total Australia
Land transport costs for coal from the two exporting States of New South Wales and Queensland amount to $925 million.

Storage, handling and loading

New South Wales
Maritime Services Board stockpiling and loading charge per tonne of coal for each port (Australian Coal Report, 1986) multiplied by the number of tonnes of coal exported from each port (Joint Coal Board, 1986), provides the estimates for the storage, handling and loading costs as shown in Table I.1. In total these amount to $190 million for New South Wales.

TABLE I.1 ESTIMATED COST FOR THE STORAGE, HANDLING AND LOADING OF EXPORT COAL IN NEW SOUTH WALES, 1985-86

Port	*Charge ($/tonne)*	*Quantity ('000 tonnes)*	*Cost ($ million)*
Sydney (Balmain)	3.81	4 773	18
Newcastle	4.98	26 210	131
Port Kembla	5.08	8 104	41
Total	na	39 087	190

na Not applicable.

Source Australian Coal Report (1986), Joint Coal Board (1986).

Queensland
Average charge per tonne of coal (estimated to be slightly less than the average Gladstone Harbour Board charge of $1.50 per tonne - refer page 14) multiplied by the number of tonnes of coal exported from Queensland

= 1.40 ($/tonne) x 50.8 (million tonnes)
= $71 million.

Total Australia
Storage, handling and loading charges total $261 million.

Port costs

New South Wales
Average charge per tonne of coal (derived from data presented in National Bulk Commodities Group, 1987) multiplied by the number of tonnes of coal exported from New South Wales (Joint Coal Board, 1986)

= 1.19 ($/tonne) x 39.1 (million tonnes)
= $47 million.

Queensland
Average charge per tonne of coal (derived from data presented in National Bulk Commodities Group, 1987) multiplied by the number of tonnes of coal exported from Queensland (Joint Coal Board, 1986)

= 1.96 ($/tonne) x 50.8 (million tonnes)
= $100 million.

Total Australia
Port charges for coal exports total $147 million.

Summary

Total shore-based shipping cost for Australia's export coal
= 925 + 261 + 147
= $1333 million.

WHEAT AND OTHER GRAINS

Wheat

For each State, total shore-based shipping costs = Total cost per tonne of wheat (as presented in Table 5.2) multiplied by the number of tonnes of wheat exported from that State (Federal Department of Transport, 1987). These total $699 million for Australia.

Other grains

Assume similar charges as for wheat (refer Table 5.2) except for storage and handling charges for barley and oats as presented in Table 5.3.

Therefore, using the same method of calculation as used for wheat, total Australian shore-based shipping costs for other grains amount to $242 million.

Summary

Total shore-based shipping costs for Australia's export wheat and other grains
= 699 + 242
= $941 million.

IRON ORE

As previously stated, data on shore-based shipping costs relating to the iron ore industry are difficult to obtain. Estimates based on limited information were:

Land transport	$3.20 per tonne
Storage and shiploading	$0.50 per tonne
Port costs	$0.20 per tonne

Total exports in 1985-86 were 85.9 million tonnes (ABS 1987b).

Therefore, total shore-based shipping costs for Australia's export iron ore amount to $340 million, on this basis.

OTHER EXPORTS

Shore-based shipping costs for other bulk exports (such as petroleum, alumina, woodchips and so on) are difficult to obtain in many cases. Estimates based on limited commercially sensitive data suggest that total shore-based shipping costs for other bulk exports (some 30 million tonnes) would be in the vicinity of $400 million.

REFERENCES

Abbreviations

AGPS Australian Government Publishing Service
BTE Bureau of Transport Economics

Association of Iron Ore Exporting Countries (APES) (1986), *Iron Ore Statistics,* no. 1, Geneva, Switzerland.

Australian Bureau of Statistics (1982), *Shipping and Cargo, Australia,* June Quarter 1982, and earlier issues, Cat. No. 9211.0, AGPS, Canberra.

__ (1986), *Foreign Trade Australia, Part 1: Exports and Imports, 1984-85,* and earlier issues, Cat. No. 5409.0, AGPS, Canberra.

__ (1987a), *Shipping and Air Cargo Commodity Statistics, Australia,* September Quarter 1986, and earlier issues, Cat. No. 9206.0, AGPS, Canberra.

__ (1987b), *Foreign Trade Australia, Exports, 1985-86,* Cat. No. 5436.0, AGPS, Canberra.

__ (1987c), unpublished computer print out on Trade Access (TRACC) data.

Australian Chamber of Shipping (1987), *The Ports of Australia,* 11th edn, January 1987.

Australian Coal Report (1986), March, 8: no.3.

Australian Financial Review (1986), Port Hedland's $87m Facelift Near Completion, 24 March 1986.

__ (1987), SRA Invested $1bn in Coal Industry, 7 September 1987.

Australian Wheat Board (1986), *Annual Report 1985-86.*

Balderstone (1986), New Directions, Opening Session Keynote Address, *Papers Presented to the 1986 Australian Coal Conference,* Surfers

Paradise, 21 to 24 April 1986, Book 2, pp1-10.

Bulk Systems International (1983), *Idle Times Ahead for Coal Terminals?,* April 1983, 23.

Bureau of Agricultural and Resource Economics (1987), *Crop Report*, No. 44, 29 September.

Bureau of Agricultural Economics (1986), *Efficiency of Transport, Milling and Handling in the Sugar Industry,* Occasional Paper 96, AGPS, Canberra.

Bureau of Mineral Resources (1987), *Australian Mineral Industry Annual Review for 1984,* AGPS, Canberra.

Business Review Weekly, (1985), Coal Rail Freights Under Fire in NSW, 12 April, 85.

BTE (1981), Outlook Series, *Transport Implications of Australian Resource Development,* Transport Outlook Conference 1981, AGPS, Canberra.

__ (1984), Background Paper on International Freight Transport, Canberra, 8-9 May 1984, Reference Paper 78, 62.

__ (1986), *Shore-based Shipping Costs, Non-bulk Cargo,* Occasional Paper 80, AGPS, Canberra.

__ (1987a), *Competition and Regulation in Grain Transport, Submission to Royal Commission, May 1987,* Occasional Paper 82, AGPS, Canberra.

__ (1987b), *Transport of Australia's Minerals,* Information Paper 20, AGPS, Canberra.

Cooperative Bulk Handling (Western Australia) (1987), *Annual Report.*

Department of Employment and Industrial Relations (1986a), Industrial Relations in the Coal Industry Export Trade, Review and Evaluation Branch, Research Paper no. 2, May 1986.

__ (1986b), Industrial Relations in the Grain Industry Export Trade, Review and Evaluation Branch, Research Paper no. 3, June 1986.

Department of Resources and Energy (1986), *Iron Ore,* Mineral Resource Development Series, AGPS, Canberra.

Engineers Australia (1985), Project May Make $400m a Year, 5 April 1985, 42.

Federal Department of Transport (1987), *Port Authority Cargo Movements 1985-86*, and earlier years, AGPS, Canberra.

Galligan, B. (1987), Queensland Railways and Export Coal, *Australian Journal of Public Administration,* 46, no. 1:77-101.

Grain Elevators Board (Victoria) (1986), *Report for the year ended 30 September 1986.*

Grain Handling Authority of New South Wales (1987), *Annual Report* 1985-86.

Hill (1986), Rail - The Vital Link Between Mine and Port, *Papers Presented to the 1986 Australian Coal Conference,* Surfers Paradise, 21 to 24 April 1986, Book 1, 93-100.

International Energy Agency (1986), *Coal Information 1986*, Publications Service, OECD, Paris.

Joint Coal Board (1986), *Black Coal in Australia 1985-86,* December 1986, and previous issues, Sydney.

National Bulk Commodities Group (1987), Port Cost Survey, 2nd edn, Melbourne.

National Energy Advisory Committee (1984), *Transportation of Export Coal, June 1983*, AGPS, Canberra.

New South Wales Grain Handling Inquiry (1981), *Final Report of the New South Wales Grain Handling Inquiry,* Sydney.

Queensland Coal Board (1986), *35th Annual Report 1985-86*, December 1986, and previous issues, Brisbane.

Royal Commission into Grain Storage, Handling and Transport (1986), *Issues for the Royal Commission's Inquiry*, Discussion Paper No. 1, as amended at 4 June 1987, Canberra Times Print.

South Australian Co-operative Bulk Handling (1986), *32nd Annual Report,* and previous issues.

State Rail Authority of NSW (1986), *6th Annual Report, Year ended 30 June 1986.*

Stones (1986), Issues in Marine Transport Consumer Viewpoint, *Papers Presented to the 1986 Australian Coal Conference,* Surfers Paradise, 21 to 24 April 1986, Book 1, 69-78.

Tasmanian Woodchip Export Study Group (1985), *Supplement to the Draft Environmental Impact Statement on Tasmanian Woodchip Exports Beyond 1988,* Tasmanian Government Printer, Hobart.

ABBREVIATONS

APCL	Australian Phosphate Corporation Ltd
AWB	Australian Wheat Board
dwt	deadweight tonne
fob	Free on board
HVCCC	Hunter Valley Coal Chain Council
km	kilometres
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
SA	South Australia
Vic	Victoria
WA	Western Australia