Australian Government

key economic issues facing marine based industries in the SOUTH EAST MARINE REGION

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contents

Summary 1
Oceans policy 1
Economic importance of the region's marine based industries 1
Strategic directions of the region's industries 3
Market pressures for particular industries 4
Conclusions 10
Information needs 11

1 Introduction 13
Background and project rationale 13
South East Marine Region 14
Industry groups 15

2 Economic contribution of marine based industries in the South East Marine Region 18
Aquaculture and commercial fishing 18
Recreational fishing 19
Offshore minerals and petroleum 20
Seabed energy and communications infrastructure 21
Marine based tourism 22
Marine related manufacturing industries 22
Ports and shipping 23

3 Macroeconomic and institutional industry drivers 25
World economic drivers 25
Australian economic drivers 27

4 Marine based industries of the South East Marine Region 33
Fisheries resource based industries 33
• Aquaculture and commercial fishing 33
• Recreational fishing 39

Seabed mining industries 42
• Offshore minerals 42
• Offshore oil and gas 46

Seabed energy and communications infrastructure 52
• Natural gas pipeline 52
• Electricity transmission lines 55
• Submarine commission cables 56
• Marine based tourism 58

Marine related manufacturing industries 63
• Ship/boat building industries 63
• Biotechnology/bioprospecting 67
• Waste disposal 71

Marine transport industries 73
• Ports – strategic directions 77

references 82

figures

A World economic growth 25
B Growth in world output and merchandise trade 26
C Australian dollar exchange rate 28
D Projected population of south east Australia 29
E World fisheries production and trade 33
F Australian fisheries production 35
G Participation rates in recreational fishing 39
H Crude oil prices 46
I Australian production of crude oil, by basin 49
J Production and trade in crude oil and other refinery feedstocks 49
K World commercial ship production 63

summary table

Key potential information needs 12

tables

1 Industry gross value added, Australia 15
2 Gross value of fisheries production – South East Marine Region, 2002-03 18
3 Aquaculture production, by species – South East Marine Region, 2002-03 18
4 Recreational fishing effort 20
5 Annual fishing effort for selected states 20
6 Gippsland Basin share of Australian production of primary petroleum, 2002-03 21
7 Australian sea freight, 2000-01 24
8 The aging of Australia's population 28
9 Action agenda status 31
10 Type of fishing, by region, in Victoria 41
11 Reserves of selected minerals (onshore) 45
12 Australian production of primary petroleum, by basin 48
13 New and potential oil and gas projects in the South East Marine Region 50
14 Tourism numbers: Victoria's coastal regions 61
15 Naval ship building and repair work currently/ previously undertaken at infrastructure location 65
16 Seaborne trade loadings, by type of cargo 74

17 Australia's share of world seaborne international trade, by volume 75
18 Annual change in world trade and economic output 76
19 Import cargo throughput in major South East Region ports 79
20 Export cargo throughput in major South East Region ports 80

summary

Oceans policy

Australia's Oceans Policy (Commonwealth of Australia 1998, p. 12) states that for each marine region it will be necessary to:

> *Understand the current uses of [ocean] resources and the emerging pressures on them.*

This report focuses on economic pressures in the South East Marine Region and their causes, and indicates areas where further work may be needed.

Economic importance of the region's marine based industries

In terms of industry value added the South East Marine Region's largest two marine based industries are marine based tourism and offshore oil and gas. These two industries together account for around four-fifths of the region's industry value added, while the remaining fifth is accounted for mainly by aquaculture and commercial fishing, ports, ship building, and shipping activities.

Marine tourism is an important component of tourism in the region generally, with international visitor numbers to Victoria and Tasmania and to the coastal regions of those states having grown in recent years.

The South East Marine Region's Gippsland Basin is a major source of offshore oil and gas, accounting for 26 per cent of Australia's crude oil, 10 per cent of its condensate, 43 per cent of its LPG (liquefied petroleum gas), and 19 per cent of its production of natural gas and naturally occurring ethane in 2002-03.

Although marine areas are potentially prospective for metallic minerals, there is currently little offshore exploration for metallic minerals either in the region or in Australia generally.

The gross value of fisheries production in the region is estimated to have been $531 million in 2002-03. Aquaculture contributed around a quarter of this, state wild catch fisheries 60 per cent, and Commonwealth fisheries 15 per cent. Regional fisheries production represented around 23 per cent of Australian fisheries' gross value of production (GVP) and 20 per cent of aquaculture GVP. The region also accounted for an estimated 4–5 per cent of national recreational fishing effort in marine areas.

The region's ports include Portland, Geelong, Melbourne and Hastings in Victoria, Port Latta, Burnie, Devonport, Bell Bay, Spring Bay and Hobart in Tasmania, and Eden in New South Wales. Melbourne and Geelong are the major ports in terms of tonnage handled.

The region's larger shipyards build large aluminium wave-piercing catamarans, warships, and medium sized aluminium catamarans for commercial fishing, ferries and motor yachts.

Shipping activity in the region is significant. A large percentage (around a third, by value) of international sea freight enters Australia through Victoria, and 17 per cent leaves from Victoria. Some of this represents transhipments from Tasmania. Together, Victoria and Tasmania account for about a quarter of Australia's coastal trade turnover. Including Bass Strait transits, an estimated 40 per cent of Australia's domestic coastal trade travels to, from or through the South East Marine Region.

Tasmania is now linked to the mainland's natural gas grid via the Tasmanian Gas Pipeline across Bass Strait. The Basslink electricity transmission interconnector now being laid across Bass Strait will also link Tasmania to the mainland electricity grid and the national electricity market. There is presently one domestic communications cable across Bass Strait and two further cables are in prospect, one as part of Basslink.

Biotechnology is a prospective new industry in the region, with sampling and biological collection sites throughout the region. Potential marine disposal of materials in the region is now mainly limited to the disposal of uncontaminated dredge spoil.

Strategic directions of the region's industries

Broad macroeconomic pressures

The main economic pressures being faced by the region's marine based industries include both broad macroeconomic pressures, and specific market pressures for particular industries. Broad macroeconomic pressures include changes in world economic growth, trade and energy prices, and at a national level, changes in Australia's economic growth, exchange rates, population and government policies.

For the world as a whole, average economic growth is projected by the International Monetary Fund to continue at its underlying trend rate of around 3.5 per cent a year to 2010. Continued growth in the world economy will influence the industries of Australia's South East Marine Region both through its effect on the Australian economy generally and through supply and demand developments in world markets for crude oil and petroleum products, fisheries products, shipping and tourism. The volume of world trade in goods and services is also projected to continue to grow at around underlying historical rates to 2010, which is likely to influence the volume of shipping in the region and the demand for port services.

In the next thirty years, world energy use and trade is expected to continue to increase, with imports of oil and gas by the major consuming regions projected to grow substantially. Australia's own consumption of energy in the form of coal, oil, natural gas and renewables is also projected to increase substantially. These developments are likely to influence the region's industries in a number of ways, including through the volume of crude oil and petroleum products shipped to and from the region, exploration for and development of the region's oil and gas resources, and the further integration of Australia's eastern seaboard electricity and gas markets.

The rate of growth in the Australian economy will influence domestic demand for the region's goods and services, including fisheries products, energy, port services and tourism services, while movements in the Australian exchange rate will affect the balance between international and domestic levels of demand for the region's goods.

In coming decades, the continued growth and aging of Australia's population will influence the region's economy in a number of ways

— for example, through the increasing number of retirees likely to be attracted to coastal areas, and through the increasing numbers of potential consumers for domestic tourism services.

Finally, in recent years, there has been increasing recognition of the need to manage the oceans as a whole and to establish integrated mechanisms for managing the marine environment. However, in the short term, management changes as a result of integrated oceans management may increase the compliance costs associated with management.

Market pressures for particular industries

Aquaculture and commercial fishing

Fish is a widely traded product, and the prospects for Australia's aquaculture and commercial fishing industries will be affected by developments in both the world and domestic markets. The global wild catch has reached a plateau, and aquaculture is increasingly seen as the major engine of future production growth. Global consumption of fish continues to increase, with most of the growth occurring in developing countries. There has been a trend toward eco-labeling of fish products, with the aim of maintaining the productivity and economic value of fisheries, while providing incentives for improved fisheries management and the conservation of marine diversity.

Australia's own wild catch is essentially static, with many of Australia's wild stocks considered either fully fished or overfished. However, aquaculture production is expected to continue to increase. Domestic consumption of seafood is expected to continue to grow, reflecting rising consumer incomes and the increased availability of competitively priced fish products. Pressure on domestic products from low priced imported seafood is likely to continue.

Many of the South East Marine Region's wild fisheries are producing at or near their maximum biological limits. Any future increase in fisheries production is likely to come from the aquaculture production of marine finfish, edible oysters, mussels and abalone.

Recreational fishing

There is little or no consistent time series information on recreational fishing, and little data on which to assess trends. The most detailed

recent study on recreational fishing in Australia is the *National Recreational and Indigenous Fishing Survey*, which reported a national participation rate of 19.5 per cent in recreational fishing. The demand for access to fish stocks generally for recreational fishing in the region's coastal and marine areas is expected to increase in the future, based on increasing population, and growth in international and domestic tourism. However, the increasing attractiveness and availability of substitutes for recreational fishing may lead to falls in participation rates in particular demographic groups. In addition, there appears to be an emerging trend to increased use of offshore areas for recreational fishing.

Offshore minerals

A number of mineral commodities have the potential to occur as economically viable offshore deposits, including construction minerals, placer minerals, manganese nodules, phosphorites, and offshore extensions of onshore mineralisation. Most interest to date for construction minerals (marine sand and aggregate) has been focused in areas outside the region (near Sydney, and in southern Queensland).

Most offshore exploration activity for metallic minerals has concentrated on potentially prospective offshore extensions of known onshore resource concentrations. Between 1990 and 2001 there were 65 applications for offshore Mineral Exploration Licences in Commonwealth waters around Australia. However, at the end of 2001 only one of these was active (T-2-MEL in Ringarooma Bay in north east Tasmania). The low level of offshore mineral exploration and development activity can be attributed to various factors, including Australia's high level of relatively accessible and proven onshore mineral reserves, a long term underlying downward trend in minerals prices, and the perceived increased cost and risk associated with offshore minerals exploration and development.

Offshore oil and gas

While the world's onshore reserves of metallic minerals and energy minerals such as coal are abundant, this is not necessarily the case with oil and gas, and economic pressures for the offshore exploration and development of oil and gas are likely to continue and intensify. World oil and gas consumption is expected to grow strongly through the current decade, reflecting strong growth in demand for oil for transport in rapidly growing large economies such as China and for gas for electricity generation worldwide.

While Australia's production of crude oil and condensate peaked in 2000-01 at 38.7 billion litres, production of natural gas is continuing to increase strongly. With the development of several new projects in northern Australia, the longer term decline in Australian crude oil production is expected to be temporarily reversed in the next few years. New natural gas developments in northern Australia will significantly increase the quantities of natural gas available for export as liquefied natural gas (LNG).

Production of crude oil and condensate from the Gippsland Basin, the first major offshore area to be developed and for many years the largest producer, is now declining; and since 1983-84, production has shifted toward a larger number of relatively smaller oil fields in the north west of Australia. However, natural gas production from the Gippsland and Otway Basins could increase in the medium term.

Seabed natural gas pipelines

With the exception of the Gippsland Basin, Australia's current main natural gas supplying basins are situated well away from the main consumption areas in Australia's south east. The south east is connected by natural gas transmission pipeline to the Cooper/Eromanga Basin in South Australia/Queensland but not to the major producing areas of Australia's north and north west. In the most recent decade, significant quantities of new gas transmission and gas distribution pipelines have been constructed, mainly in the south east. As the infrastructure has been provided to supply natural gas to new consumers, domestic consumption of natural gas has risen. Since 1998, the use of natural gas in gas fired electricity generation has also resumed its upward trend.

Future extensions to the current transmission pipeline network may involve new infrastructure to accommodate increased supplies of coal seam methane gas from Queensland and New South Wales, and possibly new pipelines to supply northern gas from the Timor Sea or Papua New Guinea.

Tasmania is now connected to the mainland natural gas grid via the Tasmanian natural gas pipeline across Bass Strait. The completion of the Tasmanian natural gas pipeline has allowed work to begin on a new major natural gas distribution network in Tasmania, as well as the conversion of the Bell Bay Power Station in Tasmania to natural gas.

Seabed electricity and communications cables

Australia's south eastern electricity regions are now linked and operate as a national electricity market. Although Tasmania is not presently part of this market, this will change once Basslink is completed.

Reflecting strong consumer demand for telecommunications services, capital expenditure on communications infrastructure has risen in recent years. In the next few years the current submarine communications cable across Bass Strait will be augmented by two more, one being laid as part of Basslink.

Marine based tourism

Globally, tourist numbers are expected to continue to grow. The proportion represented by long haul travelers (currently about a fifth) is also expected to grow. While Australia currently attracts less than 1 per cent of the world's international tourists, the natural environment is seen as a major drawcard for future tourism. Ocean and coastal tourism accounts for an estimated 19 per cent of the economic activity generated by international tourism in Australia, and 90 per cent of that generated by domestic tourism.

The number of international tourists visiting Australia rose during the 1990s but has fallen more recently. However, if confidence in international travel is restored, international tourist arrivals to Australia could increase by more than 50 per cent in the next decade. Regional dispersal of international tourism could also increase.

Victoria and Tasmania have experienced some increase in international visitor numbers in recent years. Both states are encouraging tourists to visit regional (including marine and coastal) areas.

The apparent level of domestic travel has increased only modestly in recent years, and outbound travel is expected to remain an important substitute for domestic travelers.

Ship/boat building

For many years the world ship building industry has experienced prolonged periods of excess capacity. Within the container ship sector of the market there has also been a trend toward the construction of

more, and larger, container ships, as indicated by the steady growth in average TEU (twenty-foot equivalent units — a standard measure of container size) capacity since 1990.

In the mid-1990s the Australian commercial ship building industry almost completely ceased building large conventional steel vessels and turned to manufacturing fast ferries, motor yachts and catamarans for niche and export markets. The region includes several larger shipyards as well as smaller yards that produce and export a variety of fibre-glass and aluminium or alloy recreational boats. Continued world and Australian economic growth is expected to boost export demand for these types of ships, but a stronger Australian dollar may put pressure on producer returns in the short term.

Defence related ship production for the Australian Government is also significant, and the region includes one large naval ship building facility, Tenix's Defence Marine Division's Williamstown dockyard in Victoria. Australia is emerging from a period of historically high naval ship building activity, and based on the Navy's future procurement plans, domestic demand for naval vessels is likely to be well below that of recent levels. This may increase pressure on the naval ship building industry for industry rationalisation.

Marine based biotechnology and bioprospecting

The oceans are the source of a large group of structurally unique natural compounds that are mainly accumulated in invertebrates such as sponges, tunicates, bryozoans and molluscs. Several of these compounds show pronounced pharmacological suitability and are candidates for new drugs, primarily in the area of cancer treatment. Other compounds are currently being developed as analgesics or to treat inflammation.

A serious obstacle to the development of marine based biotechnology products is that concentrations of many highly active compounds in marine invertebrates are often minute, and the wild harvesting of large quantities of invertebrates may be expensive and ecologically unsustainable. (However, there are examples from overseas where commercial harvesting is being successfully undertaken.) While mari-culture has been suggested as a means of producing a steady supply of sponges, tunicates and bryozoans for the extraction of compounds for product research, the yields of biomass likely to be required once the compound actually enters the drug market would still be large, and

alternative methods for sponge metabolite production such as industrial synthesis may be required.

Biotechnology in general has been identified by Australian federal and state governments as a priority area for development, and Australia's biotechnology industry has expanded rapidly in recent years. Biotechnology research and development is geographically clustered, primarily through the proximity of universities, hospitals and medical or agricultural research institutes with essential businesses and financial services, with the main concentrations in Melbourne, Sydney and Brisbane. Southern Australian waters have high species diversity, and the South East Marine Region is well placed as a collection point for marine species for assessment by researchers based in Melbourne, Hobart and elsewhere.

Ocean waste disposal

Ocean waste disposal, once a relatively common practice in Australia, is now highly regulated. The permits that are granted by the Department of Environment and Heritage are mainly for the disposal of uncontaminated dredge spoil, disposal of illegal vessels, and for burials at sea.

Ports and shipping

The globalisation of the world economy has increased world trade, and world seaborne cargo turnover has been increasing as a consequence. Containerisation of general cargoes has also been rising because of the advantages that this mode of transport offers. The continued growth of world trade, and development of transhipment nodes, is expected to further accelerate the growth in container trade and the volume of shipbourne cargo handled by Australia's ports is expected to rise significantly over the next decade.

Worldwide, the continuing trend toward globalisation of shipping and trade is putting increasing pressures on ports to reduce terminal cost, improve operational efficiency, and accommodate larger container vessels. The world's ports compete not only in terms of location and port services but also in terms of the availability of funds for further investment in new port infrastructure. This pressure for new investment is leading to the emergence of a small number of highly automated 'hub' ports capable of loading and unloading large container ships.

The total throughput of seaborne cargo at Australia's major ports has risen significantly in recent years and the Port of Melbourne is Australia's and the region's largest container port. Melbourne's capacity to handle projected ship sizes in the future is a concern, and the Port of Melbourne Corporation is currently studying a proposal to deepen the main commercial shipping channels in Port Phillip Bay to increase the maximum draught that these channels can accommodate. Around 30 per cent of ships using the commercial shipping channels to access the Port of Melbourne have a maximum draught that exceeds the current low tide draught level.

Conclusions

The economic pressures that are setting the strategic directions for the region's marine based industries raise a number of issues for marine planning in the region and for oceans policy generally. Broadly, continuing world and domestic economic growth is likely to increase export and domestic demand for many of the goods and services provided by the region, such as fisheries products, crude oil and petroleum products, ship building, sea transport of goods, port capacity, and tourism and recreation. Expansion of producer operations to supply these growing markets will increase pressures for access to the region's marine resources, which in term will place pressure on managers, planers and policy makers to ensure that the arrangements put in place to manage access are both economically efficient and consistent with sustainable use.

There are also a number of issues particular to specific industries. For example, for aquaculture and commercial fishing, the currently lower prices for seafood exports and increasing imports of lower priced seafood is likely to put pressure on domestic producer returns and thereby increase pressures on resource managers to allow greater access to fish stocks in the short term.

Continued growth in demand for tourism and recreational services is also likely to increase pressures for access to stocks by recreational fishers. Continued growth in demand for oil and gas will increase pressures for access to new offshore sites for exploration and development, while declining oil production from the Gippsland Basin may have implications for the region's economy. Continued growth in demand for seabed energy and communications infrastructure will have implications for other users of the marine resource, although such infrastructure by its nature involves a long easement rather than wide area access.

For sea transport of goods, continued growth in demand is likely to increase the volume of shipping in the region, although the use of larger container ships may result in fewer actual ship movements per tonne of cargo moved. However, the use of larger ships will create pressure in particular ports, such as Melbourne, for investment in new onshore facilities and channel access to accommodate larger vessels.

In addition, there are several issues that affect most industries operating within the region — for example, differing compliance standards, and uncertainty about access to resources. Multiple compliance requirements may slow development, increase the uncertainty of outcomes and raise the startup costs of businesses. Uncertainty about access may constrain investment by introducing additional uncertainty into long term business planning.

In addition, the lack of data on the economic contributions to Australia from the activities of our marine industries constrains the ability of both marine managers and users to fully understand:

- the aggregate contributions made by marine industries;
- the contributions made by individual marine industries;
- the relative contributions made by marine industries at the state and regional level; and
- the contributions made by industries that depend on marine related industrial activity.

Information needs

Further work may be needed to understand these issues at the individual and aggregate industry level and to suggest approaches for collecting more comprehensive information on the economic contributions of particular industries.

A selection of key potential information needs for particular industries is contained in the summary table on page 12. Further recommended research areas are outlined in individual industry sections of chapter 4.

Key potential information needs

Industry sector	Key potential information needs
Commercial fisheries and aquaculture	• Likely response of commercial fishers to changes in key drivers such as output and input prices • Greater understanding of the economics of the state fisheries of the region • Response of the fishing industry to changes in management, including better understanding of fishery incentive structures • Socioeconomic relationships between fishery and aquaculture activity and related communities and industries in the region
Recreational fisheries	• Trends in recreational fishing participation rates, including trends in domestic and international marine tourism focused on recreational fishing • Emerging trends to more offshore fishing
Seabed mining	• Greater understanding of the current regimes, and associated requirements, for commercial access to offshore mineral resources in the region
Offshore oil and gas	• The likely effect on the region's economy of the changes in the structure and location of oil and gas production in the region and in Australia generally • Possible socioeconomic and environmental impacts stemming from the decommissioning of offshore facilities
Marine based tourism	• Methods to project tourist numbers at the regional level and a better understanding of demand drivers • Methods to gain greater insight into the economic contributions made by marine tourism to both the regional and national economy
Ship/boat building	• Likely future demand for ships and boats from each of the diverse markets that the region's shipyards and boatyards currently supply
Biotechnology/ bioprospecting	• Review of the current and future demand for marine derived compounds sourced from the region • Greater understanding of the effect on, and the ability of, the marine environment to supply commercial quantities of biological materials
Waste disposal	• Studies into the economic and social costs of marine waste disposal • Greater understanding of the current and potential impacts of past marine disposal activities
Marine transport industries	• Assess the implications for the region of trends in world shipping and trade
Ports	• Greater understanding of impediments and opportunities for further development and investments in port infrastructure • Greater understanding of the likely consequences for the region's ports of the worldwide trend towards the use of larger vessels

introduction

Background and project rationale

Responsible oceans management requires an integrated ecosystems approach that balances the need to ensure that marine and coastal ecosystems and species are able to maintain their health and populations with the requirements of present and future human consumption (United Nations 2002). Regional marine planning is one tool available for this task. Such planning uses large marine ecosystems as one of the starting points for the planning process, with planning boundaries based on ecosystem characteristics. The South East Marine Region incorporates three large marine ecosystems: the South Eastern, the South Tasman Rise, and Macquarie.

Australia's Oceans Policy states that for each marine region it will be necessary to understand the current uses of the ocean resources in that region and the emerging pressures on them. A use is defined as a human activity that has a physical or legal presence within a region (NOO 2002).

During the South East Regional Marine Plan (SERMP) assessment phase, the National Oceans Office undertook preliminary research into the range of pressures facing the marine based industries of the region. Assessment reports were released, followed by extensive stakeholder consultation aimed at identifying issues that needed to be considered within the planning framework.

One issue raised during the consultation phase was the need to better understand the economic pressures being faced or likely to be faced by the region's marine based industries, as well as their causes. This resulted in Draft SERMP action 1.3.2 which states that the office will:

> *Investigate the need for scoping studies to identify economic issues and address strategic directions for marine based industries within the region …*

As a result, the National Oceans Office commissioned this report on the economic pressures being faced by marine based industries operating in Australia's South East Marine Region, their causes, and areas where further work on more detailed scoping studies may be needed. For the purpose of the report, causes and pressures are considered to be one and the same, thus providing the link between Draft SERMP action 1.3.2 and *Australia's Oceans Policy* requirements.

Specifically, this report identifies and reviews:

- the importance of each marine based industry in the South East Marine Region to the local, regional and national economy;
- the cross-cutting macroeconomic drivers likely to affect all the region's marine based industries and their strategic direction, including magnitude of effect;
- the main strategic directions of the region's marine industries and the key economic forces driving them in this direction; and
- areas where further, more detailed understanding of both directions and drivers is required for the marine based industries of the region.

South East Marine Region

The South East Marine Region runs from just south of Bermagui on the south coast of New South Wales to Cape Jervis near Kangaroo Island in South Australia, taking in the waters of Victoria and Tasmania, including Macquarie Island. It includes inshore state waters that extend from the shore to three nautical miles outside the territorial baseline, Commonwealth ocean waters that extend from three to two hundred nautical miles outside the territorial baseline, and claimable continental shelf beyond the Exclusive Economic Zone, a total of 1.67 million square kilometres of ocean within Australia's exclusive economic zone (EEZ) and a further 0.8 million square kilometres of claimable continental shelf beyond the EEZ (Larcombe et al. 2002). The South East Regional Marine Plan itself focuses on Commonwealth waters (NOO 2002).

The National Oceans Office considers the main marine based industries of the region to be: aquaculture; biotechnology (including bioprospecting); commercial fishing; offshore mining; ocean waste disposal; oil and gas; ports and marinas; recreational fishing; shipping (local and foreign); ship/boat building; submarine cables and energy transmission lines; and tourism. The economic importance of individual industries in the South East Marine Region is discussed in detail in the National Oceans Office Assessment Report *Resources – Using the Ocean* (NOO 2002). Updated figures are provided in this current report where available.

In terms of industry value added, the region's two largest industries are marine based tourism and offshore oil and gas. These account for an estimated four-fifths of industry value added, while aquaculture and commercial fishing, ports, ship building and shipping account for most of the remainder.

Unpublished analysis undertaken for the National Oceans Office suggests that the marine based industries in Australia may contribute around 3.8 per cent of total national industry value added. This is in line with international estimates from organisations such as the Intergovernmental Oceanographic Commission, the OECD and others, that suggest that the turnover of marine based industries and services, including the extraction industries such as offshore oil and gas, is of the order of 3–5 per cent of total turnover in most coastal countries (United Nations 2002).

Industry groups

Marine based industries are not explicitly identified as a single specific 'industry' in the Australian Bureau of Statistics' system of national accounts. Rather, parts of the marine based industries are spread throughout the seventeen 'industry groups' used in calculating the national accounts. The gross value added of these seventeen groups are shown in table 1. (Gross value added measures the contribution to the economy of each individual producer, industry or sector. At its simplest gross value added is equal to the profits generated by the activity.) After allowing for the ownership of dwellings, and taxes less subsidies on products, the sum of industry gross value added equals Australia's gross domestic product (GDP).

The contribution of a 'composite industry' such as the marine based industries to national GDP can be measured using a 'satellite account'. This has been done for tourism, one of the principal marine industry subsectors. In the System of National Accounts, tourism is not treated as an industry in the traditional sense, because tourism is defined by who the customer is rather than by the goods and services that are produced. For example, a restaurant meal eaten by a visitor may be ascribed to 'tourism', while the same meal eaten by a resident may not.

1 Industry gross value added, Australia [a]

		2001-02	2002-03
		$b	$b
A	Agriculture, forestry and fishing	27.66	20.21
B	Mining	33.82	33.98
C	Manufacturing	76.69	78.67
D	Electricity, gas and water supply	15.98	16.12
E	Construction	39.54	46.00
F	Wholesale trade	36.09	37.83
G	Retail trade	36.03	37.69
H	Accommodation, cafes and restaurants	14.63	15.21
I	Transport and storage	34.72	36.38
J	Communication services	19.16	20.37
K	Finance and insurance	50.79	53.09
L	Property and business services	75.52	75.81
M	Government administration and defence	27.76	28.54
N	Education	31.20	31.62
O	Health and community services	41.24	42.47
P	Cultural and recreational services	12.47	12.57
Q	Personal and other services	16.01	16.28
	Ownership of dwellings	63.33	65.84
Gross value at basic prices		652.64	668.70
Taxes less subsidies on products		61.73	63.71
Gross domestic product		714.37	734.60**b**

a Chain volume measures, reference year 2001-02. **b** Including statistical discrepancy of $2.19 billion.
Source: ABS (2003a).

To estimate the economic contribution of tourism to the Australian economy, the ABS uses a 'tourism satellite account'. This account partitions traditional industries into tourism and nontourism activities and allows the direct contribution of tourism to the economy to be measured using the System of National Accounts. It also allows the direct contribution of tourism to be measured on a basis that is consistent with how the respective contributions of the 'traditional' industries are measured (ABS 2003b,c; ATC 2003). Notionally a satellite account could also be set up for marine based industries.

The main unifying factor for Australia's marine based industries is their direct or indirect dependence on access to a common resource (the ocean). The property rights to this resource are often less well defined than those for the land resource. Access to the ocean resource is also often regulated on a different legal basis than access to the land resource. In practice this means that the Australian Government usually has greater powers to regulate activities and to change management regimes for ocean activities.

In this report, the marine based industries are dealt with in the following order:

Fisheries resource based industries (mainly a subset in table 1 of A , Agriculture, forestry and fishing; F, Wholesale; and G, retail)

- Aquaculture
- Commercial fishing
- Recreational fishing

Seabed mining industries (subset of B, Mining)

- Offshore mining
- Offshore oil and gas

Seabed energy and communications infrastructure (subset of D, Electricity, gas and water supply; and J, Communication services)

- Electricity transmission lines
- Natural gas pipelines
- Submarine communications cables

Marine based tourism (subset variously of F, Wholesale; G, Retail; H, Accommodation, cafes and restaurants; I, Transport and storage; P, Cultural and recreational services; and Q, Personal and other services)

- Marine based tourism

Marine related manufacturing industries (subset of C, Manufacturing; E, Construction)

- Ship/boat building
- Biotechnology (including bioprospecting)
- Ocean waste disposal

Marine transport industries (subset of I, Transport)

- Shipping (local and foreign)
- Ports

To a large degree marine based tourism covers much the same set of activities as marine based recreation and, with the exception of recreational fishing, which is discussed in the report's fisheries section, the economic contribution of marine based recreation is covered in the report's section on marine based tourism. It should be noted, however, that because 'tourism' covers only visitors and not residents, the value of 'marine based recreation' is likely to be larger than the value of 'marine based tourism' alone.

It should be noted that many of the goods produced by the marine based industries are tradable — that is, they are able to be readily exported or imported. Examples include fisheries products, petroleum products, ships and boats, and tourism services. For these particular industries, global trends as well as Australian trends are examined.

economic contribution of marine based industries in the South East Marine Region

Aquaculture and commercial fishing

The total gross value of fisheries production in the South East Marine Region is estimated to have been $531 million in 2002-03, equivalent to 23 per cent of the total gross value of Australian fisheries production in 2002-03 (table 2).

Aquaculture began to emerge as an important activity in South East marine waters over a decade ago with the growth of the Tasmanian salmonid farming industry. The main aquaculture activities in the region are the farming of Atlantic salmon and ocean trout, and the culturing of edible oysters and blue mussels (table 3).

Marine aquaculture operates in coastal (state) waters. Tasmania accounts for nearly all marine based salmonid production. Edible oysters comprise Pacific oysters and Sydney rock oysters. Pacific oysters are cultured in Tasmania and South Australia and Sydney rock oysters in southern New South Wales. Blue mussels are cultured mainly in Victoria, Tasmania and South Australia, with a small quantity of production also in New South Wales. The gross value of aquaculture production in the region is estimated to have been $135 million in 2002-03, or around 20 per cent of the total gross value of Australian aquaculture production (table 2). The region's share of aquaculture tonnage is much higher, as the total gross value for Australia includes two high unit value products, pearls and

2 Gross value of fisheries production – South East Marine Region 2002-03

	Value	Share of Australia
	$m	%
Fishery		
Aquaculture	134.7	20.2 **a**
State wild catch	316.7	26.1
Commonwealth wild catch	79.2	19.0
Total	530.6	23.1 **a**

a The aquaculture GVP figure used in this calculation is total Australian aquaculture GVP net of the value of juvenile tuna used by South Australian tuna farms.
Source: Calculated using ABARE (2004).

3 Aquaculture production, by species – South East Marine Region 2002-03

	Value	Share of total
	$m	%
Species		
Atlantic salmon	109.1	81
Edible oysters	16.2	12
Mussels	5.5	4
Other	4.0	3
Total	134.7	100

Source: Calculated using ABARE (2004).

farmed southern bluefin tuna, that are produced outside the region (in northern Australia and in South Australia around Port Lincoln respectively). New production from a number of farmed abalone operations in Victoria, Tasmania and South Australia could increase the region's gross value of aquaculture production by around $30–40 million a year in the next few years.

The region's wild catch commercial fisheries include the state fisheries of Victoria, Tasmania, and parts of southern New South Wales and south east South Australia, and Commonwealth fisheries such as the south east trawl, the gillnet, hook and trap (formerly the south east nontrawl and the southern shark), the Bass Strait central zone scallop, and parts of the east coast tuna and billfish fishery.

Wild catch from the state fisheries is dominated by high value products such as abalone and rock lobster. Tasmania's wild catch fisheries produced $162 million of fisheries products in 2002-03, mainly abalone ($98 million), rock lobster ($52 million) and finfish ($9 million). Victoria's state wild catch fisheries produced $87 million, mainly abalone ($53 million), rock lobster ($17 million) and finfish ($12 million). The main products from the New South Wales part of the region were abalone and finfish, and the main products from the South Australian part of the region were abalone, rock lobster and finfish. The region produced an estimated 26 per cent of all state/territory wild catch in 2002-03 (table 2).

Wild catch from the Commonwealth fisheries includes a mixture of higher and lower value finfish species sold to the South East domestic market and higher-value tunas sold primarily on the export market. The region produced an estimated 19 per cent of the value of the catch from Commonwealth fisheries in 2002-03 (table 2).

Recreational fishing

Recreational fishing effort can be measured in a number of ways — the number of days spent fishing, the number of 'fishing events' (defined as a discrete fishing episode), or the number of hours spent fishing (Henry and Lyle 2003). Data from the recent National Recreational and Indigenous Fishing Survey, which covered recreational fishing activity in both saltwater and freshwater in the twelve months May 2000 to April 2001 inclusive, indicate that in this period, Victoria and Tasmania together accounted for around 17 per cent of national days fished, 16 per cent of national 'fishing events', and 15 per cent of national hours fished (table 4).

New South Wales accounted for a significant proportion of all recreational fishing effort. The amount of effort occurring on the New South Wales coast south of Bermagui was not reported but is likely to have been a relatively small proportion of the state total. Similarly, the proportion of the South Australian effort attributable to the stretch of coast south of Cape Jaffa is likely to have represented a small proportion of the South Australian total.

In the survey, five categories of water body were identified to describe the distribution of fishing effort — offshore (more than 5 kilometres from the coast), coastal (shoreline to 5 kilometres), estuarine, freshwater rivers, and lakes or dams. In many cases, offshore

4 Recreational fishing effort
12 months May 2000 to April 2001

	Fisher days	Fishing events	Fishing hours
	'000	'000	'000
Victoria	2 640	2 812	11 320
Tasmania	816	913	4 295
Total Victoria and Tasmania	3 456	3 725	15 615
New South Wales	6 879	7 671	30 363
South Australia	1 944	2 216	9 768
Australia	20 645	23 204	102 910
	%	%	%
Victorian and Tasmanian share of Australia	16.7	16.1	15.2

Source: Henry and Lyle (2003). See original source for standard errors.

5 Annual fishing effort for selected states
Number of events

Water body	Victoria	Tasmania	New South Wales	South Australia	Australia
	no.	no.	no.	no.	no.
Offshore	21 138	10 081	101 480	73 715	937 367
Coastal	380 883	476 442	2 108 276	1 643 362	9 520 452
Estuarine	1 204 237	195 028	3 606 708	142 010	8 171 867
Rivers	610 008	74 194	1 119 358	316 043	2 628 167
Lakes/dams	595 625	156 944	735 060	40 911	1 946 452
Total	2 811 891	912 689	7 670 883	2 216 041	23 204 305

Source: Henry and Lyle (2003). See original source for standard errors.

waters also coincide with waters managed by the Australian government. Fishing effort was measured in terms of 'fishing events' (Henry and Lyle 2003).

Based on the survey results for Victoria, Tasmania, New South Wales and South Australia shown in table 5, it is estimated that the proportion of national recreational fishing effort undertaken in the survey period in the offshore areas of the South East Marine Region may have been around 4–5 per cent, depending on what proportion of effort in New South Wales and South Australian offshore and coastal areas is assumed to occur in the South East Marine Region.

Offshore minerals and petroleum

Currently there is only one active exploration permit for offshore metallic minerals exploration in the region, covering Ringarooma Bay in north east Tasmania, and no current mining licences (NOO 2002).

The main offshore mining industry is oil and gas. Most of the region's production is sourced from the offshore Gippsland field, one of Australia's major petroleum provinces. The field's 21 production facilities lie within an area of approximately 6000 square kilometres in Bass Strait, 30–100 kilometres off Victoria's eastern coast (Larcombe et al. 2002). In 2002-03, the Gippsland Basin produced 26 per cent of Australia's crude oil, 10 per cent of its condensate, 43 per cent of its LPG, and 19 per cent of its natural gas and naturally occurring ethane (ABARE 2003a), which would have represented an estimated 0.5–0.6 per cent of national gross domestic product (table 6). In 2000-01 the Australian mining industry contributed 5.0 per cent to national gross domestic product, with oil and gas making up around half of gross value added — $16.9 billion out of $34.0 billion (ABS 2002).

Offshore exploration for oil and gas is also being undertaken in the Otway Basin of south east South Australia and western Victoria and the Sorrell Basin off north west Tasmania. The Otway Basin currently produces small quantities of natural gas (103 gigalitres in 2002-03) (ABARE 2003a). Production could increase in the future based on the Geographe/Thylacine gas project.

6 Gippsland Basin share of Australian production of primary petroleum 2002-03

	Gippsland Basin	Australia	Gippsland Basin share
	ML	ML	%
Crude oil	6 676	26 030	25.6
Condensate	743	7 503	9.9
Liquefied petroleum gas	1 970	4 622	42.6
	GL	GL	%
Naturally occurring ethane and natural gas **a**	6 432	33 576	19.2

a Does not include methane or ethane produced from other than natural gas fields.
Source: ABARE (2003).

Seabed energy and communications infrastructure

In September 2002 Duke Energy International inaugurated the Tasmanian Gas Pipeline. This pipeline links Tasmania to the Australian mainland natural gas network via connections to the Eastern Gas Pipeline at Longford, Victoria. The $440 million project included 732 kilometres of subsea and underground pipeline (302 kilometres offshore from Victoria to Tasmania and 430 kilometres onshore in Victoria and Tasmania) and the conversion of the Bell Bay Power Station in Tasmania to natural gas (DEI 2002). In March 2004, Alinta acquired Duke Energy's portfolio of gas pipelines and gas fired power stations, including the Tasmanian Gas Pipeline (The Age 2004).

The national electricity market that commenced in December 1998 comprises five interconnected electrical regions — Queensland, New South Wales and the Australian Capital Territory, the Snowy, Victoria and South Australia (NEMMCO 2001). At present Tasmania

is not part of the 'national electricity market' as it has no interconnector to the mainland. However, the idea of linking Tasmania's electricity grid with mainland grids dates back to the 1960s, and following engineering studies undertaken in the early 1990s, the Tasmanian Government in April 1997 committed to participating in the national market via an interconnector with Victoria. Approval was given in 2002 for the construction of Basslink, a 295 kilometre seabed cable to run from Loy Yang in Gippsland across Bass Strait to Bell Bay in northern Tasmania. Basslink construction is scheduled to be completed in 2005-06. The interconnector will have the capacity to export up to a maximum of 600 megawatts of power from Tasmania to Victoria, and import a maximum of 300 megawatts to Tasmania (Basslink 2003).

Eleven submarine communications cables land in Australia from international waters, six in or around Sydney, two in Cairns, two near Perth, and one at Port Hedland. None of these pass through the South East Marine Region. However, one domestic submarine cable crosses Bass Strait between Sandy Point (Victoria) and Boat Harbour (Tasmania) (NOIE 1999). Two new cables are also in prospect for Bass Strait, one as part of Basslink.

Marine based tourism

Nationally, tourism is estimated to have accounted for 4.5 per cent of national gross domestic product in 2001-02. Victoria attracted an estimated 1.2 million international and significant numbers of domestic visitors in 2003, while Tasmania attracted 576 000 international and domestic visitors in 2001-02. Marine (ocean and coastal) tourism accounts for an estimated 19 per cent of the economic activity generated by international tourism in Australia and an estimated 90 per cent of that generated by domestic tourism (NOO 1997). Marine tourism activities undertaken in the region include diving, charter boating, recreational boating, whale and dolphin watching, cruise ship visits, yacht racing, beachgoing, surfing, coastal sightseeing, swimming, penguin watching and recreational fishing (NOO 2002).

Marine related manufacturing industries

The main marine related manufacturing industry in the region is ship and boat building. The region is also a potential source of biological materials for the pharmaceutical industry, and has been used in the past for ocean waste disposal.

Ship/boat building

Ship building, under ANZIC code C2821, includes all business units mainly engaged in the manufacturing or repairing of vessels of 50 tonnes displacement and over, and the manufacture of submarines or major components of ships and submarines. Total Australian industry turnover in the ship building industry in 2001-02 was $1.3 billion from 65 establishments, including seven in Victoria and three in Tasmania. The region's larger shipyards include INCAT in Hobart (which builds large aluminium wave-piercing catamarans), Tenix Defence systems in Williamstown (Melbourne), which builds warships, Commercial Catamarans at Lakes Entrance in Gippsland (which builds medium sized aluminium catamarans mostly for commercial fishing), and North West Ships at Margate, Tasmania, which builds

medium sized aluminium catamaran and trimaran ferries and motor yachts (Tenix 2002; Incat 2003; Commercial Catamarans 1999; North West Bay Ships 2003).

Boat building, under ANZIC code C2822, includes all business units mainly engaged in the manufacturing or repairing of vessels of under 50 tonnes displacement. The main products supplied by this industry include boat repairing, boat building, dinghy manufacturing, sail boat manufacturing, and the construction of yachts. Total Australian turnover in the boat building industry in 2002-03 was $795 million from 495 establishments, including 54 in Victoria and 15 in Tasmania. Boats built by the region's smaller yards include aluminium runabouts, recreational vessels and small commercial craft (Larcombe et al. 2002).

Biotechnology

Biotechnology is a broad term for a group of technologies based on applied biological science and includes any technique that uses living organisms or parts of organisms to make or modify products, improve plants or animals, or develop micro-organisms for specific uses. Australian marine biotechnology focuses on new pharmaceuticals, enzymes and bio-molecular materials (NOO 2002). There are over 120 sampling and biological collection sites scattered throughout the region (Larcombe et al. 2002), with material collected from the region being used in biotechnology research conducted by the Australian Institute of Marine Science, CSIRO, the University of Tasmania, and the University of Melbourne.

Ocean disposal

The types of materials that have been disposed of in the region's waters in the past have included chemicals and industrial waste, ammunition, scuttled vessels, and dredge spoils. Disposal at sea in Australia is now highly regulated, and permits from the Australian Government Department of the Environment and Heritage are required for such operations. Currently, about twenty permits are issued each year, mainly for the disposal of uncontaminated dredge spoil. The other main activity for which approvals may be granted is for the construction of artificial reefs for recreational fishing, or diving (NOO 2002).

Ports and shipping

Major ports in the region include Portland, Geelong, Melbourne and Hastings in Victoria, Port Latta, Burnie, Devonport, Bell Bay, Spring Bay and Hobart in Tasmania, and Eden in New South Wales. Victorian ports accounted for about a quarter of Australia's international seaborne imports by weight and a third by value in 2000-01. They also accounted for 15 per cent of coastal trade loadings by weight and 16 per cent of unloadings. Tasmania directly accounted for 1.3 per cent of international seabourne imports by weight and 0.6 per cent by value. However, much of Tasmania's international trade is transhipped through Melbourne. Tasmania's ports also accounted for 8 per cent of coastal trade loadings by weight and 7 per cent of unloadings (table 7).

Most of the coastal trade going from the east of Australia to the west and vice versa would transit Bass Strait. The sum of Western Australian and South Australian coastal loadings that went to New South Wales and Queensland and vice versa in 2000-01 was 9.7 million

7 Australian sea freight 2000-01

	Volume		Value	
	Imports	**Exports**	**Imports**	**Exports**
	Mt	Mt	$b	$b
International				
Australia, of which	54.4	495.7	83.0	99.4
Victoria	12.6	15.9	28.2	17.2
Tasmania	0.7	7.1	0.5	2.1
Domestic				
Australia, of which	52.0	52.0	**a**	**a**
Victoria	8.5	7.9	**a**	**a**
Tasmania	3.4	4.2	**a**	**a**
Transit Bass Strait **b**	9.7	9.7	**a**	**a**

a Not available from BTRE (2002). **b** Indicative. Sum of Western Australian and South Australian loadings that went to New South Wales and Queensland, and vice versa.
Source: Calculated from BTRE (2002).

tonnes, or 19 per cent of coastal trade turnover. Adding this to coastal turnover from Victorian and Tasmanian ports suggests that at least 40 per cent of Australia's coastal trade traveled to, from, or through the region in 2000-01.

macroeconomic and institutional industry drivers

The linkages between the marine environment and key economic sectors are such that the principal marine policy drivers are also those that affect sustainable development more generally. On a world scale, these are the globalisation of trade, investment, information, population growth, urbanisation and movement toward the coastal zone, climate change, increasing conflict and insecurity, global income inequalities, high consumption rates and intensification of pressures on the natural environment, such as from agricultural use and deforestation, and the growth and impact of shipping and tourism (United Nations 2002).

Key economic drivers likely to influence the prospects for the marine based industries of Australia's South East Marine Region are:

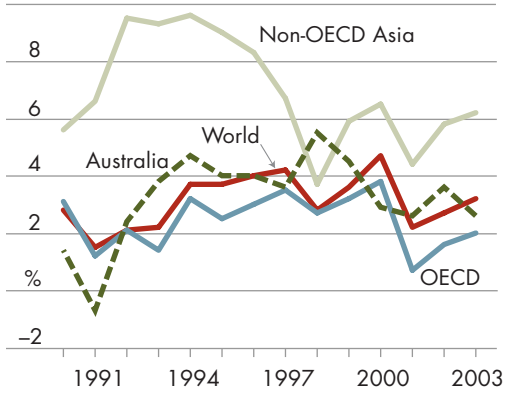
- World
  - economic growth
  - trade
  - energy trade and prices
- Australia
  - economic growth
  - exchange rate
  - population dynamics
  - government policies

World economic drivers

World economic growth

Australia's economic performance is fundamentally influenced by the performance of the world's other economies. As a trading economy, Australia is linked to other economies through merchandise trade, capital flows, and so on. Economic growth in Australia, the OECD region, non-OECD Asia, and the world from 1990 to 2003 is shown in figure A.

A World economic growth



Since 1992, Australia's annual economic growth has been higher than the OECD average, but lower than the average for non-OECD Asia except in one year (1998), when

the economic performance of non-OECD Asia was negatively affected by the Asian financial downturn. Australia's economic growth has been remarkably close to the world average over the period 1990 to 2003. The underlying trend in world economic growth in the period 1970 to 2002 was around 3.5 per cent a year, and the IMF projects average world economic growth to continue at this underlying historical rate to 2010 (IMF 2003).

Continued real growth in the world economy will influence the industries of Australia's South East Marine Region indirectly through its effect on the Australian economy and in some cases directly through world markets for specific products such as crude oil and petroleum products, fisheries products, ships and tourism services.

World trade

Historically, the volume of world trade in goods and services has grown at a rate well in excess of the rate of growth in the world economy. From 1970 to 2002, the underlying trend rate of growth in the volume of world trade in goods and service was around 6–7 per cent a year (IMF 2003). In this 32 year period there was only one year in which the growth in world trade was negative (1975) and only two years in which growth was around zero (1982 and 2001).

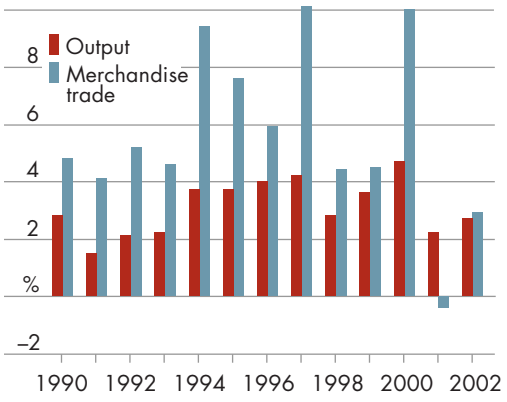
Between 1990 and 2002, world output grew at around 3 per cent a year, while world merchandise trade grew by just under 7 per cent (figure B) (World Trade Organisation 2003). As with world economic growth, the IMF is projecting that the volume of world trade in goods and services will grow at around underlying historical rates to 2010.

This projected continued increase in world merchandise trade is likely to influence the industries of Australia's South East Marine Region indirectly through its effect on the Australian economy and in some cases directly through, for example, the volume of shipping in the region.

World energy trade and prices

World energy use and trade is continuing to grow strongly. In its most recent energy projections to 2030, the International Energy Agency is projecting world energy use will increase steadily (IEA 2003a). In the IEA's reference scenario, global primary energy demand is projected to rise by 1.7 per cent a year on average between 2000 to 2030. Global oil demand is projected to rise by about 1.6 per cent a year, from 75 million barrels a day in 2000 to 120 million barrels a day in 2030.

B Growth in world output and merchandise trade



At projected rates of increase, global growth in energy demand will have significant

implications for global trade in energy commodities such as coal, oil and gas. In the next thirty years, imports of oil and gas by the major consuming regions are expected to grow substantially.

Continued growth in world energy trade is likely to influence the industries of Australia's South East Marine Region indirectly through its effect on the Australian economy as well as directly through the volume of crude oil and petroleum products shipped through the region, the rate of exploration for new oil and gas resources, and the integration of Australia's electricity grid to include Tasmania.

Australian economic drivers

Economic growth

The Australian economy has demonstrated a significant degree of resilience in recent years, continuing to grow even when the economies of its major trading partners have slowed. Over the medium term, the Australian economy is assumed to grow at a rate of around 3.5 per cent a year (Penm and Fisher 2004). Given the close integration of Australia's state (and regional) economies, this expectation for continued strong domestic growth is likely to be reflected in continued growth in the Victorian and Tasmanian state economies and in the regional economies of south east Australia.

Continued growth in Australia's economy will influence the marine based industries of Australia's South East Marine Region mainly through its effect on the domestic demand for the region's goods and services, including fisheries products, oil and gas, port services and tourism services.

Exchange rate

Australia's exchange rate directly affects the prices that overseas customers pay for Australian goods and services that are exported and the prices that Australian consumers pay for overseas goods and services that are imported.

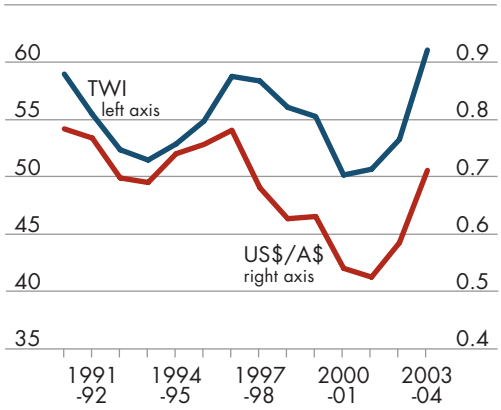
Over the 1990s the Australian exchange rate depreciated against other major world currencies such as the US dollar, the Japanese yen, and the currencies of the main western European countries. This made Australian exports of goods and services relatively cheaper to buyers in most countries, and the goods and services imported by Australians from most countries relatively more expensive.

In 2003-04, the Australian dollar was stronger against major international currencies than in the preceding immediate years (figure C), making Australian goods and services relatively more expensive to overseas buyers and overseas goods relatively cheaper for Australians.

The future trajectory of the Australian dollar will significantly affect the marine based industries of the South East Marine Region. For example, the cost to overseas tourists of visiting Australia falls as the Australian dollar depreciates (increasing the competitiveness of Australia as a destination), but rises as the Australian dollar appreciates. Similarly, the

cost to Australians of visiting overseas destinations (and therefore the relative attraction of domestic tourism) rises when the Australian dollar depreciates, and falls when the Australian dollar appreciates.

C Australian dollar exchange rate



To take another example, a large proportion of Australia's high quality wild caught fisheries and aquaculture products are exported to Japan, Hong Kong, Chinese Taipei and the United States. Australian fisheries products become relatively cheaper to overseas buyers when the Australian dollar depreciates, but more expensive when the Australian dollar appreciates. When the Australian dollar appreciates, seafood exports come under pressure to accept lower prices in Australian dollar terms in order to continue to sell their product on the highly competitive world market.

Population dynamics

Australia's changing age structure, and the geographic distribution of the population, will have an impact on the economy of the South East Marine Region in the next few decades. Australia's population recently passed 20 million and in the most recent ABS midcase (series B) projection (ABS 2003d, 2004) will reach 23.4 million by 2021, an increase of 19 per cent between 2002 and 2021.

Australia's population is also projected to continue to age. The proportion of people in the population aged 65 or more is projected to continue to rise, while the proportion of people in the population under 15 years of age is projected to continue to fall (table 8).

The aging of the Australian population is likely to influence the economy of the South East Marine Region in a number of ways. For example, increasing numbers of retirees are likely

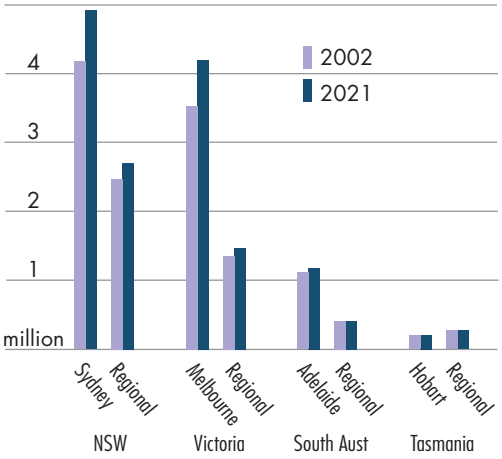
8 The aging of Australia's population

	Total	0–14 yrs	15–64 yrs	65–84 yrs	85+ yrs
	million	%	%	%	%
1901	3.8	35.1	60.8	3.9	–
1947	7.6	25.1	66.8	7.7	0.4
1971	13.1	28.7	63.0	7.8	0.5
1999	19.7	20.3	67.1	11.2	1.4
2021 **a**	23.4	16.1	64.9	16.5	2.5
2051 **a**	26.4	14.0	58.9	21.1	6.0

a ABS series B projection.
Source: ABS (2003d, 2004).

to be attracted to coastal areas, and increasing numbers of potential consumers of domestic tourism services created.

D Projected population of south east Australia



A large proportion of Australia's population is already concentrated in the south east and east, either on the coast or within a relatively short distance from it. The most significant increases in population in this area are projected for Sydney and Melbourne. In the series B projections, Sydney's population is projected to rise by 18 per cent, and the population of the rest of New South Wales is projected to rise by 9 per cent. Melbourne's population is projected to rise by 19 per cent, while the population of the rest of Victoria is projected to rise by 9 per cent. Adelaide's population is projected to rise by 6 per cent, while the population of the rest of South Australia is projected to rise by only 1 per cent. Over the projection period, Hobart's population is projected to rise by 2.6 per cent, and the population of the rest of Tasmania to fall by 1.2 per cent, resulting in a net projected increase in Tasmania's population of 0.4 per cent (figure D).

These trends in Australia's population dynamics — the aging of the population, the concentration of retirees in coastal areas, and the projected growth of Sydney and Melbourne, will have the general effect of increasing the demand for the goods and services produced by the region's marine based industries, as well as increasing the 'ecological footprint' of urban areas on the coastal environment in the next few decades.

Government policies

Government policies are another source of pressure that has the potential to affect either the supply of or the demand for the goods and services provided by the marine based industries of the region. In this section, two particular groups of policies are examined: those with the potential to affect supply, and those with the potential to affect demand. Policies with the potential to affect supply involve principally the various measures taken to manage the marine resource — planning, access and so on. Policies with the potential to affect demand involve principally those concerned with the correction of market failure, the widening of access to markets, or the reduction of administrative impediments to production.

The economic justification for government involvement in regulating activities within marine areas is based primarily on the fact that these areas are a common property resource effectively owned by all Australians. Government, as the representative of its citizens, manages ocean activities on behalf of society as a whole. Sometimes, there may also be a case for government involvement in managing environmental resources based around the presence of market failures. Market failures can occur, among other things, through the presence of externalities. An externality occurs when the activities of one party have an

impact on others whose interests were not taken into account. For example, externalities can occur through the medium of the environment where the productive decision of one party can adversely affect other stakeholders' values. Externalities can also arise where there is inadequate information and open access to resources.

Governments have been aware of the economic and legal rationales for government involvement in oceans management and have acted accordingly. However, in recent years, there has been an increasing recognition of the need to manage the oceans as a whole and to establish integrated mechanisms for managing the marine environment. The concept of integrated oceans management is a departure from the previous sectoral approach to resource management, and has been prompted by a number of international and Australian domestic agreements and developments concerning marine resource using industries and their impact on the broader environment (Sainsbury et al. 1997).

The core aspects of integrated marine resource management include:

- recognition of ecological processes and structure through the establishment of management regions;
- identification of ecological, economic, cultural and social values associated with a resource and its uses, and consideration in decision making of the effects of use on those values; and
- integration of the effects of sectoral management activities within and between governments, and between governments and community and industry groups.

A move away from sectoral only management and toward integrated management in the longer term is an attempt to increase certainty of processes and to guarantee ecosystem sustainability. Both these factors may benefit industry sectors that are active in the ocean environment. However, in the short term, management changes through integrated oceans management may increase uncertainty and or the compliance costs associated with management.

Integrated oceans management is only one of the resource and sectoral management issues that may affect ocean industries. Increasingly, international agreements affect the operations of the industries that use the ocean resource. National requirements such as the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) will also entail more rigorous environmental assessment procedures for industries that use the ocean resource.

Australia's industry/government 'action agendas' operate on both the demand and the supply sides of markets. They provide an institutional avenue for developing a partnership between industry and government to create long term sustainable competitive advantages through industrywide planning and the implementation of strategic actions by industry and government. Action agendas aim to cooperatively identify impediments to growth (such as differing compliance standards, and uncertainty about access to resources), to harness competitive advantage and to maximise opportunities for development (DFAT 2004). There are 29 action agendas in various stages of development, a number of them relevant to marine based industries (table 9).

9 Action agenda status

Industry	Announced	Status at June 2004
Marine industry	2003-04	Being developed
Mineral exploration	2002-03	Being developed
Restaurant and catering	2002-03	Under implementation
Pharmaceuticals industry	2001-02	Under implementation
National food industry strategy	2001-02	Under implementation
Environment industry	2000-01	Under implementation
Aquaculture	2000-01	Under implementation
Freight transport logistics	2000-01	Under implementation
Tourism		Completed
Biotechnology		Completed

Source: DITR (2004a).

For the aquaculture industry, the Aquaculture Industry Action Agenda, released in December 2002, has a strategic vision of tripling the value of Australia's aquaculture production to $2.5 billion in sales, and creating 29 000 new jobs, by 2010 (DITR 2004b). Some of the key issues for aquaculture, both economic and noneconomic, identified in a report that preceded the Aquaculture Industry Action Agenda were consumer concerns over the environmental effects of aquaculture, feed costs and the shortfall in the supply of feed sourced from wild stocks, lack of research and innovation, weakening overseas markets, the reallocation of land and water resources for other uses, and the small scale of operations of some parts of the industry (PMSEIC 2002).

There is no action agenda for the commercial fishing industry; however, a strategic vision enunciated by the Australian Fisheries Management Authority is the maintenance of 'highly productive fisheries managed in an ecologically sustainable way with the support of the community and industry' (AFMA 2003). Some of the key issues for commercial fishing, both economic and noneconomic, as perceived by the Australian Seafood Industry Council are security of access to the fish resource, the effect on the industry of ballast water transfer and coastal development, competition and conflict with recreational fishing, native title issues, training, falling stock productivity and species diversity, increasing fishing effort, and changing community attitudes toward commercial fishing (ASIC 2002).

There is no action agenda for recreational fishing. However, some of the key issues for recreational fishing likely to be addressed through industry/government action include:

- The identification and development of recreational fishing rights.
- The development of frameworks for the sharing of resources with other sectors that are consistent with both principles applying to other sectors and ecologically sustainable.
- The development of mechanisms for rights based management within the recreational fishing sector (AFFA 2003a).

The Action Agenda on Mineral Exploration is still being developed. However, some of the key issues for mineral exploration likely to be addressed through industry/government

action include: access to data; changes to resource rent tax; research and education; native title issues; and environmental and other approval regimes (Parliament of Australia 2002).

The Tourism Action Agenda does not address marine tourism specifically; however, the action agenda vision for tourism broadly is to 'enhance the international competitiveness of the tourism industry by reducing impediments to industry growth and capitalising on opportunities for sustainable industry development' (DITR 2003a). Key issues seen as requiring action include the need for targeted marketing strategies, the removal of unnecessary regulatory and other impediments to industry growth, the need to develop efficient and effective transport networks, the need to foster regional tourism development, and the need to enhance industry standards and skills.

The strategic vision for biotechnology and bioprospecting as stated in the National Biotechnology Strategy is: 'consistent with safeguarding human health and ensuring environmental protection, that Australia capture the benefits of biotechnology for the Australian community, industry and the environment' (Biotechnology Australia 2000). Key issues for industry and government include the need to:

– increase public awareness of the benefits of biotechnology
– ensure effective regulation
– assist companies to take up biotechnology opportunities
– attract foreign cooperation and investment
– enhance access to biological resources
– coordinate policy across governments.

Key issues for ports for industry and government to consider (based on statements by the Australian Association of Ports and Marine Authorities) include:

– ongoing development of water side port facilities and channels
– longer term land transport and modal interface issues
– ocean disposal guidelines
– oceans policy and regional marine planning
– marine pest incursion management
– marine protected areas
– maritime security (AAPMA 2004a).

marine based industries of the South East Marine Region

Fisheries resource based industries

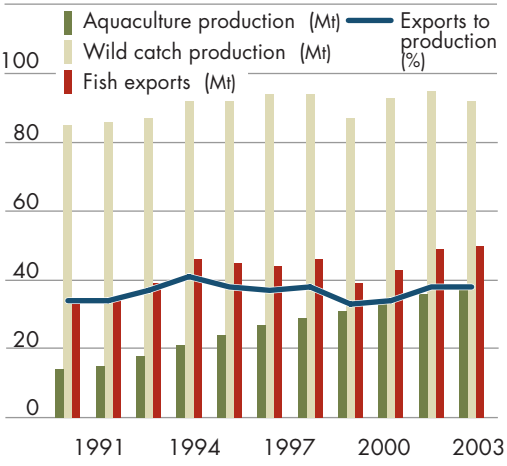
• Aquaculture and commercial fishing – strategic directions

Globally, fish is a widely traded product. Compared with many other food commodities, the proportion of fisheries products entering world trade is relatively high — world fisheries exports averaged 36 per cent of production in the 1990s. As Australia both exports and imports significant quantities of fisheries products, strategic directions for Australia's aquaculture and commercial fishing industries are affected by developments in both world and domestic markets.

World production

The global wild catch has reached a plateau and aquaculture is increasingly seen as the major future engine of production growth for fisheries products. Exploitation of the world's stocks of wild fish rose rapidly during the 1970s and 1980s as high levels of investment in fleet size and new fishing technologies increased the fishing power of the world's fishing fleets (Delgado et al. 2003). Global wild catch production rose from 69 million tonnes in 1976 to 86 million tonnes in 1990 (FAO 1987, 1998), reaching a plateau in the mid-1990s. Production in 2001 was 92.4 million tonnes, down from 95.4 million tonnes in 2000 (figure E). The application of industrial scale methods to fishing initially reduced catch costs, but in more recent years, the costs of wild catch fishing appear to have risen because of the need to gain access to more remote fisheries and to search for fish at lower stock densities.

E World fisheries production and trade



The rising cost of wild harvest and the practical limits to marine capture fisheries means that by 2030 fish and shellfish aquaculture is likely to dominate global fish production (United Nations 2002). The industrial scale application of new techniques to aquaculture

has reduced the costs of production and generated substantial new supplies of fisheries products. In some cases, the growth in supply has exceeded the growth in demand, resulting in falling real prices for some products (for example, the surplus production of farmed salmon from Chile and Norway). World aquaculture production rose from 13.7 million tonnes in 1992 to 37.9 million tonnes in 2001, more than 30 per cent of world food fish production, and Delgado et al. (2003) project that by 2020, this share will have risen to around 40 per cent.

World consumption

World consumption of fish has doubled since 1973, with most of the growth occurring in developing countries. In these countries, increases in consumption have been driven by rapid population and income growth, and urbanisation. China's share of world fish consumption rose from 11 per cent in 1973 to 26 per cent in 1997, while India and south east Asia's share doubled to 11 per cent. In the same period, total consumption in developed countries has fallen slightly, although these countries still provide the main import markets for fisheries products (Delgado et al. 2003).

In recent years there has been a trend toward the eco-labeling of fish products, with the aim of maintaining the productivity and economic value of fisheries while providing incentives for improved fisheries management and the conservation of marine diversity. There are hopes that eco-labeling will provide information about the environmental impact of producing these products and enable more informed purchasing behavior by consumers and intermediaries. It is also hoped that such labeling will encourage retailers and consumers to buy only fishery products derived from sustainably managed fisheries (Deere 1999).

While the trend in real prices for most animal origin foods entering world trade has been consistently downward, the prices of many of the higher quality fresh and frozen fisheries products have been maintained in real terms. However, reflecting a decline in the popularity of canned fish in developed countries, the real price of canned finfish has fallen. With the rapid increases in production that have followed the application of industrial scale techniques to aquaculture in many countries, the real prices of farmed shrimp and salmon have also fallen.

Australian production

Australia's wild catch is essentially static. Production fell from 201 000 tonnes in 1990-91 to 194 000 tonnes in 2002-03 (figure F). However, in the same period, reflecting rising production of farmed southern bluefin tuna, Atlantic salmon and prawns, Australia's aquaculture production rose from 16 000 tonnes to 44 000 tonnes, and aquaculture's share of the total gross value of Australian fisheries production rose from 17 per cent to 32 per cent.

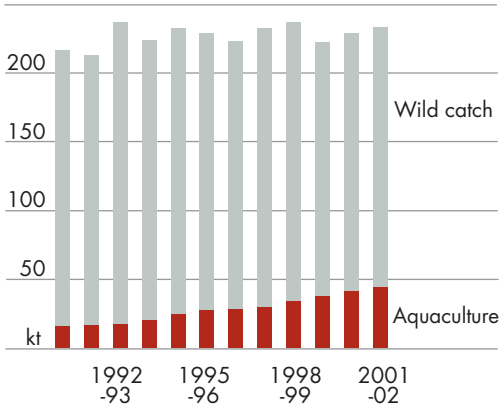
Many of Australia's wild stocks are considered to be either fully fished or overfished. The Bureau of Rural Sciences, which annually reviews stock status in Commonwealth managed fisheries in its *Fishery Status Reports*, found that in 1993, of the 35 species whose status could be classified with some degree of certainty, fourteen were classified as underfished, fifteen fully fished and five overfished. In 2003, the equivalent figures for 36 species were

four underfished, sixteen fully fished and sixteen overfished (BRS 2003). A simulation study of 220 individual Australian fisheries suggested that there could be a continued decline in capture fisheries production for at least the next decade and little prospect of a return to the peak production levels of the late 1980s and 1990s (Kearney et al. 2003). On the other hand, reflecting expected increases in the production of farmed abalone, Pacific oysters, mussels, and marine finfish such as barramundi and yellowtail kingfish, Australia's aquaculture production is projected to continue to increase in the future.

Future growth in aquaculture production is expected to help maintain Australia's real gross value of fisheries production at around the $2.0 billion mark in the medium term (Love, Langenkamp and Galeano 2004). Australian fisheries production in 2002-03 was 249 000 tonnes with a gross value of $2.3 billion (ABARE 2004). There are, however, some questions about the ability of aquaculture to continue to act as the engine of fisheries production growth in the long term, since many production systems rely on the use of other fish stocks to feed the high value aquaculture species. There also appear to be planning, social and environmental restrictions on many proposed aquaculture developments (Kearney et al. 2003).

Future approaches to fisheries management are also likely to affect levels of wild catch production and fish stocks in the medium to long term. The simulations conducted by Kearney et al. (2003) suggested that with optimal long term management of fish stocks, Australia's wild catch could rise modestly in the long term, whereas 'a profound failure in public policy or industry self-management' could result in production falling by at least a third from current levels.

F Australian fisheries production



Australian consumption

Reflecting rising population and incomes, and the increased availability of processed fish products at prices competitive with substitutes such as red and white meats, Australian consumption of seafood is continuing to grow. Seafood consumption per person grew at an average annual rate of 2.7 per cent between 1978-79 and 1998-99, to reach 11.0 kilograms in 1998-99 (comprising 8.1 kilograms of finfish and 2.9 kilograms of crustaceans and molluscs) (ABS 2000).

Consumption of fisheries products is expected to continue to increase at a rate faster than the rate of population growth, with the Australian domestic market for seafood projected to grow to around 280 000 tonnes edible weight by 2010-11, which would be around 75 000 tonnes more than in 1998-99. However, lower prices for imported seafood are likely to result in a large proportion of this potential market growth being taken by imported seafood (Love and Langenkamp 2002). Other projections suggest that the domestic market for seafood could grow by as much as 75 per cent between 2000 and 2020, although a

wide range of estimates may be derived depending on the particular growth rates assumed for population and seafood consumption per person (Kearney et al. 2003). There is anecdotal evidence that away from home per person fish and seafood consumption has been increasing throughout Australia generally. The picture for in-home consumption is less clear, although it is generally believed to be positive (Ruello and Associates 2002).

South East Marine Region

Many of the South East Marine Region's wild fisheries are producing at or near their maximum biological limits, and wild production in the region appears to be either static or declining. Between 1997-98 and 2002-03 the total catch from the Australian government managed south east trawl fishery rose from 25 400 tonnes to 30 500 tonnes, but combined production from gillnet, hook and trap fishery (formerly the south east nontrawl and southern shark fisheries) fell from 5400 tonnes to 4700 tonnes. Combined Victorian and Tasmanian state production of rock lobster and abalone fell slightly to 1900 tonnes and 3700 tonnes respectively, while combined Victorian and Tasmanian production of scallops fell from 3800 tonnes to 1300 tonnes (ABARE 1998, 2004).

A number of studies have noted that even if total production from a fishery is being maintained in tonnage terms, species shift can still be occurring and critical pressure being put on populations of the most vulnerable species. Where all species are subject to the same fishing effort and similar levels of fishing mortality, less abundant species subjected to fishing activity throughout their range could be driven to extinction, while numerically dominant species continue to support the fishery. The region's inshore fish species are likely to be particularly important from a conservation viewpoint, as the majority (about 80 per cent) of temperate southern inshore fish are endemic to Australian waters (Pogonoski, Pollard and Paxton 2002).

Any future increase in the region's fisheries production is likely to come from the aquaculture of marine finfish, edible oysters, mussels and abalone. The region's Atlantic salmon industry is in a consolidation phase, with the rate of growth in farmed salmonid production having slowed in recent years. Production of Pacific oysters and mussels is increasing, but the bulk of any future increase in South Australian Pacific oyster production is expected to come from areas of the state outside the South East Marine Region. On the other hand, a large proportion of Australia's future increase in farmed abalone production is likely to come from Victoria and Tasmania (that is, from the region).

Trends in total production also give little indication of the real net return to the fishery resource. ['Real net return' is gross revenue from the fishery less all costs of catching fish (cash costs and capital costs) and managing the fishery.]

The real net return to the fishery resource in the region's Commonwealth fisheries appears to have been falling in recent years. The average annual real net return to the south east trawl fishery in the three years 1999-2000 to 2001-02 is estimated to have been around $1.0 million, compared with an estimated $3.0 million in the years 1996-97 to 1998-99 (Galeano et al. 2004). The real net return to the southern squid jig and the southern shark

and south east nontrawl fisheries is estimated to have been around zero in recent years (Galeano et al. 2002).

While the net returns are known for some Australian government managed fisheries, little is known about the economics of state fisheries except for South Australian fisheries where annual reports on all state managed fisheries are produced. Greater understanding of the economics of all fisheries in the region would give managers an increased understanding of the pressures being faced by their fisheries and allow greater insight into various strategies to increase the efficiency of their fishing operations.

Changes in the way that fisheries are managed, such as the move toward statutory fishing rights and tradable fishing quotas for many of the fisheries in the South East Marine Region may also affect the fisheries of the region. Some impacts may result from changes such as the move away from owner operators toward fishers leasing access rights from third parties.

With the bulk of the region's future population increase expected in Melbourne, most of the future increase in the region's demand for seafood is also expected to occur in Melbourne. No studies have been found on fish consumption levels in Melbourne, but a recent study by Ruello and Associates (2002) found that away from home per person fish and seafood consumption in both Sydney and Perth had risen significantly in recent years.

Key economic drivers

Key supply drivers for fish production include the price of fish, production costs, technology, and fish stock levels. Key demand drivers for fish consumption include the price of fish, the price of substitutes, incomes, population and tastes.

The Australian dollar equivalent of output and input prices for goods and services that are tradable on world markets are influenced by the Australian dollar exchange rate. Movements in the Australian dollar have both positive and negative effects on Australian fish producers and consumers. Other things being equal, a weaker Australian dollar will increase producer export returns in Australian dollars but may also increase the cost of many of their inputs. Australian producer returns from the domestic market will also tend to be higher when the Australian dollar is lower, as competition from imported fisheries products is reduced. A stronger Australian dollar will tend to have the opposite effect. Other things being equal, a stronger Australian dollar may reduce producer returns from both the export and domestic market and increase the competitiveness of imported fisheries products on the domestic market.

For consumers, a stronger Australian dollar may reduce the price of imported fisheries products. Consumers may increase their consumption of fisheries products when prices are lower, but as food in general represents a relatively small proportion of Australian consumers' spending, movements in relative prices between fisheries products and substitutes such as red and white meats may have more influence on levels of fish consumption per person.

Regulation designed to protect the marine environment may also affect supply through its direct effect on access to fish stocks and its indirect effect on fishing operators' revenues and operating costs. Management arrangements in wild fisheries have been changed in response to the need to limit bycatch of nontarget species, and minimise the impacts of trawling on the seabed. Under the EPBC Act, the fishing and aquaculture industries must demonstrate good environmental stewardship of the marine and coastal environments. Regulation has also increased because of the need to allocate fishery resources between all sectors (commercial and recreational), and to maintain the food safety and the quality of Australia's fisheries products exports (AFFA 2003b).

Key issues – South East Marine Region

Demand issues

Demand for the region's seafood is expected to continue to grow, but difficulties in obtaining sufficient supply at competitive prices may result in local product being displaced by cheaper imported seafood. Resistance by consumers to buying fisheries products that are perceived to be unsafe or not to have been produced from sustainably managed fisheries may also increase. Demand for aquaculture products is also expected to increase, although downward pressure on seafood prices may result in further rationalisation within the industry.

Supply issues

Lower fish prices and returns to fishers may increase commercial fishing pressure on existing wild stocks, potentially conflicting with the need to sustainably manage fish stocks. Increased management burdens as a result of higher environmental or planning assessment requirements could also reduce fishers' returns if these costs are passed on. Entry costs into some fisheries, particularly those subject to quota regimes, possibly present a barrier to new entrants in some fisheries. For aquaculture, price pressures may potentially have an impact, perhaps only in the short term, on the growth in the sector. In addition some factors driving input costs, particularly for aquaculture feed sourced from commercial fisheries, are expected to continue to grow.

Institutional issues

Wild catch fisheries in the region are subject to a number of different jurisdictions and management arrangements, which could increase the difficulty of sustainably managing and conserving fish stocks in the region as a whole. For aquaculture, certainty in management and compliance regimes may be an issue. The issue of access to the marine resource is a common issue for both commercial fishing and marine aquaculture.

Regional and social issues

If lower seafood prices result in reduced domestic fishing effort, this may affect the local economy in fishing dependent towns. However, any reduction in fishing pressure in the short term may be beneficial for fish stocks in the medium to longer term.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for aquaculture and commercial fishing in the region include basic information on:

- the likely response of commercial fishers to changes in key drivers such as output and input prices;
- greater understanding of the economics of the state fisheries of the region;
- the response of the fishing industry to changes in management, including better understanding of fishery incentive structures;
- environmental and intersectoral impact issues associated with the current sources of aquaculture feed stock; and
- the socioeconomic relationships between fishery and aquaculture activity and related communities and industries.

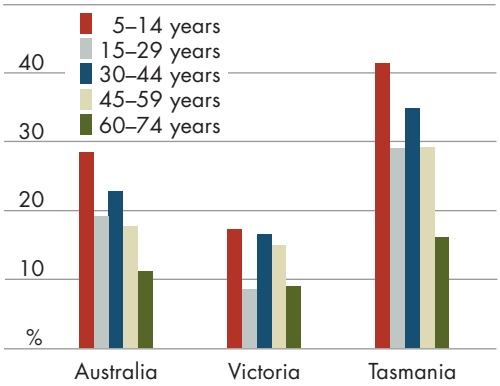
• Recreational fishing – strategic directions

Australia

There have been numerous surveys conducted on recreational fishing in Australia over the past twenty years. However, there has been a general lack of followup to each survey and, consequently, little consistent time series information available on recreational fishing. Kearney et al. (2003) estimate that approximately 30 000 tonnes liveweight are currently caught by recreational fishers, a figure which accords well with the ABS estimate of 18 250 tonnes edible weight for recreational and noncommercial fishing in 1998-99 (ABS 2000). Simulations by Kearney et al. (2003) suggest that the recreational catch has grown by a factor of about 2.5 since the 1940s.

The recent National Recreational and Indigenous Fishing Survey reported a national participation rate in recreational fishing of 19.5 per cent, although participation rates varied considerably by state, gender and age class. For example, the estimated national participation rate for males was 26 per cent compared with 12 per cent for females, and reported state average participation rates varied from a low of 13 per cent for Victoria to a high of 31 per cent for both Tasmania and the Northern Territory. Nationally, the highest average participation rates by age class were reported for the 5–14 years (29 per cent) and 30–44 years (23 per cent) classes (Henry and Lyle 2003). Reported participation rates by age class for Victoria, Tasmania and Australia as a whole are shown in figure G.

G Participation rates in recreational fishing



An earlier report by the National Recreational Fisheries Working Group (1994) pointed to increases in boat registrations, population and imports of fishing equipment to suggest increasing interest in recreational fishing, but the report did not deal with fishing effort. A review of the literature by McIlgorm and Pepperell (1999) concluded

that the participation rate in recreational fishing in Australia appeared to have been fairly consistent over the past twenty years.

The periodic surveying of recreational fishing in itself suggests two things, however. One is that the level of recreational fishing is sufficiently large to require periodic assessments of the 'supply–demand' balance for recreational fishing. That is, the supply of fish available for recreational catch relative to the demand for recreational fish by fishers. The second is that the level of recreational fishing is sufficiently large for recreational fishers to request a periodic examination of potential alternative sources of supply. That is, the level of supplies available to the recreational catching sector compared with that available to the commercial catching sector. As noted by Henry and Lyle (2003), when describing the background to the recent National Recreational and Indigenous Fishing Survey:

> *'Community groups lamented the paucity of information on recreational and indigenous fishing in view of the apparent growth in the number of participants and the technical advances in fishing gear'* (Henry and Lyle 2003, p. 16).

South East Marine Region

Similar comments to those above pertain to the surveys conducted in the South East Marine Region's four states. In November 1996 the National Institute of Economic and Industry Research (NIEIR) surveyed recreational fishing and associated industries in Victoria (Fisheries Victoria 1997). Although the survey was not repeated, the results are worth examining, as the bulk of population growth in the region is projected to occur in Melbourne. (If the participation rate for recreational fishing is consistent over time, then the greatest increase in the future pressure on the marine resource from recreational fishing may align reasonably well with areas in or near where the greatest future increase in population is projected.) The Victorian survey examined five regions, two of which, the North West and North East, were entirely inland. Three, the South West, Melbourne and South East (Gippsland), included both inland and coastal areas, and all of Victoria's coastline.

Of the survey respondents interviewed in the Melbourne region, 92 per cent were from Melbourne. In the South West, around half the recreational fishers surveyed were from Melbourne and half were local. In the South East just over 40 per cent of fishers were from Melbourne and around half were local. In the Melbourne region, three-quarters of the recreational fishers interviewed fished in bays. In the South West around a third of saltwater fishers fished offshore and a third on the beach. In the South East, around a third of saltwater fishers fished in bays and half in estuaries (table 10) (Fisheries Victoria 1997).

Key economic drivers

The three key components that determine changes in the total recreational fish catch are population growth, changes in recreational fishing participation rates (the proportion of the population that fishes recreationally in a particular year), and changes in the number of fish caught per fisher (Kearney et al. 2003). The recreational fishing participation is likely to be affected by the net cost of recreationally catching fish, the price and availability of alternative activities, income and tastes.

10 **Type of fishing, by region, in Victoria**

	Fresh inland	Estuarine	Surf rock	Offshore	Bay
	%	%	%	%	%
Melbourne	16	5	2	2	75
South West	44	9	17	17	13
South East	40	29	5	5	21

Source: Fisheries Victoria (1997).

The net cost of recreationally catching fish will be influenced the direct costs of fishing (equipment, bait, licence and so on) plus any indirect costs (such as boat expenses, transport and accommodation). Around 85 per cent of recreational fishing is done with a rod and reel (Henry and Lyle 2003). As with many other consumer goods, the cost of fishing equipment varies with quality and brand and may represent a large or a small outlay depending on consumer choice. Prices for equipment are therefore not necessarily a large cost component.

Boat prices and boat related expenses potentially represent a larger cost component, but fishers can substitute between boat fishing and shore fishing. Other equipment that may be purchased by recreational fishers includes compressed air, wetsuits (for spear fishing), and fishing nets, pots and traps.

On the supply side, the stocks available for recreational fishing are likely to be determined by the level of the current recreational catch, the level of the commercial catch, administrative restrictions on the level of recreation catch (such as bag limits), and any additions to supply from state hatcheries. (The latter is likely to be more significant for inland fishing than for coastal or ocean fishing.)

In addition, as the type of coastal species that are fished recreationally become relatively more scarce there may be a move by certain segments of the recreational fishing sector to move further offshore. This move may be facilitated by the increasing access to new technology and equipment such as global positioning systems, sophisticated sounders and recreational fishing boats capable of offshore activity.

Key issues – South East Marine Region

Demand issues

Increasing populations are likely to raise the demand for access to the recreational fishing resource. Future growth in international and domestic tourism in the region may also increase pressure on this resource. On the other hand, the increasing attractiveness and availability of substitutes for recreational fishing may lead to decreases in participation rates by particular demographic groups in the future.

Supply issues

While some recreational fishing is directed to inland, freshwater areas, where there is the possibility of increasing supplies of fish for recreational fishing through stock enhancement, a significant proportion of recreational fishing is also directed to the marine and

coastal areas where both recreational and commercial fishers are both likely to want to use the fish resource.

Institutional issues

Data for efficiently allocating the fish resource between competing groups do not appear to be readily available at present.

Regional and social issues

Increases in demand for recreational fishing have the potential to generate increased levels of economic activity in particular areas in the region.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for recreational fishing in the region include basic information on:

- trends in the recreational fishing participation rate, including trends in domestic and international marine tourism focused on recreational fishing;
- the relationship between the above and economic drivers such as the cost of undertaking recreational fishing and the cost of alternatives;
- supplies of fish (stocks) available for recreational fishers; and
- emerging issues associated with the trend toward more offshore fishing.

Seabed mining industries

• Offshore minerals – strategic directions

Australian production

A number of mineral commodities have the potential to occur as economically viable offshore deposits. These include construction minerals, placer minerals, manganese nodules, phosphorites, and offshore extensions of onshore mineralisation. Construction minerals are mainly near shore deposits of sand and gravel. Placer mineral deposits are found near shore and include diamonds, gold and tin. Manganese nodules are deposits principally of manganese, nickel, cobalt and copper that occur in the deeper waters of Australia's exclusive economic zone. Phosphorite deposits are found on the continental shelf margins and seamounts (NOO 2002).

Most interest to date for marine sand and aggregate has been focused around Sydney. Marine sand has been used for beach replenishment — for example, in South Australia, Hallett Cove sand was used for beach replenishment at Brighton, Adelaide (Sait 2001). Extensive sand extraction also occurs in Moreton Bay, Queensland. The sand is used as fill for major land reclamation projects associated with the airport and port, and as marine sand for the construction industry (Australian State of the Environment Committee 2001).

Queensland's substantial silica sand resources have been mined for many years for export, mostly from Cape Flattery, in Queensland state waters. Production increased from 670 000 tonnes in 1980 to 2.6 million tonnes in 1996-97. Mineral sands are also mined for the minerals rutile, ilmenite and zircon that are used in paint pigments and for foundry applications. Although virtually all Queensland's mineral sands are produced on North Stradbroke Island, these resources will be largely depleted by 2020 (Australian State of the Environment Committee 2001).

To date, most offshore exploration activity for metallic minerals has concentrated on suspected offshore extensions of known onshore resource concentrations. The main focus has been on diamonds, gold, heavy mineral sands and tin. Other mineral commodities with offshore extensions from known onshore deposits include tungsten, coal, manganese and iron ore (Geoscience Australia 2002).

Between 1990 and 2001, there were 65 applications for offshore mineral exploration licences (MEL) in Commonwealth waters. Of these, only one was active at the end of 2001, T-2-MEL in Ringarooma Bay in north east Tasmania. Here, previous exploration has identified an inferred tin resource of 23 million cubic metres at a grade of 149 grams of tin metal per cubic metre (Geoscience Australia 2002).

During the 1990s there was some exploration for alluvial diamonds in offshore palaeo-channels and tidal shoals in the Joseph Bonaparte Gulf region of north west Australia. No diamonds were discovered in Commonwealth waters, but a limited number of gem quality diamonds were discovered in state waters (Geoscience Australia 2002).

The low level of offshore mineral exploration and development activity can be attributed to various factors, including Australia's high level of relatively accessible and proven onshore mineral reserves, and the perceived increased cost and risk associated with offshore minerals exploration and development (NOO 2002).

Minerals prices

The prices of most minerals and energy commodities have risen in 2004, driven by higher growth in world industrial activity, and consequent higher demand for most minerals and energy commodities. Rises in minerals and metals prices would increase the attractiveness of offshore mining, but they would also increase the attractiveness of onshore mining of large existing demonstrated onshore reserves. In any case, currently higher prices are expected to encourage expansions in production capacity and place downward pressure on the prices of most of minerals commodities in 2005 (Maurer, Wells and Haine 2004).

Minerals and energy commodity prices move in cycles, with the duration and profile of each cycle determined by the strength of the respective influences of key drivers such as economic growth and industrial activity, exchange rate differentials, the cost structure of production, and the level of trade barriers. More importantly, independent of these cycles, since the 1970s, there has been a long term underlying downward trend in minerals prices, reflecting the combined effects of reductions in the real costs of production, improvements in technology, and increased access to reserves in many regions of the world that

had previously been off limits to international mining companies (Maurer, Wells and Haine 2004). While increasing population and economic growth tends to increase the demand for minerals commodities, changes in technology tend to reduce demand through substitution, recycling, introduction of new materials, and miniaturisation (OTA 1987).

South East Marine Region

At the end of 2001, Australia's one active mineral exploration licence in Commonwealth waters was T-2-MEL, in Ringarooma Bay in north east Tasmania, where there is an inferred resource of tin.

Key economic drivers

Prospective offshore minerals fall into two groups, construction minerals and metallic minerals. The particular economic drivers for these two differ. Historically, the demand for construction minerals such as marine sand and gravel has been associated with levels of demand for housing and infrastructure in nearby urban areas. As the price to weight for these minerals is low, there is typically little or no long distance trade. Some of the infrastructure or the works requiring the dredging of marine sand and gravel are also specifically associated with the construction of marine based infrastructure such as ports, or the dredging of channels. For the metallic minerals, the main factors likely to determine the attractiveness of offshore exploration are the price of the metals obtained, and the cost of production.

The long term downward trend in metal prices since the 1970s largely reflects a reduction in the real costs of production. Like most goods, the long run real prices of metals reflect the real costs associated with their production. In real terms, production costs for minerals have declined in the past thirty years due to advances in exploration and mining technology, improvements in workplace organisation, and greater access to prospective mining areas. In particular, over the past three decades, many (onshore) regions of the world have become more attractive for mining investment because of improvements in property rights and declines in sovereign risk (Maurer, Wells and Haine 2004).

Australia's generally low costs of production reflect in part the large demonstrated economic and 'para-marginal' reserves of many metallic minerals (table 11). The latter are reserves that are likely to become economic only at higher prices or lower costs of production. However, reflecting various political developments, there has been a large increase over the past thirty years in the onshore areas of the world that are both accessible for exploration and attractive for investment. The world's mining companies are likely to bring these large reserves into production long before they need to turn to seabed minerals, with their attendant additional costs and technical risks. (Even in previous decades when large onshore areas were relatively inaccessible to western mining companies, the economic potential of seabed mining was not considered favorable when compared with alternative sources of supply for most mineral commodities — OTA 1987.)

11 Reserves of selected minerals (onshore) a
2001

	Unit b	Australia		World
		Economic	Para-marginal	Economic
Diamond				
– gem and near gem	Mc	79	222	–
– industrial	Mc	82	230	580
Gold	t Au	5 156	1 061	50 156
Tin	kt Sn	95	103	6 900
Manganese ore	Mt	125	23	1 878
Nickel	Mt Ni	22	3	60
Cobalt	kt Co	1 466	121	3 366
Copper	Mt Cu	24	15	355

a The table shows only demonstrated or paramarginal reserves. Total reserves, including demonstrated subeconomic reserves and inferred economic and subeconomics reserves are much larger. **b** Mc – million carats; Au – gold; Sn – tin; Ni – nickel; Co – cobalt; Cu – copper. A dash indicates no data.
Source: Geoscience Australia (2002).

Key issues – South East Marine Region

Demand issues

There is little current interest in exploring for offshore metallic minerals because of the existence of relatively more accessible and abundant onshore mineral reserves. Future construction activity (ports, housing) may generate some interest in the mining of marine sand and aggregate in areas of high population (for example, Melbourne).

Supply issues

There are some areas in the region where the known existence of onshore coastal mineralisation may generate interest in exploring for offshore extensions of these reserves in the future. However, at present, the economics of production may be marginal at best, as there is already an abundance of demonstrated economic reserves of most metallic minerals in Australia.

Institutional issues

The attractiveness of exploring for and developing offshore mineral resources is likely be influenced by the level of environmental assessment required relative to that required for competing onshore resources.

Regional and social issues

With only one currently active mineral exploration licence, there is little economic activity currently being generated in the region from offshore minerals.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for offshore mining in the region are:

- a need to collate studies that identify areas where construction minerals, such as marine sand and gravel, may be sought for future housing and infrastructure; and

- greater understanding of the current regimes, and associated requirements, for commercial access to offshore mineral resources.

• Offshore oil and gas – strategic directions

Although the world's onshore reserves of metallic minerals and some energy minerals such coal are abundant, this is not necessarily the case with oil and gas. The primary seabed mining activity in Australia's South East Marine Region is, and is likely to continue to be, the extraction of oil and gas, and oil and gas exploration. Oil and refined petroleum products are widely traded on world markets, and the prices obtained by Australian producers closely follow world prices (figure H).

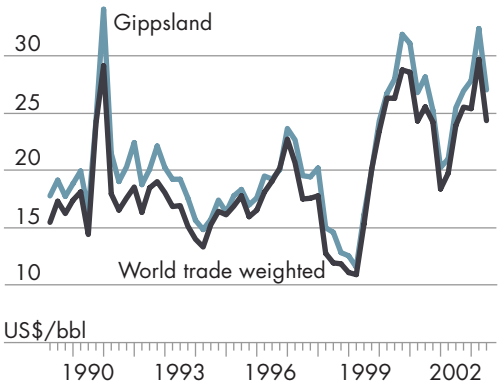
World production

From 1973 to 2002, world crude oil production rose by around a quarter (from 2860 million tonnes to 3548 million tonnes). Production rose rapidly in the 1970s but fell in the early 1980s as world demand for oil fell because of the combined effects of world economic recession and the cumulative effects of past increases in real oil prices. However, oil production resumed its upward trend after only a few years. World production of natural gas more than doubled in the 1973–2002 period, from 1227 billion cubic metres to 2618 billion cubic metres (IEA 2003b).

Offshore oil and gas contributes substantially to total world production. The oil industry began moving offshore in the mid-1900s and in 2000 an estimated 23 per cent of world petroleum production came from offshore. This proportion is growing as technology allows for increasingly deeper installations. Wells are producing from 1500 metres in water depth off Brazil, and in the Gulf of Mexico drilling is taking place at 2500 metres depth (Scott 2000).

World crude oil production is expected to grow strongly through the current decade, but the rate of increase in production in the non-OPEC countries is expected to moderate. This reflects expected declines in output from some mature oil fields in the Russian Federation, north America and the North Sea, and the time required to develop new discoveries such as those in the Gulf of Mexico. Between 2002 and 2009, world crude oil production, both OPEC and non-OPEC, is projected to rise by 16 per cent, from 76.6 million barrels a day to 89.1 million (Ball et al. 2004).

H **Crude oil prices**
Quarterly, ended June 2003



World consumption

Long term energy consumption trends indicate that oil's share of the global energy market has fallen in recent decades, while the share of natural gas has been rising. With the growth of nuclear power, the combined

share of oil and natural gas in global primary energy supply fell from 61 per cent in 1973 to 56 per cent in 2001. Individually, oil's share fell from 45 per cent to 35 per cent, while the share of natural gas rose from 16 per cent to 21 per cent. In absolute terms, however, global energy consumption from all sources has risen appreciably, as indicated by the two-thirds increase in global energy production from all sources from 6034 million tonnes oil equivalent in 1973 to 10 029 million tonnes oil equivalent in 2001 (IEA 2003b).

World oil consumption is expected to continue to rise in the short to medium term. Reflecting a strengthening in world economic growth, global consumption of crude oil is forecast to grow by 2.5 per cent to 80.6 million barrels a day in 2004 (ABARE forecasts at June 2004). Much of this growth in demand is expected to occur in non-OECD countries such as China and India. China is also expected to be the main driver of growth in global oil consumption in the medium term. Consumption by the United States, the world's largest oil consumer, is also projected to grow in the medium term, by an average of just over 1 per cent a year (Ball et al. 2004).

World prices

Two characteristics of oil set it apart from many other commodities. One is its strategic significance. As the primary energy source for the world's transport networks, oil and its products are vital to the functioning of industrial economies and the societies they support. Short term substitutability is limited and only relatively small inventories are held. Consequently, even short term supply disruptions can lead to large and rapid price rises.

The second characteristic is the extent to which a producer cartel controls (or attempts to control) world prices. Global supply is determined in part by the strategic actions of the OPEC cartel, which includes most of the world's 'low cost' oil producers. The OPEC countries accounted for 38 per cent of world oil production in 2002-03. Although OPEC's ability to control prices in the short term is questionable, because the cartel controls the bulk of the world's reserves of 'low cost' oil, its ability to influence supplies and therefore prices in the long term may be more significant, as the OPEC countries are projected to account for 41 per cent of world oil production in 2008-09 (Ball et al. 2004).

In 2003, world oil prices averaged around US$31 a barrel for West Texas Intermediate (WTI) crude oil, up 19 per cent on the WTI price average in 2002, and are forecast by ABARE to average around US$37 a barrel in 2004. In the medium term, WTI prices are projected to fall to average around US$27 a barrel in nominal terms (implying a continuing decline in real terms) in the 2005–09 period (Ball et al. 2004).

Australian production

Australia's primary petroleum production comprises crude oil, condensate, LPG and natural gas. In 2002-03 Australia produced 25.8 billion litres (GL) of crude oil, 7.5 billion litres of condensate, and 4.7 billion litres of LPG. Natural gas production was 36.8 billion cubic metres (Gm^3) (ABARE 2003a). Australia's main four producing basins are the Gippsland Basin in Victoria, the Cooper–Eromanga Basin in Queensland and South Australia, the

Bonaparte Basin in the Northern Territory, and the Carnarvon Basin in Western Australia (table 12).

Since the mid-1980s, the adoption of new technologies has allowed the discovery and development of smaller and more remote fields, and production has been shifting away from the giant fields of the Gippsland Basin toward a larger number of relatively smaller oil fields in the north west of Australia (Hogan 2003) (figure I). The Gippsland Basin's share of Australia's crude oil production has fallen from 90 per cent in 1983-84 to 26 per cent in 2002-03, and its share of natural gas and ethane production has fallen from 49 per cent to 19 per cent.

Overall, following a period of flat production in the early to mid-1990s and a period of rising production in the late 1990s when production from the Bonaparte Basin came on stream, Australia's total production of crude oil and condensate rose to and peaked at 38.7 billion litres in 2000-01. Production of LPG also peaked in the late 1990s at around 4.9 billion litres. However, production of natural gas is continuing to increase, with a record 36.8 billion cubic metres produced in 2002-03.

Reflecting falling production from mature oil fields in the Gippsland Basin and in the Timor Sea, Australia's production of crude oil, condensate and LPG is forecast to fall by 13 per cent in 2003-04 to 33.1 billion litres, and production in 2004-05 is projected to fall by a further 1 per cent. However in 2005-06 and 2006-07, Australian production is expected to increase as two major new liquids projects come on stream, the Bayu/Undan gas recycling project in the Timor Sea and the Mutineer/Exeter oil field development in the Carnarvon Basin of Western Australia. Production from these new projects is expected to boost Australia's production of crude oil, condensate and LPG to a record 40.3 billion litres in 2006-07. After this, though, production is projected to decline again because of expected lower production from Australia's mature oil fields (Ball et al. 2004).

In contrast, natural gas production is projected to rise significantly (by two-thirds) in the period 2002-03 to 2008-09 to reach around 61 billion cubic metres by 2008-09. The main contributors will be Woodside's North West Shelf fourth LNG train (near completion) and ConocoPhillips' Darwin LNG plant. Apart from these two advanced projects there

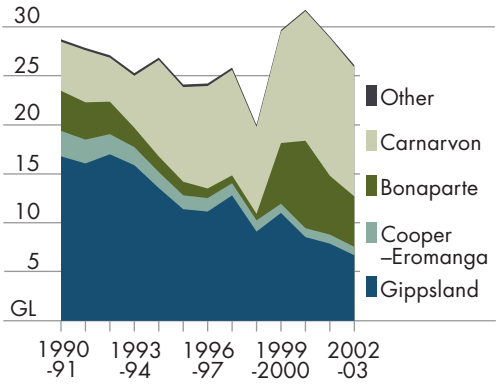
12 Australian production of primary petroleum, by basin
2002-03

	Crude oil	Condensate	LPG	Natural gas a
	ML	ML	ML	GL
Gippsland	6 676	743	1 970	6 432
Cooper–Eromanga	863	588	724	5 753
Bonaparte	5 131	0	0	0
Carnarvon	13 148	6 155	1 911	19 982
Other	212	17	17	1 409
Total	26 030	7 503	4 622	33 576

a Naturally occurring ethane and natural gas. Does not include methane or ethane produced from other than natural gas fields.
Source: ABARE (2003a).

are three other LNG projects currently under consideration, all in north west Australia. The decision to proceed with these projects will depend on the availability of export markets (Ball et al. 2004).

J Australian production of crude oil, by basin



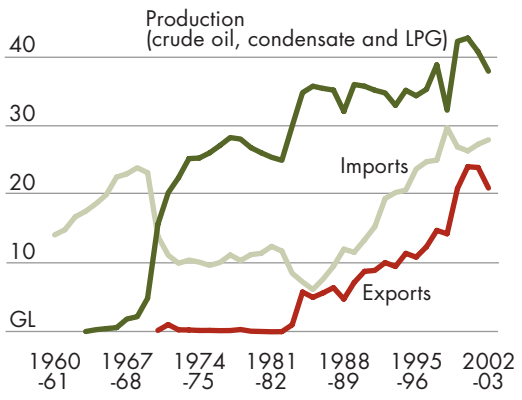
Oil and gas trade

The discovery of oil and gas in Bass Strait in 1965 and the subsequent development of these resources significantly boosted Australia's domestic oil and gas production from around the early 1970s. Australia's imports of crude oil and other refinery feedstocks fell from a peak of 24 billion litres in 1968-69 to a low of 6 billion litres in 1985-86. Since then, however, imports of crude oil and other refinery feedstocks have steadily risen. Exports have also risen, reflecting in part the proximity of Australia's more recently developed oil and gas resources to export markets (figure J).

In 2002-03, Australia exported 24.1 billion litres of crude oil, condensate and LPG. Reflecting production projections for these products, exports are projected to decline in 2003-04 and 2004-05 but to rise in 2005-06 and 2006-07 as the previously mentioned new liquids projects come on stream. However, reflecting expected falling production from Australia's mature oil fields, exports are projected to begin to fall again toward 2008-09. In contrast, exports of natural gas in the form of LNG are projected to rise strongly in the medium term — to more than double from 7.9 million tonnes in 2002-03 to 19.6 million tonnes in 2008-09 (Ball et al. 2004).

In the medium term, Australian crude oil and condensate production is expected to decline, with new production not expected to come on stream as fast as old production is expected to fall. However, significant increases are expected in natural gas production and exports in the medium term, and a large proportion of new oil and new natural gas production in Australia is expected to come from Australia's offshore areas.

J Production and trade in crude oil and other refinery feedstocks



South East Marine Region

As discussed above, Gippsland's crude oil and condensate production has been declining since the mid-1980s and is projected to continue to decline in the medium term. On the other hand, natural gas production is expected to be augmented by

projects that target modest size gas resources that are able to be accessed mostly through existing infrastructure.

Offshore exploration for oil and gas is being undertaken in the Otway basin of south east South Australia and western Victoria, which currently produces small quantities of natural gas, and in the Sorrell basin off north western Tasmania. Production from the Otway Basin is expected to increase from 2005 when the Minerva offshore gas project comes on stream (table 13).

Developments in the South East Marine Region will also be influenced by future supply developments in coal seam methane gas production in Queensland and New South Wales, and by prospects for the import of northern gas into the eastern seaboard gas market. Gas demand on the eastern seaboard and in Australia generally is projected to grow strongly in the next two decades, primarily reflecting the increasing use of gas for electricity production.

Key economic drivers

The key economic driver of global oil and other petroleum product prices is the balance between global supply and demand. The global demand for oil is affected by the price of oil, the price of substitutes (of which there are few in the short term, but in the long term could include virtually any other type of fossil and nonfossil fuel), and the level of economic activity in the oil consuming countries. Seasonal factors such as the increased demand for heating oil in the northern hemisphere each winter also come into play. Finally, history suggests that the market is also periodically subject to panic buying of this strategically vital commodity.

Global oil supplies are also influenced by the price of oil and in the long term by the price of substitute fuels, as well as by strategic marketing behavior by the oil producing countries, particularly the OPEC cartel. Australia is a relatively small player in the global oil market

13 New and potential oil and gas projects in the South East Marine Region

Project	Location	Status	Expected startup	New capacity
BassGas project (Yolla gas/LPG/condensate field)	Bass Strait	Under construction	Late 2004	20 PJ pa natural gas; 67 ktpa LPG; 2.5 kbd condensate
Minerva offshore gas field	Otway Basin	Under construction	Mid-2004	150 TJ pd gas; 600 bd condensate
Casino gas discovery	Otway Basin	Feasibility study underway	2006	293 PJ over 11 years
Geographe/Thylacine gas discoveries	Otway Basin	Committed	2006	60 PJ pa

Source: ABARE.

and movements in the US dollar denominated price for Australian crude oil closely track movements in world oil prices.

The main drivers that determine the rate at which discovered resources are brought into production are the prices of oil and gas, in conjunction with cost of production. The latter is affected by advances in the technology available for extracting oil and gas. As previously noted, much of the recent increase in domestic oil and gas resources has been made economically viable by the development of techniques for extracting oil and gas from smaller, more remote fields.

As for other traded commodities, the exchange rate between Australian dollar and major trading partner currencies determines the Australian dollar equivalent of primary petroleum product prices and thereby primary petroleum production, consumption and trade.

Key issues – South East Marine Region

Demand issues

Local demand for the region's petroleum products is expected to remain high, encouraging continued offshore oil and gas exploration and development activity in the region.

Supply issues

While Gippsland's production of crude oil and condensate is expected to continue to decline, a number of new projects could increase natural gas production in the Gippsland and Otway Basins. However, these projects will face competition from other potential sources of supply for the eastern seaboard market, including coal seam methane and northern gas.

Institutional issues

Some of the prospective areas of the offshore Otway Basin are also thought to be areas of high conservation value, which may necessitate detailed environmental assessment of production proposals. The environmental requirements involved in the decommissioning of some of the existing production infrastructure in the Gippsland Basin may also be an issue

Regional and social issues

Any large decline in petroleum product output from the region would have implications for the local economies that depend on the offshore oil and gas industry.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for the offshore oil and gas industries of the region are likely to include:

World oil market

- the sensitivity of current oil price projections to the type of supply and demand shocks that have been periodically experienced by the market in the past; and
- the longer term trend in world oil prices.

Australia/South East Marine Region

- the relative economic attractiveness for oil and gas exploration and development in different regions in Australia;
- the likely effect on the region's economy of the current changes in the structure and location of oil and gas production in the region and in other Australian oil and gas producing regions; and
- the socioeconomic and environmental impacts stemming from the decommissioning of offshore facilities.

Seabed energy and communications infrastructure

• Natural gas pipelines – strategic directions

Australia

Australia's major conventional reserves of natural gas are located in four areas: the Carnarvon and Browse Basins in Western Australia; the Bonaparte Basin in the Northern Territory; the Gippsland Basin in Victoria, and the Cooper/Eromanga Basin in South Australia and Queensland (BHP Billiton 2003). With the exception of the Gippsland Basin, these basins are situated in relatively isolated areas away from the main gas consuming centres in south east Australia. The Cooper/Eromanga Basin is linked to south east Australia by transmission pipelines, but there are no transmission pipelines from Western Australia or the Northern Territory. 'Unconventional' reserves of gas now being increasingly developed centre on the extraction of coal seam methane gas in the coal rich areas of Queensland and New South Wales.

Large lengths of new gas transmission and distribution pipeline have been constructed in the past decade, mainly in the south east. The length of transmission pipelines in Australia increased between 1989 and 2002 from 9399 kilometres to 20 109 kilometres, while the length of distribution pipelines laid over the same period increased from 51 906 kilometres to 75 449 kilometres (BHP Billiton 2003, quoting AGA 1990, 2003).

As new infrastructure has been provided to supply natural gas to new consumers, domestic consumption of natural gas has risen. Australian domestic consumption of natural gas rose by 49 per cent between 1990-91 and 2000-01, while between 1990 and 2002, the number of residential, and commercial and industrial customers rose by 40 per cent and 33 per cent respectively. The consumption of natural gas in gas fired electricity generation, which had been rising in the early 1990s, declined between 1993 and 1997, largely as a result of inter-state connections in power markets and the consolidation of power generators. However, since 1998, the use of natural gas in gas fired electricity generation has resumed its upward trend (BHP Billiton 2003).

The role of natural gas in electricity generation is expected to continue to grow. Over the years, electricity demand has developed an increasing summer peak, driven by the air conditioning load. While the demand for gas has traditionally seen a winter peak as a result

of seasonal domestic heating loads, this is now changing for many major pipelines as a result of gas being used for electricity generation (Moran 2002).

Future extensions to the current transmission pipeline network may involve new infrastructure for the supply of coal seam methane gas, and probably new pipelines to supply northern gas to the eastern seaboard market from either the Timor sea or Papua New Guinea. The likelihood of these projects proceeding will depend in part on developments in producing areas closer to the main south eastern consuming centres. It has been suggested that the prospect of competing northern gas may have accelerated the development of new south eastern onshore and offshore fields, as well as coal seam methane (McDonald 2002).

South East Marine Region

The Tasmanian Natural Gas Project (TNGP) has involved the construction of a transmission pipeline across Bass Strait from Longford in Victoria to Georgetown in northern Tasmania. The pipeline is capable of transporting up to 60 petajoules of gas each year. Recently, the Tasmanian Government signed the first agreement to facilitate the development of a gas distribution network that will supply natural gas to commercial and domestic users in Tasmania (Tasmanian Government 2003). The new network will reticulate natural gas in Hobart and to some of the population centres on the northern coast of Tasmania (Productivity Commission 2003). Part of the Tasmanian Gas Pipeline project also involves the conversion of the Bell Bay Power Station in Tasmania to natural gas (DEI 2002).

Several new transmission pipelines have also been constructed in southern Victoria since 1989. These have included the 680 kilometre SEA Gas Pipeline linking Victoria to Adelaide, the 188 kilometre North Paarette to Portland/Hamilton pipeline in Victoria, and the 795 kilometre Eastern Gas Pipeline from Longford in Victoria to Hoarsley Park in Sydney (BHP Billiton 2003). These new transmission pipelines are part of the pipeline infrastructure established to export offshore gas from the Bass Strait area. The Eastern Gas Pipeline, the Tasmanian Gas Pipeline and the GasNet transmission system near Longford were interconnected in May 2003 by Duke Energy International's VicHub project (DEI 2003).

Key economic drivers

The demand for transmission and distribution infrastructure for natural gas is derived from the demand for natural gas itself for residential, commercial and industrial use. This is influenced by the price and availability of gas, compared with the price and availability of alternatives such as electricity and LPG, and by conventional demand shifters such as income and population growth. The increased use of natural gas for applications such as heating reflects its lower price relative to alternatives such electricity, LPG and heating oil.

The supply of transmission and distribution infrastructure is influenced by the price obtained from supplying gas and the cost of constructing pipelines and operating the distribution system. Gas transmission pipelines exhibit significant economies of scale. Modestly increasing the pipeline diameter can significantly increase pipeline capacity without greatly increasing capital costs. A large proportion of the capital costs of installing a pipeline are

associated with obtaining right of way and laying the pipe. These costs do not vary significantly with the diameter of the pipeline and its capacity (Productivity Commission 2003; APIA 2003).

It is possible to add capacity to an existing pipeline by using compressors and looping. The economic tradeoff is between initially building a larger diameter pipeline or adding capacity later through the use of compressors and/or looping. In other words, between the opportunity cost of having underused pipeline capacity in the earlier years of the pipeline's existence and the likely costs of having to add capacity through compressor stations and looping in later years. Making the correct choice requires an evaluation of the likely life of the pipeline together with expected growth of demand (Productivity Commission 2003; APIA 2003).

The cost effectiveness of using coal seam methane as an alternative fuel to natural gas may also influence future developments in the domestic supply of natural gas (McDonald 2002).

Key issues – South East Marine Region

Demand issues

Natural gas demand in Tasmania is likely to continue to increase, and although Tasmania's electricity generation system is predominantly hydro based, the prospect of gas fired electricity becoming available could further boost the demand for natural gas in Tasmania.

Supply issues

The development of new natural gas fields in the Gippsland and Otway Basins in Victoria may lead to the construction of further new seabed gas pipelines in these areas.

Institutional issues

Institutional arrangements may need to be put in place that will allow an integrated approach to the development of future gas and electricity infrastructure, including an integrated approach to environmental and other approval mechanisms.

Regional and social issues

The construction of additional energy infrastructure is likely to assist the further development of the state economies.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for natural gas pipelines include:

- the need for an integrated assessment of likely future domestic gas demand and supply developments for regional gas production, transmission, distribution and consumption infrastructure.

• Electricity transmission lines – strategic directions

South eastern Australia

Electricity generation is the largest user of primary energy in the Australian economy. Dickson, Akmed and Thorpe (2003) forecast the gross generation of electricity in Australia to increase by an average 2.2 per cent a year, increasing from 218 TWh (785 petajoules) in 2000-01 to 330 TWh (1188 petajoules) by 2019-20. (Gross generation includes electricity purchased by all consumers as well as own use by generators and transmission losses. That is, it is the total amount of electricity generated in Australia.

Australia's south eastern electricity regions (Queensland, New South Wales and the ACT, the Snowy, Victoria, and South Australia) are now linked and operate as a National Electricity Market (NEMMCO 2001). Interconnections allow the regions to trade electricity, particularly during periods of maximum demand. In Queensland, the maximum demand occurs in summer. In New South Wales, the maximum demand can occur in either summer or winter. Victoria and South Australia are subject to similar weather patterns and generally attain their peak demands in summer (NEMMCO 2003).

While Tasmania is not presently part of the national electricity market, this will change once Basslink (see chapter 2) connects the Tasmanian electricity region to the existing national market. Tasmania is generally capacity rich but energy limited — that is, there is not enough water inflow to Tasmania's storages to allow the generation of hydroelectricity indefinitely. With the Basslink interconnection, Tasmania will manage its water resources to provide sufficient reserves for Tasmania, as well as support for other national electricity market regions (NEMMCO 2003). The Tasmanian Government strategy for energy reform will involve the use of both water (hydro) and gas for electricity generation, sale and export (Tasmanian Government 2003).

The supply–demand balance for Tasmania indicates that reserves will be above the minimum reserve level for the next ten years. Maximum demand in Tasmania occurs in winter. In contrast to the other national electricity market regions, peak summer demands in Tasmania occur as a result of cooler weather rather than as a result of hot weather (NEMMCO 2003). The addition of Tasmania to the national electricity market will therefore enhance the ability of the national electricity market to even out the seasonal peaks in maximum demand that occur in different parts of the national market.

Key economic drivers

The demand for and supply of electricity in Australia can be considered within the broader context of the demand for and supply of energy from all sources. Electricity is both a product produced from other fossil and nonfossil energy fuels, and a fuel in its own right. The demand for electricity is thus related to its own price, the price of substitute fuels, levels of income or economic activity, and technological change.

The recent creation of a wholesale market for electricity through the national electricity market and the increasing privatisation of electricity generation could assist the process of

efficient investment in future generating facilities. The operation of the wholesale market and its many participants is described in more detail in NEMMCO (2001).

The interconnection of electricity regions will also influence the mix of fuels likely to be used for electricity generation in the future. For example, generators fired by natural gas, which can be brought on line more quickly than coal fired generators, are increasingly likely to be used for the generation of electricity during periods of peak demand. The demand for electricity and natural gas connection infrastructure is therefore linked (see next section).

Key issues – South East Marine Region

Demand issues

The demand for a seabed electricity connection between Tasmania and the mainland states reflects both the continuing strong increase in the demand for electricity across south eastern Australia generally, and demand for a reliable electricity supply during periods of peak electricity demand.

Supply issues

As the transmission capacity represented by Basslink is designed to handle both the current and foreseeable demand for such capacity, there is unlikely to be any future requirement for further seabed electricity connections between Tasmania and the mainland in the foreseeable future.

Institutional issues

The connection of the Tasmanian electricity grid to those of the neighboring mainland states will expand the scope and flexibility of the national electricity market and therefore enhance the ability of the market to operate effectively.

Regional and social issues

Expansion of electricity infrastructure is likely to assist the further development of the relevant state economies.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for electricity transmission lines include:

- information required on the question of whether more electricity interconnectors are likely to be constructed in the future.

• Submarine communications cables – strategic directions

Australia

Prior to 1 July 1997, Telstra, Optus and Vodafone were the only organisations permitted to operate as telecommunications carriers in Australia. Since the opening of the telecommunications market in 1997, however, around 100 new carrier licences had been issued to 30 June 2002 (DCITA 2003).

Reflecting strong consumer demand for telecommunications services, capital expenditure by the carriers has risen in recent years. Estimated carrier revenue in 2001-02, including intercarrier payments, was $28.7 billion, compared with just under $20 billion in 1997-98. During 2001-02, telecommunications carriers reported capital expenditure of around $7.9 billion, compared with around $4.9 billion in 1997-98. Carrier expenditure on research and development expenditure has also risen. Both new and established carriers have undertaken research and development projects in a wide range of areas including, among other things, mobile telephony and wireless delivery systems, high speed digital access technology, and high speed data and ecommerce development (DCITA 2003).

South East Marine Region

At present there is only one active submarine communications cable across Bass Strait, Telstra's Bass Strait 1 optical fibre cable from Sandy Point, Victoria, to Boat Harbour (near Stanley) in Tasmania, that was laid in 1995. Bass Strait 1 had an original capacity of 622 megabits per second. Telstra is currently laying a second optical fibre cable, Bass Strait 2, from Inverloch in south east Victoria to Stanley, each pair of optical fibres in the new cable capable of carrying simultaneously more than 125 000 telephone calls or 10 gigabits per second of data. The new Telstra cable will cater for the increasing demand for cross-Strait high bandwidth data transmission, broadband internet and voice traffic, and the requirements of Tasmania's growing call centre industry, as well as providing a redundant loop to complement Bass Strait 1. The $27 million Telstra project will involve the laying of 240 kilometres of armoured undersea cable to be ploughed 1.4 metres into the mud and sand at the bottom of Bass Strait (Barker 2003; Withers 2003).

A second new fibre-optic cable is expected to become operational in 2005 in competition with Telstra's Bass Strait 2. When in February 2000 the Tasmanian government selected Basslink to build, own and operate an undersea electricity cable across Bass Strait, it encouraged the company to lay fibre-optic cable alongside it. The new cable is expected to significantly enhance telecommunications connectivity between Tasmania and the mainland (DPC 2003).

The Tasmanian government has also entered into an agreement with Tas21 to construct a 420 kilometre fibre-optic backbone connecting north, north west and southern Tasmania using the Duke Energy (now Altina) natural gas pipeline trench. The government has also reached agreement with gas distributor PowerCo to use its pipeline trenches for the installation of conduit for fibre-optic. The first phase of this distribution is expected to be completed by the end of 2004 (DPC 2003).

Key economic drivers

The large increase in demand for telecommunications services in recent decades has been driven by the falling real price of telecommunications, in conjunction with the increase availability of telecommunications services. The fall in the real price of telecommunications has been driven by rapid technological change in all areas of telecommunications and information processing technology.

These changes have interacted with each other to constantly create new consumer demand for products and services that did not exist previously. For example, the laying of the trans-Atlantic fibre-optic cable in the mid-1980s and the development of the personal computer were significant stimulants to the development of the world wide web, which in turn has stimulated greatly increased demand for broadband. Access to broadband in turn tends to encourage the development of consumer communications services that require the sending of large amounts of data via cables (IPC 2002).

Key issues – South East Marine Region

Demand issues

Demand for fibre-optic based communications systems appears likely to increase in Tasmania, potentially increasing the demand for more connectivity with the mainland.

Supply issues

Future additional cables may not be able to take advantage of the same type of cost savings likely to have been achieved by integrating construction of the second cable with Basslink.

Institutional issues

Institutional issues include the pricing of access to new users.

Regional and social issues

Increased broadband availability is likely to contribute significantly to the growth in the higher technology sectors of Tasmania's economy.

Future information requirements

Areas where further, more detailed understanding of both directions and drivers for submarine communications cables include:

- information on the likely future growth in demand for communications services in Tasmania.

• Marine based tourism – strategic directions

The marine environment has long been one of the most attractive settings for tourism. Marine tourism, as defined by Orams (1999), includes 'those recreational activities that involve travel away from one's place of residence and which have as their host or focus the marine environment' (CCC 2003). Marine tourism thus includes a wide range of activities including scuba diving and snorkelling, wind surfing, recreational fishing, observing marine mammals and birds, cruise shipping and ferrying, sea kayaking and recreational boating. The inbound, outbound and domestic tourism sectors are closely linked. Accordingly, the following section examines strategic directions in both the global and the Australian tourism market.

World

Global tourism has enjoyed strong growth over recent decades. Tourist numbers are expected to continue to grow, and the proportion represented by international travelers (currently about a fifth) is also expected to grow. The World Tourism Organisation (2003) forecasts that the number of international arrivals worldwide will more than double to 1.56 billion by 2020, with around a quarter of these being long haul travelers. Although the industrialised countries of Europe, the Americas and east Asia and the Pacific are expected to remain the main sources of tourists, with rising levels of disposable income many developing countries are expected to contribute increasing numbers of outbound tourists.

Australia

International visitors

Australia, a long haul destination for most international tourists, currently attracts less than 1 per cent of the world's international tourists. Australia's natural environment is a major drawcard for those who do visit (DITR 2003b). Marine (ocean and coastal) tourism accounts for an estimated 19 per cent of the economic activity generated by international tourism in Australia (NOO 1997).

The number of international tourists visiting Australia rose during the 1990s — from 3.06 million in 1993 to 4.93 million in 2000 (TFC 2003). (The only year in which numbers fell in this period was in 1998, when arrivals declined slightly because of the Asian financial downturn.) Growth in tourist numbers was particularly high in 1999 and 2000, reflecting factors such as the Sydney Olympic Games, the low value of the Australian dollar, and strong income growth in north America and western Europe (DITR 2001).

More recently, however, international tourist arrivals have fallen, with the fall attributed to a combination of: the terrorist attacks in the United States in September 2001; the collapse of Ansett Airlines; the October 2002 Bali bombings; the Iraq War in early 2003; and the SARS (Severe Acute Respiratory Syndrome) outbreak in Asia in early 2003. The number of inbound visitors to Australia fell to 4.85 million in 2001 and 2002 and fell further to 4.58 million in 2003 (TFC 2003).

With a return of confidence in international travel, international visitor arrivals to Australia could increase to around 5.0 million in 2004 and to 7.56 million by 2012. One sign of the return of confidence in the sector is that air capacity in Australia has been restored to 2000 levels (prior to the collapse of Ansett), with airlines discounting to try to capture market share (TFC 2003). Qantas has formed a low price carrier, Jetstar, to compete with Virgin Blue, and intends to buy 23 Airbus jets for Jetstar, as well as five new planes for its own existing operations (Vitorovich 2003).

The provision of information is seen as one part of the process of confidence rebuilding. Providers of tourist services are facing a better informed, more discerning, more wealthy, and culturally and linguistically diverse consumers. More potential customers are obtaining their information from the internet and looking for unique experiences in destinations considered relatively safe from terrorist attack (DITR 2003).

An Australian government study has suggested that there is scope to expand the tourist experience in Australia through more regional dispersal of international tourism — that is, encouraging international visitors into regions from the main gateways. Currently, regional and rural Australia accounts for over 70 per cent of domestic tourist visitor nights, but only 23 per cent of international tourist visitor nights (DITR 2003).

Domestic tourism

Marine (ocean and coastal) tourism accounts for an estimated 90 per cent of the economic activity generated by international tourism in Australia (NOO 1997). The level of domestic travel (as measured by visitor nights away) has increased only modestly in recent years and outbound travel is expected to remain an important substitute for domestic travel. In the 1990s, the number of outbound visitors to traditional destinations such as the United Kingdom and the United States was relatively flat, possibly because these destinations became increasingly expensive for Australian visitors as the Australian dollar depreciated against the US dollar and major European currencies. However, there was continued growth in outbound travel to 'cheaper' destinations such as New Zealand, Singapore, Thailand, Fiji and China.

Modest rises are forecast in domestic visitor nights in the next few years. Domestic visitor nights were estimated to be 298.7 million in 2002 and 304.3 million in 2003, and are forecast to rise to 306.1 million in 2004 (TFC 2003). The recent appreciation of the Australian dollar may have increased the relative attractiveness of outbound versus domestic travel (the 'price factor'), but there may be offsetting 'nonprice' factors still working in favor of domestic tourism.

South East Marine Region

Victoria

Under Victoria's regional marketing program, Tourism Victoria is working with local government agencies, regional and local tourism associations, regional development organisations and business operators to develop and implement tourism strategies and marketing programs. Twelve regional tourism marketing regions have been defined. Of these, four — the Great Ocean Road, Melbourne's Bays and Peninsulas, Phillip Island and Gippsland Discovery (west Gippsland), and Lakes and Wilderness (east Gippsland) — cover Victoria's regional coastal areas and their immediate hinterlands (Tourism Victoria 2003a).

Between 1998 and 2003, international visitor numbers to Victoria and to Victoria's coastal regions grew, but domestic visitor numbers did not (table 14). However, tourism numbers are only one of many possible indicators of tourism trends. Other possible indicators being total visitor nights, expenditure per visitor, or expenditure per visitor night. A comprehensive analysis of trends (outside the scope of this report) would require an examination of many indicators.

Victoria's *Tourism Industry Strategic Plan 2002–2006* envisages, among other things, growth in domestic and international visits, and greater visitor dispersal throughout regional Victoria, including coastal areas. The number of international visitors to the state is expected to rise from 1.1 million in 2000 to almost 2.1 million by 2010 (Tourism Victoria

14 Tourism numbers: Victoria's coastal regions [a]

	Domestic				International	
	Overnight		Day trip			
	1998 [b]	2003 [c]	1998 [b]	2003 [c]	1998 [b]	2003 [c]
	'000	'000	'000	'000	'000	'000
Great Ocean Road	2 729	2 837	5 416	5 217	117	167
Bays and peninsulas	2 513	2 133	7 046	6 488	44	52
Phillip Island and Gippsland	1 976	1 876	3 726	3 267	54	49
Lakes and wilderness	797	690	517	530	34	42
All Victoria	18 637	18 190	43 949	37 235	1 034	1 210

a Outside of Melbourne. The regional figures should not be directly compared with each other or with the state total as there is some overlap between the regions. **b** Calendar year. **c** Four quarters ended September.
Source: Tourism Victoria (2003b) and previous issues.

2002). Overnight domestic visitors to Victoria stay on average around three nights, while international visitors stay on average around nineteen nights. Therefore, while international visitors made up only a small proportion of total visitors, they represent around 30 per cent of visitor nights (Tourism Victoria 2003b).

Tasmania

Tasmania's tourism strategy is built around wilderness, heritage and lifestyle attractions and the touring routes that link these attractions, marine and nonmarine (Tourism Tasmania 2003). In 2001-02, around half of all visitors (both international and domestic) arriving by scheduled air and sea services were visiting Tasmania for leisure and holiday purposes (Tourism Tasmania 2002).

Between 1997-98 and 2001-02, the total number of visitors to Tasmania increased by 10 per cent, from an estimated 523 000 to 576 000. The number of international visitors arriving by scheduled air and sea services rose by 30 per cent, but the total number of visitors from other Australian states fell slightly overall (Tourism Tasmania 2002). As with Victoria, a comprehensive analysis of Tasmanian tourism trends would require detailed examination of a number of other indicators such as numbers of visitor nights, visitor expenditure, regions visited, and so on.

Key economic drivers

Broadly, the demand for tourism products is influenced by a number of factors that may be classified as either price or nonprice. Potential tourists tend to compare the total cost of visiting alternative destinations. For travelers from north America and Europe, Asia Pacific destinations (including Australia) are viewed as long haul and therefore relatively costly destinations. Potentially offsetting this, however, are a number of nonprice factors, many of which would work in Australia's favor, such as political stability and personal safety, special events, the availability and quality of airline flights, and the uniqueness and range of natural and other tourist products (DITR 2001).

Demand for tourism products is also influenced by the personal income levels of potential tourists. For example, in Asia, a wealthy new middle class is now able to tour because of increases in disposable income and leisure time, the breakdown of political barriers, the easing of travel restrictions, the falling real price of air transport, and aggressive marketing campaigns in tourist destination countries (Singh 1997). Other factors influencing outbound tourism from Asia include falling household sizes, increases in the number of married couples who are working (both tending to increase individual disposable income), the rising economic status of women, higher levels of education, and a growing interest in outdoor adventures (Keng 1997). Many Asian countries are both large producers and consumers of tourist services. Japan, Chinese Taipei and South Korea are major tourist generating countries, while China, Thailand and Singapore are major receivers (Singh 1997).

Perception of the likely attributes of the destination also plays a role in the demand for tourism products. For example, studies of the attitudes of inbound Japanese tourists into the United States have found that these tourists like to go to places that have been previously visited by Japanese visitors and where they have opportunities for sightseeing, shopping and dining. They were very concerned about personal safety, were not interested in associating with the local community, and liked to receive Japanese-style services (Chacko 1997).

Key issues – South East Marine Region

Demand issues

The number of international tourist visitors to Australia has recently fallen, with attendant negative flow-through effects on tourism service industries such as transport and accommodation, although state data suggests that international tourist visitor numbers to Victoria and Tasmania have continued to rise. Overall international tourist numbers are expected to rise in the near future, but this expectation is predicated on a restoration of confidence in international travel. No large changes are expected in domestic tourist numbers to the South East Marine Region in the short term.

Supply issues

While the supply of key services for tourism such as airline transport has recently suffered disruption, confidence appears to be returning and the supply of services for tourism adjusting to current demand.

Institutional issues

Both the Australian and the Victorian and Tasmanian state governments are working to encourage more international tourists to visit regional areas, including the marine and coastal parts of these regions.

Regional and social issues

Tourism, including marine tourism, will continue to make an important contribution to the economy of the region. Marine tourism is also likely to increase because of the demographic trends discussed in chapter 3.

Key information needs

Areas where further, more detailed understanding of both directions and drivers for marine tourism include:

- methods to project tourist numbers at the regional level and a better understanding of demand drivers; and
- methods to gain greater insight into the economic contributions made by marine tourism to both the regional and national economy.

Marine related manufacturing industries

The main marine related manufacturing industry in the South East Marine Region is ship and boat building. The region is also a potential source of biological materials for the pharmaceutical industry, and may also be accessed for ocean waste disposal.

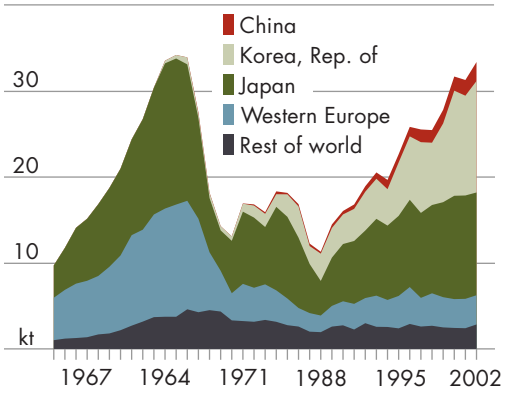
• Ship/boat building industries – strategic directions

World

For many years the world ship building industry was characterised by prolonged periods of excess capacity. For example, overcapacity was estimated at around 15 per cent in 2002 (OECD 2002). Some of the main drivers of this overcapacity were subsidies and other forms of government support that allowed shipyards that would otherwise have gone bankrupt to continue to operate. This resulted in a long period of sustained downward pressure on new ship prices, with many shipyards attempting to attract the business needed to keep their workforces employed.

In terms of gross tonnage, world commercial ship production rose rapidly from the mid-1960s to the mid-1970s as both Japan and western Europe increased their production. According to Lloyd's Registers' World Fleet Statistics, world production of self propelled commercial vessels of over 100 gross tonnes peaked in 1975 at around 34 000 gross tonnes (Maritime Business Strategies 2004). Production fell in the late 1970s as both Japan and western Europe significantly reduced output. From the 1980s, however, the Republic of Korea emerged as a major new builder of commercial ships, and in 2000, overtook Japan as the world's largest commercial ship builder in terms of tonnage. Korea is now considered to be the world's price leader for the types of commercial ships that it builds. World production of commercial ships in 2002 was around 33 000 gross tonnes, just under the 1975 peak (figure K).

K World commercial ship production
gross tonnes



Within the container ship sector of the market there has also been a trend toward the construction of more, and larger, container ships, as indicated by the steady growth in average TEU (twenty-foot equivalent units – a standard measure of container size) capacity since 1990. From 1980 to 1998, the TEU capacity of this class grew sixfold while average ship length grew by only 30 per cent (Haralambides, Tsolakis and Cheung Tam He 2000).

Australian commercial ship building

In the mid-1990s there was a significant structural change in the Australian commercial ship building industry. The industry almost completely ceased building large conventional steel vessels and turned to manufacturing fast ferries, motor yachts and catamarans for niche and export markets. While Australia is a minor player in the world market in terms of gross tonnage produced, its market presence in terms of the numbers of ships completed is somewhat larger, with 2 per cent of all commercial ships completed in the world in 1994 built in Australia (Industry Commission 1998).

While some Australian firms still build in steel for fishing vessels, tugs and offshore oil and gas industry vessels, Australia's commercial ship building industry now concentrates on the construction of high speed aluminium vessels such as car and passenger ferries and large luxury motor yachts. Since the Australian company Incat introduced its first 20 metre catamaran in 1978, Australia has become a major world manufacturer of aluminium ships. The industry is also highly export oriented, with over 80 per cent of commercial ship production being exported. Major export sectors and markets include fast passenger or car/passenger ferries (Europe, Asia, south America, Oceania), high speed patrol and/or rescue boats (south Asia, south east Asia, Oceania, Middle East), and high speed ocean freight vessels (Oceania) (Industry Commission 1998; Australian Trade Commission 2003a).

Australia also produces and exports a wide variety of fibreglass and aluminium or alloy recreational boats. The majority of such vessels exported are sport fishing and luxury motor cruisers, followed by customised racing yachts and one-design class yachts (Australian Trade Commission 2003b).

Australian naval ship building

Defence related ship production for the Australian Government is also significant, especially in terms of industry turnover. This reflects not only the volume of work and the size of defence vessels, but also the requirements for fitout. The armaments and electronics embedded in defence shipping mean that a commercial vessel of equivalent size to a naval frigate can be constructed for as little as a tenth of the cost (Industry Commission 1998).

In August 2002 the Australian Department of Defence released its Australian Naval Shipbuilding and Repair Sector Strategic Plan (DMO 2002). The plan noted that Australia's policy of defence self reliance requires that the Australian Defence Force (ADF) be able to defend Australia without relying on the combat forces of other countries. To achieve this policy objective, Defence relies heavily on Australian industry for the provision and support of ADF equipment. The Australian Naval Shipbuilding and Repair Sector has traditionally provided most necessary facilities to build, maintain, modify, upgrade and repair

Australia's warships. However, Australia is emerging from a period of historically high naval ship building activity, centred largely on the ANZAC Frigate and Collins submarine projects. By Australian standards, both of these projects have been atypically large in terms of value, numbers of vessels and complexity of technologies.

Based on the Navy's future procurement plans, however, after the completion of the ANZAC Frigate and Collins submarine projects, the average level of ship building activity, even including major upgrades to the existing contingent of FFG class vessels and future builds of Air Warfare Destroyers and large amphibious and support vessels, is likely to be well below that of the recent past (DMO 2002).

Since the mid-1980s the Australian Government has largely withdrawn from the operation and ownership of ship building and depot level repair and maintenance facilities. Williamstown Dockyard in Victoria was sold in 1985 and is currently owned by the Tenix Group. Cockatoo Island Dockyard in Sydney ceased operation in 1992. Garden Island Dockyard in Sydney is operated under lease by ADI Ltd. The Australian Government currently retains part ownership of the Australian Submarine Corporation but it is intended that this share will eventually be sold to the private sector (DMO 2002). Virtually all current or previous naval ship building and repair work has been undertaken by four companies at various infrastructure locations in the five mainland states (table 15).

The strategic plan concludes that future demand by the Navy for naval ship building and repair may be sufficient to sustain only one ship builder, although a number of options are discussed that would have different implications for the level of new build activity versus repairs (such as reducing the length of ships' in-service lives from the current thirty, to twenty years) (DMO 2002).

15 Naval ship building and repair work currently/previously undertaken at infrastructure location

	Major surface ships				Submarines		
Company/facility	**Consolidation/ final assembly**	**Modular fabrication**	**Upgrade**	**Repair and maintenance**	**Consolidation/ final assembly**	**Upgrade**	**Repair and maintenance**
Tenix Defence Marine Division, Williamstown, Victoria	✔	✔	✔				
Tenix Defence Marine Division, Henderson, Westerm Australia				✔			✔
ASC, Osborne, South Australia					✔	✔	✔
ADI, Garden Island, New South Wales		✔	✔	✔		✔	✔
Forgacs, Tomago, New South Wales	✔	✔					
Forgacs, Carrington, New South Wales			✔	✔			
Forgacs, Cairncross, Queensland				✔			

Source: DMO (2002), p. 39.

Defence Industry commentators have however suggested there are a number of alternative business models for the naval ship building and repair sector to that presented in the strategic plan, such as increased involvement with international naval ship builders and international acquisitions programs (Thomas 2002). Australian shipyards have also sold 'civil' vessels for military purposes — for example, Incat in Tasmania has supplied three large wave-piercing catamarans to the US military, two to the Navy and one to the Army (Incat 2003; Vaile 2003).

South East Marine Region

According to the Australian Bureau of Statistics, in 2001-02, there were 65 enterprises in Australia engaged in ship building (the manufacturing or repairing of vessels of 50 tonnes and over displacement). Seven were located in Victoria and three in Tasmania. There were also 495 enterprises engaged in boat building (the manufacturing or repairing of vessels of under 50 tonnes displacement), 54 in Victoria and fifteen in Tasmania. Some of the main shipyards in the South East Marine Region are:

- Tenix Defence Marine Division's Williamstown dockyard in Victoria, which builds the ANZAC class guided missile frigate for the Australian and New Zealand navies. Ten ANZAC frigates are to be built under the seventeen year contracted awarded in 1989. Ballarat, the eighth ANZAC frigate, was launched on 25 May 2002 (Tenix 2002).
- Incat Australia's Prince of Wales Bay facility at Hobart, Tasmania, which builds large, high speed wave-piercing catamarans. Incat has built around 40 per cent of the world's high speed vehicle/passenger ferry fleet over 70 metres in length (Incat 2003).
- Commercial Catamarans' facility at Lakes Entrance, Victoria, which builds large aluminium fishing catamarans of 23–30 metres length (Commercial Catamarans 1999).
- North West Bay Ships' facility at Margate, Tasmania, which builds a diverse range of aluminium ships, including fast catamaran ferries of 25–50 metres length, trimaran fast ferries, and motor yachts, including superyachts of 60 metres length (North West Bay Ships 2003).

Key economic drivers

The demand for ship building and boat building services derives from the demand from sectors of the economy that require ships and boats for a diverse range of uses, including passenger and cargo transport, recreation, fishing and military applications. A detailed demand model that would accommodate all these diverse sources of demand is beyond the scope of this report. Conceptually, however, the demand for ship building and boat building services would be the sum of the demands from each individual sector, each of which would be determined by the conventional drivers of demand — that is, own price, the price of substitutes, levels of income and population, and other factors such as tastes. The attractiveness of Australian vessels to export buyers and the attractiveness of imported vessels to Australian buyers will also be influenced by the level of the Australian dollar.

As previously noted, Australian ship and boat builders construct a wide range of vessels for the domestic and export markets, including warships, fast passenger/goods ferries, fishing vessels, tugs and offshore oil and gas industry vessels, motor yachts and smaller recreational craft. However, Australia does not compete in the market for large steel container ships, tankers and bulk carriers. Currently, the price leader in this market is the Republic of Korea (European Commission 2001).

Key issues – South East Marine Region

Demand issues

A stronger Australian dollar may reduce the returns obtained by local ship and boat builders in niche export markets. The level of demand by Australia's Navy for new warships is expected to be lower in the medium to long term. The prospects for a decline in activity in the region's offshore oil and gas sector may adversely affect local demand for the type of vessels used by this industry. On the other hand, the prospects for increased demand from the recreational and tourism sectors may lead to an expansion of the industry in the region for these markets.

Supply issues

There is likely to be some rationalisation in naval ship building in the medium to long term. For example, after the ANZAC frigate project concludes in the middle of this decade, the future of the Williamstown dockyard will depend on the direction of any future rationalisation of the Australian naval ship building and repair sector.

Institutional issues

The Australian Government currently provides a number of incentives for local ship building. In addition, current government and industry moves to restructure the Australia's naval ship building capacity may also have an impact on the region.

Regional and social issues

Rationalisation in naval ship building could significantly reduce building activity at particular shipyards and thereby local employment.

Key information needs

Areas where further, more detailed understanding of both directions and drivers is required for the ship and boat building industries of the region are likely to include:

- the likely future demand for ships and boats from each of the diverse markets that the region's shipyards and boatyards currently supply; and
- better understanding of the linkages between the region's ship and boat building sector and key demand sectors.

• Biotechnology/bioprospecting – strategic directions

The oceans are the source of a large group of structurally unique natural products that are mainly accumulated in invertebrates such as sponges, trunicates, bryozoans and molluscs.

Several of these compounds show pronounced pharmacological activities and are candidates for new drugs, primarily in the area of cancer treatment. Other compounds are currently being developed as analgesics or to treat inflammation (Proksch, Edrada and Ebel 2002).

As sessile, soft bodied organisms, marine invertebrates lack obvious physical defences and/or the ability to run or swim away and hide. They are therefore prime candidates to possess chemical defence mechanisms that utilise bioactive metabolites. While chemical defence mechanisms cannot be directly equated with potential biomedical activity, the two are closely correlated in reality (Faulkner 2000a).

World

Serious attempts to tap the potential of marine organisms as sources of bioactive metabolites that might be directly utilised as drugs or serve as lead structures for drug development began in the late 1960s (Proksch, Edrada and Ebel 2002). By 1975 there were three parallel tracks in marine natural products chemistry: marine toxins, marine biomedicinals and marine chemical ecology. Marine natural products chemistry developed rapidly in the 1980s and matured in the 1990s (Faulkner 2000b). From 1969 to 1999 approximately 300 patents on bioactive marine natural products were issued. The number of compounds isolated from various marine organisms now exceeds 10 000, with hundreds of new compounds being discovered every year (Proksch, Edrada and Ebel 2002). A number of promising compounds have been identified that are either already at advanced stages of clinical trials, most of them in the treatment of cancer, or have been selected as promising candidates for extended preclinical evaluation (Faulkner 2000b).

A serious obstacle to the ultimate development of most marine products that are currently undergoing clinical trials or that are in preclinical evaluation is the problem of supply. The concentrations of many highly active compounds in marine invertebrates are often minute. For example, in order to obtain approximately 1 gram of the promising anticancer agent ET-743, close to one tonne (wet weight) of the tunicate *E. turbinata* has to be harvested and extracted (Mendola 2000). This already causes difficulty and delay in clinical studies where gram quantities of compounds are generally needed but may prove a serious obstacle where market quantities of these compounds are required. The harvest of large quantities of sponges, tunicates or other pharmacologically promising marine invertebrates in the thousands of tonnes from the wild may not only be difficult and expensive but harvesting large quantities of organisms may also not be ecologically sustainable.

Commercial harvesting for this purpose is already being undertaken, however, as evidenced by an example from the Caribbean. The pseudopterosins, a group of diterpene glycerosides thought to have anti-inflammatory and analgesic properties, are obtained from the gorgonian *Pseudopterogorgia elisabethae*. Although the pseudopterosins have not yet been developed as anti-inflammatory drugs, a partially purified extract of *P. elisabethae* is being used as an additive in cosmetic products. Divers have harvested more than 4.5 tonnes of gorgonians by hand pruning in 18 metre depths in coral reefs along an approximately 97 kilometre length of the Bahamas coastline. Since the currently commercial requirement for the product is estimated to be at least five times the current supply, the harvesting of gorgorians elsewhere in the Caribbean is now being investigated (Faulkner 2000a).

It has been suggested that mariculture could be used to produce a steady supply of sponges, tunicates and bryozoans for the extraction of compounds. However, the yields of biomass likely to be required once the compound actually enters the drug market would still be large. Like the conventional mariculture of finfish, crustaceans and molluscs, the mariculture of invertebrates in tanks or in the sea would be subject to similar production risks such as disease, storms and poor water quality (Proksch, Edrada and Ebel 2002).

The supply problem has stimulated research on alternative methods for sponge metabolite production. While chemical synthesis is the most direct way to produce sponge metabolites in large quantities, developing a chemical process can be expensive and is generally not begun before the target compound has completely passed through clinical trials. Biotechnology has been suggested as an easier and less expensive alternative to achieve a sufficient supply of the target compound for clinical research. Biotechnological production of sponge metabolites may even be a permanent alternative to chemical synthesis as it is not always possible to develop low cost, large scale chemical production methods for complex structures of bioactive compounds (SARDI 2001).

Some research has raised the possibility that the bioactive compounds of interest may be of microbial origin. In other words, they may be present in marine invertebrates by virtue of their ingestion by these filter feeders. This raises the possibility that the compounds of interest may one day be able to be synthesised using industrial processes (Proksch, Edrada and Ebel 2002).

Australia

In Australia, biotechnology in general has been identified by Australian federal and state governments as a priority area to take a national strategic approach for investment attraction. Australia's biotechnology industry has expanded rapidly in recent years. There are now over 300 companies in Australia whose core business is biotechnology (Invest Australia 2003a). Significant amounts of venture capital are being invested (around $325 million in 2000-01). Of Australia's 64 Cooperative Research Centres, which bring together researchers from universities, the CSIRO, private industry and other public sector agencies, approximately twenty have a primary biotechnology focus, with another ten incorporating biotechnology in their research (Invest Australia 2003b).

The Australian biotechnology industry is dominated by small to medium companies, with a handful of much larger players. Representatives of most major international pharmaceutical and agribusiness companies are located in Australia, with many investing in research and development. As with other countries, biotechnology research and development is geographically clustered, primarily through the proximity of universities, hospitals and medical or agricultural research institutes with essential businesses and financial services. Clustering is either evolutionary, by building on existing local attributes, or achieved through planned and purpose built technology parks that house designed incubation facilities. The greatest concentration of biotechnology companies are presently in Melbourne, Sydney and Brisbane (Ernst & Young and Freehills, and Department of Industry, Science and Resources 2001).

Australia administers one of the world's largest and most biodiverse marine exclusive economic zones, which covers all five ocean temperature zones — tropical, subtropical, temperate, subpolar and polar. Along with traditional fisheries, this unique network of ecosystems is home to an exceptional biodiversity of marine life, and represents a significant resource for marine bioprospecting. Accessing biodiversity from Australia's marine flora and fauna provides a basis for the discovery of unique molecules with pharmaceutical potential.

South East Marine Region

Southern Australian waters have high species diversity, and the South East Marine Region is well placed as a collection point for marine species for assessment by researchers based in Melbourne, Hobart and elsewhere. Scientists at the University of Melbourne's Marine Natural Products Research group have collected a large variety of southern Australian sponges for bio-assays, which target such diverse properties as protein phosphatase and/or acetylcholinesterase inhibition, antibacterial, antifungal, antimalarial and/or anticancer activity, and agrochemical applications (AVCC 1998).

In 2001, Victoria accounted for more than 32 per cent of the biotechnology companies in Australia. Most of them were located in Melbourne, which also features several concentrations of universities, research centres and teaching hospitals with an interest in biotechnology at Parkville, Clayton, Heidelberg and Werribee. Tasmania also has a strong research infrastructure base concentrated in Hobart based around the University of Tasmania, CSIRO Marine Research, and three CRCs. In addition, the Australian Maritime College, based in Launceston also undertakes some research. Biotechnology spinoff or startup companies in Tasmania are able to access the Tasmanian Technopark (Ernst & Young and Freehills, and Department of Industry, Science and Resources 2001).

Key economic drivers

The main area where marine derived compounds are presently seen as having the greatest commercial application is in the field of human health and pharmaceuticals, to create new drugs with anticancer, anti-inflammation and analgesic properties. The use of marine derived compounds as replacements for toxic antifouling agents is also being investigated. The demand for new drugs for human health and pharmaceuticals is growing with rising incomes and the aging of the population. The demand for such drugs derived from marine derived compounds will depend as usual on the price of these drugs and the price of substitutes.

The 'supply problem' has been discussed above. That is, marine derived compounds are present in the source organisms (sponges and the like) in only minute quantities, and large quantities of these marine organisms would need to be produced if the even moderate amounts of marine derived compounds were to be commercially harvested from marine organisms. The most likely economically viable future source of such compounds would appear to be direct, using industrial methods for synthesis. The costs of these processes will directly affect the price at which such compounds are able to be marketed.

Key issues – South East Marine Region

Demand issues

With the 'aging' of the population, and increasing per person incomes, there is likely to be a continual increase in demand for the type of anticancer and anti-inflammatory drugs that can be synthesised using compounds derived from marine species.

Supply issues

Such compounds occur naturally only in minute quantities and while commercial wild harvesting and possibly aquaculture has been considered for small scale production, large scale production would probably require industrial synthesis.

Institutional issues

The main issues for the collection and use of marine organisms for biotechnology include inconsistent access regimes, contradictory or overlapping management responsibilities, intellectual property issues, and returns to the community from the discovery of new compounds.

Regional and social issues

Because of the wide biodiversity of its marine environment and its proximity to the main centres of Australian population, the South East Marine Region is likely to remain a key collection area for southern Australian marine organisms thought likely to be useful in the search for new drugs for human health and pharmaceuticals.

Key information needs

Biotechnology is a rapidly developing field, and marine organisms represent only one possible source of useful biological material. Areas where further, more detailed understanding of both directions and drivers is required for marine biotechnology and marine bioprospecting in the region are therefore likely to include:

- a review of the current and future demand for marine derived compounds sourced from the region;
- prospects for the further development of marine based research and marine derived biotechnology industry in key centres such as Melbourne and Hobart; and
- greater understanding of the effect on, and the ability of, the marine environment to supply commercial quantities of biological materials.

• Waste disposal – strategic directions

Australia

The deliberate disposal of waste material into the sea from vessels, aircraft and platforms was a relatively common practice in Australia from the time of first settlement until quite recently (Larcombe et al. 2002). The deliberate loading and disposal of waste materials at sea in Australia is now highly regulated under the *Environment Protection (Sea Dumping) Act 1981*. This act was enacted to fulfil Australia's international responsibilities under the

London Convention of 1972 and has been amended to implement the 1996 Protocol to the London Convention, which Australia ratified in 2001. Under the Protocol, Australia is obliged to prohibit ocean disposal of waste materials considered harmful to the marine environment, and to regulate the permitted disposal of wastes at sea to ensure that the environmental impact is minimised (DEH 2002).

The *Sea Dumping Act* regulates the deliberate loading and disposal of wastes and other matter at sea. Some materials, such as those produced for biological and chemical warfare and radioactive material, cannot be disposed of in Australian waters under any circumstances. For other materials, the Department of Environment and Heritage may grant a permit, depending on the type of material to be disposed, the disposal site, and the potential impacts on the marine environment. Typically, the Department issues around thirty permits a year, mainly for the disposal of uncontaminated dredge spoil, the disposal of illegal vessels, and for burials at sea (DEH 2002).

South East Marine Region

Material that has been disposed of at sea in past years in the South East Marine Region includes chemicals, ammunition and industrial waste, as well as vessels that have been shipwrecked or deliberately scuttled. A large number of the 'officially dumped' vessels are located near the entrance to Port Phillip Bay in Victoria (Larcombe et al. 2002).

In line with Australia's obligations under the London Convention and the operation of the *Sea Dumping Act*, the offshore disposal of jarosite from Pasminco's zinc smelter in Hobart ceased in 1997 when the permit for the disposal of this material expired (Larcombe et al. 2002).

Key economic drivers

Potentially environmentally damaging disposal of wastes in both terrestrial and marine environments tends to arise when 'market failures' such as the presence of externalities, a lack of clearly defined property rights, the absence of markets (nonquantification of environmental values) and inadequate information, cause private benefits and costs to diverge from social benefits and costs. However, in markets that are complete, participants should be able to trade off the benefits and costs of waste disposal (Beare et al. 2003). Any future use of the ocean for waste disposal would probably entail the development of a market in permits for the disposal of 'permitted' materials. Such a market would identify the 'price' of ocean disposal and allow it to be compared with the 'price' of alternative methods of disposal such as recycling, terrestrial land fill, and so on. In most cases, however, it would be expected that if the full economic or social cost of ocean disposal was taken into account, the 'price' of ocean disposal would be prohibitive.

Key issues – South East Marine Region

Demand issues

When examining the issue of disposal at sea, a distinction may need to be made between materials that could be satisfactorily disposed of on land, and materials such as dredge

spoil, that is not suitable for land fill or reclamation, and for which there may be few, if any, economical recycling opportunities.

Supply issues

It may also be necessary to make some allowance for the disposal of dredge spoil at sea in order to provide for the further development of ports to handle the increased numbers of ships or ships of larger sizes likely to be associated with future increases in sea trade.

Institutional issues

Direct regulation is probably presently more effective in controlling point source pollution than nonpoint source pollution.

Regional and social issues

None directly applicable.

Key information needs

Areas where further, more detailed understanding for marine dumping is required include:

- studies into the possible application of a tradable permit regime for sea dumping; and
- greater understanding of the current and potential impacts of past dumping activities.

Marine transport industries

World

The globalisation of the world economy has increased world merchandise trade as manufacturers pursue the most economic and competitive manufacturing facilities. Production centres of most industries have shifted their basis beyond national borders. Consumers have also started to bring in agricultural and manufactured goods from all over the world (Inoue 2002).

Reflecting this growth in world trade, world seaborne cargo turnover has been increasing in recent years. In the 1990s, the volume of international trade goods loaded for transport by sea rose by 46 per cent. Global international seaborne cargo turnover in 2002 was 12.03 billion tonnes, comprising 5.89 billion tonnes loaded and 6.14 billion tonnes unloaded (UNCTAD 2003). Seaborne trade loadings, by type of cargo, are shown in table 16.

Australia, a major exporter of iron ore, coal, wheat and alumina, features prominently in the 'big five' dry bulk trades. Global iron ore shipments totaled 475 million tonnes in 2002, with just over a third of shipments originating in Australia. Global coal shipments were 575 million tonnes, with a third of shipments again originating in Australia. World grain shipments were 220 million tonnes, of which Australia accounted for 8 per cent. Shipments of bauxite and alumina were 53 million tonnes, of which a quarter originated in Australia (as alumina).

16 Seaborne trade loadings, by type of cargo

	2001	2002
	Mt	Mt
Tanker cargo, of which		
– crude oil	1 672	1 643
– petroleum products	498	497
Total tanker cargo	2 170	2 140
Dry cargo, of which		
– five main dry bulks **a**	1 331	1 352
– other dry cargo **b**	2 339	2 396
Total dry cargo	3 670	3 748
Total of all goods	5 840	5 888

a Iron ore, coal, grains, bauxite/alumina and rock phosphate. **b** Minor bulks and liner cargoes.

The minor bulks (bulk agricultural, metals and minerals, and energy commodities) accounted for 835 million tonnes of loadings in 2002 and liner cargoes for the balance (1.56 billion tonnes) (UNCTAD 2003). Containerisation of general cargoes is rising because of the advantages that this mode of transport offers. At present, about 80 per cent of the general cargo that potentially could be containerised is containerised, with this proportion expected to rise to 95 per cent in the medium term as more general cargo is made suitable for container transport (Haralambides, Tsolakis and Cheung Tam He 2000).

The container trade has been growing at a much faster rate than that of maritime trade overall. This expansion has taken place consistently over the years, despite some periods of economic downturn. Continuing containerisation of cargoes on secondary routes is also expected (Inoue 2002).

Australia

In 2002, Australia accounted for 7.6 per cent of the world's international seaborne cargo loadings, and 1.1 per cent of the world's unloadings, by volume (table 17). Export tonnage far exceeds import tonnage, reflecting the dominance of bulk cargoes such as iron ore and coal in exports. Australia's seaborne international exports were valued at $99.4 billion and its imports at $83.0 billion in 2000-01 (BTRE 2002).

The tonnage of international sea freight moved across Australian wharves has risen rapidly in recent years. From 1994-95 to 2000-01, tonnage exported rose by 37 per cent (from 362.4 million tonnes to 495.7 million tonnes), and tonnage imported by 19 per cent (from 45.9 million tonnes to 54.4 million tonnes).

While international trade represents the bulk of seaborne goods, there is also a significant coastal trade, mainly tanker cargoes and dry bulk cargoes. The Bureau of Transport and Regional Economics' *Australian Sea Freight 2000-01* reports that 653.6 million tonnes of cargo was moved across Australian wharves in 2000-01. Of this, 76 per cent was interna-

17 Australia's share of world seaborne international trade, by volume 2002

	Australia	World	Australia's share of world
	Mt	Mt	%
Goods loaded			
Crude oil	10.8	1 643.4	0.7
Other petroleum products	2.7	496.8	0.5
Dry cargo	433.1	3 747.8	11.6
Total	446.6	5 887.9	7.6
Goods unloaded			
Crude oil	32.1	1 683.2	1.9
Other petroleum products	6.7	547.5	1.2
Dry cargo	31.1	3 906.7	0.8
Total	69.9	6 137.3	1.1

Source: UNCTAD (2003).

tional exports, 8 per cent was international imports, 8 per cent was coastal cargo loaded, and 8 per cent was coastal cargo discharged.

The total tonnage of coastal sea freight increased only modestly (by 6 per cent) between 1994-95 and 2000-01. Intrastate coastal cargo loaded rose by 21 per cent, from 15.5 million tonnes to 18.8 million tonnes, but interstate coastal cargo fell by around 1.5 per cent, from 33.7 million tonnes to 33.2 million tonnes. The main coastal bulk cargoes were iron ore, steel products, bauxite and alumina, crude oil and petroleum products (BTRE 2002).

Container traffic is expected to rise by 66 per cent through Australia's mainland ports by 2010-11. The interface between ports, road and rail is an area of increased attention because of the forecast growth in trade. A key policy area that seeks to address this issue is through the Australian Government's discussion paper *Auslink – Towards the National Land Transport Plan*. AusLink will place greater emphasis on improving the land transport links to major national ports (Anderson 2003).

South East Marine Region

A significant proportion of international sea freight moves through Victoria. In 2000-01, by value, Victoria accounted for 34 per cent of all international sea freight entering Australia and for 17 per cent of international sea freight leaving. There is also a significant cross-Strait coastal trade, with Victoria and Tasmania together accounting for about a quarter of coastal trade turnover. Another 19 per cent of coastal trade is estimated to transit through Bass Strait (see table 7).

Key economic drivers

The demand for seaborne transport is derived broadly from the demand for trade, both bulk and container. Changes in the volume of world seaborne trade tend to be closely related to

18 Annual change in world trade and economic output

	2000	2001	2002	2003
	%	%	%	%
Seaborne trade (tonnage of goods loaded)	3.6	–0.5	0.8	na
Merchandise exports	11.9	–1.5	2.5	4.5
Economic output	3.9	1.2	1.9	2.5

na Not available.
Source: UNCTAD (2003); World Trade Organsiation (2004).

general changes in the volume of world trade generally, which is itself related to changes in the level of world economic activity (table 18).

Developments in specific commodity markets will also drive the volume of particular bulk commodities shipped, such as crude oil, petroleum products, coal, iron ore, bauxite/alumina, other metals and minerals, grains, other agricultural commodities, and fertilisers.

Key issues – South East Marine Region

Demand issues

The continuing growth in global and Australian merchandise trade is increasing both global and local demand for seaborne freight, increasing the quantity of shipping moving through Australian waters, including the South East Marine Region. Growth of the Victorian and Tasmanian state economies is also tending to increase the demand for cross-Strait coastal shipping services.

Supply issues

Globally, general cargoes are increasingly becoming containerised, changing the relative shares of the different types of ships moving international seaborne cargo to and from Australia, and also moving general cargo between Tasmania and the mainland states.

Institutional and social issues

A large proportion of Australia's seaborne international trade moves through a small number of key nodes, concentrating the pressure of ship movements in a small number of marine areas. Victoria accounts for a relatively large proportion of the shipping associated with international trade, while Victoria and Tasmania together account for a significant proportion of coastal trade.

Key information needs

Two key information needs appear to be a requirement to:

- obtain region specific projections of levels of future international and coastal freight both entering and leaving regional ports, and transiting Bass Strait; and
- assess the implications for the region of trends in world shipping trade.

• Ports – strategic directions

World

Worldwide, the continuing trend toward globalisation of shipping and trade is putting increasing pressures on ports to reduce terminal cost and improve operational efficiency. International transport management has also been rapidly changing from the fragmented approach by respective players to integrated logistics systems that better meet individual needs of customers (Inoue 2002).

Shipping lines have undergone a series of alliances and mergers, one result of which has been the deployment of ultralarge container vessels (Inoue 2002). As the size of ships going to megahubs in south east Asian ports increases, this will have a cascading effect on the size of ships servicing Australia, from megahubs and from many other ports, in terms of vessel size.

There is also increasing pressure for new investment is increasing private sector involvement in ports. While the majority of port authorities are still fully responsible for navigation, harbor master services, dredging, warehousing and port information, there is increasing private ownership or involvement in bulk terminals, pilotage, stevedoring, towage, ship agents, land transport and other shipping services (Inoue 2002).

The introduction of megacontainer ships of 5000–7000 TEUs (when or if it occurs) will compel major ports to expand their infrastructure to safely and efficiently accommodate such megavessels if they are to be considered as a hub port. There is also continual pressure to increase automation of container terminals to reduce operating costs. For example, a new container port at Amsterdam will have three container berths, including one 'indented' berth where a megacontainer ship can be loaded and unloaded from both sides of the ship, reducing by half the time to turn around ships at the terminal.

Another direction of development for ports is the inland terminal, that connects the port via a dedicated road and rail cargo expressway. Ports are increasingly expected to be more than just a point of transfer between different modes of transport — they are also expected to be logistic hubs and centres in global transport chains.

There is also a trend toward heavier regulation of ports' operations and activities. Increasingly ports will have to obey regulations not only in order to achieve further growth but also to carry on with existing operations. According to many transport economists, some of the major trends and challenges that the global port industry is facing are: a steady increase in international trade and ship size; capital shortfalls; increasing competition; continued capital investment; privatisation; accelerating technology; rationalisation of the international transport system; and increasingly strict environmental regulations (Haralambides, Tsolakis and Cheung Tam He 2001).

The current changes in the liner industry are also expected to affect the way in which most ports operate. Transhipment in general is expected to increase, as unit costs per TEU are lower for larger ships than for smaller ships. The use of larger ships and more transhipment leads to more port container movements but fewer ship miles. Some analysts envisage the

use of up to 15 000 TEU vessels making use of just four or five megahubs worldwide. These megahub facilities would be 'offshore' in the sense that they would cater exclusively for transhipment (Haralambides, Tsolakis and Cheung Tam He 2001).

Others have suggested, however, that there are technological and natural limits and diseconomies of scale that may not allow vessels to become much larger than 8000 TEUs. The current limiting factors are the water depths of ports, the outreach of cranes and the quantity of containers that have to be moved through the port in a very short time (Haralambides, Tsolakis and Cheung Tam He 2000).

If there is a maximum economic limit to the size of container ships, then in the future there could be an increase in the market share of smaller ships that call directly at more ports that serve a limited hinterland. This would be akin to what happened in the aviation industry after that market was deregulated (Haralambides, Cheung Tam He and Tsolakis 2001).

Australia

The Association of Australian Ports and Marine Authorities (AAPMA) publishes information on cargo throughput for around 45 major Australian ports. AAPMA data indicate that between 1998-99 and 2002-03, the total throughput of seaborne export cargo through Australia's major ports rose significantly — from 431 million mass tonnes to 507 million mass tonnes. The rise in the total throughput of import cargo was more modest, however — from 105 million mass tonnes to 109 million mass tonnes. The container component of this rose relatively significantly, with the tonnage of export containers rising from 17 million mass tonnes to 22 million mass tonnes. The tonnage of import containers rose from 14 million mass tonnes to 19 million mass tonnes (AAPMA 2004b).

South East Marine Region

South East Marine Region ports include Portland, Geelong, Melbourne and Hastings in Victoria, Port Latta, Burnie, Devonport, Bell Bay, Spring Bay and Hobart in Tasmania, and Eden in New South Wales (Larcombe et al. 2002).

The AAPMA data covers Victoria's four major ports (Melbourne Port, Geelong, Westernport and Portland), Tasmania's four major ports (Hobart, Launceston, Burnie and Devonport) and Eden in New South Wales. Total export and import throughput, including container throughput, as reported by the respective port corporations, is shown in tables 19 and 20.

In 2002-03, Melbourne and Geelong accounted for nearly three-quarters of the cargo imports, by weight, by the nine major ports. Melbourne also accounted for around 85 per cent of the region's container imports by major ports. Total import cargo for the region's nine major ports rose by 12 per cent between 1998-99 and 2003-04, compared with a rise of 4 per cent for Australia's major ports in total. The tonnage of containers imported rose by 44 per cent, reflecting large increases in container throughput in Melbourne, Devonport and Hobart. In comparison, the tonnage of containers imported through Australia's major ports in total rose by 35 per cent.

19 Import cargo throughput in major South East Region ports million mass tonnes

	Total throughput		Of which container throughput	
	1998-99	**2003-04**	**1998-99**	**2003-04**
Eden (NSW Waterways)	0.08	–	0	0
Victoria				
– Melbourne Port Corporation	12.62	14.55	5.32	7.25
– port of Portland	1.16	1.24	0	0
– toll GeelongPort	5.89	6.14	0	0
– toll Westernport	1.22	1.31	0	0
– **total** for Victoria	20.89	23.25	5.32	7.25
Tasmania				
– Burnie Port Corporation	0.77	0.90	0.51	0.58
– Hobart Ports Corporation	0.83	1.04	0.05	0.01
– port of Devonport Corporation	1.01	1.25	0	0.51
– port of Launceston	1.31	1.52	0.08	0.25
– **total** for Tasmania	3.91	4.71	0.64	1.34
Total for the nine major SEMR ports	24.88	27.98	5.96	8.59
Total for major Australian ports	105.37	109.41	14.24	19.23

A dash (–) within the numerals indicates a small amount.
Source: AAPMA (2004b).

In 2003-04, Melbourne and Geelong also accounted for just under half of the cargo exports, by weight, from the nine major ports, and Melbourne accounted for just over 80 per cent of the region's container exports from major ports. Total export cargo throughput for the region's nine major ports rose by 10 per cent between 1998-99 and 2003-04, compared with a rise of 18 per cent for Australia's major ports in total. The tonnage of containers exported rose by 35 per cent, reflecting large increases in container throughput in Melbourne, Devonport and Launceston. In comparison, the tonnage of containers imported through Australia's major ports in total rose by 29 per cent.

A study undertaken in 2002 by the Victorian Department of Infrastructure on container movement through the Port of Melbourne found that the port is the freight transport hub of south east Australia. While around 40 per cent of all moves to or from the port were to the metropolitan area (that is, within 35–50 kilometres of the port), the port's hinterland extends also through the rest of Victoria and into other states (DOI 2002).

Freight movements in Victoria relate to the state's role as the 'south east hub' of the national freight task, and its role as a major producer of primary produce. Victoria is positioned to act as a hub to attract freight from South Australia, New South Wales and Tasmania for export and to act as a distribution centre for international imports. The three major interstate corridors are the Goulburn/Hume, attracting freight from the northern states, the Western Corridor, moving freight to and from south and western Australia, and the Bass Strait sea corridor to Tasmania. In the decade to 2010, freight movements between Melbourne and other states are projected to increase by nearly 40 per cent, with further increases projected to 2020 (Knightly 2002).

20 Export cargo throughput in major South East Region ports million mass tonnes

	Total throughput		Of which container throughput	
	1998-99	**2003-04**	**1998-99**	**2003-04**
Eden (NSW Waterways)	0.55	0.74	0	0
Victoria				
– Melbourne Port Corporation	8.85	10.11	6.54	8.35
– port of Portland	2.34	2.39	0	0
– toll GeelongPort	5.19	4.83	0	0
– toll Westernport	3.96	2.84	0	0
– **total** for Victoria	20.34	20.17	6.54	8.35
Tasmania				
– Burnie Port Corporation	2.51	2.99	0.82	0.96
– Hobart Ports Corporation	1.26	2.14	0.12	–
– port of Devonport Corporation	1.77	1.91	0	0.47
– port of Launceston	2.41	3.78	0.13	0.51
– **total** for Tasmania	7.95	10.81	1.07	1.94
Total for the nine major SEMR ports	28.85	31.72	7.61	10.29
Total for major Australian ports	431.35	506.96	17.01	21.95

A dash (–) within the numerals indicates a small amount.
Source: AAPMA (2004).

The Port of Melbourne is Australia's largest container port, handling approximately 1.6 million containers in 2002-03. There are more than 7000 commercial vessel movements each year in the shipping channels in Port Phillip Bay that provide access to the ports of Melbourne and Geelong. However, the port's capacity to handle ships of the size projected for the future has become of concern to the shipping industry. The proportion of deeper draught ships in the world's shipping fleet is increasing, and already around 30 per cent of ships using the commercial shipping channels to access the Port of Melbourne have a maximum draught of 11.6 metres or greater. The current maximum draught for ships using the main commercial shipping channels in Port Phillip Bay is 11.6 metres at low tide and 12.1 metres with tidal assistance. The Port of Melbourne Corporation is currently investigating a proposal to deepen the main commercial shipping channels to the Port of Melbourne to accommodate ships up to 14 metres draught (Port of Melbourne 2003).

Key economic drivers

The demand for major port facilities and services is derived from the demand for seaborne transport, the main economic drivers of which were discussed earlier in this chapter.

Key issues – South East Marine Region

Demand issues

To attempt to reduce their costs of moving freight, ship operators are moving toward larger ships, particularly so in the case of containers. This is putting pressure on existing ports to handle larger ships, or lose business to other ports that will.

Supply issues

Stevedores are being required to finance new infrastructure for faster loading and unloading of these larger ships, while port authorities are being required to finance channel works to allow the larger ships to be admitted to the ports.

Institutional issues

Governments are encouraging ports to better integrate their operations with land based freight to achieve overall efficiencies in the freight handling chain. However, the incidence of benefits and costs may be borne by different parties in the freight handling chain, some of them private, and some of them public.

Regional and social issues

The benefit to the local economy generated directly and indirectly by the economic activity associated with major ports can be large. However, the implications for other users of the marine area of major works such as channel deepening may need consideration.

Key information needs

Areas where further, more detailed understanding is required includes:

- greater understanding of impediments and opportunities to further development and investments in port infrastructure; and
- greater understanding of the regional impacts of the move toward larger vessels.

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