

Drivers and Shapers of Economic Development in Western Australia in the 21st Century

A Discussion Paper

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Foreword

The last half of the century has seen massive changes in the global economy which have, in turn, driven transformations in the Western Australian economy. Some industries, like whaling, have disappeared. Others, like the wool industry, are shadows of their former glory. The resources boom and North West Shelf developments are among a range of new activities that have supported wealth creation over recent years, whilst the global information and communications technology revolution is enabling further change by transforming how business is conducted.

The 21st century will bring with it new drivers and shapers of demand that will result in further changes to the Western Australian economy. In order to manage these forces we need to develop policies which address issues relating to the environment, sustainable development, global trading and competition, shifting patterns of demand, changes in demographics and in social values.

With this in mind, and in the context of globalisation and the emerging knowledge economy, TIAC has produced a discussion paper that seeks to identify and evaluate:

- the impacts on Western Australia of global trading patterns and the consequent structure of production in Western Australia;
- environmental drivers that will influence global economic development into the first quarter of the 21st century;
- how the pursuit of sustainable development might effect future economic growth in Western Australia, given the pursuit of unsustainable development policies by competing economies; and
- the impact of demographic changes and changes in social values on the pace and direction of economic development in Western Australia over the coming decades.

This discussion paper is intended to provoke debate. We have sought to explore the likely positive and negative effects on industry in Western Australia, outline possible scenarios and responses and recommend options for future studies, which might assist the Western Australian government to develop policy in order to optimise economic development in Western Australia in over the next 25 years.

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Bruce Sutherland
Chair, Steering Committee

Executive Summary

A Major Achievement

In 1962, the year in which the Australian Government lifted export controls on iron ore, the economy of Western Australia was a relatively backward one within the Australian Federation. Average living standards in Western Australia, as measured by per capita gross state product (GSP), amounted to only about 75 per cent of those in the rest of Australia. However, in a period of less than forty years since that decision the economy of Western Australia has been transformed.

This remarkable transformation has above all been driven by export related activity in the resource industries. Agriculture and mining now account for over 20 per cent of GSP in Western Australia compared to less than 10 per cent in the other states, and a high proportion of output is exported. The State's growth has also been tied into the rapid expansion of East Asia over the last 30 years, with about 60 per cent of merchandise exports now going to East Asia.

Another Turning Point

In spite of these impressive achievements, it seems clear that Western Australia is at another crucial turning point in its economic history. The world is changing rapidly. It is no longer the one in which Western Australia's recent growth was achieved, and the economy of the State will need to change equally rapidly. Indeed, if Western Australia is to maintain its high living standards, the State's economy may need to be transformed as much in the next twenty years as it has in the last forty.

This is because the world economy is undergoing a period of fundamental change – often referred to as the emergence of the global knowledge economy. It is likely that, looking back from 2050, the period from around 1985 to 2020 will be seen to represent as dramatic a change in human affairs as did the original Industrial Revolution. The joint forces of globalisation and the emergence of the knowledge-based economy are *driving* a transformation of the nature and structure of the world economy. Increasing national and international pressures to halt environmental degradation, long-term demographic trends, national and international market deregulation, the opening of trade in goods and services, and the advent of global e-commerce are among a range of factors *shaping* that process of change.

The consequences of these emerging trends are likely to be particularly acute for Western Australia, given the nature of the economy which has been built over the last forty years and on which the State's prosperity currently depends. Western Australia certainly has both the opportunity and the vitality to achieve another transformation in its economic structure, but the issues must be addressed as a matter of urgency. In this discussion paper we examine the implications of global change for Western Australia and explore, at a broad strategic level, some of the options available to the State in developing a response.

Three Key Challenges

When the economy of Western Australia is considered in the emerging global context, three challenges are most striking.

1. Structure of Trade and Production

As knowledge becomes increasingly embodied in goods and services, resources become relatively less important. Intense global competition in resource industries, and in the manufacturing industries which are their major markets, also contributes to pressure on prices, volumes and the terms of trade. Even for an economy with such a rich resource base as Western Australia's, heavy reliance on the resource industries is unlikely to provide a passport to prosperity in the emerging knowledge economy.

Western Australia is heavily dependent on commodity exports – with relatively low growth opportunities. The knowledge intensity of world trade is increasing – with high-technology manufactures and services offering higher growth potential than commodities. Western Australia also faces a significant exposure to greenhouse gas emission targets – with a large proportion of Western Australia's exports either carbon-based or produced by heavy users of greenhouse gas emitting fuels.

Western Australia's trade structure is suggestive of an economy competing mainly via exchange rates and wages, rather than through technology and innovation – with declining terms of trade and negative implications for employment and living standards. The structure of production in Western Australia reflects its resource dependence – with mining, construction, agriculture and energy highly represented; and manufacturing, finance and business services relatively thinly represented.

The structure of the Western Australian economy has a number of adverse implications. Outside mining there are relatively few innovating companies and few avenues for innovation. The industrial structure limits job creation opportunities. And apart from a few very large companies firms are small in Western Australia, leading to lower levels of innovation, export activity and productivity. With a heavy reliance on foreign firms and on firms headquartered in the Eastern States, companies operating in Western Australia have limited mandates for action. They also have limited exporting experience – 86 per cent of Western Australia's merchandise exports come from the top 10 products and only about 4 per cent of firms export.

2. Climate Change and Sustainable Development

Global environmental drivers will be among the most significant factors shaping the development of Western Australia's economy and society over the next 10 to 20 years. Paramount among these will be global climate change, and the need to achieve or approach sustainable development. What may once have been dismissed as 'green' issues are now central to economic development. They are mainstream business issues.

The threat of global climate change through greenhouse gas emissions presents a major challenge. Predicted changes in temperature and sea level could have major

consequences. The physical and biological impacts of global climate change are difficult enough to predict, but addressing the possible impacts of policy and regulatory responses flowing from the Kyoto Protocols is even more hazardous and uncertain.

In addition to the challenge of global climate change the pressure to achieve sustainable development is likely to be a major shaper of the Western Australian economy over the next twenty years. The adoption by Australia, along with another 178 governments, of a program of action for sustainable development worldwide at the UN Conference on Environment and Development in 1992 (ie. *Agenda 21*) marks an international commitment. Increasing global pressures on Australia to reduce resource consumption and waste production are inevitable.

For Western Australia, as for other states in Australia, this is not just a global problem. The impact of human development on the local environment has also been significant, particularly in terms of land salinisation, the loss of biodiversity and the salinisation of inland waters. For example, it is estimated that 9 per cent of the State's agricultural land is affected by salinity, and this proportion is increasing. It could rise to 35 per cent before a new equilibrium is reached, if appropriate action is not taken.

The highest priority areas for Western Australia's sustainability can effectively be divided into three groups of issues: land and inland waters – the pollution of which is closely related to land degradation; the atmosphere – greenhouse and ozone depletion; and biodiversity.

3. Demographic Trends and Changing Social Values

Attitudes and values are changing as the global village becomes a reality. The world economy is becoming more unequal, both within and between countries, but there is growing resistance to this trend as global communications make these changes more apparent to both the advantaged and disadvantaged. As the global economy becomes more polarised, many of those on high incomes seek improved quality of life, while others become more dissatisfied. As a consequence, both business migration and refugee flows are likely to grow – as may more direct expressions of dissatisfaction. There is also increasing emphasis on the treatment of disadvantaged groups, such as aboriginal people, and on the importance of environmental sustainability.

Demographic trends are very different in different regions. By 2025 over half the world's population will live in a dozen Asian countries, while Western Australia will have fewer than three million people occupying more than 40 per cent of Australia's land mass. How Western Australia is positioned in this emerging world – in terms of population growth, migration, integration with Asia, and the role of aboriginal people – will be an important determinant of its future prosperity.

Social values will also be an important shaper of development. Attitudes to globalisation, the environment, green production, genetic modification, increasing inequality, isolation, rural and regional development can all make or break even the most carefully thought through development strategies. Mobilising broad coalitions of

support and staying one step ahead of suddenly emerging latent issues will be essential ingredients for success.

Responding to the New Economic Context

Each of these issues represents a fundamental challenge for Australia as a whole. But in Western Australia they are especially serious, for Western Australia shows the national characteristics which give rise to them in a most acute form.

The Western Australian economy is the most heavily resource dependent of all the States. It generates much more than its 'national share' (by GDP) of greenhouse gases. The State's environment is seriously damaged, in some respects more so than in other parts of Australia, and is in many cases more fragile. Given its size, natural endowments, export orientation and proximity to Asia, Western Australia exemplifies to an acute degree the broader issue of Australia's role in a world of changing demographics and social values. But the State also exemplifies those strengths – openness to the world, to new ideas and to emerging technologies; an innovative self-reliant tradition and a willingness to embrace change – which the nation as a whole brings to the challenge of the new global economy.

Thus, how Western Australia responds will be of great importance not only for the State but also for Australia as a whole. This leading role provides real opportunities for the State. By being forced to take early and vigorous action, Western Australia can gain the 'first mover' advantages which can accrue from a prompt response to emerging realities. On the other hand, failure to act decisively may have much greater long term costs in Western Australia than in other regions

In this discussion paper we seek to explore some of the strategic options available to the Government and people of Western Australia in coming to terms with these three challenges. Some of our conclusions about these options are summarised below.

1. Structural Change and Economic Diversity

As documented in the body of this discussion paper, the structure of the Western Australian economy has a number of adverse characteristics. Most importantly, Western Australia's economy is heavily resource dependent, with long run declining terms of trade that will make it increasingly difficult to maintain, let alone enhance, prosperity. Structural change, building on strengths and increasing diversity will be essential ingredients for further economic development into the 21st century.

Thus a central goal of policy in Western Australia over the next decade or so should be to build a much more diversified economy, with growing capabilities in areas which will thrive in the global knowledge economy. There appear to be many opportunities to do this by, for example:

- *Identifying and building on existing strengths* in engineering and technical services, wine and related lifestyle developments, remote sensing and mapping, shipbuilding and marine engineering, information technology, education and health services;

- *Identifying and pursuing amenity driven development*, such as lifestyle, location and knowledge economy investments, tourism and eco-tourism;
- *Identifying and further developing time zone related opportunities*, by encouraging the operations of global business in the East Asian time zone to locate in Western Australia, Western Australian businesses to operate in those markets, and the intensification of the whole range of trade and services activities;
- *Developing environmental industries*, and the production and processing of clean, green food and other products; and
- *Identifying and exploiting emerging technologies*, such as e-commerce and the Internet, biotechnology, nanotechnology, microproducts, new materials and rare earths.

Some of these areas of opportunity for economic diversification are already the subject of government strategies, but the rapid emergence of the knowledge economy, the consequent need for structural change and the potential significance of environmental drivers suggest that accelerated efforts to broaden the structure of the Western Australian economy are likely to be necessary.

2. The Environmental Challenge

The pursuit of sustainable development provides fundamental challenges to the future potential and direction of Western Australia's development. The State needs to ask some hard questions about what it thinks is possible, and desirable, as well as what it thinks is probable at the international level in greenhouse/global warming negotiations.

In both its global and local dimensions, the degradation of the environment will provide a make-or-break challenge for Western Australia over the coming decades. Indeed, as noted above, this challenge arises directly from the very nature of the State's success over the last forty years, founded as it was on the growth of energy intensive industries and on more extensive use of the land. Both changing realities, such as increasing signs of global warming and growing degradation within the State, and changing values both at home and abroad mean that this challenge cannot be avoided.

The options available to Western Australia in responding to this challenge depend heavily on the national and international responses to the Kyoto Protocol, and on the stance the Western Australian Government itself takes to this agreement. The Kyoto Protocol represents a far from optimal response to the problem of global warming, its deficiencies being particularly relevant to the position of Western Australia. Nevertheless, given the growing awareness around the world of the reality of global warming, it is quite likely that the Kyoto Protocol, and successor agreements, will indeed be enforced.

From an environmental perspective, the deficiencies of the Kyoto Protocol derive from two aspects. One is that the greenhouse gas emissions (GHGE) targets relate to emissions resulting from productive activities within a country, rather than to the more

fundamental issue of the level of emissions implicit in the country's consumption patterns (ie. are production-based rather than consumption-based). The other is that, for historical reasons, they relate only to developed countries (ie. Annex 1 countries).

Taken together, these aspects imply – to the extent the targets are met by shifting production to other countries, rather than by changing consumption patterns or improving the environmental efficiency of production – that no reduction in global emissions need occur from the achievement of the Kyoto targets. Indeed, in some cases production in the new country (an Annex 2 country) may generate more emissions than would be the case were production allowed to continue in the old country (an Annex 1 country), thereby worsening the global environmental problem that they are supposed to alleviate. This deficiency may be particularly relevant for Western Australia, which could come under pressure to close, or not to permit the expansion of, plants which are the most efficient, in environmental terms, of their type in the world.

In responding to the two issues – increasing signs of global warming and environmental degradation within the State – there are a number of paths that the State might take. Three such paths are distinguished in this discussion paper.

(i) Business as Usual, with Some Adjustments

In a modern democracy faced with major economic change, the initial reaction is nearly always inertia, combined with responses more or less at the margin. This is a likely response in Western Australia also. Uncertainty about climate change projections, and conflicting scientific views, provide some justification for delaying major immediate action.

Many businesses in Western Australia have become environmentally efficient, and many valuable environmental programs are in place. Some international companies operating in Western Australia have achieved international best practice in environmental terms, and there is pressure on others to follow suit. Issues of salinity have been the subject of much discussion, and substantial plans to address salinity are under way. Programs to address biodiversity, river pollution and other issues are all under way or under development.

These programs are important, but in our view not adequate to the scale of the problem. Even with enhanced programs in a business as usual context, GHG emissions generated in Western Australia will continue to increase, salinity will be a growing economic problem, biodiversity will decline further and pollution of ground water will probably increase. What is needed is a strategic, structural approach to change, not more of the same.

(ii) Forced Adjustment to Kyoto Targets

The future is difficult to predict, and it may be the case that business as usual, with adjustments, might be sufficient for Western Australia to get through in terms of climate change, if not for the environment more generally. But it is more likely that the reality of global warming, and the increasing determination of many individuals and countries

to ensure that it is addressed, will force rapid adjustment in Australia to achieve the Kyoto targets. This could have a devastating effect on Western Australia.

Australia's Kyoto target is for GHG emissions to be no more than 8 per cent higher than 1990 levels by 2008-2012, and this target is regarded by many nations as a concessional one, agreed to reluctantly. But on current trends Australian emissions would be 28 per cent above 1990 levels by 2010, and increase 40 per cent in the energy sector. If Australia is forced even to approximate its Kyoto targets by 2010, much of the burden will inevitably fall on Western Australia – and on firms and industries which lie at the heart of the State's current prosperity. Thus global insistence on real responses to climate change hangs as a very real threat over the State's future, unless addressed by positive action.

(iii) Environmental Excellence, with Growth in Best Practice Industries

The principle behind the third path is that Western Australia pursues environmental leadership in all areas, not only in energy intensive industries but also in terms of land protection and reclamation, biodiversity and so on. But, as the environmentally best producer of products linked to GHG emissions, it would also seek to expand its share of global markets for such products.

Thus this option would involve:

- vigorous action to achieve and maintain environmental leadership in selected mining, resource and energy intensive industries (eg. phasing out of coal generation, extensive use of natural gas, and serious attention being given to the potential for the development of a hydrogen economy, etc.);
- continued expansion of high GHGE industries, but only where they are at world best practice in environmental terms;
- strong action on land salinisation, with a major sequestration program; and
- heavy government focus on advanced environmental programs more generally – including a central focus on advanced environmental technologies and 'green' industries.

Because of continued expansion of GHG emission intensive industries, this option may not be consistent with meeting the Kyoto targets by 2010. But, if pursued in a sufficiently vigorous manner, it would be a responsible and defensible environmental strategy, contributing significantly to the reduction of global GHG emissions over the longer term.

Avenues for investigation

Fundamental issues concerning the State's future are involved in determining which of these paths Western Australia should follow over the next decade. In the meantime, and as part of that consideration, there are several avenues for investigation that the State Government might consider. They include:

- looking urgently and seriously at the potential environmental and economic impact of climate change in Western Australia, and at the requirements of an adaptation strategy;
- investigating the potential for stricter and/or more imaginative application of Environmental Impact Assessment regulations relating to greenhouse gas emissions in major project approvals;
- investigating the potential for pushing the Commonwealth Government to consider seriously the establishment of a differentiated 'bubble' of GHGE targets between the Australian States, with due recognition being given to Western Australia's greater dependence on GHGE;
- looking at a similar bubble philosophy within Western Australia, with attention to industry shares of GHGE;
- investigating more deeply the implications of the various flexibility mechanisms of the Kyoto protocol with a view to educating Western Australian industry and influencing Australia's negotiating position concerning these mechanisms;
- exploring the benefits of arguing strongly for ecological factors (rather than trade and development) to take priority in climate change negotiations, and for policy measures which ensure a better environmental outcome on a global basis in relation to GHGE;
- looking dispassionately at the relative merits of a global carbon tax or emissions trading scheme, compared to proposed flexibility mechanisms which may penalise energy efficient Annex 1 producers;
- considering the potential of the flexibility mechanisms from the point of view of technology transfer and economic diversification, rather than simply as carbon credit mechanisms;
- exploring in greater detail the potential of the hydrogen economy in Western Australia as a long-term option to the current GHG constrained minerals and processing activities; and
- analysing the potential for green industries and jobs in the Western Australian economy, particularly those with a GHGE benefit.

3. Western Australia in the World of the New Millennium

Like Australia as a whole, Western Australia enters the new millennium as a small, rich society occupying a vast land mass within reasonable proximity of half of the world's

population. The world of which it is part is being globalised, is undergoing very rapid technological change and is becoming increasingly unequal, both within and between nations. With such massive change comes realignment in social structures and values: the decline of family structures, awareness of different lifestyles, increased mobility, greater individualism, reduced willingness to tolerate unacceptable outcomes, and so on.

It is not possible to respond to the emerging global knowledge economy without being aware of, and also responding to, the changes in social structures and in values that it carries with it. The new technologies may themselves provide a central means of providing this response. In the case of Western Australia, particularly important issues include:

- the integration of various groups within society – rural and city, indigenous and non-indigenous, young and old – into genuine participation in the emerging economy;
- the development of forms of integration with Asia which make use of the State's skills and resources to contribute to Asian development, while preserving the State's integrity;
- the development of an acceptable basis for increased migration to Western Australia, striking an agreed balance between different types of migrants – lifestyle and knowledge workers, business migrants, family reunion and refugees – and securing the environmental base for an increased population; and
- the creation of coalitions of support, which bring together different social and geographical groups, for the changes which Western Australia faces.

It is impossible to predict how Western Australia, or indeed Australia as a whole, will be placed in the global knowledge economy of 2025. But what is clear is that the technological and commercial challenges cannot be addressed in isolation from changing social structures and value systems. For example, strong and demonstrable progress in terms of the economic position of aboriginal people will be necessary if Western Australia is to have a secure place in the economy of the 21st Century.

Future Study Options

In addition to the specific study questions outlined above, there are a number of broader issues that require greater understanding if we are to develop an integrated, long term strategy. We need:

- Greater understanding of the mechanisms for, and implications of, shifting the structure of production in Western Australia towards higher growth, higher value-adding activities, be it through building on history and strengths or developing new activities from scratch.
- Greater understanding of regional inequality, exploring its dynamics, causes and possible solutions.

- Greater understanding of the mobility of human capital, including the importance of lifestyle for location, services 'trade' by telecommuting, and fly-in/fly-out employment.
- Greater appreciation of the real opportunities available to Western Australia through increased linkages, cooperation and partnering with Asian countries (esp. China), and of the potential risks involved.
- Greater understanding of the importance and current effectiveness of local, state, national and sectoral innovation systems – focusing on potential mechanisms for building institutions, capabilities, organisations and linkages.
- Greater understanding of the nature of the current phase of globalisation, and the implications of investment location decisions, global competition and the death of distance.
- Greater understanding of education and skills development needs for the knowledge-based economy.
- Greater understanding and awareness of emerging business models for the knowledge economy.

All provide fertile ground for further study, and the opportunity to develop greater understanding of the dynamics and wealth creating potential of the emerging global knowledge-based economy in the 21st century.

Conclusion

The central argument of this discussion paper is that Western Australia is at a critical point in its economic history, arising from the unsustainability of its historic pattern of development in the global knowledge economy. Three issues – the narrowness of the State's economic structure, the inevitability of responses to climate change and to environmental degradation, and the challenge of changing social structures and value systems – drive the need for urgent action. In these ways Western Australia exemplifies in an acute form the challenges facing Australia as a whole.

This is meant to be a realistic but not a pessimistic message. The issues facing Western Australia are indeed serious, as is the need for a profound change in economic structure. Failure to act quickly and on an adequate scale may have very adverse consequences. But every nation and region has to find its own way of adjusting to the 'brave new world' of knowledge intensity, globalisation and environmental sustainability. Given the State's assets – its rich human and physical resources, vitality and openness to change – Western Australia remains a privileged place from which to address that common challenge.

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1 The Context of Development in the 21st Century

Globalisation and the transition to a knowledge-based economy are *driving* a transformation of the nature and structure of the world economy. This transition is changing the ways in which people live and work, changing the demands on national, state and local governments, and changing people's attitudes to work, leisure, economic development and the environment. Increasing national and international pressures to halt environmental degradation, long-term demographic trends, national and international market deregulation, the opening of trade in goods and services, and global e-commerce are among a range of factors *shaping* the nature of the transformation.

In order to manage change, rather than becoming a victim of it, governments need to develop policy which addresses issues relating to changing global trading patterns and demands for goods and services, climate change, sustainable development, demographic changes and changing social values. In this discussion paper we identify key drivers and shapers that are likely to influence global economic development in the first quarter of the 21st century, draw out their implications for Western Australia, identify major issues, and recommend future study options to support the Western Australian government in policy development.

1.1 Context of development

To understand the context of development at the beginning of the 21st century it is necessary to understand something of the nature and characteristics of the current phase of globalisation, and of the emerging knowledge economy. Despite widespread usage these characteristics are not always well understood.¹

1.1.1 Globalisation

The main characteristics of globalisation since the 1980s can be summarised in terms of impacts relating to the emergence of a global economic system, global competition, and the location, organisation and rationalisation of economic activity.

A global system: One feature of the current phase of globalisation is that international flows of goods and services, foreign direct investment, capital and technology are becoming increasingly inter-related.² This implies a need to consider more integrated and holistic policy responses, to ensure that foreign, trade, taxation, investment, industry, science and technology policies are coordinated, or at least in harmony.

The current phase of globalisation also features the emergence of a new core-periphery system, in which there are a number of 'global cities' acting as nodes in a global network. To various degrees these global cities link their surrounding regions into the

global system. This implies a need to focus attention on local linkages into global production systems, and on projecting capital cities' global city status.

Competition and production: Globalisation and related deregulation has led to increased international competition and to the emergence of a new form of 'global competition', in which there is nowhere to hide. To compete successfully firms must compete head-to-head in all markets, including their home market.³ No longer do distance or national borders afford protection.

Production is being rationalised globally, with firms combining the factors, features and skills of various locations in the process of competing in global markets. There are three major dimensions of change involved:

- increasing national and locational specialisation – resulting in greater line-item by line-item trade imbalances;
- increased international 'fracturing' of value chains or chains of production – witnessed in increased intra-industry and intra-firm trade; and
- substantial structural dislocation in local, regional and even national economies – demanding substantial, ongoing structural adjustment.

Strategy and location: Globalisation is a fundamentally microeconomic phenomenon, driven by the strategies and behaviour of firms. In a global strategy the comparative advantages of each nation, state or location are no longer considered separately. Comparative advantages are determined by a firm's objectives (eg. low production costs, new markets for standardised or differentiated products, access to new technologies or know-how). Hence, comparative advantages, advantages of location, are increasingly firm specific and will vary according to the firm's global strategy.⁴

Consequently, nations, states and locations need to attend to the development of a coherent set of advantages, and find a niche in the global economy which attracts the type of economic activity they want to foster. Attending to the generic business environment is necessary, but no longer sufficient. Policy development must be based on an understanding of the changing nature of competition, global corporate strategies and enterprise capabilities; and consider market support and support for expansion – including fostering and supporting the further development of supply chain linkages, and facilitating the outward (as well as inward) direct investment so important for international expansion and global competition.

Networks and geographical clusters of firms are a particularly important feature of the knowledge economy. Firms find it increasingly necessary to work with other firms and institutions in technology-based alliances, because of the rising cost, increasing complexity and widening scope of technology. Many firms are becoming multi-technology corporations locating around centres of excellence in different countries. Despite improved capability for global communication, firms increasingly co-locate because it is the only effective way to share understanding (tacit knowledge).⁵

Consequently, skills and lifestyle are becoming increasingly important locational factors. "As we enter the age of human capital, where firms merely lease knowledge-assets, firms' location decisions will be increasingly based upon quality-of-life factors that are important to attracting and retaining this most vital economic asset. In high-tech services, strict business-cost measures will be less important to growing and sustaining technology clusters... Locations that are attractive to knowledge assets will play a vital role in determining the economic success of regions."⁶

A new role for Governments: Globalisation sees the emergence of supra-national organisations, such as the World Trade Organisation (WTO), and the increasing need to move governance to international fora is leading to considerable power shifts between supra-national, national, state and local governments. "In a global economy – which boasts rapid transportation, high-speed communication, and accessible markets – one would expect location to diminish in importance. But the opposite is true. The enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialised skills and knowledge, institutions, rivals, related businesses, and sophisticated customers. Geographic, cultural, and institutional proximity leads to special access, closer relationships, better information, powerful incentives, and other advantages in productivity and innovation that are difficult to tap from a distance. The more the world economy becomes complex, knowledge-based, and dynamic, the more this is true."⁷ Some have referred to this power shift as 'glocalisation'.

For these and other reasons, governments have a new role to play – a shift from being regulator to *playing host* to capital, knowledge workers, innovation, and investment.

1.1.2 The Emerging Knowledge Economy

The emergence of the knowledge economy can be characterised in terms of the increasing role of knowledge as a factor of production and its impact on skills, learning, organisation, innovation and our understanding of how the economy works.

Economics of the Knowledge Economy: In the knowledge economy there are new ground rules. Knowledge has fundamentally different characteristics from ordinary commodities and these differences have crucial implications for the way a knowledge economy must be organised.⁸ The whole nature of economic activity, and our understanding of it, is changing.

Unlike physical goods information is not destroyed in consumption. Its value in consumption can be enjoyed again and again. Hence, social return on investment in its generation can be multiplied through its diffusion.

Ideas and information exhibit very different characteristics from the goods and services of the industrial economy. For example, much more than is the case with a frozen dinner or a haircut, the social value of ideas and information increases to the degree they can be shared with and used by others. More important, the costs associated with their production are distributed very differently over time.

While up front costs associated with the production of traditional goods such as a car or house may not necessarily be high, each item is still costly to produce. The more of these one produces, the more likely one will eventually encounter scarcities that drive up production costs and reduce the size of social returns. In the case of innovation, ideas and information, however, the opposite would seem largely to be the case. While up front development costs can be very high, the reproduction and transmission costs are low. The more such items are (re)produced, the greater the social return on investment.⁹

Traditional economics is founded on a system which seeks to optimise the efficient allocation of scarce resources, but because of the unique characteristics of information and knowledge the very meaning of scarcity is changing. Indeed, the 'scarcity defying expansiveness of knowledge' is the root of one of its most important defining features. Once knowledge is discovered and made public, there is essentially zero marginal cost to adding more users.¹⁰

Because knowledge does not wear out and people can duplicate it practically without cost, it is a source of supervalue and superproductivity. Knowledge alone can add value to an otherwise closed, zero-sum system of value. It can increase value without diminishing it somewhere else...¹¹

...ideas and innovations have extensive externalities, their benefits typically extending well beyond those who first put them forward; and it can be difficult to exclude other potential users of knowledge through intellectual property rights. What is more, there is an inherent 'unknowability' in knowledge: it is like an experience good, which consumers find hard to value unless they have used it.¹²

Knowledge goods and services are subject to, or part-and-parcel of, almost every form of 'market failure' that traditional approaches to economics have identified. Indeed, there is every sign that in a knowledge-based system market failure will be systemic, and every sign that we need a fundamentally different economic understanding for the knowledge economy.

Increasing inequality: One of the consequences of the tendency for knowledge economy products and services to exhibit increasing rather than decreasing returns is divergence – inequality is increasing.¹³

At the national level there is increasing evidence that countries are polarising, rather than converging, in economic terms. Standard neoclassical growth theories suggest that economies subject to market forces should converge in terms of per capita GDP levels, either absolutely or relatively. But the reality is quite different. Countries appear to be moving towards two peaks or nodes, one at high incomes and one at relatively low incomes. This polarisation of countries into different strata of economic activity and of living standards is becoming both pronounced and persistent.¹⁴

At the level of the firm, global giants have emerged in the information industries wherever regulation permits – Microsoft in computer software, Intel in semiconductors, etc. At household and individual levels the same phenomenon can be observed.

Musicians and sports people have gone from almost universal poverty to a situation where the stars, by means of global communications, command global audiences and astronomical salaries while the majority remain poor.

What the future will show as the knowledge economy unfolds remains to be seen, but there is little in the recent historical record to assure policy makers that market forces will deliver a continuing process of convergence to US levels. In such a world the consequences of policy failure or inaction in the face of divergence at the individual, household, suburb, regional, state and national levels could be dramatic. All private and public sector providers of goods and services must also come to grips with this divergence. Having 'haves' and 'have nots' divides consumers into either 'time rich–money poor' and 'money rich–time poor', challenging traditional business models to supply what consumers want at prices they can afford.

Knowledge, skills and learning: Information and communication technologies have greatly reduced the cost and increased the capacity of organisations to codify knowledge, process and communicate information. In doing so they have radically altered the balance between codified and tacit knowledge in the overall stock of knowledge – in essence, creating a relative shortage of tacit knowledge.

As access to information becomes easier and less expensive, the skills and competencies relating to the selection and efficient use of information become more crucial, and tacit knowledge in the form of the skills needed to handle codified knowledge more important than ever. The skills required of humans will increasingly be those that are complementary with information and communication technology; not those that are substitutes.¹⁵ Whereas machines replaced labour in the industrial era, information technology will be the locus of codified knowledge in the knowledge economy, and work in the knowledge economy will increasingly demand uniquely human (tacit) skills – such as conceptual and inter-personal management and communication skills. An understanding of these changes should inform skills development strategies.

Innovation and knowledge networks: The success of enterprises, and of national economies as a whole, will rely more upon their effectiveness in creating, gathering, absorbing and utilising knowledge. A knowledge economy is, in effect, a hierarchy of networks, driven by the acceleration of the rate of change and the rate of learning, where the opportunity and capability to get access to, and join knowledge-intensive and learning-intensive relations determines the socio-economic position of individuals and firms.¹⁶

Firms must become learning organisations, continuously adapting management, organisation and skills to accommodate new technologies and grasp new opportunities. They will be increasingly joined in networks, where interactive learning involving *creators, producers and users* in experimentation and exchange of information drives innovation.

Learning organisations and innovation systems: In a knowledge economy, firms search for linkages to promote inter-firm interactive learning, and for outside partners

and networks to provide complementary assets. These relationships help firms spread the costs and risks associated with innovation, gain access to new research results, acquire key technological components, and share assets in manufacturing, marketing and distribution. As they develop new products and processes, firms determine which activities they will undertake individually, which in collaboration with other firms, which in collaboration with universities or research institutions, and which with the support of government.¹⁷

Innovation is, therefore, the result of numerous interactions between actors and institutions, which together form an innovation system. The ‘knowledge distribution power’ of the system, or its capability to ensure timely access by innovators to relevant stocks of knowledge, is therefore a major determinant of prosperity.¹⁸

Systems of creation, production and distribution: The commonly held notion that a knowledge economy is a services economy is dangerously misleading. Services are increasingly important, and are the source of much value-adding in the value chain. But, the knowledge economy is not simply a services economy. Rather, it is one in which services are linked intimately with production. As information and knowledge add value to basic products, manufacturing and services are becoming increasingly integrated into complex chains of *creation, production and distribution*.¹⁹

With increasing use of integrated computer aided design and manufacturing systems (CAD/CAM), just in time (JIT) and other technologies, and labour and other physical resource costs accounting for an ever smaller proportion of overall costs, the need to integrate research, design, development, manufacturing, distribution and after sales service into seamless chains of creation, production and distribution is likely to increase.²⁰ We cannot assume that a services economy linked to offshore manufacturing will work. Co-location, or deep integration through information and communication technology networks and logistics and distribution networks, will increasingly replace arms-length, off-shore, low wage manufacturing. Obviously, this will have profound implications for investment location and attraction, structural adjustment, infrastructure development, and skilling.²¹

1.2 Drivers and shapers of demand

Against this background, the remainder of this discussion paper focuses on some of the major the drivers and shapers of demand for Western Australian goods and services over the next 25 years. We explore:

- how emerging global trading patterns might effect demand for Western Australia's products and services, and influence the course of future economic development;
- the potential impacts of environmental drivers, such as climate change and sustainability;
- how long-term demographic trends may effect demand, and how changing social values might impact on both the pace and direction of development.

We then examine some possible responses and suggest future study options.

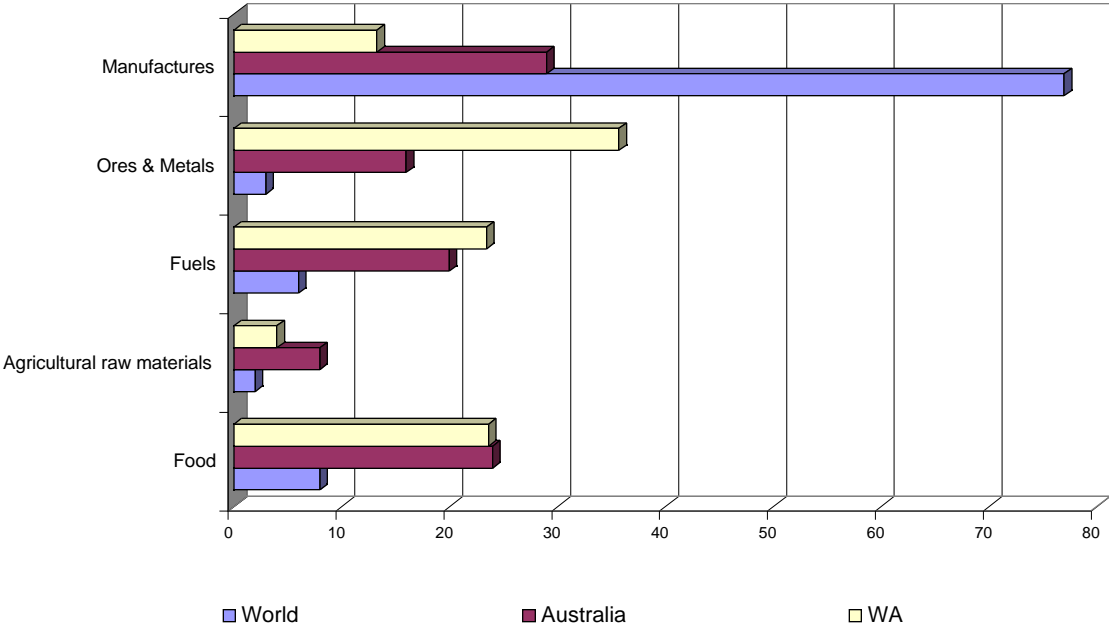
2 Trade patterns and industrial structure

This chapter identifies some of the major impacts on Western Australia of evolving global trading patterns. It focuses on long-term shifts in the composition of trade, changing global demand, new and evolving structures of production, and the structural suitability of the Western Australian economy for sustained prosperity in the 21st century.

2.1 Trade and its structural implications

In this section we explore the composition and direction of Western Australia's trade, and then briefly look at trends in global trade patterns and their impact on the demand for what Western Australian produces.

Figure 2.1 Merchandise Export Shares: Western Australia, Australia and World (per cent)



Note: Chart shows percentage shares of merchandise exports, World (1997), Australia (1997) and Western Australia (1998-99) excluding SITC 9.
Source: World Bank (1999) *World Development Indicators*; and TradeData; CSES analysis.

2.1.1 Composition of trade

A comparison of the composition of Western Australia's merchandise exports with those from Australia and the World highlights Western Australia's dependence on resources and its low share of manufactured exports.²²

World demand for manufactures is large and growing. In 1997, manufactured products accounted for 61 per cent of world trade by value, and no less than 77 per cent of total merchandise exports. By contrast, manufactures accounted for 29 per cent of Australia's merchandise exports, and just 13 per cent of Western Australia's.²³ Since 1980, manufactures have accounted for more than 64 per cent of the growth in world trade, but only just over 23 per cent of the growth in Australia's exports.²⁴

Table 2.1 Australian and World Trade: Structure of Exports, 1980-1997

	<i>World</i>			<i>Australia</i>		
	<i>1980</i> <i>% of total</i>	<i>1997</i> <i>% of total</i>	<i>Change</i> <i>(% points)</i>	<i>1980</i> <i>% of total</i>	<i>1997</i> <i>% of total</i>	<i>Change</i> <i>(% points)</i>
<i>Merchandise exports</i>	82	79	-2	85	75	-10
Manufactures	53.3	60.8	8	18.7	21.8	3
Food	10.7	6.3	-4	28.9	18.0	-11
Fuels	9.0	4.7	-4	9.4	15.0	6
Ores & Metals	4.1	2.4	-2	14.5	12.0	-3
Agricultural raw prds	3.3	1.6	-2	9.4	6.0	-3
<i>Services exports</i>	18	21	2	15	25	10
Information & Business	6.8	8.5	2	3.0	4.9	2
Travel	4.7	6.7	2	4.4	12.1	8
Transport	6.1	4.9	-1	7.4	6.7	-1
Finance & Insurance	0.5	1.1	1	0.2	1.4	1
	<i>\$US m</i>	<i>\$US m</i>	<i>CAGR %</i>	<i>\$US m</i>	<i>\$US m</i>	<i>CAGR %</i>
Total	2,125,867	6,613,763	6.9	25,141	75,066	6.6
Merchandise exports	1,733,712	5,241,880	6.7	21,279	56,228	5.9
Services exports	392,155	1,371,883	7.6	3,862	18,838	9.8

Note: Current prices.

Source: World Bank (1999) *World Development Indicators*.

Conversely, commodities accounted for just over 23 per cent of world merchandise exports in 1997, compared to 71 per cent of Australia's and almost 87 per cent of Western Australia's merchandise exports. Commodities have accounted for only 14 per cent of the growth in world trade since 1980, but they have accounted for almost 47 per cent of the growth in Australia's exports. World demand for fuels has declined as a share of total trade by 4 percentage points since 1980, and now accounts for less than 5 per cent of world trade. But fuels accounted for 15 per cent of Australia's total exports in 1997, up from just over 9 per cent in 1980, and no less than 23.5 per cent of Western Australia's merchandise exports in 1998-99.²⁵ Because of its dependence on

commodities Western Australia is missing out on a good deal of the potential trade growth enjoyed by manufactures.

Table 2.2 Composition of Australia's Manufactured Exports, 1987-88 to 1997-98

	1987-88		1997-98		Average Annual Growth %
	\$m	Share %	\$m	Share %	
Crude materials	12,227	30.0	17,878	20.4	4.6
Food	8,033	19.7	16,040	18.3	10.0
Mineral fuels	6,882	16.9	15,400	17.5	12.4
Machinery & equipment	2,706	6.6	11,111	12.7	31.1
Manufactured materials	4,897	12.0	10,594	12.1	11.6
Chemical products	903	2.2	3,297	3.8	26.5
Other manufactures	1,031	2.5	3,185	3.6	20.9
Beverages & tobacco	258	0.6	1,059	1.2	31.0
Animal & vegetable oils	141	0.3	333	0.4	13.6
Other	3,643	8.9	8,867	10.1	14.3
Total	40,721	100.0	87,764	100.0	11.6

Source: ABS (1998) *International Merchandise Trade*, Cat No 5422.0.

Australia's apparently strong performance in services trade is patchy. Services account for a slightly larger share of Australia's exports than they do in high income countries, and have been growing faster since 1980. However, travel and transport services account for a large part of this. Indeed, communications, IT and other technical and business services accounted for around 5 per cent of Australia's exports in 1997, compared to more than 9 per cent of high income country exports, and 8.5 per cent of world trade.²⁶ These data suggest that Australia has little revealed comparative advantage in high value business and technical services.

Western Australia's is a highly traded economy. Western Australia accounts for just 11 per cent of Australia's total factor income, but around 25 per cent of Australia's total merchandise exports (by value).²⁷ However, the dependence on resources is even more pronounced for Western Australia than it is for Australia as a whole. Ores (including gold) accounted for 38 per cent of Western Australia's total merchandise exports in 1998-99, petroleum for a further 8 per cent, and gas 7.4 per cent. Western Australia's Top 10 merchandise exports, 5 of which are mining related and 3 agriculture related, account for almost 86 per cent of total merchandise exports.²⁸

Western Australia's services exports have grown more rapidly during the 1990s than have Australia's – from \$1.6 billion in 1992-93 to \$2.5 billion in 1997-98. However, Western Australia accounts for 25 per cent of Australia's total merchandise exports, but just 10 per cent of total services exports – somewhat less than the State's share of the national economy. Exports of finance, insurance, information and other business services from Western Australia are very low, accounting for less than 10 per cent of the

State's services exports combined – transport and travel services exports account for almost all of the remaining 90 per cent. These data suggest that Western Australia has no revealed comparative advantage in high value business and technical services.

Table 2.3 Top 10 Merchandise Exports from Western Australia, 1998-99

<i>Product</i>	<i>\$m</i>	<i>%</i>
Metalliferous Ores and Metal Scrap	4,303	19.7
Gold	4,068	18.6
Combined confidential items of trade	3,556	16.3
Cereals and Cereal Preparation	1,887	8.6
Petroleum, Petroleum Products and Related Materials	1,672	7.7
Gas, Natural and Manufactured	1,618	7.4
Non-Ferrous Metals	437	2.0
Textile Fibres & Their Wastes not Manufactured into Fabric	410	1.9
Fish, Crustaceans, Molluscs, etc.	406	1.9
Dyeing, Tanning and Colouring Materials	391	1.8
Other products	3,099	14.2
<i>Total Top 10 Products</i>	<i>18,748</i>	<i>85.8</i>
<i>Total All Products</i>	<i>21,847</i>	<i>100.0</i>

Source: TradeData (see <http://www.tradedata.net>)

These data clearly reflect a significant resource dependence. Not only is Western Australia dependent on exporting things for which there is already a long term relative decline in demand and hence prices, but dependence on the export of fuels (fully 23 per cent of Western Australia's merchandise exports) makes it particularly vulnerable to national and international moves to reduce energy consumption and greenhouse gas emissions.

2.1.2 Direction of Trade

The last decade has seen a significant change in the composition of Australia's major export customers – away from the US and Europe and towards Asia. In 1987-88, the US and Europe took more than 27 per cent of Australia's merchandise exports and 37 per cent of services exports, and Asia some 49 per cent of merchandise and 32 per cent of services exports. A decade later the US and Europe accounted for 21 per cent of merchandise exports and 30 per cent of services exports, while Asia accounted for 54 and 45 per cent, respectively.

The fastest growing regional destination for Australian merchandise and services exports is ASEAN – with merchandise exports to the ASEAN 7 growing at an annual average 27 per cent and services exports at an annual average 31 per cent over the decade to 1997-98. ASEAN now takes 13 per cent of Australia's merchandise exports and more than 16 per cent of services exports.

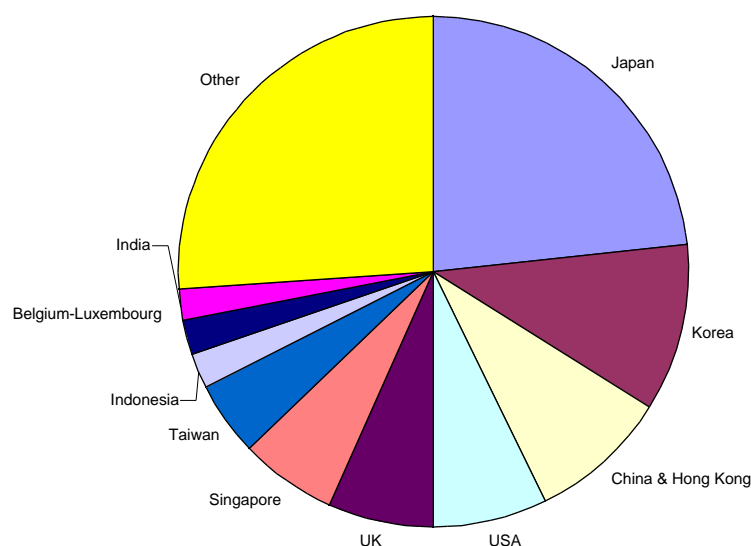
Table 2.4 Australia's Export Destinations, 1987-88 to 1997-98

Merchandise Exports					
	1987-88	Share	1997-98	Share	Average Annual
	\$m	%	\$m	%	Growth %
US	4,608	11.3	7,793	8.9	6.9
EU	6,455	15.9	10,242	11.7	5.9
ASEAN	3,085	7.6	11,502	13.1	27.3
North Asia	17,000	41.7	36,175	41.2	11.3
Other	9,573	23.5	22,052	25.1	13.0
Total	40,721	100.0	87,764	100.0	11.6

Services Exports					
	1987-88	Share	1996-97	Share	Average Annual
	\$m	%	\$m	%	Growth %
US	1,463	14.9	3,196	13.1	13.2
EU	2,149	21.9	4,127	16.9	10.2
ASEAN	1,043	10.6	3,990	16.4	31.4
North Asia	2,069	21.1	6,899	28.3	25.9
Other	3,079	31.4	6,172	25.3	11.2
Total	9,803	100.0	24,384	100.0	16.5

Notes: Merchandise exports 1987-88 to 1997-98, services exports 1987-88 to 1996-97. Current prices. North Asia includes China, Hong Kong, Japan, Korea, and Taiwan.

Source: ABS (1998) *International Merchandise Trade*, Cat No 5422.0; DFAT (1999) *Trade in Services: Australia, 1997-98*, Department of Foreign Affairs & Trade, Canberra.

Figure 2.2 Top 10 Destinations for Western Australian Merchandise Exports, 1998-99

Source: TradeData (see <http://www.tradedata.net>)

The Top 10 country destinations account for more than 67 per cent of Australia's total exports – with Japan alone accounting for 19 per cent, the US just over 10 per cent, New Zealand 6.4 per cent, the UK and Korea 5 per cent, Hong Kong 4.7 per cent, Singapore 4.6 per cent, Taiwan and China for 3.9 per cent, and Indonesia for 3.2 per cent in 1997-98.

One notable feature is the increasing importance of China and 'greater' China – including China, Hong Kong and Taiwan – which now accounts for 12.5 per cent of Australia's combined merchandise and services exports. Over the decade to 1997-98, Australia increased merchandise exports to greater China at an annual average of almost 17 per cent and services exports at an annual average of more than 35 per cent.

Western Australian exports are even more concentrated on a few destinations and the share of exports taken by the top destinations trails off more quickly. The Top 10 destinations for Western Australia's merchandise exports account for 74 per cent of total State exports, and Japan alone accounts for more than 23 per cent.

The increasing importance of North Asia, including greater China, is also more pronounced for Western Australia than it is for Australia as a whole. North Asia (including Japan, China, Hong Kong, Korea, and Taiwan) accounted for more than 47 per cent of Western Australia's total merchandise exports in 1998-99, with 'greater' China accounting for almost 14 per cent of total State merchandise exports.

Table 2.5 Top 10 Individual Exports and Destinations for Western Australian Merchandise, 1998-99

<i>Product</i>	<i>Destination</i>	<i>\$m</i>	<i>% share</i>
Combined confidential items of trade	Japan	2,030	9.3
Metalliferous Ores and Metal Scrap	Japan	1,864	8.5
Gold	Korea	979	4.5
Gold	UK	944	4.3
Combined confidential items of trade	USA	812	3.7
Metalliferous Ores and Metal Scrap	China & HK	753	3.4
Gold	Singapore	705	3.2
Metalliferous Ores and Metal Scrap	Korea	618	2.8
Combined confidential items of trade	Belgium- Luxembourg	425	1.9
Combined confidential items of trade	South Africa	373	1.7
Other		12,346	56.5
<i>Total Top 10</i>		<i>9,501</i>	<i>43.5</i>
<i>Total All</i>		<i>21,847</i>	<i>100.0</i>

Source: TradeData (see <http://www.tradedata.net>)

The concentration of Western Australia's trade in terms of both destinations and products is notable. Western Australia is highly dependent on a few products and few customers. Ore exports to Japan account for no less than 8.5 per cent of all Western

Australia's merchandise exports. Ore (including gold), gas and petroleum fuel related exports to North Asia account for almost 30 per cent of Western Australia's total merchandise exports.

A number of factors will influence the direction of Western Australia's trade over the coming years. The changing composition of trade, which sees increasing emphasis on ETMs and on services, is likely to increase the focus on trade with America and Europe compared with recent focus on Asia. Moreover, growth in the newly industrialised Asian countries is likely to slow to more 'normal' developed country rates, while at the same time growth in America and Europe is likely to be fuelled by the new or knowledge economy. Increasing use of e-commerce will also tend to increase our trade focus on America and Europe at the expense of Asia. Longer term, demographic changes, such as those discussed in chapter 4, will be important for both the direction and composition of trade. Declining and ageing populations may not only demand less, but also demand different things – health services rather than video games, for example.

2.1.3 Increasing knowledge intensity

One of the notable trends in world trade is the long-term decline in the share of natural resource-based products in world exports vis-a-vis engineered products. Indeed, elaborately transformed manufactures (ETMs) have been the major source of growth in world trade for the past 50 years.

Table 2.6 World Manufacturing Exports by R&D Intensity, 1985-95 (\$US billions)

	1985	1990	1995	Average Annual Growth % 1985-95
High Technology	183.2	421.3	738.7	15.0
Medium High	406.0	794.5	1,116.1	10.6
Medium Low	395.5	724.1	900.3	8.6
Low Technology	424.2	822.6	1,087.7	9.9
Total Manufactures	1,414.6	2,773.1	3,857.6	10.6
High Technology Share %	12.9	15.2	19.1	-

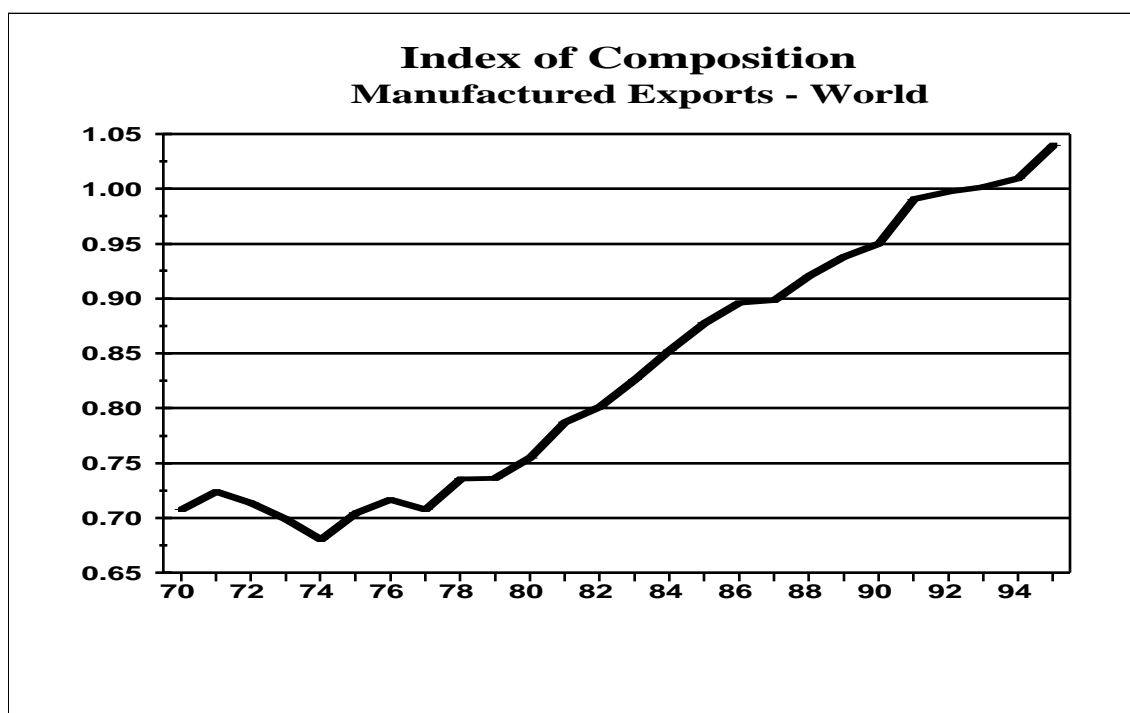
Note: Uses OECD definitions of technology levels based on average R&D intensities in each industry for 13 OECD countries.

Source: Sheehan, P. & Tegart, G. (1998) *Working for the Future*, Victoria University Press, p41.

World exports of high-technology products – including ICTs, aerospace and pharmaceuticals – grew by 15 per cent per annum between 1985 and 1995, compared to a growth in total manufactures exports of 10.6 per cent and non high-technology exports of 9.7 per cent. Over the decade to 1995, high-technology manufactures increased their share of world manufactures exports from less than 13 to more than 19 per cent. This trend towards high-technology appears to be gathering pace. Between 1985 and 1990

high-technology exports grew at an annual average 18 per cent, compared to an annual average growth of 14 per cent for low-technology exports. But between 1990 and 1995, world high-technology exports increased at more than twice the rate of low-technology exports.²⁹

Figure 2.3 Knowledge Intensity of World Manufactured Exports



Note: Index of knowledge composition for a country's exports is defined by weighting industry j 's share of total manufacturing by the average OECD R&D/Production ratio for industry j for the period 1987-89, and dividing by the average R&D weight.

Source: Sheehan, P. & Tegart, G. (1998) *Working for the Future: Technology and Employment in the Global Knowledge Economy*, Victoria University Press, p43.

Looking longer term at an index of the knowledge intensity of world manufactured exports, two things are clear. First, the knowledge intensity of manufactured exports has increased steadily and persistently since the late 1970s – rising by about 50 per cent. Second, since around 1993 world manufactures trade has been more concentrated in higher than in lower knowledge intensity industries.

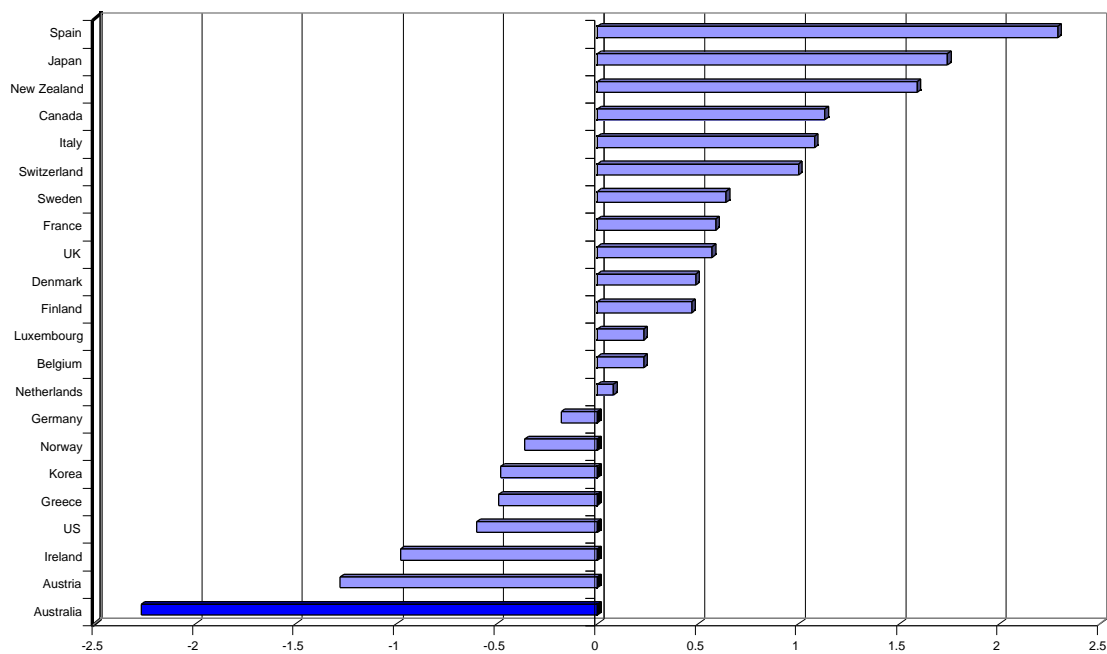
2.1.4 Declining terms of trade

Knowledge intensive goods and services are an increasingly important component of world trade, but commodities still dominate Western Australia's exports. This means that Western Australia's exports are not providing the same growth opportunities that ETM exports are providing for other countries. Moreover, prices fetched on world markets for natural resource-based products are falling vis-a-vis those fetched by ETMs. As

a result, the things Western Australia is exporting are earning less and less on world markets, while the things Western Australia is importing are costing more and more.

For example, the Australian dollar was worth an average of \$US 1.25 during the 1970s, an average of 89.3 cents US during the 1980s, an average of 69.9 cents US during the 1990s and is now worth around 60 cents. When Australia decimalised it did so on the ten shilling note, so the Australian dollar was worth 50 pence UK in 1966 compared to less than 40 pence today. So over the last 30 years the Australian dollar has declined some 20 per cent against the pound and 50 per cent against the US dollar. Compared to the mid 1960s Australia now has to export around 50 per cent more commodities (by volume) to be able to afford to import the same volume of manufactures. As a consequence Australia's terms of trade have fallen faster and further over the last decade than in any other OECD country.

Figure 2.4 Terms of Trade: Average Annual Percentage Change (OECD Countries), 1986-96



Source: OECD (1998) *OECD In Figures, 1997*, OECD, Paris.

Such a decline in terms of trade affects our standard of living over the long term. In the late nineteenth century Australians enjoyed the highest per capita income in the world. By 1970, Australia had slipped to 10th place in the international league table of income per capita.³⁰ Since then the decline has accelerated. By 1997, Australia had slipped to 23rd place in the World Bank's ranking of GNP per capita.³¹ Clearly, other jurisdictions have a better wealth creation record.

Western Australia cannot rely on natural resource-based products for ever. For one thing, while endless productivity improvements in agriculture and mining are possible,

over the last century they have not been sufficient to prevent a relative decline in Australia's standard of living vis-à-vis other countries. The present course is not working. For another, natural resources are finite. The present course is not sustainable.

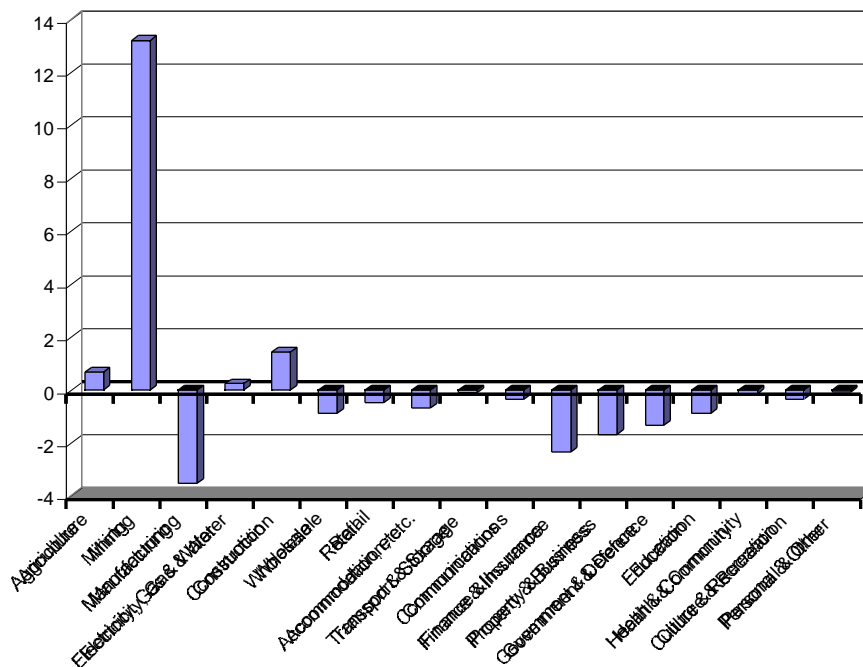
2.2 Structure of Production in Western Australia

The structure of production in Western Australia reflects the combined features of being highly traded and heavily resource dependent.

2.2.1 The Western Australian Economy

Within the Western Australian economy there is a marked dependence on mining, with both construction and agriculture also playing a larger role than in Australia as a whole. Conversely, manufacturing, finance and insurance, education, property and business services play a smaller role in Western Australia than in Australia. Mining accounts for almost 17.5 per cent of Western Australian State factor income, compared to just over 4.2 per cent in Australia as a whole; while total manufacturing accounts for less than 10 per cent of Western Australian factor income, compared to 13.4 per cent in Australia as a whole.³²

Figure 2.5 Total factor income by industry, percentage shares Australia versus Western Australia (1998-99)

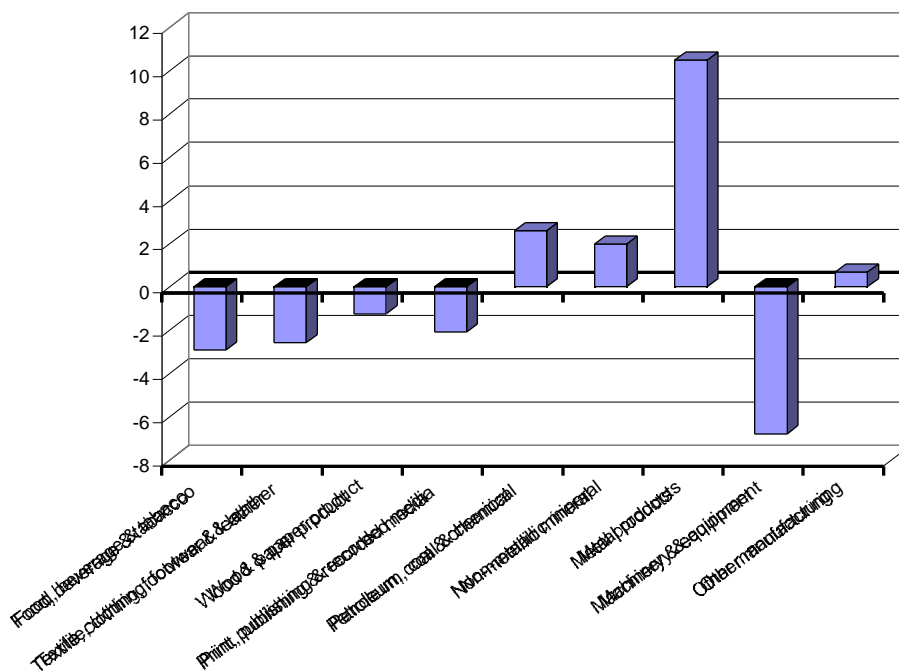


Note: Chart shows the difference in percentage share of industries' total factor income in 1998-99 between Western Australia and Australia – the Y-axis measures relative over/under representation in Western Australia.

Source: ABS (1999) *State Accounts*, Cat No 5220.0; CSES analysis.

Western Australia's resource dependence is also reflected within the structure of manufacturing. Mining and construction related manufacturing industries – including metal products manufacturing, petroleum, coal and chemicals manufacturing, and non-metallic mineral manufacturing – are more heavily represented in Western Australia than Australia as a whole. Perhaps surprisingly, given the agricultural base in Western Australia, the food, beverage and tobacco, and wood and paper product manufacturing industries account for a lower share of total manufacturing turnover in Western Australia than in Australia as a whole. Significantly, the relatively higher technology areas of machinery and equipment, and print, publishing and recorded media manufacturing are relatively under-represented in Western Australia.³³

Figure 2.6 Manufacturing industry turnover shares, Australia versus Western Australia (1996-97)



Note: Chart shows the difference in percentage share of manufacturing industries' turnover in 1996-97 between Western Australia and Australia – the Y-axis measures relative over/under representation in Western Australia.

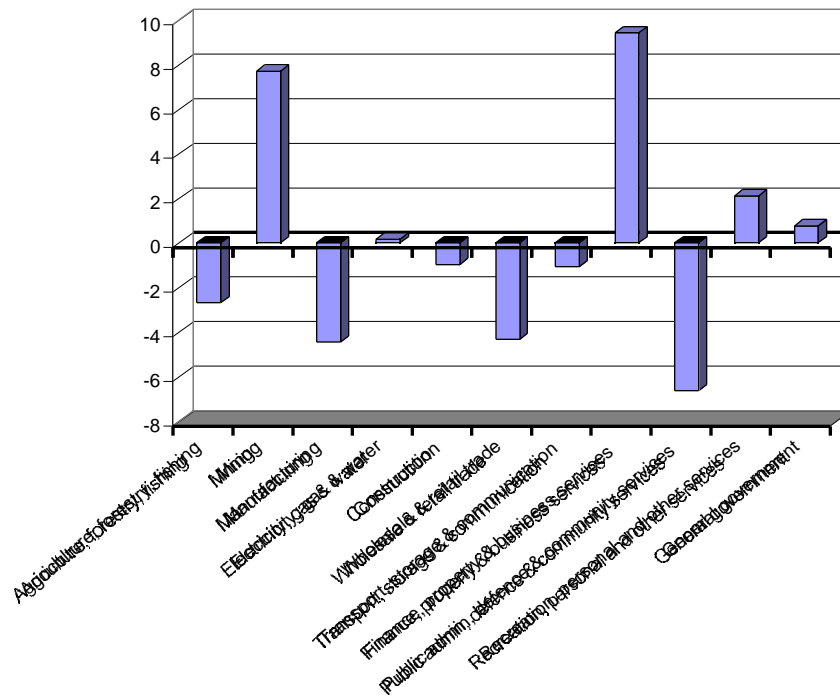
Source: ABS (1997) *Manufacturing Industry: Australia*, Cat No 8221.0; CSES analysis.

Evidence of change in Western Australia's structure of production during the 1990s brings mixed news. Mining now accounts for a smaller share of the Western Australian economy than it did in 1990-91, but its share in Australia as a whole has declined more; such that mining is now relatively more concentrated in Western Australia than it was a decade ago. The importance of the construction industry in Western Australia is increasing in both absolute and relative terms. The manufacturing industries' share of the Western Australian economy has fallen slightly during the 1990s, but somewhat less

than in Australia as a whole. Conversely, services have increased their share of the Western Australian economy, but less than they have in Australia as a whole. Hence, Western Australia is relatively more dependent on mining and agriculture now than at the start of the decade.³⁴

Looking longer term, it is clear that there has been significant structural change in the Western Australian economy over the last 25 years. Changes in categorisation over the years make these data no more than approximate, but it would appear that mining, finance, insurance, property and business services have increased their share of Western Australia's State output, while the shares of public administration and defence, manufacturing, wholesale and retail trade, and agriculture have declined over the period 1977-78 to 1998-99. These changes indicate the potential for the Western Australian economy to generate new strengths and undergo significant structural change over the longer term.

Figure 2.7 Changes in Industry Contribution to State Product, Western Australia 1977-78 and 1998-99 (change in percentage shares)



Note: Differences in categorisation between years makes these data approximate only. Chart shows the difference in percentage share of industries' total factor income in Western Australia between 1977-78 and 1998-99 – the Y-axis measures relative growth/decline in industry share of GSP.

Source: ABS (various years) *Australian National Accounts: State Accounts*, Cat No 5220.0

2.2.2 Local strengths

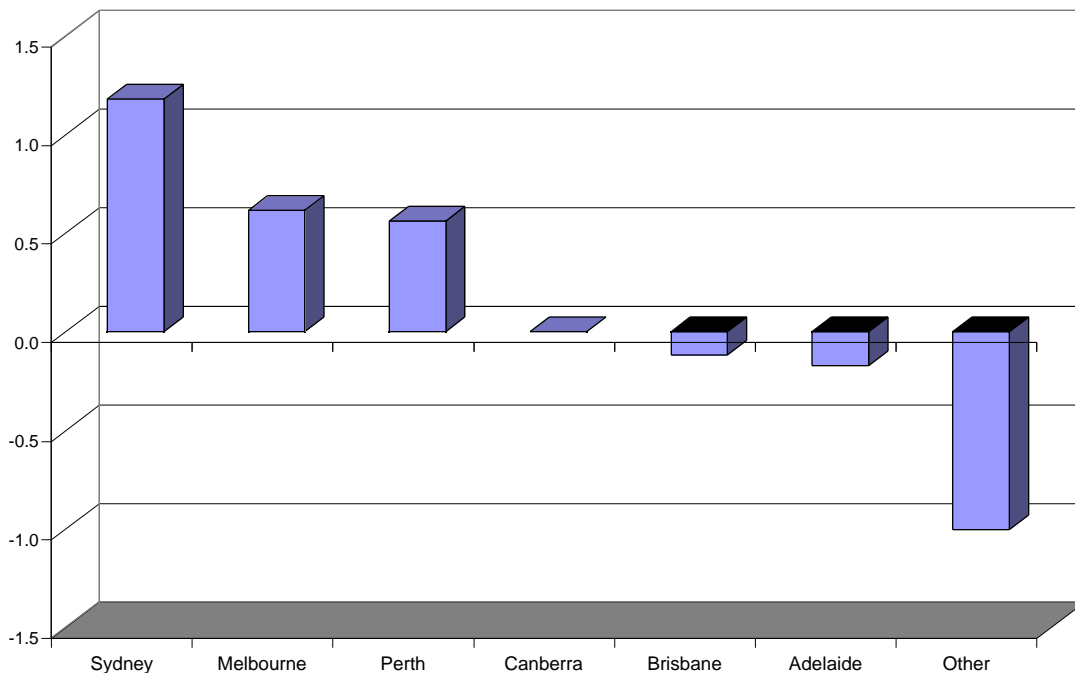
It is not surprising to find that many of Western Australia's local strengths are linked to mining, construction and agriculture. However, there are some significant developments in high-technology manufacturing and related services industries, especially in shipbuilding (eg. Austal Ships) and some aspects of information and communication technologies (eg. ERG).

For example, shipbuilding exports³⁵ have grown from just over \$89 million in 1990-91 to \$266 million in 1998-99 – with Austal Ships alone reporting sales revenue of more than \$200 million for 1998-99. Over the same period exports of IT equipment³⁶ from Western Australia have doubled. These emerging strengths suggest potential paths for diversification of the Western Australian economy, building out from the current resource base – opportunities that are discussed in more detail below.

2.2.3 Outward orientation

That the Western Australian economy is highly trade is reflected in its outward orientation. Indeed, Perth's international orientation makes it one of Australia's 'global cities'.

Figure 2.8 Relative Global versus National Orientation



Note: Capital cities are ranked by the difference between their ratio of the cities' proportion of total international and national traffic to proportion of total population.

Sources: Budde (1999) *Telecommunications Strategies in Australia, 1999/2000*, Paul Budde Communications; ABS (1999) *Australia Now - A Statistical Profile*; CSES analysis.

National and international telecommunications traffic data for Australian capital cities show that Canberra is highly linked both nationally and internationally. Sydney, closely followed by Canberra, has the highest level of international linkage. Melbourne and Perth are the other two cities with relatively high international linkage. Brisbane and Adelaide are relatively more nationally linked than internationally linked, while other areas of Australia demonstrate much greater national focus.³⁷

Communications traffic is sometimes used as an indicator of services trade and may also indicate the propensity for people to locate in an area for lifestyle reasons while continuing work outside the region – by virtual and/or physical means. Perth's communications data suggest that it may be emerging as a lifestyle location for high-technology services workers, it certainly indicates a strong outward orientation.

The implications of Western Australia's trade and industry structures are discussed in chapter 5, as are some possible responses to the current situation.

3 Global Environmental Drivers

Global environmental drivers will be among the most significant shapers of the Western Australian economy, and society, over the next 10, and probably 25 years. Paramount among these will be global climate change. Another important environmental driver is the need to achieve or approach sustainable development. Much of the consequent effort may be aimed directly at such issues as land and ocean degradation, land-use, and threats to bio-diversity. But concerns about pollution are also likely to lead to much more stringent examination of the environmental performance of companies, as judged by regulators, customers, the stock market and local and international communities.

The growing public awareness of, and concern for, the environment (ultimately reflected in government policies), the competitive advantages in the marketplace of environmentally conscious businesses, and the pressure of threatened international regulations – all of which are beginning to have an effect on share market value – mean that what may once have been dismissed as ‘green’ issues are now central to economic and business development. They are now very much mainstream business issues.

3.1 Global climate change

The possible threat of global climate change due to greenhouse gas emissions may present a major challenge. The ‘greenhouse effect’ is a naturally occurring phenomenon that regulates the surface temperature of the earth. The greenhouse gases – carbon dioxide, water vapour, methane, nitrous oxide and ozone – occur naturally in the atmosphere. Through their retention of heat absorbed from solar radiation, these gases warm the Earth’s surface and atmosphere.

Greenhouse gas concentrations have been increasing since the Industrial Revolution starting in the late 18th century. Carbon dioxide concentrations have increased by some 30 per cent, methane by 145 per cent and nitrous oxide by 15 per cent. Consequent climate change effects are difficult to assess because of the natural climate variability. However the global mean surface air temperature has increased, and global sea levels have risen by between 10 and 25 cm over the past 100 years.

While there is considerable variation in estimates of the extent of likely global warming, there is now little doubt about the reality of the greenhouse effect. The UN Intergovernmental Panel on Climate Change (IPCC) concluded at the end of 1995 that the balance of evidence suggests a discernible human influence on global climate – ie. that global warming arising from industrial output, as opposed to natural processes alone, is occurring.

In 1990, estimates from the IPCC predict an effective doubling of CO₂ between 2000 and 2025-2050. If this occurred there would be an increase in global mean temperatures of 1°C above the present value by 2025, and 3°C before the end of the century.

Moreover, the effects are not homogeneous, with an increase in temperature of half the global mean in the tropical regions, and twice the global mean in the polar regions. A rise of 20cm in the sea level is predicted by 2030, and about 65cm by the end of the century.³⁸

It is equally clear that these changes in temperature and sea level could have major consequences. The range of areas of potential impact is formidable. They include: rainfall patterns, crop growth potential, land degradation, pest and disease spread, forest growth potential, changes within ecosystems and in the boundaries of vegetation zones, species extinction, threats to hydrology and water resources, air quality, human health, human settlement, biomass (a principal source of energy in developing countries), transport and industry, coastal zones, low-lying islands and regions, barrier islands and reefs, estuaries and wetlands, seasonal snow cover, ice sheets and glaciers.³⁹ While there is substantial variation in the nature and extent of these possible effects, there is no doubt that the potential threats are a major international issue, and that they constitute a huge challenge to national and regional environmental and economic policies and strategies.

There are a number of features unique to the greenhouse challenge. First, global climate change is the first environmental problem that mankind has had to face in a worldwide context. Domestic policy measures (either command-control or market-based) have to varying extents been effective in the past at coping with local pollution problems. However, the characteristics of the climate change issue make it necessary to devise collaborative solutions involving all the countries of the world, via a complex negotiation process in which the interests of many actors will come into play, and whose outcome is far from predictable.

Second, given the very nature of the problem, which is associated with the massive use of a range of natural resources (predominantly fossil fuels, but also land use), rather than by-products or impurities of production processes, technology cannot provide end-of-pipe solutions.

Third, the time scale involved is so long and the natural processes involved so little understood that any attempt at even the most approximate quantification of the damages and mitigation costs becomes a formidable task.⁴⁰

3.1.1 The 'physical' impact of global climate change

In general, Australia would appear to be exposed to a relatively moderate scale of impacts, certainly compared with many other countries and regions. However, Australia's relatively low latitude makes it particularly vulnerable to impacts on its scarce water resources and on crops growing near or above their optimum temperatures.

It is assumed that changing climatic conditions will impact upon most regional ecosystems in Australia and the human activities that occur within them. For Western Australia these impacts may prove significant and for some sectors a lack of forward planning may prove potentially ruinous. Agriculture will be the first sector to face

impacts. Most cereals have been bred to perform at optimum levels within a narrow range of climatic conditions. If winters become drier or wetter, unseasonally hot weather increases or storm incidences increase, then crop production could be severely affected. Whole regions dependent on selected monocultures may fail in some circumstances, though in different circumstances others may thrive. It is possible that in less than fifty years Western Australia's current agricultural profile may no longer exist, with many crops, practices and regions abandoned in favour of adaptation to new climatic conditions. Resource development, mining and transport sectors will probably be least affected by changed climatic conditions, but these sectors will be most affected by global greenhouse governance.

Agriculture in the region is regarded as adaptable, and hence to have relatively low vulnerability. However, there may be a greater impact in the longer term, as the full effects of climate change are felt, in the high cereal production area of Western Australia. This is a consequence of an increase in the number of days where temperatures exceed 35°C, resulting in poorer wheat quality. Alterations to soils, plants and ecosystems are likely, with some increase in fires and insect outbreaks. These changes will add to existing problems of land degradation, weed and pest infestation. A particular issue for Australia is the clearing of land, which releases carbon dioxide. Australia is unique in having over 20 per cent of its greenhouse gas emissions attributable to land clearing activities. In other developed countries, land use change and forestry function as a sink for carbon emissions, not a source.

The effect on *fisheries* is very difficult to predict. There is some concern that the prosperous western rock lobster industry may be affected by changes to the Leeuwin Current, which affects the life cycle of the lobster.

Water resources are another critical issue. Constraints on the availability and quality of water for domestic, agricultural and industrial applications have the potential to limit further population and economic growth in Western Australia. Rainfall in the south-west corner of the State has been diminishing at a rate which is of concern. This is attributable to climatic change and overclearing of land, with subsequent precipitation changes. Shifting towards 'real cost water pricing' will be necessary and may soon require an additional component to reflect the costs of maintaining water quality into the medium term future. Ground water is already under significant pressure in Western Australia from urban and industrial contamination as well as over-pumping. Rising seas may drive sub-surface saline wedges further inland, increasing the costs of quality maintenance and distribution.

With over 80 per cent of the Australian population living near the coast, the impact on *coastal areas and settlements* could be considerable. Some of Western Australia's coasts and rapidly growing coastal settlements and infrastructure are vulnerable to any increase in coastal flooding and erosion. This applies particularly to metropolitan Perth, where the design and construction standards of much infrastructure – including drainage systems, culverts, bridges, dams and sewage treatment – may prove inadequate.

With regard to *energy, transport and industry*, the greatest impacts are more likely to be shaped by policy responses to climate change – such as fuel regulations, emission fees, or mass transit subsidisation – than by the direct physical and biological effects. These will have a particular effect on the Western Australian economy, as it specialises in the production and export of energy and greenhouse gas-intensive goods – such as aluminium, fuels and agricultural products.

Tourism (especially ecotourism) could suffer as forests die, coral reefs bleach, whales, birds and fish change migration patterns and popular holiday islands are inundated by rising seas. The threat to biodiversity may represent an even greater long-term economic impact than the contraction in tourism. ‘Bioprospecting’ (discovering and commercialising beneficial genetic properties of selected Western Australian flora and fauna) has already commenced and represents a potentially enormous wealth-generating industry. But it could be stopped in its tracks by a combination of climate change and current land use practices. Rapid extinctions will spell the end for a range of pharmaceuticals, biocides, fuel substitutes and industrial products only recently explored or awaiting discovery.

3.1.2 Impacts of policy responses to global climate change

If the physical and biological impacts of global climate change are difficult to predict, addressing the possible impacts of policy and regulatory responses is even more hazardous and uncertain.

Climate change presents the decision maker with a set of formidable complications: a considerable number of remaining uncertainties (which are inherent in the complexity of the problem), the potential for irreversible damages or costs, a very long planning horizon, long time lags between emissions and effects, wide regional variation in causes and effects, the irreducibly global scope of the problem, and the need to consider multiple greenhouse gases and aerosols. Yet another complication arises from the fact that effective protection of the climate system requires global cooperation.⁴¹

Nevertheless, a number of general principles to guide decision-making have emerged, and they are attracting increasing international attention. These include:

- adopting a portfolio approach aimed at mitigation, adaptation and improvement of knowledge;
- early mitigation action, which may increase flexibility in moving towards stabilisation of the atmospheric concentration of greenhouse gases;
- there are significant opportunities for ‘no-regrets’ measures⁴² available in most countries;
- realisation that the risk of aggregate net damage due to climate change, consideration of risk aversion, and application of the precautionary principle provide a rationale for actions beyond no regrets;

- the value of better understanding of, and information about, climate change processes and impacts is likely to be considerable; and
- that more and better research is needed on integrated assessment and analysis of decision-making related to climate change.

Box 3.1 Evolution of Knowledge about Climate Change

1824 Jean Baptiste Fourier first describes the natural greenhouse effect, comparing the action of the atmosphere to that of glass covering a container.	1985-87 International meetings establish climate change as an international concern.
1850-70 The Industrial Revolution intensifies, starting a process of steadily growing greenhouse gas emissions.	1988 An international group of science experts is organised as the Intergovernmental Panel on Climate Change (IPCC).
1896, 1903, 1908 In three articles the Swedish scientist Svante Arrhenius hypothesises that burning coal will increase the atmospheric concentration of carbon dioxide and warm the earth.	1990 The second World Climate Conference presents the results of the first IPCC assessment report. They estimated that a 60% cut in emissions would be needed to stabilise CO ₂ at the 1990 level, but no conclusive link between human activity is established.
1958 Continuous monitoring of carbon dioxide concentrations in the atmosphere begins.	1992 The UN framework convention on climate change is signed in Rio by more than 160 nations.
1965 The US President's Science Advisory Committee includes a chapter on atmospheric carbon dioxide in its report on environmental problems.	1995 The IPCC publishes its second assessment report, concluding that the balance of evidence suggests human influence on climate change.
Early 1970s Widespread concern develops over potential global climate cooling.	1997 Agreement is reached on the Kyoto Protocol. Industrial countries and most economies in transition commit to reducing greenhouse gas emissions by an average of 5.2% below 1990 levels.
1979 The First World Climate Conference is held in Geneva. Concern about global warming is revived, but the conference statement is cautious about the issue.	

Source: World Bank (1999) *World Development Report 1998/99*, World Bank, p102.

The major international policy instrument developed to address global climate change is known as the Kyoto Protocol. Under the Kyoto protocol (1997) developed countries have agreed to reduce their greenhouse gas emissions to at least 5 per cent below 1990 levels for the commitment period, 2008-2012. To achieve this collective objective, individual countries were allocated differentiated reduction targets: Japan and Canada 6 per cent, USA 7 per cent, and members of the European Union 8 per cent.⁴³ Six countries were given dispensations for varying local circumstances: Australia 108 per

cent, Iceland 110 per cent, New Zealand 100 per cent, Norway 101 per cent, Russian Federation 100 per cent and Ukraine 100 per cent.

There are a number of flexibility provisions in the protocol, which if implemented, offer the prospect of reducing the costs of meeting abatement targets. These are emissions trading, joint implementation and a 'clean development mechanism'. However, principles and guidelines to govern the operation of these mechanisms have, to date, not been agreed.

None of these uncertainties reduce the importance of global climate change as a shaper of Western Australian economic development. But they certainly do make anticipation of the ways in which it will operate and impact, and the development of anticipatory policies and plans, rather difficult. Principle sources of uncertainty about the impact of the Kyoto Protocol, as distinct from the impact of global climate change itself, include:

- whether the Protocol will be ratified by the signatory governments;⁴⁴
- what sanctions will be imposed or threatened for non-compliance;
- what scope there may be for re-negotiation of targets;
- whether, and in what form, flexibility provisions will be implemented;
- the implications of the Kyoto quantitative targets for emissions regardless of the costs of meeting those targets, in the absence of an international mechanism to establish the price of carbon and equivalents;
- a consequent inability of governments to signal to firms the magnitude of the future target; and
- specific aspects of the Kyoto protocol, which may discourage, penalise, or not reward, action taken prior to 2008.

In the light of these uncertainties, there have been a number of assessments of the economic implications of the Kyoto protocol.⁴⁵ Perhaps the most comprehensive attempt in the Australian context is the ABARE assessment,⁴⁶ using a Global Trade and Environment model built on their central economic model – MEGABARE. As with all modelling, the findings have not been without dispute.

Overall, the change in real GNP in Australia at 2010 relative to the reference case is estimated at about -0.6 per cent without, and -0.4 per cent with, emissions trading. Another measure of impact is the change in investment attractiveness as a result of the necessary greenhouse gas abatement measures. For Australia, that figure is calculated at -0.8 per cent.

ABARE estimates of the impact of Kyoto Protocol driven abatement policies for various industries in Australia are summarised in the Table below. The largest impacts are, unsurprisingly, on the fossil fuel production industries and the relatively energy-intensive metals production industries – both very important sectors within the Western Australian economy. These are the industries that would appear to face the largest challenge from greenhouse gas abatement in Australia.

However, each industry, and company, will have to arrive at its own assessment. No industry is necessarily immune from a flow-on effect. The example of recent heavy financial losses in the reinsurance business, as a result of real or perceived climate change impacts, having major consequences for the share prices of some of Australia's leading financial institutions should serve as a warning.

Table 3.1 Impact of abatement policies for various industries in Australia

<i>Industry</i>	<i>% Change at 2010 without emissions trading</i>	<i>% Change at 2010 with emissions trading</i>
Coal	-23	-5
Gas	+2	+3
Oil	-12	-4
Iron and Steel	-12	-7
Nonferrous metals	-14	-6
Livestock	-8	-4
Meat and milk	-5	-2
Grain	+4	+2

Source: ABARE (1999) *Economic Impacts of the Kyoto Protocol: Accounting for the Three Major Greenhouse Gases*, Commonwealth of Australia, Canberra.

It is worth drawing attention to the difference between the impact assessment via physical and policy drivers. Analysis of the climate effects on grain production suggests a marginal decline, concentrated in the Western Australian Wheatbelt region. In contrast, the international comparative analysis of the impacts of the Kyoto Protocol suggests Australia may gain some comparative advantages in grain production. Both projections could be correct. But the crucial lesson to draw is that any policy will need to be formulated in ways that make full allowance for this degree of uncertainty. Careful risk assessment and management will be crucial in any planned action.

3.1.3 The Australian National Strategy

Australia represents just 0.3 per cent of the world's population, but contributes 1.4 per cent of global greenhouse gases. This constitutes one of the highest per capita emission rates in the world, reflecting the structure of the Australian economy. In the absence of intervention, substantial growth in emissions has been projected, by 28 per cent overall from 1990 to 2010, and 40 per cent in the energy sector.⁴⁷ This would expose Australia to international pressure, criticism, and possibly sanctions.

The goals of the National Greenhouse Strategy are to limit net greenhouse gas emissions to meet international commitments, to foster knowledge and understanding of greenhouse issues, and to lay the foundations for adaptation to climate change. A sectoral breakdown of carbon emissions worldwide shows that conventional thermal power and transport are both the largest and fastest growing carbon producing sectors.

Together they account for more than half of all carbon emissions. Therefore, one could expect remedial action to be strongly focussed on these areas.

As we have seen, however, the situation is not precisely the same in Australia. Around 40 per cent of all CO₂ emissions were generated in the energy and transformation sectors, with another 24 per cent by the industrial and transport sectors. Transport production of greenhouse gases, however, is well below the average for OECD nations. Hence, the Australian National Greenhouse Response Strategy directs measures particularly towards fuel combustion and 'fugitive' fuel emissions, constituting as they do 70 per cent of national carbon emissions.

Key elements in the strategy to mitigate these emissions, largely through 'no regrets' initiatives, include:⁴⁸

- structural reform of the electricity generation and transmission industries;
- removal of barriers to inter-state trade in power;
- removal of legal and regulatory barriers to the greater use of gas;
- promotion of co-generation;
- stimulation of fuel switching; and
- increased use of renewable energy sources.

In the end-use sectors, key measures are focussed on continuing improvement of energy efficiency, including voluntary agreements with industries, appliance labelling and the setting of minimal energy standards.

Beyond the energy sector, the major emphases are on:

- incorporating greenhouse considerations into traffic management;
- a 15 per cent fuel efficiency improvement target for 2010 for motor vehicles;
- the promotion of greenhouse best practice management in industrial processes and waste management through partnerships with industry;
- environmental strategies for the 'synthetic gases' (essentially the fluorocarbons); and
- minimisation and capture of methane emissions from landfill and waste water.

In the land use and forestry sectors, which account for 30 per cent of current carbon emissions, measures focus on sustainable land management through grassland conversion and managed forests, monitoring and control of land clearing and enhancing carbon uptake, particularly through the 'One Billion Trees Program'.

Methane emissions contribute 23 per cent of total greenhouse gas emissions, with over 50 per cent arising from the agricultural sector, especially enteric fermentation – a figure far higher than in most OECD nations and reflecting the agricultural basis of exports, if not of the economy.

With regard to improved knowledge and understanding, the major initiatives are concerned with better profiling of emissions through reducing uncertainties in land use and forestry data, and improved knowledge about the carbon storage capacity of vegetation.

The States in general are modelling their responses on that of the Commonwealth Government, taking account of their own special characteristics. Whether they will be adequate to meet the pressures of climate change, international obligations, and community pressure remain to be seen.

3.2 Sustainable development

In addition to the challenge of global climate change the pressures to achieve sustainable development are likely to be a major shaper of the Western Australian economy over the next twenty years.

The Brundtland Report provided the most widely used and known definition of sustainable development in 1987:

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*⁴⁹

Another common and more expansive definition of (ecologically) sustainable development outlined by the InterGovernmental Agreement on the Environment and agreed to in 1992 by the Council of Australian Government (COAG) includes the following principles:

- Precautionary principle – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty would not be used as a reason for postponing measures to prevent environmental damage;
- Inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- Conservation of biological diversity and ecological integrity;
- Improved valuation, pricing and incentive mechanisms – environmental factors should be included in the valuation of assets and services; and
- Intra-generational equity – a commitment to social justice and poverty alleviation.⁵⁰

In the Report on the State of the Australian Environment,⁵¹ it is argued that sustainable development requires the maintenance of three components of the environment:

- *biodiversity*: the variety of species, populations, habitats and ecosystems;
- *ecological integrity*: the general health and resilience of natural life-support systems; and

- *natural capital*: the stock of productive soil, fresh water, forests, clean air, oceans and other renewable resources that underpin the survival, health and prosperity of human communities.

Sustainable development has its origins in environmental concerns, but is about much more than just the environment. It recognises that global poverty is still a major issue and cannot be alleviated without development that will consume resources. But given the inequalities in resource use, both historically and currently, between developed and developing nations, it will be necessary for the former to take a lead in both reducing their resource intensity and use while at the same time assisting the latter to develop in a more sustainable way. This is encapsulated in the ‘Differentiated Obligations Principle’ – different countries have contributed differently to environmental problems and have different responsibilities and capacities to deal with them.

Increasing global pressures on Australia to reduce resource consumption and waste production are inevitable. The adoption by Australia, along with another 178 governments, of *Agenda 21* – a program of action for sustainable development worldwide – at the UN Conference on Environment and Development in 1992 marks an international commitment.

The State of the Environment Report concludes:

Environmental awareness has increased dramatically in the past decade, penetrating all sections of the community. There is now ready acceptance of national and international environmental standards. Environmental management is growing rapidly. However, we do not yet have an integrated, systems-based approach to the management of natural resources. Until we do, environmental management will be characterised by ad hoc responses to urgent, emerging problems. Despite the adoption of national strategies for ecologically sustainable development and conservation of biological diversity, there is little evidence that this broader approach and commitment to sustainability has been fully integrated into decision-making.

This view is reinforced by a recent Productivity Commission report which argued this commitment has been more rhetorical than real. Sustainability has not yet been fully built into policy-making processes. Environmental impact assessments are common, but sustainability is not yet the guiding principle or objective of policy. Economic planning focuses primarily on growth, with cleaning up the environment still too often seen as a follow up activity. This approach is itself unlikely to be sustainable, under increasing pressure of international obligations, community pressure, recognised best practice in industry and the economic opportunities associated with sustainable production.

3.2.1 The Industry Response

The crucial role of industry in achieving the goals of sustainable development are widely recognised:

*As we enter the next century, industry will be the most important engine for change in the drive for sustainable solutions to the world's environmental problems*⁵²

There has also been a substantial response to the threats and challenges emerging from the sustainable development movement by the business community. One indication is the emergence of a variety of peak industry bodies to address these challenges.⁵³ Challenges that include the expansion of global trade, which leads to new environmental concerns, quickly followed by new legislation – eg. environmental taxes, eco-labelling requirements, laws on packaging; the pressure of environmental concerns in trade liberalisation and access to foreign markets; and the tension between trade law and environmental law.

The unifying concept in the analyses and proposals emerging from the business community is 'eco-efficiency'. This concept/label is intended to combine both ecological and economic efficiency in business considerations. According to the World Business Council for Sustainable Development, a company seeking to become eco-efficient should strive to:

- reduce the material intensity of its goods and services;
- reduce the energy intensity of its goods and services;
- reduce the dispersion of any toxic materials;
- enhance the recyclability of its materials;
- maximise the sustainable use of renewable resources;
- extend the durability of its products; and
- increase the service intensity of its goods and services.

There are a wide variety of sustainable development-related issues and mechanisms which will impinge in the future on economic development. They include the following.

Regulation of process and production methods (PPMs) – product-related PPMs deal directly with the permitted characteristics of the product (eg. toxicity, hazard, etc.); process-related PPMs could include issues such as how raw materials are grown and harvested (eg. using rainforest timbers), production processes, air, water and waste emissions, and transport to market.

Life-cycle regulation – this might range from raw materials used, proportion of recycled material, to conditions of use, lifetime, etc. through to provisions for disposal/recovery. An interesting example is an international carpet company which leases rather than sells its product, and takes responsibility for life-time maintenance, and eventual repurchase and recycle.

Eco-labelling – which will signify that products and services meet an agreed independent sustainable development standard. This may prove very influential over consumer choice.

The establishment of the *ISO 14001 standard in environmental management* – experience of the impact of the ISO 9000 series of standards addressing quality management on business practice in the 1990s would give an indication of possible impact.

There is evidence, from various UN and US Congress debates, and positions at the most recent WTO meeting in Seattle, that such considerations might be further broadened to include labour standards on matters such as child and prison labour, and minimum pay-rates.

The broader movement to corporate responsibility is reflected also in arguments emerging about the importance, necessity and value of ‘triple-bottom-line’ accounting – whereby companies are required, or see value in, reporting not only financial performance, but also environmental and social performance.⁵⁴

Together, these forces suggest that companies will find it wise, or be forced, to develop business strategies, practices, products/services and markets, that can be shown to meet adequate standards of sustainable development.

3.3 Implications for the Western Australian economy

These environmental drivers and shapers are set to have a profound effect on the Western Australian economy. One factor is public attitudes. The turnaround in public attitudes towards the continued logging of native forests, and the results of a recent ABS survey showing Western Australians to be more concerned about environmental issues than residents of any other State, are two indications of ‘greener’ public attitudes to the environment. These attitudes will have economic impacts, because they will shape what is politically possible.

A second factor is the state of the Western Australian environment itself. The 1998 State of the Environment Report (SOE) for Western Australia⁵⁵ summarised the situation as follows:

In general, available information shows a steady decline in the condition of the environment and an increase in the pressure humans place on the environment.

The report went on to identify and prioritise the major environmental issues facing the State. The areas of highest priority were land salinisation, maintaining biodiversity, and salinisation of inland waters. The next highest priority group of environmental issues was enhanced greenhouse effect, erosion, eutrophication, land contamination, loss of fringing vegetation, and stratospheric ozone depletion. Three further groupings were identified as being of lower priority.

The highest priority areas can effectively be divided into three groups of issues: land and inland waters – the pollution of which is closely related to land degradation; the atmosphere – greenhouse and ozone depletion; and biodiversity. These issues are themselves related to each other. For example, the way we use land affects greenhouse

and biodiversity, and climate change induced by the enhanced greenhouse effect will impinge upon the State's biodiversity.

Many of the issues identified as the most pressing by the SOE report have direct economic relevance to the ability of the Western Australian economy to supply world markets. For example, salinity and related land problems already adversely affect the potential growth of the agricultural sector. Around 9 per cent of the State's agricultural land is affected by salinity, and this could double within the next 15-25 years and double again before a new equilibrium is reached.⁵⁶ Marine pollution and depletion of fish stocks will reduce the export potential of the fisheries industry. Pollution and declining biodiversity will reduce the potential of the tourism industry.

In addition, a number of problem areas highlighted by the SOE report have an indirect economic effect. In particular, there are opportunity costs involved in having to devote substantial public and private resources to the rehabilitation and remediation of land because of unsustainable land use, and in devoting a greater proportion of resources to transport because of the unsustainable structure of our cities.

Finally, although not mentioned explicitly by the SOE report, there are also resource supply issues that are likely to have an impact on future economic growth. The availability of water in suitable quantities at a reasonable price was highlighted as an important issue in that report. If water usage rates continue to grow, then industry will find its price increasing. This will reduce competitiveness unless compensating measures are applied, or efficiencies in water use improved substantially.

The impact of these environmental issues on the economy will present a major challenge to government in Western Australia in financial terms. Solutions will not come cheaply for many of the most intractable problems – eg. salinity. Such expenditure will place government budgets under severe pressure.

Moreover, sustainable development places great demands on governance in general, since it requires the integration of:

- environmental, economic and social concerns within government policy;
- policy across departments and agencies within the same level of government (ie. horizontal integration);
- policies between levels of government (ie. vertical integration between Commonwealth, State and local governments); and
- policy across time (ie. generational integration), so that cumulative environmental effects can be managed.

The impact of global warming, and the various regulatory decisions associated with diminishing its possible impact, will also have a very substantial impact on the future of the Western Australian economy. Some of these impacts have already been identified in Section 3.1. In chapter 6 we will place the present Western Australian economy in the context of greenhouse pressures, discuss how they might play out and explore possible strategies to address these challenges.

4 Demographic Trends and Changing Social Values

In this chapter we look at global, national and state demographics and draw out some of their implications for the evolving structure of demand for Western Australia's products, before looking at the changing nature of social values and their possible impacts.

4.1 Demographic trends

In 1999, the world's population reached 6 billion. Rapid population growth is a relatively new phenomenon, starting in the 1950s with a sharp decline in mortality in the less developed countries. World population is now almost two-and-a-half times what it was in 1950, and is still growing. The rate of growth, however, has started to slow with a decrease in fertility, and is now around 1.3 per cent per year, compared to its peak in 1965-1970 at 2.0 per cent.

The long-term population projections by the United Nations indicate that the World population will continue to grow, albeit at a slower pace, after 2025 and probably well into the 22nd century. The US Census Bureau estimates that by the year 2025, the world population will be close to 8 billion, and will exceed 9 billion by 2050. This growing population will be straining the natural environment and resources available on the planet. Food and freshwater security will be a major problem, as well as all types of pollution. The natural habitat of a number of plant and animal species will be affected.

The various regions of the World are changing at different rates. Most of the developed countries already have declining population numbers, while the developing countries are still growing. The most populous country at the beginning of this century is China, but by 2025 it is likely to be overtaken by India.

Most population pressure will be coming from the developing world (because of the relatively high fertility rates) and this will affect not only the countries themselves but also their neighbours, the region and countries that are traditionally perceived as offering employment opportunities, shelter for refugees and opportunities to start a new life for migrants. There will also be additional pressure from zones of conflict and political turbulence, as well as from areas of environmental deterioration.

With increasing life expectancies and declining birth rates, the world population will be getting older. The proportion of children under 15 will be getting smaller (it was 30 per cent in 1998 and is projected to drop to 24.8 per cent by 2025), while the share of people above 60 will be getting larger (it was 10 per cent in 1998 and is projected to increase to 16.2 per cent by 2025, and will exceed the proportion of children by 2050).

Population ageing is not only a demographic phenomenon, it has significant social and economic implications. Older people have different lifestyles and require different types

of products and services. In the more developed countries they are economically active and make up a significant proportion of the consumer market. Another aspect of population ageing is that, as women tend to live longer than men in the more developed regions of the world, the gender ratio of the older aged groups is biased towards women.

Table 4.1 Largest countries in the world in 1999 and 2025

<i>Rank in 2025</i>	<i>Country</i>	<i>1999 Population</i>	<i>Country</i>	<i>2025 Population</i>
1	China	1,246,871,951	India	1,415,273,665
2	India	1,000,848,550	China	1,407,739,146
3	United States	273,131,194	United States	335,359,714
4	Indonesia	216,108,345	Indonesia	287,985,072
5	Brazil	171,853,126	Pakistan	211,675,333
6	Russia	146,393,569	Brazil	209,586,835
7	Pakistan	138,123,359	Nigeria	203,423,396
8	Bangladesh	127,117,967	Bangladesh	179,129,264
9	Japan	126,182,077	Mexico	141,592,523
10	Nigeria	113,828,587	Russia	138,841,556
11	Mexico	100,294,036	Philippines	120,519,345
12	Germany	82,087,361	Japan	119,864,560
13	Philippines	79,345,812	Congo (Kinshasa)	105,737,162
14	Vietnam	77,311,210	Vietnam	103,908,883
15	Egypt	67,273,906	Ethiopia	98,762,736
16	Turkey	65,599,206	Egypt	97,431,183
17	Iran	65,179,752	Iran	91,889,233
18	Thailand	60,609,046	Turkey	89,736,104
19	Ethiopia	59,680,383	Germany	75,372,295
20	United Kingdom	59,113,439	Thailand	70,315,728
53	Australia	18,783,551	Cote d'Ivoire	27,840,275
60	Chile	14,973,843	Australia	22,190,652

Source: <http://www.census.gov/cgi-bin/ipc/idbrank.pl>

The demographic profile of the world is closely linked to its economic development. A high economic performance is associated with lower fertility levels, longer life expectancies and lower morbidity and mortality rates. With the exception of the countries that accept large number of migrants and the newly industrialising countries, high economic performance also means decreasing population numbers. This does not necessarily mean that the markets in these countries are shrinking, as purchasing power per capita increases. However, the range of goods and services demanded is likely to change.

By 2025 only 6 of the top ranked economies will have increasing population numbers – Singapore, USA, Hong Kong, *Australia*, Canada and Israel.

Table 4.2 Median age by major area 1998 and 2025

	1998	2025
World Total	26.1	32.2
More developed regions	36.8	41.4
Less developed regions	23.9	30.5
Africa	18.3	24.7
Asia	25.6	32.7
Europe	37.1	42.4
Latin America and the Caribbean	23.9	31.1
Northern America	35.2	38.8
Oceania	30.7	35.2

Source: Estimated from <http://www.popin.org/pop1998/8.htm>

As the world's population is getting older, there are shifts in wealth. Being old in the developed world does not mean being poor or living at subsistence levels. A recent study by the National Centre for Social and Economic Modelling at the University of Canberra shows that the age pension in Australia increased in real value by over 70 per cent in between 1970 and 1997.⁵⁷ The average age pension is about 33 per cent of the male disposable average weekly earnings. The difference between age pension and average disposable income *per person of working age* is very small. Moreover, the elderly typically have lower housing costs (most already own their homes), do not have to look after children and spend very little on education. They have more discretionary income. A modelling exercise by the same Centre forecasts that in 2010 the three main expenditure areas for the people aged 65 and over are food and non-alcoholic beverages, recreation and entertainment and transport.⁵⁸ The aged are not yet a booming market, but it is expected that in the next 25 years their purchasing power will increase dramatically.

4.1.1 Demographic profiles of major trading partners

Chapter 2 outlined the Top 10 foreign trading partners for Western Australia in 1997-98. They include 4 of the Top 10 largest economies (or 8 of the Top 20), 5 of the Top 20 best performing economies on a per capita basis, as well as strong links with our two closest neighbouring countries – New Zealand and Indonesia. The only weakness in terms of Western Australia's connections with the World's major economies are the links with strong European countries, the UK, Germany, France and Italy, which are likely to see population aging and decline.

Table 4.3 Population projections for Top 10 trading partners

		<i>Population 1999</i>	<i>Population 2025</i>	<i>Average annual growth rate 2000-2050</i>	<i>Share of economically active (%)</i>	
					<i>1999</i>	<i>2025</i>
1	Japan	126,182,077	119,864,560	-0.4	62	60
2	South Korea	46,884,800	54,256,166	0.2	71	67
3	China	1,246,871,951	1,407,739,146	0.1	68	69
3	Hong Kong	6,847,125	7,816,391	-0.1	71	66
4	United States	273,131,194	335,359,714	0.7	66	61
5	United Kingdom	59,113,439	59,984,961	-0.2	65	64
6	Singapore	3,531,600	4,230,872	0.3	72	66
7	Taiwan	22,113,250	25,897,118	0.3	70	66
8	Indonesia	216,108,345	287,985,072	0.8	65	68
9	Belgium	10,182,034	9,533,170	-0.6	66	63
9	Luxembourg	429,080	447,368	-0.4	67	63
10	India	1,000,848,550	1,415,273,665	1.0	61	67

Source: <http://www.census.gov/ftp/pub/ipc/www/idbsum.html>

With the exception of Indonesia, all these countries seem to have completed the demographic transition, have relatively high life expectancies, low fertility rates and relatively low population growth rates. South Korea and China are experiencing the effect of the population momentum. Populations in the US, Hong Kong, Singapore and Taiwan are significantly affected by migration.

Table 4.4 Summary of economic characteristics of Top 10 trading partners (1996)

		<i>GNP Rank</i>	<i>Average</i>	<i>GNP</i>	<i>Rank</i>	<i>Average</i>	<i>GNP</i>	<i>Per</i>	<i>Rank</i>	
		<i>\$US Bn</i>	<i>annual</i>	<i>per</i>	<i>annual</i>	<i>PPP</i>	<i>capita</i>	<i>Rank</i>		
		<i>1996</i>	<i>growth</i>	<i>capita</i>	<i>growth</i>	<i>\$US Bn</i>	<i>PPP</i>	<i>\$US</i>		
			<i>1995-96</i>	<i>\$US</i>	<i>1995-96</i>	<i>1996</i>	<i>\$US</i>	<i>1996</i>		
				<i>1996</i>				<i>1996</i>		
1	Japan	5149.2	2	3.9	40940	2	3.6	2945.3	23,420	5
2	United States	7433.5	1	2.3	28020	8	1.4	7433.3	28,020	1
3	New Zealand	57.1	45	0.6	15720	21	-0.6	60.0	16,500	22
4	South Korea	483.1	11	6.9	10610	24	5.6	595.7	13,080	25
5	UK	1152.1	5	2.6	19600	17	2.3	1173.3	19,960	14
6	Hong Kong	153.3	26	4.7	24290	13	2.2	153.1	24,260	4
7	Singapore	93.0	33	7.6	30550	5	5.6	81.9	26,910	2
8	Taiwan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9	China	906.1	7	10.0	750	81	8.9	4047.3	3,330	72
10	Indonesia	213.4	22	7.5	1080	74	5.8	652.3	3,310	74

Notes: PPP - purchasing power parity n/a - not available.

Source: 1998 *World Development Indicators*, World Bank, Washington.

As far as the future is concerned, the share of the economically active people (ie. between 15 and 64 years of age) is going to be decreasing in all of these countries, with the exception of China and Indonesia. However, as most of these are top performing economies, the shrinking numbers of working people will probably be offset by increases in per capita earnings and strong purchasing power, thereby sustaining the overall demand levels.

4.1.2 Western Australia's demographic trends

According to ABS population projections,⁵⁹ Western Australia will be the third fastest growing region in Australia between now and 2051 – after the Queensland and the Northern Territory. Its population is projected to reach 3 million by 2051.

In Western Australia, population will continue to age. Fertility rates will continue to be below replacement level. People will live longer and the 65+ category will be increasing as a proportion of the State's population. The highest annual rates for the increase of this age group will be between 2011 and 2021, when the Baby Boom generation (people born from the mid 1940s to 1960s) will reach that age. By 2025, most of the Baby Boomers would have retired from full time work. Consequently, the dependency ratio will be increasing – projected to reach over 50 dependent per 100 people of working ages by 2025. However, with changes of lifestyle, better health and older people more actively involved in different aspects of the economy (including volunteer work), older people will not be the burden to society they once were.

A new approach to looking at dependency has been gaining broader acceptance. It takes into consideration the fact that people have to study longer before they join the workforce. If the dependency ratio is calculated this way, then it will be decreasing between now and 2025 – from around 60 per 100 people above 24 to 45.

Life expectancies will continue to increase, but at a slower rate. For example, the 1997 ABS projection of the Australian population used slowly increasing life expectancies at birth up to year 2010, and then fixed at the 2010 level.⁶⁰ Currently the gender ratio of the elderly is well below 100 – there are more women than men. However, it is estimated that further health and medical improvements will influence men's life expectancies to a greater degree than women's, hence reducing the gap between male and female longevity. Consequently, the gender ratio is expected to have higher values for the old age groups in 2025 than it has now. ABS estimated that it would remain at 85 for people above 65 in 2021 – compared with 77 in 1991.

Migration is the most politically sensitive component in any population projection. The WA2029 business as usual scenario assumed 10,000 migrants per year in 2000 and 2001, climbing to 12,000 in 2006 and remaining at that level until 2025. The quantum expansion scenario assumed 26,000 per year between 2002 and 2006, then 31,000 per year until 2011, 36,000 until 2016 and 56,000 until 2025. These are significant intakes

which Western Australia would need to be ready to absorb – socially, culturally, politically and economically.

Interstate migration is not a significant component of Western Australia's growth. In some years the State tends to attract more people from the other parts in Australia than it loses, in others the net balance is negative. Nevertheless, the *WA2029* scenarios assumed a 4,000 annual net intake for Western Australia from interstate migration between now and 2025 – implying some increase in attraction as a location within Australia.

There are no obvious threats from the demographic trends in the countries with which Western Australia has intensive trade links, although their market sizes may decrease and the nature of demand shift, in some cases, towards things more likely to be in demand by older people – eg. healthcare services, leisure activities, etc. The most economically powerful countries have declining populations, the major population increase will occur in the developing world. Western Australia must be in a position to meet these changing requirements.

4.2 Social values

The significant economic, political, environmental and demographic changes that have been outlined have underpinned dramatic shifts in societies around the world. This section draws on some of this earlier material and combines it with other perspectives to focus on social factors likely to be important in determining the trajectory of Western Australia's economy over the coming quarter century.

4.2.1 Global Changes

Global changes in social values relate to the emergence of the 'hourglass' society, new politics, responses to globalisation and rural and regional issues.

The Hourglass Society: The rise of the hourglass, or 'twin-peaks', society in which people become more polarised in terms of income is well accepted as a feature of the new economy. An obvious corollary of this is the relative decline in the proportion of the population who are middle class. For Australia, with its large middle class and belief in egalitarianism, this shift has been as unsettling as it has in any country.

Research by Monash University in 1998 found that the most affluent 30 per cent of households control about 60 per cent of the total national household income, while the bottom 30 per cent can only lay claim to 10 per cent. Access Economics say the wealth of the richest 10 per cent of Australians increased from 43 per cent to 48 per cent between 1993 and 1998. The richest 1 per cent now own 15 per cent of Australia's wealth. Ibis estimated that in 1997-98 the most affluent 20 per cent of households had an average annual income of \$142,000, the next 20 per cent \$78,900 and the bottom 20 per cent an average of just \$12,625.⁶¹

These statistics provide an economic perspective on this polarisation, but do not capture important social changes. In the context of this study two of these stand out. First, the polarisation of western societies between elites and parochially-oriented groups. Second, the rising suspicion between these groups, particularly parochials of elites.

Parochials are those who have either never left home, or if they have, have always returned and never voluntarily contemplated living anywhere else. The elites are increasingly linked with multi-national corporations and other internationally oriented groups. Castells says, “elites are cosmopolitan, people are local.”⁶² Paul Kelly says Australians feel frustration “at globalisation dividing the nation along a new class fault of winners and losers”.⁶³ Today’s elites are more numerous and even more globally oriented than earlier elites. Castells suggests they may account for 30-40 per cent of the population of some developed countries.⁶⁴ They often have closer ties with colleagues and friends overseas than they have with people next door.⁶⁵ Membership of either of these groups tends to be correlated with income, but it is not as important an indicator as are education level and use of information and communication technologies.

Frustration at changes in the social fabric has been graphically illustrated in Australia’s political environment. The rise of One Nation, the defeat of the 'Yes' case in the republican referendum⁶⁶ and the defeat of Jeff Kennett at the recent Victorian election, despite the State’s strong economic performance, are all indicators of this trend. Hugh Mackay has said, “we no longer expect politicians to keep their promises, tell the truth or do what they say they will do.”⁶⁷ The lack of confidence in or the scepticism about politicians and the political process generally also applies to a string of other institutions that a few decades ago were often held in the highest regard – eg. the churches, banks, the media and unions.

New Politics: The divergence of society, the scepticism toward politicians and the fall of the Iron Curtain have rearranged the political map. Traditional ideas of what are left or right wing policies have become less useful in explaining alliances. Linked with this is the suggestion that more centralised, command and control forms of government – whether they are left or right wing – are unsuited to the demands of a knowledge economy.

*In a deeper sense, Australia just does not get the politics of globalisation. Our leaders cannot manage the new politics necessary to get and carry the people with them. There is a danger in Australia that the political class will become a menace to the national changes necessary to make globalisation work.*⁶⁸

A 'Third Way' has been promoted, by Tony Blair and Bill Clinton in particular, as a progressive philosophy suited to the information age. The Third Way is based upon a recognition that the First Way – social solutions by state intervention – will not suffice any more, and that the Second Way – solutions based upon individual wealth and economic libertarianism – will not suffice any more.⁶⁹

The proponents of this approach say it rests on three cornerstones:

- that government should promote equal opportunity for all, while granting special privilege for none;
- an ethic of mutual responsibility that equally rejects the politics of entitlement and the politics of social abandonment; and
- a new approach to governing that empowers citizens to act for themselves.

The Third Way stresses technological innovation, competitive enterprise, and education rather than top-down redistribution or laissez-faire. On questions of values, it embraces traditional moral and family values while resisting attempts to impose them on others. It favours an enabling rather than a bureaucratic government, expanding choices for citizens, using market means to achieve public ends and encouraging civic and community institutions to play a larger role in public life.⁷⁰

On the conservative side of politics parties like One Nation have arisen in many developed countries, attracting support from the most disaffected groups. These parties commonly share strong nationalistic language, xenophobic views which can manifest themselves in racist policies, highly protectionist economic policies and advocacy for a return to 'the good old days'. The supporters of One Nation and parties like them are archetypal parochials who have lost most in the changes brought by globalisation.⁷¹ While many of them have struggled to gain stability, both internally and at the ballot box, support for these parties has fluctuated between 5 and 20 per cent in many developed countries. There seems every likelihood that this level of support will continue.

Responses to Globalisation: Globalisation has rapidly become a bogey for many social and economic problems in countries around the world. The protests in Seattle in November 1999 at the opening of a new round of negotiations by the World Trade Organisation (WTO) were one of the most significant demonstrations of the reservations many people have. Gary Chapman, a columnist writing for the *Los Angeles Times* commented on the failure of many to understand this groundswell of opposition, suggesting that:

*Pundits mused over their surprise that any Americans cared about the WTO and its agenda, or had even heard about the world trade body. They shouldn't have been surprised, but most elite opinion-makers in the U.S. don't go to union hall meetings, church basement gatherings or the living room discussions of concerned citizens.*⁷²

The Seattle protests may have captured attention, but opposition to many of these changes has been evident for some time. The stalling of the OECD's efforts to implement the Multilateral Agreement on Investments (MAI) after opponents persuaded national politicians and officials it would remove national autonomy from elected governments was another indicator of the rising opposition to globalisation.⁷³ In that case the *Financial Times* reported,

...the unexpected success of the MAI's detractors in winning the public relations battle and placing governments on the defensive has set alarm bells ringing.

*'This episode is a turning point' says a veteran trade diplomat. 'It means we have to rethink our approach to international economic and trade negotiations.'*⁷⁴

The globalisation of culture, facilitated by advances in communications technologies, have also become a flashpoint. Images of Nepalese teenagers wearing Michael Jackson t-shirts and Nike shoes have become emblematic for the spread of western – particularly American – cultural products.

*...by the beginning of 1993 [the US music clips cable channel] MTV programming was beamed daily into 210 million households in seventy one countries.*⁷⁵

The French government has led other governments in opposing this trend arguing that national cultures are sacrosanct and should not be regarded in the same way as other products and services in trade liberalisation negotiations. As Barnett and Cavanagh say, “the cultural-environmental movement has no powerful organisations promoting its message, but it has a large global constituency.” Another way of describing this would be as a latent issue – an issue awaiting a catalyst to gain momentum and bring it to prominence.

Rural and Regional: Globalisation has been unkind to regions outside the major urban centres. The common reliance of these areas on commodity products as their prime source of income has meant they have generally suffered economic decline. This, combined with the cultural pressures mentioned above, has encouraged an even greater flow of young people out of these areas to major centres and cities.

Human Rights Commissioner, Chris Sidotti, says that “...distance and remoteness, the extremes of weather and the uncertainties of the rural economy are all factors that can influence and erode the quality of life of many people in rural Australia.” He argues that access to health services, levels of poverty, youth suicide and the position of many aborigines in rural areas are all serious enough to be considered significant human rights issues.⁷⁶

The important exception to the decline in population in Australia’s rural and regional areas is the strong growth in many coastal towns as people migrate there to reduce their cost of living or for improved lifestyle, or both.⁷⁷

4.2.2 The Community Level

There is a concern that we are becoming a less connected, more isolated society in which trust and reciprocity are increasingly unfashionable or irrelevant. The ratings success of the ABC television program *Seachange* has been attributed to this concern.

Attitudes to technology: Australians have long had a reputation for being amongst the fastest adopters of technology. Even so, there are now signs of a growing divide

between the technology champions and the technology sceptics – in part, along the globals-parochials fault line.

Debates about patenting plants and various other more profound applications of biotechnology have gone on between interested groups for well over a decade, but they have only recently come to a wider audience. In 1995, the European Parliament rejected a proposal which would have allowed the patenting of virtually all life forms. A survey by the US Drug Administration in 1992 found 90 per cent of those polled opposed the insertion of human genes into animals, 75 per cent opposed the insertion of animal genes into plants, 60 per cent opposed the insertion of any foreign genes into animals and over half said using biotechnology to change animals was 'morally wrong'.⁷⁸

The reaction in Britain to Genetically Modified (GM) food has been instructive and may be an indication of how this debate will evolve over the coming years. Possibly through seeing the arrival of 'Dolly' the cloned sheep and undoubtedly influenced by the Mad Cow disease scare, GM food has been effectively boycotted by British consumers. One of the country's largest supermarket chains, responding to pressure from its customers, has issued an assurance that it would not stock any GM products.⁷⁹

Given Western Australia's dependence on agriculture and the potential to develop the food industries through such initiatives as the Supermarket to Asia, the issues of genetic modification, biotechnology more generally, the use of agricultural chemicals and pollution present Western Australia with a range of important and difficult choices.

Quality of life: Following the release of last year's federal budget a newspaper survey found that only 15 per cent of Australians thought they would be better off in the next 12 months, almost twice that many (29 per cent) thought they would be worse off and a third of those surveyed expected no change.⁸⁰ Given that most economic indicators have been performing strongly over recent times it seems reasonable to conclude that there is a significant divergence between policy goals and what many people want. In other words, what goes to make for a high quality of life.

This paradox is well illustrated in research undertaken last year by Richard Eckersley of the CSIRO for the Australia Institute. It shows that only about a quarter of the population believe their lives are improving, 38 per cent say they are 'about the same' while 36 per cent believe their quality of life is getting worse.

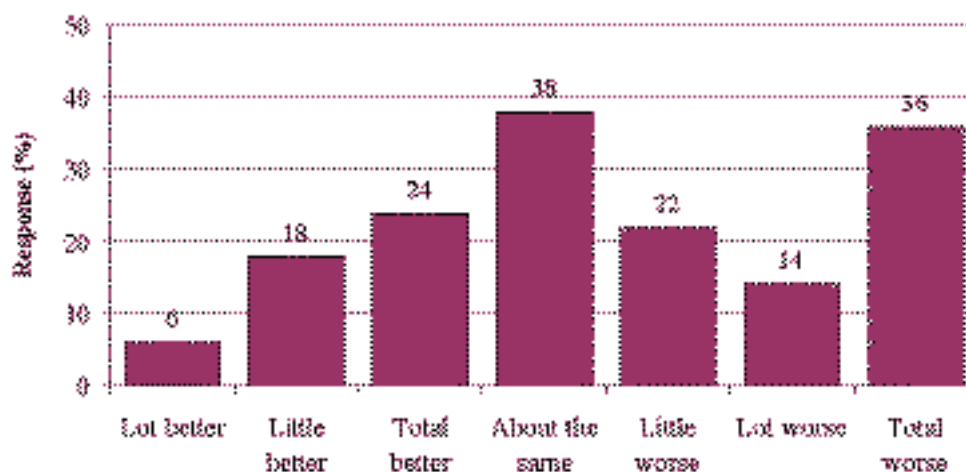
In *Sleepers, Wake!*⁸¹ Barry Jones referred to a survey by New Zealand's Commission for the Future of people's national and personal goals. As part of the research 2000 people were asked to choose between these four scenarios of economic growth.

- *Option 1:* High growth in economic living standards is encouraged with no effort to improve social and environmental conditions, the aim being for future economic living standards to have increased sufficiently to offset possible worsening social and environmental living standards.
- *Option 2:* moderate growth in economic living standards is encouraged, with economic, social and human resources also being used to encourage limited improvements in social and environmental conditions.

- *Option 3:* Growth in economic living standards is not emphasised with economic, social and human resources being mainly used to improve social and environmental conditions.
- *Option 4:* Growth in economic living standards is not desired, with all economic, social and human resources being used to improve social and environmental living conditions, the aim being for future social and environmental living standards to have increased sufficiently to offset lower economic living standards.

The results of the survey were: Option 2 – 59 per cent, Option 3 – 21 per cent, Option 4 – 13 per cent, and Option 1 – 7 per cent.

Figure 4.1 Perception of trends of quality of life



Source: Australia Institute.

If Option 1 describes the professional goals of political and business elites (differentiating from their *personal* goals) and the perspective foreign exchange markets and investment fund managers have, then it provides a picture of a remarkable disjunction with the broader community. In terms of the applicability of these results to Australia Jones said,

*...a similar survey would not necessarily produce an identical result: here the concept of 'Development' has been pushed by developers, the media and most politicians (especially in the resource-based states) much more persistently. Nevertheless, it is equally as rash to ignore the possibility that Australians might choose a lifestyle which puts more emphasis on human, community and environmental considerations than the conventional wisdom asserts.*⁸²

As economic development proceeds to higher levels it becomes more multi-dimensional – no longer is it simply about economic growth. Looking to the future, governments must increasingly consider lifestyle, community, environment and a range of other development goals, and develop policies for their pursuit.

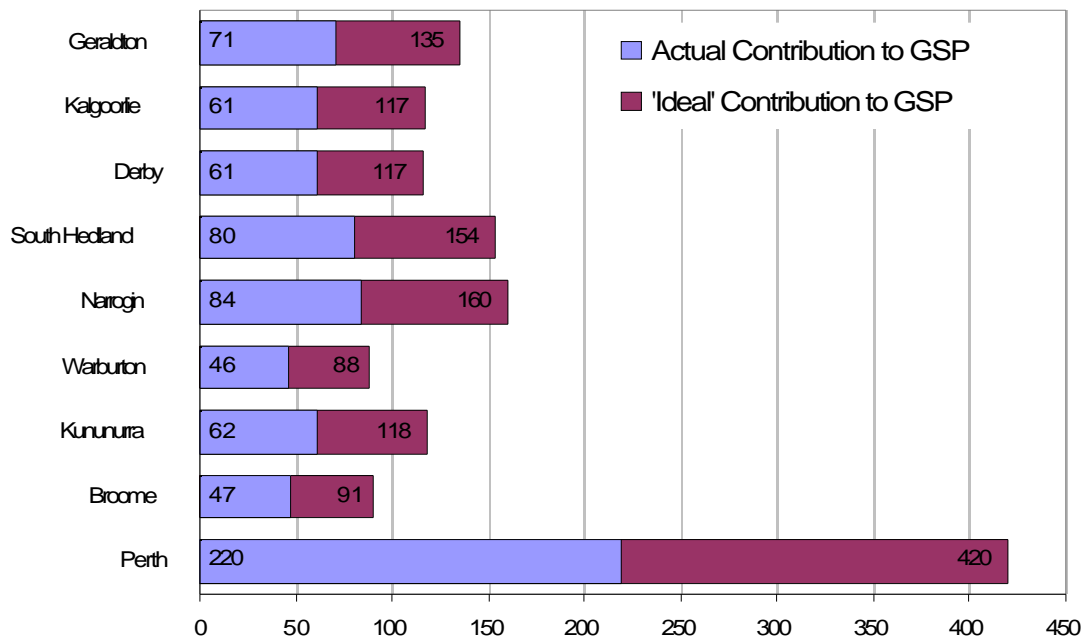
4.2.3 Western Australia

The issues outlined above all effect, and have implications for Western Australia, to a greater or lesser extent. Others are more specifically local.

The Environment: Western Australians' concern over environmental issues has run roughly parallel with the views of other Australians until recently. Now, according to a survey of attitudes by the ABS, the issue ranks far higher in Western Australia than elsewhere in Australia. The government's change in its policies with regard to the Regional Forest Agreement (RFA) are a reflection of this change in the mood of the electorate on this issue. As the most important issue in the minds of many electors, a sea-change appears to have occurred in those forms of development which are considered acceptable.

Aboriginal issues: The disparity in standards and conditions of living between aboriginal and other Australians has changed little over the recent past. In Western Australia 2.3 per cent of the population aged over 15 is aboriginal. Aboriginals remain significantly over represented in the State's prison system and receive only 1.5 per cent of total income. Their position in relation to many other indicators further highlights their level of disadvantage.

Figure 4.2 Actual and 'Ideal' Indigenous Contribution to Gross State Product in 1997-98 (\$m)



Source: Department of Commerce and Trade, 2000.

Amongst these significant differences there are success stories. The number of aboriginal people undertaking further education is steadily increasing, employment in

the private sector is growing – albeit from a very low base – and there is a growing realisation in some regional areas of the contribution aboriginal people can and have made to economic life, particularly in relation to cultural tourism services and land-based primary production. Nonetheless high levels of unemployment mean that in every region of the State aboriginal people earn – and so contribute – significantly less to these economies than could be expected if employment levels matched the averages for the wider community.

Importantly, some of the success stories demonstrate that aboriginal people and aboriginal culture offer significant opportunities in broadening the base of many regional economies away from their dependence on commodity products.⁸³ They are not just a problem, they may well be a solution.

This continuing discrepancy between the black and white communities has the potential to fuel disharmony and escalate as the international community becomes more aware of the position. The Sydney Olympics could well be a catalyst for this. In this environment Australia and Western Australia are vulnerable to boycotts unless the position is altered. These may not be boycotts by national trading partners, but could easily snowball amongst activist consumers. For a State so dependent on trade, the economic implications if this issue gains momentum could be profound.

Aside from the potential implications for international relations the continuing debate and conflict over reconciliation and land issues is very demanding for decision-makers in government, industry and the indigenous community. It acts as a major diversion from other key issues including opportunities for development that will benefit from or require Aboriginal participation or support.

Attitudes to China: Western Australia already has significant commercial links with China, and given its development over the past decade these are likely to grow further. This promising relationship may come under significant strain over the coming years as pressure grows from some quarters in the western world (and possibly within Western Australia itself) over China's human rights practices. This pressure could put severe strain on this vital trading relationship.

'The Most Isolated City in the World': Perth has long described itself as 'the most isolated city in the world'. Whilst its distance from other major centres is clearly not changing, the impact of this isolation appears to be. In recent years, Western Australia has become far more accessible – and the rest of the world far more accessible to its residents – as air travel has become easier. Liberalisation of the domestic industry has generated a substantial increase in air travel in the last ten years. Over this period the number of international and domestic airline passengers travelling to Perth has more than double.⁸⁴ Air travel trends suggest that this growth will continue.

The State's mining and resources industries have been very important in this growth. Perth is now used by many companies as the base for their fly-in/fly-out operations, both within Western Australia and in the region. While these sectors have been leaders in this regard there is anecdotal evidence of workers in other areas increasingly using

Perth as their base – attracted by the lifestyle – and travelling to other centres to earn all or a substantial proportion of their income. Advances in information and communication technologies are crucial for these 'mobile workers'.

Quality of Life: As has been highlighted earlier, the demand for improved 'quality of life' is already strong and is certain to grow. By any measure the vast majority of Western Australians enjoy a high quality of life. In the future this will become an even more attractive prospect for potential migrants around the world. There is already anecdotal evidence of an increasing number of 'global citizens' who have settled in Western Australia and who use the improved communications to continue their professional lives overseas. The challenge for policy planners will be to manage this opportunity in such a way that the state's quality of life is not compromised for the current residents, and it does not create further divide between globals and parochials.

Latent Issues and volatility: The political environment is now one in which latent issues – those issues that are 'sleepers' in the public mind – have become an important driver and a source of volatility. People have a view on these issues – sometimes it is a very strongly held view, most often it is something they have given only passing thought – but they have not acted. Pressure of time, lack of ability to contemplate or discuss issues, a sense of disempowerment or being overwhelmed by the apparent complexity of the issue and their inability to see an 'intervention point' all contribute to this apparent passivity. People's real concerns and feelings on these issues may not even be picked up when they are asked directly by public opinion pollsters or during an election because the issues appear out of context.

A catalytic event or statement can put a spark to these nascent issues and cause them to flare up quickly and apparently from nowhere. A recent example of this in the Western Australian context is the change in the dynamics of the debate over old-growth forest. For decades the state has been accustomed to hearing claims and counterclaims between the Department of Conservation and Land Management and the forestry industry, in one corner, and the conservation movement in the other. This had become part of the political landscape. The decision by former West Coast Eagles coach Mick Malthouse – a well-respected, successful and apolitical figure – to enter the debate changed these dynamics completely. Malthouse articulated a view held quietly by many people, and because of his stature it rapidly gained currency. It is a case where the pressure for a change had momentum before it was politically 'visible' to many.

Political history is riddled with events that have proven to provide the spark. The difference in this environment is there appear to be so many issues that are latent and, if provoked or prompted, the community is extremely willing to lash out over. This adds volatility to an already extremely complex political environment.

Social values, influenced by both global and local forces, and changing social structures are likely to emerge more overtly into policy development and public life. The cannot be ignored.

5 Structure of Trade and Production: Implications and Responses

This chapter outlines some of the implications of the structure of trade and production in Western Australia and looks ahead to future developments. It then sketches some broad directions worth exploring in pursuit of increasing the diversity of the State's economy.

5.1 Implications for Western Australia

The structures of trade and production in Western Australia carry a number of implications for its future development.

5.1.1 Innovators and avenues of innovation

Overall Western Australian businesses perform slightly less R&D than those in other parts of Australia. They accounted for \$384 million or 9.5 per cent of total business expenditure on R&D (BERD) in 1997-98, while Gross State Product (GSP) accounted for 10.9 per cent of Australia's Gross Domestic Product (GDP). Some 23.8 per cent of manufacturing businesses in Western Australia report undertaking R&D, compared to 26 per cent Australia-wide. Defining innovation activities more broadly, just 6.5 per cent of Western Australian firms report innovating in the 3 years to 1994-95, compared to 8.1 per cent Australia wide; and 32 per cent of firms with 20 or more employees reported innovating, compared to 34.1 per cent Australia wide.⁸⁵

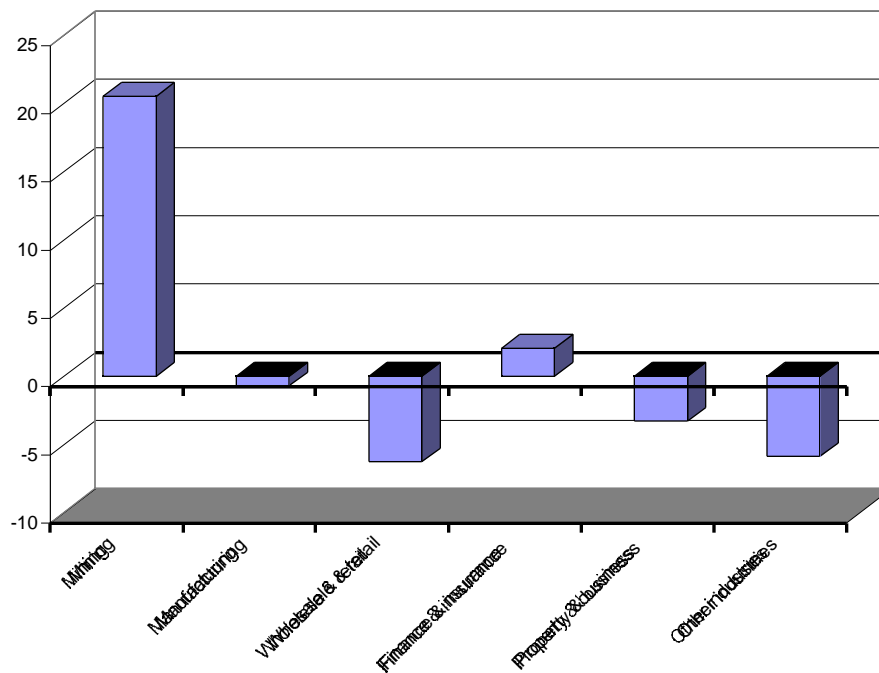
A breakdown of R&D expenditure by industry reveals a strong dependence in Western Australia on mining. For example, more than 30 per cent of all mining industry R&D expenditure occurs in Western Australia.⁸⁶ Of 67 Cooperative Research Centres listed in May 1999, just 6 were located in Western Australia, and of these 4 are in the field of mining and energy and 1 in agriculture.⁸⁷

On the basis of expenditure shares it would appear that there were something in the order of 300 businesses in Western Australia undertaking R&D in 1996-97.⁸⁸ Of these approximately 30 would have been in the mining industry and 14 in both petroleum, coal, chemical and associated product manufacturing, and in non-metallic mineral product manufacturing. Less than 400 of the firms in Western Australia employing 20 or more people report any innovative activity.⁸⁹ Disturbingly, business expenditure on R&D in Western Australia fell by \$112 million or 23 per cent between 1996-97 and 1997-98.⁹⁰

Overall, the R&D performance of Western Australian businesses lags Australia's, but is comparable. However, concentration of activity in mining and related sectors, and the small number of institutions and innovative enterprises in Western Australia means that

there are few avenues for innovation. Notwithstanding the excellent innovative performance of Western Australia-based high-technology companies like ERG, and the fact that a significantly higher proportion of firms in the mining industry (42 per cent) than in other industries (26 per cent in manufacturing) are innovative,⁹¹ overall there are relatively few opportunities and few avenues to market for innovations in Western Australia.

Figure 5.1 Business R&D Expenditure by Industry in Western Australia & Australia, 1997-98



Note: Chart shows difference in percentage share of BERD by industry in Western Australia and share of total BERD.

Sources: ABS (1999) *Research & Experimental Development: Businesses, 1997-98*, Cat No 8104.0 and ABS (1998) *Research & Experimental Development: All Sector Summary, 1996-97*, Cat No 8112.0; CSES analysis.

5.1.2 Job creation opportunities

The structure of the Western Australian economy makes the task of job creation especially difficult. Whether one looks at the changing structure of employment in Australia or employment trends in OECD countries, it is clear that employment growth is stronger in relatively high information-intensity services and in high-technology manufacturing industries, and generally negative in agriculture, mining and lower-technology manufacturing.

In Australia, total employment in property and business services grew at an annual average 5.8 per cent over the decade to 1995-96, while declining at an annual average

0.1 per cent in mining and 2.1 per cent in agriculture, forestry & fishing. Across OECD countries employment is declining in the very industries that are the core of Western Australia's economy, including: mining, agriculture, metal and non-metallic mineral products manufacturing, petroleum, chemicals, ferrous and non-ferrous metals.⁹² With its current structure of production job creation in Western Australia is likely to become increasingly difficult.

5.1.3 Firm size and performance

Western Australia's economy has a relatively large proportion of small firms. Just 9.6 per cent of firms in Western Australia have 20 or more employees, with a mere 0.4 per cent employing 200 or more. In 1995, there were only 339 firms in Western Australia with 100 or more employees.⁹³

This is because the industries that are strongly represented in Western Australia tend to exhibit relatively small firm size. For example, of the 175 mining establishments operating in Western Australia in 1996-97, just 6 employed 500 people or more, and a total of 44 employed 100 or more.⁹⁴ In metal products manufacturing, 55 per cent of enterprises employed fewer than 100 people, whereas in the manufacturing industries overall 50 per cent of enterprises employed fewer than 100.⁹⁵ In 1996-97, private sector construction businesses employed an average of just 4.1 people.⁹⁶

Small firm size carries a number of penalties:

➤ *Small firms tend to suffer from lower productivity.*

In 1994-95, gross product per head in Australian manufacturing firms with more than 100 employees was nearly three times higher than in firms with less than 5 employees, and more than double that in firms with less than 20 employees. Across all industries in Western Australia, gross product per employee in 1994-95 was \$31,500 in firms with fewer than 20 employees, compared to \$76,400 in firms with 100 or more employees.⁹⁷ The share of firms in Australia with less than 20 employees is almost twice that of the US, and the US share of firms with more than 500 employees is more than twice that of Australia. If Australia had the same firm size distribution as the US, all other things equal, Australian productivity would be about 20 per cent higher than it actually is.⁹⁸

➤ *Small firms tend to be less export oriented.*

In 1994-95, only 2.5 per cent of firms with less than 20 employees exported at all, whereas 18 per cent of firms with more than 500 employees exported more than 10 per cent of their production.⁹⁹ In Western Australia, only 2.6 per cent of firms with fewer than 20 employees exported at all, while 15 per cent of firms with 20 or more employees did so.¹⁰⁰

➤ *Small firms tend to be less innovative.*

In their survey of innovation activities in manufacturing the ABS found that only 29 per cent of firms with less than 20 employees were innovating in 1993-94, compared to 79 per cent of firms with 100 or more employees.¹⁰¹ Unpublished analysis of Business Longitudinal Survey data suggests that over the period 1994 to 1997 innovative firms in Australia were on average twice the size (in terms of employees) of non-innovative firms.¹⁰²

However, these aggregates disguise an important reality. Those small firms that do export tend to have a higher export intensity than larger firms, and those that innovate tend to have higher levels of innovation intensity than larger firms. *While it usually is, small firm size need not be a major constraint.*

5.1.4 Ownership and mandates

The relatively high level of foreign ownership, particularly among larger firms, tends to adversely effect export and innovation performance. Only around 2 per cent of all firms operating in Australia have any foreign ownership, but some 47 per cent of firms with more than 500 employees are at least partly foreign owned and 29 per cent are at least 50 per cent foreign owned.

Importantly, foreign ownership tends to be higher among firms in the high-technology manufacturing sector. Foreign owned manufacturing firms tend to have lower R&D/sales ratios and much lower propensities to export than do similar Australian owned firms. This is particularly marked in the high-technology manufacturing industries where the foreign share of sales is more than 50 per cent, but foreign owned firms have an export/sales ratio half that of their Australian owned counterparts – 11.6 compared to 24.4.¹⁰³

Western Australian enterprises suffer doubly. Not only is foreign ownership high, but many enterprises are branch operations of firms based in Sydney, Melbourne and elsewhere. Hence the mandate for independent action, innovation, opening new markets, creating new product lines, etc. is often missing. *In important respects, Western Australia's is a branch economy.*

5.1.5 Limited exporting experience

Despite Western Australia's high level of export activity, exporting experience is relatively limited. There are number of reasons for this.

Firstly, many of the commodities that Western Australian exports are traded according to annual price contracts with relatively few clients – be they domestic marketing organisations in agriculture, or international clients in the case of mining. Producers focus on production to contract more than is typically the case in manufacturing or

services, where there is a more regular stream of individual sales and more attention given to those sales.

Secondly, there are relatively few exports. Iron Ore alone accounted for more than 19 per cent of total Western Australian merchandise exports in 1998-99, gold for a further 19 per cent, and petroleum and related products for 8 per cent. LNG and wheat were not far behind. Western Australia's Top 10 export products accounted for almost 86 per cent of total merchandise exports.¹⁰⁴ So export experience is constrained within very narrow product limits.

Thirdly, there are few customers. Japan takes 23 per cent of Western Australia's merchandise exports. North Asia (including Japan, China & Hong Kong, Korea and Taiwan) takes more than 47 per cent. Hence much export experience is limited to a few destinations and customers.

Fourthly, there are few exporting firms. Australia wide, the Top 10 exporting firms in 1998 accounted for more than 30 per cent of total national exports, and the Top 20 for 40 per cent. In Western Australia, just 4 per cent of businesses or 1,300 firms in the State did any exporting in 1994-95. Few are small to medium sized enterprise exporters (SMXs). In 1995-96, there were no more than 860 firms in Western Australia with fewer than 20 employees exporting anything.¹⁰⁵

Hence export transactions and clients are relatively few, few people are involved in trade negotiations and most businesses have little or no experience of dealing with export clients.

5.2 What does the future hold?

Clearly, Western Australia's resource dependence is locking it into a growth path lower than might be achieved with a more typical developed country structure of trade and production, is adversely effecting Western Australia's development and prosperity in a number of ways, and making it highly vulnerable to national and international moves to limit greenhouse gas emissions.

However, there are other drivers and shapers of demand that will also effect Western Australia's future.

➤ *Demographics:*

The impacts of aging populations in much of the developed world, young and rapidly growing populations in the developing world, and other major trends are discussed elsewhere in this discussion paper.

➤ *Economic growth and geopolitics:*

The pace of development, the economic rise of Asia, and shifting geopolitics (especially China's opening and development) are likely to have a major impact on Western Australia. There is an opportunity for Western Australia to build on its

already considerable links with China and North Asian more generally, as well as South East Asia and the Indian sub-continent as these areas further develop, and to benefit from their relatively strong growth. There are many potential synergies between Western Australia and these regions that could lead to increased prosperity in integration. Should the economic and socio-political development of these regions falter, however, Western Australia could be adversely impacted.¹⁰⁶

➤ *The global restructuring of production:*

While globalisation in the 1970s and 1980s saw heavy industry shifting to low wage countries and a consequent hollowing out of manufacturing in many developed countries, there is the potential for increasing knowledge intensity to reverse this trend. Increasingly, it seems that production in a knowledge-based economy demands greater manufacturing–services integration in order to achieve flexible customisation and shorter time to market. Consequently, we are beginning to see increasing co-location of high value-adding services and manufacturing, with a long tail of relatively lower value-adding manufacturing in less developed locations. While scale and distance to market have worked against Western Australia in the era of the mass production of heavy manufactures, it is possible that there are newly emerging opportunities for integrated high-value services and manufacturing developments in such locations as Western Australia.

➤ *Changing industry structures:*

The emerging global knowledge economy is changing the relative investment attractiveness of all locations. The knowledge-based economy brings a greater role for knowledge or 'content' products, and thereby increases the number of industries facing increasing returns. This is likely to increase pressures for concentration in a number of industries, and will change corporate strategies, investment and location decision parameters. Like other jurisdictions, Western Australia will have to learn to operate in this new environment and to make the most of its opportunities.

➤ *Mobility of factors:*

Globalisation is, in no small part, about the mobility of factors of production. One of the keys to prosperity in the emerging global knowledge-based economy will be to supplement high levels and standards of education and skills development with the creation and maintenance of an attractive location for high-skilled people. Governments will increasingly need to think in terms of creating an attractive location for high-skilled working people, rather than simply thinking in terms of attracting investments that create jobs. Location for lifestyle reasons, and 'trade' in the services of skilled people, are likely to be more sustainable in the longer term than are investments in processing plants.

➤ *E-commerce:*

While there can be little doubt that the hyperbole surrounding e-commerce greatly exaggerates its immediate impacts, it does bring new threats and opportunities for Western Australian businesses (especially in rural and remote areas) that require

immediate attention. Dealing with the 'death of distance', global market reach, and consequent global competition could mean the difference between life and death for many of Western Australia's small businesses.

To date, Australian governments have tended to focus on enabling the consumers. But it is essential that we focus on enabling SME producers to market and sell online in order to defend their local markets and launch into new ones overseas. It will also be essential to focus on physical distribution and the delivery of things sold, which is currently a major limitation in the area of business-to-consumer (B2C) e-commerce. And it will be necessary to engage SMEs in local and global business-to-business (B2B) supply chains.

Western Australia's status as a branch economy raises further challenges in this regard. On the one hand the restructuring of many industries opens opportunities, on the other decisions about how sectors are going to be reformed are likely to be made from the home base of the dominant players, rather than in Western Australia.

➤ *Social values:*

Australia, along with many other western democracies, has been showing significant signs of 'change fatigue' illustrated in a far more volatile electorate and the widespread rise of reactionary political groupings. There is also evidence to suggest a significant increase in the number of 'latent issues' felt by society which can quickly arise and damage a government. With the effects of globalisation and market liberalisation these social conditions are arguably making the challenge of governing, and the necessity for governments to 'bring the electorate with them' even more essential.

5.3 Responses and directions for development

It is possible to see a number of potential directions for development emerging from this analysis. They involve building on emerging and current strengths, pursuing amenity driven and time zone developments, and making the most of environmental and emerging technology opportunities. They all provide potential means to foster greater diversification of the State's economy.¹⁰⁷

5.3.1 Building on strengths

There are a number of existing strengths upon which Western Australia can build in order to develop a more diversified and sustainable economy over the next quarter century.

Engineering and technical services: Western Australia has a long history and great strength in mining and construction. In both industries a number of Australia's major companies are, or were originally, based in Western Australia. The analysis above shows the strong representation of mining and construction in Western Australia's

economy, and the strength of metal products and non-metallic mineral products manufacturing within the manufacturing sector. Mining accounts for more than 17 per cent of Western Australia's total factor income, compared to just over 4 per cent in Australia as a whole; and construction for 8 per cent compared to 6.6 per cent. Metal products manufacturing accounts for 29 per cent of Western Australia's factor income, compared to 18 per cent in Australia as a whole.¹⁰⁸

There are many links between these industries, in terms of construction materials supply, common earth moving and other heavy equipment supply, and common engineering and other technical services. These product system linkages form a base for further development of high value services for domestic and export markets. Architectural, engineering and related technical services exports from Australia were worth \$379 million in 1997-98 and have grown at a compound annual 10.2 per cent since 1992-93, compared to 9.6 per cent for all services exports.¹⁰⁹ While state data on services are incomplete, there is little evidence that Western Australia is yet fully sharing in this growth – having grown technical business services at an annual average of just 3 per cent since 1992-93.¹¹⁰

Development in Asia, especially China as it opens to trade in services on joining WTO at the same time as undertaking enormous construction development, presents a major opportunity to further develop the construction, engineering and related technical services product system.

Wine and related industries: Western Australia's wine industry has been expanding rapidly and developing export markets around the world. Total sales reached \$123 million in 1997-98, with \$11.6 million exported. Sales have been increasing 20 to 30 per cent a year over recent years, and exports by 30 to 40 per cent a year. There are opportunities to further expand markets in Europe, Japan, South East Asia and North America.

Western Australia's 'niche' is at the premium end of the market. Western Australia produces just 2 per cent of Australia's wine, but accounts for 20 per cent of premium bottled wine. The unit value of Western Australian export wine was \$8.50 per litre in 1997-98 – twice the national average. Taxation treatment, based on wholesale sales tax, has historically favoured bulk producers and encouraged investment away from premium wines. Shifting towards a taxation regime based on alcoholic content would help Australia's premium producers and be more in line with health and community concerns about drinking. As demand for premium wines increases Western Australia is well placed to respond, given a sound base to build upon, large areas of undeveloped land available in areas with climates suitable for the production of premium wines – advantages not enjoyed by the Eastern States of Australia.¹¹¹

Wine industry development also brings with it a number of related development opportunities, including:

- tourism, and a whole range of related regional and rural developments – eg. accommodation, restaurants, cafes, crafts, etc.

- wine industry related education, training and research facilities; and
- the development of attractive lifestyle locations, which may in time provide the focus for knowledge industry investment attraction.

Remote sensing and mapping: There are further opportunities to build on already advanced remote sensing and mapping activities, and develop high value services out of the resources sector.

Remote sensing data are used to provide timely and detailed information about the Earth. Examples of uses of such data include: assessment and monitoring of vegetation types and their status, soil surveys, mineral exploration, map making and revision, production of thematic maps, water resource planning and monitoring, urban planning, agricultural property management planning, crop yield assessment, and natural disaster assessment.

AUSLIG, whose purpose is to ensure that fundamental geographic information is available for the benefit of the Australian community, provides a national focus and impetus. AUSLIG provides opportunities for:

- industry to develop innovative commercial products based on AUSLIG's raw map and satellite image data through 'Value Added Reseller' agreements;
- Australian industry to further develop capabilities, including the uptake of more efficient technology; and
- ensure that the needs of regional Australia are met by providing a valuable tool for programs undertaken in regional areas – eg. Landcare.¹¹²

In Western Australia, the Department of Land Administration's Satellite Remote Sensing Services (SRSS) branch – a State Government facility – provides specialised services for the acquisition, processing and analysis of satellite data. These activities generate economic and environmental benefits, including:

- improving exploration and management of renewable resources;
- promoting clients own use of satellite data, by providing specialist advice and support in the acquisition and processing of satellite data;
- providing the basis for monitoring environmental changes by building an archive of historical satellite data of Western Australia; and
- protecting remote communities from bush fires and supporting sustainable management of semi-arid lands and coastal resources by providing near real-time monitoring information.¹¹³

The Western Australian Land Information System (WALIS) also promotes the development of new information-based businesses.

There are already a number of examples of the ways in which successful commercial services can be developed from these raw data, and given increasing environmental

concerns at home and abroad further development and export opportunities could be expected.

Shipbuilding and Marine Engineering: The development of the Jervoise Bay complex represents an opportunity to build on Western Australia's emerging shipbuilding activities and link them into heavy engineering activities related to offshore oil and gas exploration, drilling and recovery, mining and mineral related fabrication. The Jervoise Bay complex, supported by both Federal and State governments, is expected to have the capacity to generate work to an annual value of \$250 million and direct employment for some 1,600 people.¹¹⁴ The facility is an attempt to capitalise on the global trend for modular construction and assembly activities, which see greater offsite construction and correspondingly greater manufacturing and fabrication trade opportunities.

Information and Communication Technology: Information and communication technologies (ICTs) continue to enjoy rapid growth in demand worldwide. While a small player in the global market, there are some highly successful indigenous small-to-medium exporters (SMXs) based in Western Australia – perhaps most notably ERG, which has experienced rapid growth in its smartcard systems business.¹¹⁵

Recent analysis of ICT equipment exports from Australia has shown that while NSW and Victoria dominate with a combined 88 per cent of total Australian ICT equipment exports during 1998, Western Australia is the third largest exporting state with 5.2 per cent of total ICT equipment exports – ahead of Queensland. Western Australia's ICT equipment exports grew at a compound annual rate of 36 per cent between 1990 and 1998, compared to Queensland's 19 per cent and just 13 per cent across Australia as a whole.¹¹⁶ Continued strong world demand for ICT equipment and services presents an opportunity to build on these successes and develop strong innovative ICT businesses in Western Australia.

Education and Training: Exports of educational services by Western Australia's universities have been strong in recent years. In 1996-97, the state's tertiary institutions generated an estimated \$390 million. During 1996 there were 7,697 overseas students undertaking higher education courses in Western Australia. This represented 14 per cent of the total number of overseas students studying in Australia.¹¹⁷ In 1995, Curtin University was ranked in the top 50 exporters in the information industries having some \$36 million in export revenue.¹¹⁸ Up to 1998 the market had been growing at 20-25 per cent a year. The strongest markets for Western Australia are Indonesia, Malaysia and Thailand.

The financial crisis in Asia has had a negative effect for some institutions but others offset losses by attracting students who had originally planned to attend more expensive universities in North America or Europe. The crisis highlights the dynamism and volatility of this market. Western Australia's universities already face strong competition in the export market from universities on the east coast and those overseas.

The Western Australian International Education Marketing Group (WAIEMG) has been established to have a coordinated approach to selling educational services off-shore and

promote Perth as an educational destination. WAIEMG is a cooperative marketing group with 19 member institutions, from both the tertiary and ELICOS¹¹⁹ sectors. It operates regional offices in Mumbai, Singapore, Kuala Lumpur and Hong Kong.

The prospect of courses being offered online poses a substantial potential threat. After years of speculation about the Internet as a means of delivering educational services, a number of significant strategic partnerships – both in Australia and overseas – and a growing number of working sites mean this will become a real issue over the next five years. Several Western Australian universities have invested significant resources into online delivery but, as with most transitions to electronic operations, the greatest challenges will be in responding to the changed business dynamics.

The training sector has recorded “mixed results”¹²⁰ in its attempts to export services. Estimates of the Western Australian training sector’s export earnings are between \$3 and \$5 million a year, about 1 per cent of the amount earned by the state’s tertiary sector. AusAID, the federal government’s aid agency – an important funder of overseas training programs – did not record any Western Australian companies in its 1995/96 statistics, except for projects under \$500,000. The Overseas Projects Corporation of Victoria won contracts worth \$60 million and South Australia’s SAGRIC International had contracts for that year of \$89 million. These figures indicate the potential for expansion of education and training services exports.

Health Services: The demand for the provision of health services within Australia and overseas has been growing steadily due to demographic changes and increased incomes. There have also been increasing expectations by consumers of health care services, fuelled by the widespread availability of information on health and medical matters.¹²¹ The impact of information and communication technologies on the sector have also been profound, both internally and externally. Health has always been a heavy user of technology and this trend is certainly continuing. The use of ICTs in actually delivering services (under the heading telemedicine and other related titles) has also gained a lot of attention recently.

For Western Australia these changes have profound implications due to the financial strain the sector is placing on public finances (for the reasons outlined above), the capacity ICT has to facilitate the delivery of some health services to more isolated parts of the state, and sharing the same time zone with much of Asia and the export opportunities this opens.

In June 1996, The Australia Clinic (formerly The Western Australian Health Export Unit) was established to facilitate the export of the state’s health services. It serves as a marketer and broker for the members of the consortia.¹²² The Clinic has clients in Malaysia, Indonesia, Philippines, Pakistan, India, the People’s Republic of China and Singapore. It has a major project with an Indonesian Hospital, Rumah Sakit Pondok Indah.¹²³ There are opportunities to develop such initiatives, and build significant export markets.

Risk in the knowledge economy: One possible advantage flowing from Western Australia's strength in mining is an entrepreneurial attitude to risk that may prove important in seizing knowledge economy opportunities. A significant number of 'junior miners' have successfully transformed themselves into 'dot coms' and/or shifted into Internet related businesses. One factor in this may be familiarity with risk and speculation, and the relatively high proportion of 'risk seeking' investors in the State. While some may simply be adopting a 'dot com' guise in the face of difficulty raising exploration capital, there is some indication that its mining experience may yet stand Western Australia in good stead in the emerging world of 'dot com' business.

5.3.2 Amenity driven developments

Natural and social amenity is likely to become an increasingly important draw card, and provide new opportunities for sustainable development.

Lifestyle: One of the features of the emerging knowledge economy is that high skilled workers, knowledge workers, are increasingly *the* critical resource. "As we enter the age of human capital, where firms merely lease knowledge-assets, firms' location decisions will be increasingly based upon quality-of-life factors that are important to attracting and retaining this most vital economic asset. In high-tech services, strict business-cost measures will be less important to growing and sustaining technology clusters... Locations that are attractive to knowledge assets will play a vital role in determining the economic success of regions."¹²⁴

Knowledge economy investments already chase knowledge workers and are increasingly likely to do so in the future. There are many examples of vibrant knowledge industry clusters emerging in locations that build on the attractiveness of their lifestyle. One widely cited is the emergence of multimedia, film and editing activities in the south of France. Perth/Fremantle and a number of coastal centres in Western Australia have the potential to develop their skills base and attractiveness to knowledge workers, with careful and strategic urban and regional development, mindful of developing and maintaining natural and social amenity.

Tourism and Eco-Tourism: With increasing wealth, more competitively priced travel and health and lifestyle allowing retirees increasingly active leisure there are likely to be more opportunities to further develop tourism in Western Australia.

Western Australia's tourism industry has enjoyed strong growth in recent years to the point where Western Australia now attracts between 13 and 15 per cent of all overseas tourists and travellers. The domestic tourist and travel market share is around 10 per cent, more in keeping with Western Australia's share of the national population. This divergence between international and domestic visitors is well illustrated by passenger statistics for Perth airport. In 1997-98, 1.4 million overseas passengers passed through the airport, almost one third of all passengers. The next highest overseas:domestic ratio is Brisbane with a little over 20 per cent of their airport users coming from overseas.¹²⁵

Overseas visitors are well balanced between the major categories – business, visiting friends and relatives (VFR), and holiday travellers. Visitors from the UK are very important to the Western Australian VFR market, driven by the large number of British-born people who have settled in the State. British holiday visitor numbers have also grown strongly in recent years. The State's traditional strengths for holiday visitors have been from Singapore and Malaysia – one third of all Singaporean visitors to Australia come through Western Australia. Business travel is very heavily influenced by the performance of the resources sector. The state government has initiated a project to develop a convention centre largely to add another dimension to this segment of the market.

Western Australia is well positioned for the anticipated growth in natural or eco-tourism internationally. For most tourists to the State its natural environment had been the dominant drawcard long before this market segment became the world industry's 'hot' growth area.¹²⁶ Industry projections for tourism internationally are strong. In particular the Asia-Pacific market, Western Australia's strongest in the holiday segment, is predicted to grow faster than most as it recovers from the financial shocks of the last few years.¹²⁷ There are significant development opportunities.

5.3.3 Time zone developments

Western Australia is in the most populous time zone in the world (including China) and has extensive trade links with North Asia. Whatever the wonders of modern communications, it is still easier to work with people who work the same hours. Time zones remain a significant opportunity.

The potential to develop links between Western Australia and its time zone region to the north has not yet been fully realised. Promotion and awareness among enterprises, education linkages that continue into professional life, reducing airfares and communications costs and, perhaps, some shift in social values with increased visits and migration, can all contribute to the further development of linkages between Western Australia and its time zone. Delivering services and servicing products delivered to clients requires the kinds of personal contact that is simply easier within time zone, putting Western Australia in a favourable position to further develop markets in the region.

5.3.4 Environmental opportunities

The demands and constraints, indeed threats, presented by national and international regulation of greenhouse emissions to Western Australia's resource-based economy also present some opportunities. Western Australia's resource and energy industries are not the only ones facing demands for emission reductions.

Environmental industries: A recent report for the Western Australian Department of Training and Employment (DTE) has found numerous examples of existing and

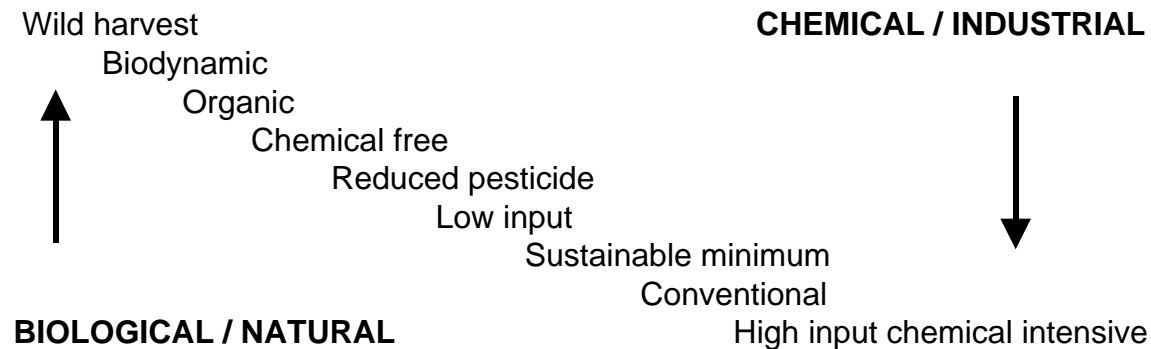
potential businesses in the environmental industries which could form a crucial and substantial part of a diversification strategy for the State's economy.¹²⁸ Based on the sectoral model outlined by Australian futurist (and former head of the South Australian Department of Industry) Peter Ellyard, it looked at prospects in six 'environmental industry sectors'.

- *Earth repair industry*: that which restores and rehabilitates degraded, polluted or even totally obliterated ecosystems such as rainforests, coral reefs and rangelands and their soil, water and biotic components.
- *Environmental survey industry*: assessing, monitoring and auditing of ecosystems.
- *Resource renewal industry*: the reduction, reuse or recycling of what is traditionally known as 'waste'.
- *Sustainable energy industry*: researching, developing and marketing energy products that are based on renewable resources, and improvements in the efficiency of current energy systems through better process technology and conservation.
- *Sustainable communities and cities industry*: integrating the work of the architectural, building, industrial design and planning professions in the design and construction of sustainable schools, shopping centres, transport systems, homes and commercial buildings.
- *Clean/green food and sustainable agriculture industry*: the production and processing of food that is uncontaminated by toxic substances, pesticides and radioactive materials.

Each of these presents Western Australia with potentially significant development opportunities.

Organic foods: As environmental concerns grow, and these concerns are manifested in both government regulations and consumer preferences, it seems inevitable that demand for explicitly clean/green or organic food will increase.¹²⁹ Consumers increasingly perceive organic products as satisfying concerns relating to food safety, nutrition and environmental impact. Many products formerly marketed with poorly defined terms such as 'natural' or 'green' have evolved into organic products. A considerable amount of work has been done in defining these products and implementing quality control systems. Products labelled 'organic' have become clearly defined and well recognised.

The concept of 'clean' food ranges from inconsequential to increasingly important with rising affluence, increased sophistication and changing food demand as consumers gain a wider choice in product variety and styles. The two major trends within the food industry, especially in affluent societies, are toward convenience and health or safety. Over the last decade public awareness of environmental issues has also increased significantly. In addition, a number of incidents relating to food safety have made consumers less confident, and trusting, of agricultural production and food processing systems.

Figure 5.2 The Biological-Chemical Food Continuum

Source: Rural Industries Research and Development Corporation.

Demand for organic products has been expanding by 20 per cent per year for at least the past five years, with world trade estimated to be \$US 11 billion in 1997. Organic products are the fastest growing sector of the food industry in a number of major food markets. It is estimated that retail sales of organic food in Australia were worth around \$250 million last year, and growing rapidly. The European market worth an estimated \$US 4.5 billion in 1997, and Japan's worth \$US 1.2 to 1.5 billion are considered the trend-setting markets. The US market, worth \$US 3.5 to 4.5 billion, is seen as being reactive. Even so, a report by the Hartman Group in the United States conclude that the 'green' consumer is now mainstream, and can no longer be considered a marginal niche. Based on these patterns the global organic food market is predicted to be worth between \$US 58 and 100 billion by 2006.¹³⁰

It is generally agreed that Australia has great potential to build on its position as a supplier of organic products. The major impediment is in providing appropriate and accurate information. The target markets are very discerning about information, particularly in terms of overstating benefits or loose and misleading claims about 'clean' attributes. Markets increasingly require objective proof of organic, clean or other quality claims. Australia has lagged behind other nations, notably the USA and New Zealand, in developing production systems and products to suit these markets.¹³¹ Nevertheless, export potential from Australia is significant, with the perception existing in Europe and Asia that Australia is a relatively 'unspoilt' environment, and Western Australia could take a greater share.¹³²

5.3.5 Emerging technologies

Emerging technologies also offer Western Australia potential opportunities for the further diversification of the State's economy.

E-commerce and Internet: E-commerce offers the prospect of lower transaction costs, lower barriers to entry, and improved access to information for the consumer. It may significantly lower prices while improving quality, improve efficiency, enhance

competitiveness, improve the allocation of resources and increase long-term growth. A recent report has suggested that GDP may be higher by around 2.7 per cent by the year 2007 if Australia adopts greater use of e-commerce than if it does not. Using the current size of the economy as an indicator, that increase is equivalent to more than \$14 billion per annum. The increase in activity (real GDP) obtained by 2007 is equivalent to achieving 11 years of economic growth in ten.¹³³

However, impacts are different for different industries and in different regions. Some of the industries in which Western Australia is a major producer are expected to enjoy less growth than others. The food products sector is likely to be adversely affected in the short term, although the sector's exports recover as the appreciation in the real exchange rate weakens. Eventually, growth in consumption in the economy at large will increase demand for food products by 1.4 per cent by 2016. Many of the export commodity sectors recover as the real exchange rate weakens. This is the case for basic metal products and chemicals. The exception is mining, which faces a predicted contraction.¹³⁴ *The study suggests that Western Australia will be the least stimulated by the widespread adoption of e-commerce of all Australian states.*

These findings highlight the importance of vigorously promoting the adoption of e-commerce in Western Australia, encouraging key growth industries to adopt e-commerce wherever practicable, and facilitating regional development through, *inter alia*, imaginative e-commerce strategies.

Microproducts: There is rapid growth in markets for microproducts around the world as they are finding their way into an ever greater range of high value manufactured products – such as actuators for airbags in automobiles, hearing aids, computer disk drive and inkjet printer heads and a wide variety of other products. The Nexus Market Analysis Taskforce has estimated that the world market for existing microstructure products will be worth some \$US 33 billion, and that for emerging products worth up to \$US 4 billion, by 2002. A conservative extrapolation of these growth trends to 2010 suggests that a total world market for microstructure products of the order of \$US 80 billion is possible. And because microproducts are increasingly important for the competitiveness of the 'macro' products in which they are components, the value of microproducts is much greater than that of their direct market alone. A leveraging factor of up to 50 times has been suggested.¹³⁵

While a large proportion of micro devices currently on the world market relate to the ICT equipment industries, there are a range of other high value devices in areas where Australia has some track record – eg. hearing aids, in-vitro diagnostics, lab-on-a-chip and drug delivery, optical switches, micro relays and motors. The CSIRO division of Manufacturing Science and Technology (DMST) in Melbourne has used electron beam lithography, the x-ray lithography program at RMIT is among a number of such programs in Australian universities, and Swinburn University hosts a number of groups doing leading-edge work using laser equipment for machining and scanning applications. The new MicroTechnology CRC, with centres located in Melbourne and Brisbane, will build on these efforts and provide new focus and impetus in the area.

Companies like Cochlear and Robert Bosch, and their co-participants in the MicroTechnology CRC Alcatel, Motorola and Bioproperties, are likely to pursue developments in this area into the future, and there is no reason why Western Australia could not share in some of this development.

New materials and rare earths: At various times during the past few decades this sector has promised to become a major contributor to the Western Australian economy. Significant deposits of mineral sands at Capel in the south west and Eneabba north of Perth, which have been mined since the 1960s, have made the state a major player in the sector.

Several attempts at extending this position into exploiting deposits of rare earths and value adding have been frustrated over the years. The major impediment appears to have been very aggressive pricing by established players seeking to retain their market position.¹³⁶ Projects, particularly those involving value-adding, have been frustrated by the high energy demands of these processes. Nevertheless, it may well be worth reviewing likely potential for developments over the next 10 to 20 years.

Biotechnology and the next great wave: Western Australia is home to only 7 per cent of Australia's biotechnology companies and is, therefore, punching a little below its weight. Nevertheless, there is an opportunity for Western Australia to develop its biotechnology industry base, by forging linkages with strengths in its existing industrial base as well as capitalising on the 'biotechnology revolution'.

Combined agriculture, food and food processing, and environmental and resources related biotechnology accounted 44 per cent of Australian biotechnology company focus in 1998-99.¹³⁷ These areas also represent significant development opportunities. The worldwide biotechnology market is estimated to be \$US 12 billion in food, more than \$US 8 billion in agriculture, \$US 4.3 billion in metal recovery, and almost \$US 100 million in pollution control biotechnology.¹³⁸ There are enormous opportunities in such areas as food and food processing, ore leaching and bioremediation, in which Western Australia could develop a world leading presence, with government building upon its already significant support activities.

Looking somewhat further ahead, it appears that the next great transformational technology on the horizon may be nanotechnology – giving us the capability to manipulate and reconstruct matter at the atomic level, thereby unleashing powers and capabilities that are now but dimly seen. The potential of such longer terms opportunities should also be examined.

5.3.6 Other ingredients

Being in a position to seize these opportunities will depend on the development and maintenance of a number of key resources and infrastructures.

Education and Skills: One of the fundamentals of the knowledge economy will be skills, and an important role for governments will be the development of world leading

education, capable of providing the high order knowledge workers and entrepreneurs required to prosper in the 21st century.

Anecdotal information suggests that Western Australia may have a growing 'skills surplus' – ie. the workforce having a higher skill level than the economy can productively use. Many of these higher skilled individuals are employed on a fly-in/fly-out basis with organisations around the world. Discussions with the ABS have established that the data they currently collect does not allow them to determine the extent of this trend, or whether it actually exists.

Skills surpluses are a common feature of many regions which have a very attractive physical environment. The increased mobility of many knowledge workers, in particular, enables them to locate virtually anywhere with good telecommunications services and access to a well served airport. This group – the 'road warriors' – are one part of this shift. The other are those professionals who are even more strongly committed to the lifestyle and are not prepared to spend so much time travelling and, if necessary, are prepared to sacrifice their careers to allow this. If these individuals do exist in significant numbers, and given the growing demand for highly skilled people in all areas of the economy, they may well provide Western Australia with the basis for lifestyle-based development.

Migration: In pursuit of diversification to a more multidimensional economy there is a need to develop new areas and build on emerging areas of activity. It is not a case of stopping activity in one area (eg. mining) and starting others, but rather one of building up and out, overlaying a range of new activities and building linkages between them and existing strengths and potentials.

Whatever way one looks at this, it is clear that it must involve significant migration into Western Australia. Starting new skills development in secondary and tertiary education institutions is necessary, but will not be quick enough to ensure that the threats that face Western Australia's resource-based economy can be turned into opportunities. Western Australia must find ways to attract and make welcome increased number of skilled migrants from the Eastern States of Australia and overseas.

There is also significant potential to actively work to attract emigres back, in particular the many graduates and other skilled workers who are working interstate and overseas, very often primarily for professional reasons. A Western Australian alumni program to identify, locate and contact Western Australian graduates overseas or interstate and encourage them to return could contribute to this.

Environmental management and planning: Environmental management and planning will be an important underpinning for the kind of amenity driven and lifestyle development opportunities outlined. Managing the balance between resource-based and industrial developments on the one hand, and the development of lifestyle attractors for knowledge economy investments and for the knowledge workers that will be needed to support them on the other, will continue to present the State with an ongoing challenge. The benefits of getting it right and the costs of getting it wrong could hardly be greater.

Infrastructure for the 21st Century: As knowledge economy developments progress there will be a shift in emphasis, and additional demands for infrastructure for the 'weightless economy'. Land and air transport will continue to be a key infrastructure, as will power and water. However, there will likely be increasing demand for knowledge economy infrastructure, including: education and skills development, communications, intellectual property rights, privacy and content regulation. And their development will demand new skills and present new challenges.

These are just some of the potential avenues for diversification and further development of the Western Australian economy into the 21st century. Some are already the focus of development strategies outlined by the Western Australian Government, others require further study.

6 Environmental Drivers: Implications and Responses

As chapter 3 indicated, environmental drivers and the general move towards sustainable development will be major shapers of the Western Australian economy in the future. These environmental pressures manifest themselves economically in at least two ways.

First, there are the actual environmental impacts themselves, which have both direct and indirect economic effects. For example, both global warming and land salinisation will have profound direct effects on the agricultural sector. Furthermore, there are indirect, opportunity costs incurred by the State in continuing unsustainable practices (eg. the high private and social costs of automobile dependence) or in cleaning up environmental problems (eg. pollution and land degradation), since the money could have been spent more productively elsewhere if there was no environmental problem to fix in the first place.

Second, there are the policy challenges induced by sustainable development which will mean that 'business as usual' cannot continue. These challenges come from international, national and local concerns, and require behavioural changes from governments, businesses and the community at large. The policy issue which is likely to be most significant and which has already been highlighted in chapter 3 is global climate change and policy responses aimed at mitigating the enhanced greenhouse effect. But as we have already noted, there are several other environmental and sustainable development pressures which will impact on current policy settings and business practices (eg. in agriculture).

This chapter does not seek to provide a set of policy prescriptions for these issues. Instead, it aims to set out some of the most significant policy dilemmas, options and possible paths for Western Australian economy in the first quarter of the new century.

6.1 Environmental problems and their potential economic impact

As noted in the 1998 *State of the Environment* (SOE) report, the condition of the Western Australian environment has been in steady decline. Measures to address this decline will cost money – money that will therefore not be available for other, economically productive uses. But some environmental problems will have a direct and more immediate economic impact. The two most serious of these are likely to be land degradation/salinity, and the enhanced greenhouse effect.

The **salinity problem** is now recognised as being of crucial significance to the future of Western Australian agriculture and the environment more generally. It was the top priority problem in the *SOE* report. A revised salinity action plan for the State is due out

during 2000, so this issue will not be discussed in great detail here, except in the context of the greenhouse effect and of the potential for carbon sequestration in relation to tree planting that is aimed at helping overcome salinity.

The focus of **greenhouse gas** (GHG) policy to date has been on trade related issues implicit in the Kyoto Protocol. In Australia this has manifested itself mainly as a short term concern for maintaining production, expansion, growth and profit levels while taking ‘no regrets’ and ‘least cost abatement’ actions. This may be understandable, but lacks a prudential element. Global warming is a real phenomenon and it will have significant ecological impacts that will, in turn, generate a range of positive and negative economic impacts. Where and how these impacts will occur, and what we will do to manage them is the subject of adaptation studies. Strategic planning for adaptation to the new climate conditions will have to be conducted in conditions of high uncertainty and significant risks.

Successful social and economic transcendence of these rapidly shifting ecological conditions will require dynamic policy formulation able to meet the demands of ecological ‘surprises’. So far, too little time and money have been spent in adaptation and risk mitigation planning. For example, the Adaptation Panel of the Western Australian Greenhouse Council met only once during 1999, while the other panels dealing with the economic impacts of GHG abatement all reported in 1999. Yet, global warming and its physical consequences may not occur gradually or incrementally. Policy settings need to be put in place to understand the potential effects, and to prepare for and – if necessary – adapt to them.

6.2 Policy responses and their potential economic impact

The demand for Western Australia to pursue sustainable development does not only come from the costs and impacts of deteriorating environmental conditions. They also arise from the policy responses to meeting local, national and global environmental needs. As chapter 3 indicated, the global warming issue will probably be the most crucial environmental policy driver. While this is true of all advanced industrial economies, Western Australia is more precariously placed than most.

Western Australia, as a part of the developed, industrialised world, has a responsibility for the global environment because of the perceived collective historical industrial contribution to global warming through the enhanced greenhouse effect. Hence, we are under some obligation to both alter our own behaviour and to assist in a global solution seeking to avoid or mitigate any further global warming. Western Australia (as part of Australia) has been given targets for cutting back on greenhouse gas emissions that are not being applied to developing countries, for the moment at least.

In other areas of environmental policy and performance Western Australia is expected, by its own citizens as well as the rest of the world, to act like the rich, developed society

that it is. In other words, Western Australia is increasingly expected to meet world class performance standards in energy efficiency, waste and materials minimisation, environmental rehabilitation, pollution control, etc. Although there are areas of excellence within Western Australia, we are still a long way from world best practice in several areas – as the *SOE* and other reports make clear. Improving our performance will not be cheap, but it cannot be avoided. Indeed, as argued below, pursuing such standards has great economic potential in terms of industry development and job creation.

On the other hand, Western Australia's economic structure is much more like that of a developing country, due to the large role that the agricultural and mineral commodity production and processing sectors play in the economy. Over 17 per cent of the State's GSP comes from mining, with another 4 per cent from agriculture. Much of the State's manufacturing and construction is related to mining activities, and the vast majority of its exports are commodity-based (see chapter 2).

Many companies in these sectors, and in particular the mining sector, have become world class environmentally – often because of the environmental expectations that Western Australians have of the companies operating in Western Australia. However, global warming, and the current policy approach adopted at Kyoto in December 1997 to tackling it at a global level, means that Western Australia's traditional economic strategy is under threat. The State is faced with the unfortunate fact that, as things currently stand, it is strong in precisely the 'wrong' industries. Global warming requires that the world shift to a less carbon-intensive production regime, but Western Australia's strongest industries are heavily carbon-based.

The rich, advanced industrial countries are being asked to make the first moves in de-carbonising their economies. This means an even heavier adjustment for Western Australia than for most, since it is more carbon-dependent. More seriously still, its main competitors in several key industries are not subject to the same CO₂ reduction targets as Australia (and, by implication, Western Australia). It appears that we are being asked to take on the burdens of a rich society while the economic activities at our disposal are being denied us, because they are now deemed to be environmentally unacceptable.

Effectively, therefore, Western Australia faces a paradox or dual challenge in pursuing an economic strategy consistent with sustainable development. On the one hand, we are considered in many respects to be well behind other rich industrial societies in several aspects of sustainable development (eg. we are relatively wasteful in transport, electricity, gas, and water usage – especially in residential and non-export sectors). From this perspective, *it appears that we are not pursuing sustainable development hard enough*. On the other hand, we are environmentally world class, especially by comparison to most of our competitors, in the key industries of mining and mineral processing that dominate our economy. These competitors, however, are being given a potentially large boost in their competitiveness because they are not being asked to meet the Kyoto GHG targets that are being placed on Western Australia. From this perspective, *it appears that we are pursuing sustainable development too hard*.

The current Kyoto-based GHG policy regime presents Western Australia with a fundamental strategic dilemma. At least on the surface, it appears to make it very difficult for the State to follow its traditional economic development route built around natural resources. Moreover, it makes it even harder for it to further develop its resources through downstream processing at the very moment when the availability of cheap energy (through LNG) has made it possible for this long-held dream to become a reality. Proposals for petrochemical complexes, steel factories and alumina plants are all threatened, at least in theory, by the GHG ceilings being placed on Australia. How can and should the State respond?

6.3 Dealing with Greenhouse and the Kyoto Protocol

The policy issues, let alone the science, surrounding GHG abatement are incredibly complex and uncertain, which make predictions very hazardous. There are uncertainties over several issues, such as:

- whether the Kyoto Protocol itself will be ratified by a sufficient number of Annex 1 countries (in particular, the USA);
- whether developing countries will eventually be included in GHG reduction targets;
- how the ‘flexibility mechanisms’ (Joint Implementation, Clean Development Mechanisms and Emissions Trading) will operate;
- how the baseline GHG figures for 1990 will be determined; and
- whether trade or environmental issues will predominate in policy negotiations.

Developing policy in this context is inevitably a difficult task – flexibility and preparedness for change are crucial requirements. Nevertheless, an attempt is made below to suggest some possible directions.

6.3.1 Trade or Environment?

Perhaps of most crucial importance to Western Australia is the last of these points: the extent to which trade or environmental objectives predominate in the negotiations over GHGE reductions.

If environmental objectives take precedence, then efficient producers of CO₂ (ie. low CO₂ emissions per unit of output) should be rewarded. Thus gas is favoured over coal, renewable energy over fossil fuels. In effect, an environmentally-driven policy regime would assume that some commodities and products are perceived as environmental ‘bads’ (rather than ‘goods’) because of the GHGE created in their production and/or end use. In order to limit the production and consumption of these products, three measures can be applied.

The first is a comprehensive global ban of the end-product (as in the case of CFC's and Persistent Organic Pollutants, or POPs), followed by subsequent product substitution. This is a supply-oriented solution. Given that most products generate GHGE somewhere in the production chain, such a ban is not feasible.

A second alternative is a carbon tax. This measure is demand-oriented in that the costs of the carbon emissions embodied in the end-product are passed on down through every stage of the production process. The consumer must then pay the full cost of carbon externalities. Demand and supply decline, but in principle, efficient and low cost producers of this 'bad' are not unfairly punished. In fact, they should be rewarded with a greater share of the, admittedly declining, market for that product. A carbon tax also stimulates R&D and substitution with non-carbon based energy sources, production processes, and transport systems.

A third and related option is emissions trading based on 'cap and trade' principles. Absolute limits or targets, declining over time, are set for GHGE and countries and companies must trade within these targets. Again, more efficient producers and users of CO₂ are rewarded within this scenario.

Under such an environmentally-driven policy, Western Australia has the potential to be a major beneficiary, at least in the short to medium term, because of its large reserves of relatively GHG-benign natural gas. Also, its extremely energy efficient production processing operations in alumina, other base metals and potentially petrochemicals and iron and steel mean that it would have a comparative advantage in these products as well. The potential for the economy to grow built around these commodities and processing operations would continue as long as world demand for them remained sufficiently high, although it would need to be acknowledged that eventually demand for gas, which is still a GHG, would decline in absolute terms, while processing operations would need to shift to alternative energy sources to maintain their output.

This scenario is in many respects the assumed policy position of the Australian and Western Australian government and policy communities. The assumption is that Western Australia should not be, and will not be, punished for producing GHGE, because it is better – environmentally – for the world that gas be used rather than coal, and for processed commodities to be produced by world class energy efficient processes than by older and less efficient technologies.

However, this logic only applies if environmental concerns are at the core of GHG negotiations. The current policy regime, deriving from Kyoto, combines environmental, trade and development concerns. In fact, there is little global environmental logic, although there is some environmental and social justice and development logic, inherent in the Kyoto protocol in terms of reducing future GHGE. The Protocol places an onus on Annex 1 (mainly developed, OECD countries) to reduce their emissions, while developing countries are not so constrained.

Under Kyoto, as currently constituted, the rapid development of natural gas production and of downstream processing operations in Western Australia is threatened because it

will cause Australia's GHGE targets to overshoot. A carbon tax applied only to Annex 1 countries as a way of reducing CO₂, will make CO₂ production more expensive in Western Australia, thus pushing it and related industries (such as downstream processing operations) to non-Annex 1 countries. The main role of Annex 1 countries would become that of technology providers to non-Annex 1 countries through the flexibility mechanisms such as the CDM under this scenario. In addition, the exact form of emissions trading will become crucial to determining the economic benefits to be derived from low-cost and efficient production of GHG-efficient energy in Annex 1 countries.

Western Australia's main problem is, therefore, that its resource development sector is energy intensive *and* energy efficient. This means that Western Australia specialises in production of commodities that require large amounts of energy to produce, yet per tonne of output our industries use less energy than comparative industries globally – comparing alumina to alumina, LNG to LNG, etc. Our rapid increases in GHGE are not attributable to inefficiency, but rather to increased global demand for our energy-intensive commodities. In effect, our efficiency is increasing, but demand is increasing even faster, thus raising our aggregate energy consumption and therefore GHGE.

6.4 Squaring the circle on greenhouse

Western Australian industry currently has a substantial and increasing base of relatively clean gas-generated energy, though significant coal powered energy is still used, and yet GHGE growth remains unacceptably high according to the targets we have been set. Is there a way for Western Australia to square the greenhouse gas circle, faced with the dilemma of being 'not sustainable enough compared to the OECD countries' and 'too sustainable compared to the developing countries'?

One option is, of course, 'business as usual' without moving beyond 'no regrets' measures, such as keeping up the pressure on industry to be as efficient as possible in lowering GHGE per unit of production. This approach might be based on a belief that greenhouse science is flawed, too uncertain or not serious enough to warrant the scale of changes being suggested. Or it might be based on more naked self-interest, in the belief that the US will not ratify the Kyoto Protocol and that an international agreement is still a long way off. In the meantime, Western Australia can continue to develop its commodities and downstream processing, powered by fossil fuels. Alternatively, it could be based on a view that the Kyoto agreement will be changed to accord with the environmental version noted above – that is, a policy and trading regime where efficient low-GHG producers in Annex 1 countries are rewarded for their efforts, rather than being punished, as currently appears to be the case.

These considerations are in many respects the basis of existing policy and behaviour within Australia (including Western Australia). A number of large industry developments have been announced in recent times that could blow out Australia's GHGE targets as set in Kyoto. There does not appear to be any coordination at national

or state level in attempting to control the cumulative GHG impact of private industry decisions.

While this policy might appear to have some merit, it must be acknowledged that it also has its risks. First, there is still the substance of Kyoto to deal with, and the prospect that developed and developing countries will continue to be treated differently. Efficient CO₂-producing Annex 1 countries (in terms of energy production) will continue to be penalised in such a scenario. As things currently stand, Australia and Western Australia in particular show no sign of being able to meet GHGE targets. It is uncertain what sanctions, if any, might be applied as a result, but the possibility must at least be entertained.

Second, the rest of the Australian economy is becoming more knowledge-based, and in the future there may not necessarily be the same political will to support the mining sector as there has been over the last 20 years or so, especially in the face of international GHG sanctions.

Third, the benefits of a commodities-based economy are not necessarily unambiguous. The long-term trend of commodity prices is one of decline – the State has to run harder and harder to stay still (see chapter 2).

Fourth, and as will be discussed further below, other economic possibilities exist beyond fossil fuel-based industry (such as green industries and jobs, knowledge-based industries, etc). In particular, industries based on technology transfer of mineral and agricultural expertise (as TIAC has suggested in other reports) have distinct potential, even if there is a decline in minerals and agricultural production itself.

What seems clear is that there is a potential two-fold approach.

- First, the State should ensure that its voice is heard in national and international climate change negotiations. Its position should be one that emphasises the *environmental*, rather than the trade and development, aspects of these negotiations (as discussed above).
- Second, it should at the same time recognise that GHGs are nevertheless ‘bads’, and that moving away from a GHG-based economy through diversification, increased environmental efficiency and performance and, ultimately, a shift away from fossil fuels, are necessary long-term goals that to be achieved need action now.

It is very likely that a combination of these and other measures will be necessary in order to retain flexibility in the face of uncertain and changing international and national policy settings. Below we provide some possible directions for research and policy.

6.4.1 Greenhouse Accounting: Determining a Baseline

The Australian Greenhouse Office (AGO) has released a strategic plan for the development of a National Carbon Accounting Scheme (NCAS). Its objective is to create a national record of emissions and removals for land-based sources and sinks

within 3 years. A Co-operative Research Centre in Greenhouse Accounting has also been set up to assist in this task.

Given that Australia is permitted an increase in GHG emissions of 108 per cent of 1990 levels for the commitment period of 2008-2012, accurate *determination of the 1990 baseline is critical*. Negotiations on definitions of forestation, deforestation and revegetation are continuing at international level and will have to be factored into the NCAS as clarifications emerge of what will or will not be deemed 'carbon accountable'. Definitions of these sources will have major implications for Western Australia's emission inventory, causing it to be revised upwards or downwards. The NCAS data will also help form the accounting basis for any national or international carbon-trading scheme that emerges from Kyoto negotiations and national deliberations. It is vital that Western Australia play its part in determining Australia's 1990 baseline figures and in subsequent greenhouse accounting.

6.4.2 Achieving world class GHG efficiency

If Western Australia's is to convincingly and persuasively argue that environmental, rather than trade, factors should predominate in the GHG policy regime, then it is imperative that it continue to press for all industry sectors to improve their energy efficiency to world's best standards.

The National Greenhouse Strategy has stated that GHGE must be considered in Environmental Impact Assessments for new project approvals. Western Australia has already issued an Interim Guide (No.12)¹³⁹ through its Environmental Protection Authority that requires proponents to consider methods for minimising GHGE. At this stage the requirement is only to 'consider' the issue. However, current legislative powers of the EPA and Department of Environmental Protection (DEP) are sufficient to reject or require modification to development proposals on the basis of their GHGE. Modifications could include carbon sequestration requirements, energy fuel-substitution requirements or outright rejection. Other alternatives may include an emitting industry levy based on the polluter pays principle already supported by government and its agencies in relation to some sectors (eg. the landfill levy), and as is being considered in others (eg. salinity). Such a levy could be directed to renewable energy research and implementation, sequestration schemes or other emission abatement purposes.

6.4.3 The Flexibility Mechanisms

If trade factors continue to predominate in GHG negotiations, or if emissions trading (in a 'cap and trade' format) becomes the main means by which GHGE reductions are to be achieved, then it will be important for Western Australia to be actively involved in setting and understanding the rules of these new trading mechanisms. Some details are provided below about the three key mechanisms created at Kyoto, namely Emissions Trading, Joint Implementation and the Clean Development Mechanism.

Emissions Trading: At this stage the Australian government has given no commitment to, and is still taking advice on the desirability of, establishing a national carbon credit and trading scheme in advance of any possible international scheme. If a domestic scheme were to be introduced, it would commence in 2008, the beginning of the first reporting period. However, in the lead up to the establishment of the new market, potential players should consider positioning themselves early to gain advantage in the system. The ecological objectives of Kyoto (real reductions in GHG) can be met if total emission levels are capped, permits are issued up to that level, trading commences and the cap is lowered over time.

It should also be acknowledged that substantial risks exist for those who engage in informal carbon trading or sink production ahead of the establishment of the national and international markets. Uncertainty abounds over definitions and accounting of acceptable sinks, posing valuation and compliance problems for early investors. States and Territories may also alter legislative approaches to the separation and demarcation of carbon rights. It would appear that some degree of confidence is developing in the emerging trading framework with the announcement of financial exchanges or forward trading between individual parties in the Sydney Futures Exchange by mid-2000.

Joint Implementation and the Clean Development Mechanism: The JI and CDM measures available to industry and investment institutions are also subject to the accounting uncertainties raised above, and therefore it is difficult to be definitive about the way in which the State might approach them.

JI is similar to CDM but refers to cooperative arrangements between Annex 1 countries rather than between Annex 1 and non-Annex 1 countries. It will be considered a sub-set of CDM in this context, but it may be that not enough attention has been paid to JI, given that both partners have definite CO₂ targets to work from, which should enable more equal bargaining and common interests in substituting cleaner energy (such as gas) for coal or oil-based energy.

CDM itself allows annex 1 countries to transfer technology or establish in developing countries that have no requirement to lower GHGE. The CDM allows for the investing country to achieve low cost abatement by earning carbon credits to the value of the GHGE reduction in the recipient country (eg. replacing a coal fired power station with best practice gas energy generation). It is primarily a technology transfer rather than an emissions trading tool, in that the end result is likely to be GHG production in the developing country, aided by technology from the annex 1 country, rather than enabling the latter to supply the energy itself. Hence from a Western Australian perspective it should be seen as a tool in shifting away from domestic energy production (and CO₂-intensive processing) towards the supply of knowledge and expertise for energy producers and processors in developing countries

Some of the potential advantages of CDM are:

- net reductions in global GHGE;

- reductions in the severity of carbon leakage through annex 1 countries maintaining competitiveness;
- low-cost off-shore GHGE abatement for annex 1 countries;
- improved infrastructure, investment and economic growth in recipient country;
- that it may permit maintenance or expansion of GHGE in annex 1 industries that produce commodities with “world’s best efficiency” in GHGE terms; and
- that a share of CDM’s value will be distributed, through a fund, to assist those countries most at risk through global warming (low lying nations etc.).

Some of the disadvantages may include:

- recipient countries may be disadvantaged in the long term if annex 1 countries have claimed most of the ‘easy’ carbon cuts in credits. (ie. when and if developing countries are required to join annex 1 in emission reductions);
- CDM does not address the problems of local polluting effects of carbon emitting facilities (like refineries);
- CDM can undermine technology innovation in annex 1 countries where business as usual can continue as long as it is more viable to purchase international credits than to modify production processes;
- CDM has a tendency to favour large industry over smaller enterprises that cannot afford international projects;
- in trade terms, CDM may lack incentive mechanisms – some developing countries are already requiring that the cost of the technology and expertise, transferred from annex 1 countries under CDM arrangements, be discounted to the value of the carbon credits obtained by the latter; and
- delays resulting from uncertainty in the rules governing CDM may limit the ecological effectiveness of the measure.

Clearly, more analysis will be needed and industry will need to become more aware of the detail of potential costs and benefits, opportunities and threats of ET, JI and CDM. At this stage, it is too uncertain to assess with confidence the potential of any of these measures in enhancing the Western Australian economy and in easing its strategic dilemma on GHGE. A good start has been made with the establishment of a voluntary ET scheme; there may need to be similar initiatives (with careful monitoring) in relation to JI and CDM.

6.4.4 Carbon Tax

As discussed earlier, if GHG are deemed to be environmental ‘bads’ due to their global warming impact, the ecologically sensible thing to do would be to restrict the demand for GHG, rather than to punish efficient (in energy terms) suppliers of them. The current

policy regime encourages annex 1 countries to push energy-intensive production to developing countries, even if the latter are less efficient, with little if any reduction in global CO₂, in order to reduce the annex 1 country's direct emissions. Emissions trading within a system of CO₂ caps is one way to do this; another is a carbon tax. A carbon tax pushes the cost-sharing burden through the whole production chain, which is a fairer method of apportioning 'blame' for GHG production and encourages a global reduction in demand.

Two major factors may affect the success of a carbon tax: comprehensiveness and price inelasticity. It would be difficult to justify a State-based carbon tax that would impact on its competitiveness vis-à-vis other states that have no carbon tax. Similarly it would be politically difficult to unilaterally introduce a national carbon tax which would impact on Australia's global competitiveness. Price inelasticity affects a small group of products which consumers will continue to buy in similar amounts irrespective of price rises (tobacco, alcohol, petrol, some pharmaceuticals). This may be due to cultural factors or to a lack of substitutes. Imposition of a carbon tax also carries equity considerations (people driving older, petrol-driven cars are the least likely to be able to afford the petrol price increase, new efficient cars or fuel substitutes such as LNG). Concerns over the electoral backlash this may generate, and industry concerns over competitiveness have led the Australian Government to rule out a carbon tax to date.

Other developed countries are wrestling with a combination of carbon tax measures. New Zealand is considering a hybrid carbon charge and permit trading system or just a low level carbon charge. France has just announced a carbon tax that exempts energy-intensive businesses but allows for future emission trading. Norway too is going hybrid as it already has a carbon tax that excludes process industries (but will soon include them) and is proposing upstream emission trading for petroleum refineries and wholesalers as capturing millions of downstream users is 'too difficult'. Canada has ruled out a carbon tax under pressure from the petrochemical sector and is undecided on equity issues for emission trading. Denmark intends to structure its carbon tax so as to minimise impacts on domestic fossil fuel production but to limit the net export based on fossil fuel, especially coal.

Although space precludes a detailed discussion here, Swiss researchers have indicated that a carbon tax may be unilaterally implemented, focus on energy-intensive industry and retain sectoral competitiveness.¹⁴⁰ They argue that this can be achieved through: border tax adjustments; industry-targeted tax credits that preserve the environmental incentive; and efficiency investment credits. Hamilton¹⁴¹ concurs with some aspects of this position, as he argues that only 18 per cent of Australia's emissions come from industries that are energy-intensive and exposed to foreign trade. Over 80 per cent of emissions come from sectors like commerce, household and land-clearing where increased energy costs would not necessarily hurt jobs and foreign trade if carbon revenues were reinvested wisely.

The carbon tax issue neatly encapsulates the strategic dilemma over the direction of the Western Australian economy. To even consider a carbon tax is often seen as anathema

to large energy producers and consumers, as it implies a decline in demand for their products. Yet if GHG reductions are here to stay on the global policy agenda, then some form of global carbon tax (or ET within a declining global GHGE cap) may well be the best outcome for Western Australia, given its position as an energy-efficient GHG producer. Although a carbon tax would mean a decline in overall demand for energy based on fossil fuels it could – depending on how it was structured – mean that Western Australia had an increasing share of this declining market, possibly at increased prices. But at the same time, it would be necessary to look at diversifying away from GHG production.

6.4.5 Differentiation

Following the EU concept of ‘the bubble’, Australia could distribute its domestic GHGE increases in a differentiated manner. The States within Australia could divide emission allowances so as to recognise the unique economic structural differences attributable to each State. Western Australia, with its fossil fuel intensive resource and energy sectors, accounts for a disproportionately high share of GHGE. Tasmania on the other hand, with substantial hydroelectric capacities and a relatively small economy contributes relatively little to GHGE. It would seem sensible then to avoid a flat 108 per cent GHGE increase for each State, when Tasmania could easily meet this target and Western Australia would struggle to contain emissions to anything like that level.

However, the dynamics of interstate and Federal/State relations are such that this option has yet to be championed by any particular State. Each is keen to preserve the right to expand its GHGE as part of its economic development strategy. Western Australia could argue for a ‘differentiation’ strategy with vigour as a means by which to permit increased expansion in the resource development sector and maintain competitiveness.

Longer term alternatives, such as shifting towards a hydrogen-based economy are also worthy of consideration. See Appendix B.

6.5 Rethinking Western Australia’s economic structure

The long-term implication of the Kyoto protocol as it currently stands is that rich countries should not be in GHG-producing industries, or that they will pay a price if they are – at least until developing non-annex 1 countries are brought into global GHGE targets. The suggestions in the previous section are variations on a ‘business as usual’ economic scenario in which mining and processing of raw materials continue to be the backbone of the Western Australian economy.

However, as noted earlier in this chapter, there are good economic reasons for reconsidering or recasting this strategy, over and above the potentially negative impact which GHG negotiations might have on Western Australia’s mining sector. Just as it

will be essential to achieve the highest energy efficiencies in industry, whatever the eventual GHG policy regime, it will also be essential for other aspects of the Western Australian economy to demonstrate a commitment to sustainable development, under pressure from its own citizens, from the actual effects of environmental degradation, and from international observers wary of Australia's apparently 'special' position on greenhouse. Western Australia needs to develop more strings to its economic bow, and part of the repertoire should be 'green' industries and jobs.

There have been a large number of analyses showing the economic and employment potential of green industries. Already, environmental industries are among the fastest growing in the world, and this is likely to continue. A range of regulatory, pricing and tax changes could be implemented to improve the environment while simultaneously increasing jobs and maintaining economic growth. A recent report for the Western Australian Department of Training and Employment (DTE) has found numerous examples of existing and potential businesses in these industries which could form a crucial and substantial part of a diversification strategy for the State's economy (see previous chapter). Several areas of strength build on the State's existing economic base, such as mine site rehabilitation, remote sensing, waste management, remote area power supplies, and water management.¹⁴²

There are obvious links between many of these environmental industries and GHG abatement, which has been the main focus of this chapter. The hydrogen economy, for example, could be a key element in a sustainable energy industry. Growing industries around cities and sustainable communities would inevitably involve efforts to reduce automobile dependence, with consequent GHGE reductions. Perhaps most significant is the potential of a carbon sequestration program to be met principally through tree planting, which would form part of both the 'earth repair' and 'sustainable agriculture' industries. Currently Western Australia is in a position where, depending on carbon accounting rules, carbon sequestration from tree planting could provide a triple benefit in terms of environmental, economic and social returns.

Rapidly declining rural land clearing, in combination with large scale tree planting, could see the Land Use Change and Forestry sector become a major sink to offset industrial emissions up until the Kyoto reporting period of 2008-12. Major emitters within Western Australia are already engaging in tree planting programs well ahead of definitive carbon trading or accounting rules in anticipation of gaining credits against their emissions.

The Sustainable Land Management Technical Panel of the Western Australian Greenhouse Council envisages a bright future for this sector with potential savings of 25 per cent of Western Australia's 1990 emissions from the planting of 1.35 million hectares of land with a combination of Maritime pine, Bluegums and Oil Mallee tree crops. Planting on this scale would provide much needed stimulation in regional employment and generate substantial economic flow-on effects in these areas. Oil Mallees are also being researched for their considerable crop value as a fuel source. Skills and expertise in mass tree planting techniques may have export value as well.

Negotiations on carbon sinks may lead to some harvested wood products (structural timber and furniture) being classified as a sink, with the potential to develop a continually expanding carbon sink and promoting further economic opportunities. Similarly substitution of timber for steel structural products could result in savings of 0.33mt CO₂-e.¹⁴³ Widespread and strategic planting of trees will also provide much needed ecological controls for the burgeoning salinity problem and loss of biodiversity.

Tree planting for carbon sequestration purposes has some difficulties relating to 'residual liabilities' (ie. who is responsible for the carbon released when trees fall, decompose, burn or are harvested) if carbon credits are attributed to given plantations. Trees also need to be planted in the very near future if they are to be of substantial size and carbon-absorbing capacity by the Kyoto accounting period of 2008-12. Trees under 2m do not have significant carbon-absorbing capacity and therefore swift action is required to maximise the potential of this form of sequestration. A time-factor is also significant for sequestration itself, as 30 years may represent the outside limit of a given tree's ability to absorb useful amounts of carbon (though they continue to store absorbed levels until harvest or death). The maximum absorption period occurs substantially earlier than this.

Carbon sequestration has significant potential in an international or national carbon trading scheme with emitters being able to enter into arrangements to either grow trees for themselves on land they have purchased or leased as a carbon sink offset, contract out planting to Western Australian companies or farmers, or simply through buying credits generated by local tree planters.

The pursuit of sustainable development provides fundamental challenges to the future potential and direction of the Western Australian economy. The State needs to ask some hard questions about what it thinks is possible, and desirable, as well as what it thinks is probable at the international level in greenhouse/global warming negotiations.

Our trade dependence on base commodities is a significant problem under a Kyoto-based future. But even if the Kyoto Protocol is changed to make the end-user more liable to pay for the carbon content of production, all CO₂ producers are likely to at some stage face a declining demand for their product (and carbon leakage to non-annex 1 countries). Gas is a valuable transitional fuel, but it is only a transition – partly because it is itself a fossil fuel (and, as it gets scarcer, becomes more expensive in money and energy terms to produce) and partly because it is estimated to peak in Western Australia by around 2020 anyway on current trends.

Boldness in shifting Western Australia's economic strategy towards an economy with substantial green industries and jobs may be called for as there will be a huge demand for such industries, but a coalition supporting such radical change would need to be constructed first. In the meantime, there are several measures which the State Government might consider. These are outlined in chapter 7 below.

7 Future study options

This chapter identifies some of the major issues arising from our analysis and suggests future study options for the Western Australian government to consider. The study options we suggest are intended to provide the background information to support the development of policies which seek to optimise economic development opportunities in Western Australia over the next 25 years.

Two main themes emerge from our analysis.

- First, the importance of exploring ways in which to diversify the Western Australian economy.
- Second, the importance of exploring options and putting forward alternatives for the management of climate change and environmental sustainability.

7.1 Diversification of the Economy

Western Australia's economic history provides examples of radical structural change over quite short periods of time. Whaling was an important industry, with some coastal communities almost entirely dependent upon it. It is now gone. In 1942, there were less than half a million Western Australians – out of a national population of seven million – living in “arguably Australia’s poorest state”¹⁴⁴ and requiring regular support from the Commonwealth Government. Over the 30 years to 1960, Western Australia's development was often slow and painful.

Table 7.1 Western Australia's International Merchandise Trade, 1955 to 1995 (\$m)

	1960	1965	1970	1975	1980	1985	1990	1995
Exports	240.1	251.2	675	1,880	3,854	8,156	12,426	18,914
Imports	92.3	153.5	242	570	1,449	7,018	3,635	6,289
3 Main Exports	Wool wheat petrol	Wool wheat petrol	Iron ore wool wheat	Iron ore wheat wool	Iron ore wheat wool	Iron ore wheat wool	Gold petro- products wheat	Gold Iron wheat
Major Trade Clients	UK Japan US	Japan US UK	Japan US China	Japan US China	Japan US China	Japan US China	Japan US Singapore Korea	Japan US Singapore China

Note: Current prices.

Source: ABS.

In 1952, a storm forced mining magnate, Lang Hancock, to fly his plane on a different route and led him to discover iron ore in the Pilbara. Nothing could be done with the

deposit until the Commonwealth Government's export embargo on iron ore was lifted almost ten years after Hancock's discovery. It was this decision, and the subsequent development of those massive iron ore deposits in the 1960s that marked the beginning of Western Australia's modern economic era.

In 1960, Charles Court, then Minister for Industry Development, visited London. He was quoted at the time, saying:

We realised in 1959-60 we were on the wrong track. We got into office obsessed with trying to get industry to the point where we could overcome the problem of unemployment that was worrying us at the time. We worked mighty hard but after a year or two it was quite obvious we were running up and down on the same spot; there was literally no response.¹⁴⁵

His meetings with various British industrialists persuaded Sir Charles to switch the government's focus from labour-intensive to capital-intensive industrial development.

Table 7.2 Leading Industries in Western Australia by Product Value, 1955-1995

	1960	1965	1970	1975	1980	1985	1990	1995
	£m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Mining	14.5	32.1	339.8	860.4	1,772	3,934	6,243	14,582
Fisheries	3.0	13.9	17.9	49.2	84	138	231	N/A
Forestry	4.9	11.3	12.7	20.0	34	N/A	N/A	N/A
Agriculture	88.3	193.8	233.4	715.3	1,446	2,602	2,758	3,860

Note: Current prices. N/A - Statistics not available for this period.

Source: ABS

The change in Western Australia's economy during the 1960s was quite spectacular. Between 1962-3 and 1967-8 the value of mineral production rose 240 per cent, in the seven years to 1974-5 production increased 420 per cent. By 1978 mineral production accounted for half the State's exports, and Western Australia had gone from being a drain on the country to contributing 22 per cent of total Australian export income.¹⁴⁶

Trends in the value of production of Western Australia's leading industries illustrate the transformation of the economy during the 1960s. In 1960, the value of agricultural product was 6 times that of mining – a proportion that remained the same in 1965. By 1970, however, the value of mining product was almost 1.5 times that of agriculture, and by 1995 it was approaching 4 times that of agriculture. Major structural change has occurred in the Western Australian economy, it can and will do so again.

7.1.1 Future study options (Economic Diversification)

It is possible to see a number of potential directions for development emerging from our analysis. Many are already the focus of government initiatives, but the rapid emergence of the knowledge economy, the consequent need for structural change and the potential

significance of environmental drivers suggest that they may be worthy of even more attention than they have received to date. Key diversification strategies might include:

Identifying and building on emerging and current strengths

- Further developing product system linkages in mining and construction to form a base for further development of high value architectural, engineering and related technical services for domestic and export markets;
- building on already advanced remote sensing and mapping activities, and further developing high value services out of the resources sector;
- developing the wine industry and further expanding export markets for premium quality wines;
- developing wine related industries, including:
 - tourism (eg. travel, accommodation, restaurants, cafes, crafts, etc.);
 - wine industry related education, training and research facilities, and
 - attractive lifestyle locations, which may in time provide the focus for knowledge industry investment attraction;
- building on Western Australia's emerging shipbuilding activities and linking them into heavy engineering activities related to offshore oil and gas exploration, drilling and recovery, mining and mineral related fabrication;
- building on ICT export successes and exploiting continued strong world demand for ICT equipment and services; and
- further developing education and health services.

Identifying and pursuing 'amenity driven' developments

- Because knowledge economy investments chase knowledge workers, and are increasingly likely to do so in the future, Perth/Fremantle and a number of coastal centres in Western Australia have the potential to develop their skills base and their attractiveness to knowledge workers with careful and strategic urban and regional development, mindful of developing and maintaining natural and social amenity, and thereby becoming foci for knowledge economy investments; and
- with increasing wealth, more competitively priced travel, improved health, longevity and lifestyle allowing retirees increasingly active leisure and encouraging more tourism out of the developing Asian countries there are likely to be more opportunities to further develop tourism in Western Australia, and the potential to greatly develop eco-tourism.

Identifying and pursuing time zone developments

- The potential to develop links between Western Australia and its time zone region to the north has not yet been fully realised – promotion and awareness among enterprises, education linkages that continue into professional life, reducing airfares and communications costs and, perhaps, some shift in social values with increased visits and migration, can all contribute to the further development of linkages between Western Australia and its time zone.

Making the most of environmental opportunities

- There are numerous examples of existing and potential businesses in the environmental industries, which could form a crucial and substantial part of a diversification strategy for Western Australia, including:
 - *Earth repair* – restoring and rehabilitating degraded and polluted ecosystems;
 - *Environmental survey* – assessing, monitoring and auditing ecosystems;
 - *Resource renewal* – reduction, reuse or recycling of what is traditionally known as ‘waste’;
 - *Sustainable energy* – researching, developing and marketing energy products that are based on renewable resources, and improving the efficiency of current energy systems through better process technology and conservation;
 - *Sustainable communities and cities* – integrating the work of architectural, building, industrial design and planning professions in the design and construction of a sustainable built environment; and
 - *Sustainable agriculture* – producing and processing food that is uncontaminated by toxic substances, pesticides and radioactive materials.

The real potential of all of these industries is worth serious exploration.

Identifying and exploiting emerging technology opportunities

- Maximising the potential competitive advantages of e-commerce;
- exploring the real longer-term potential for Western Australia to participate in microproducts industry developments; and
- exploring the real longer-term potential of biotechnology, new materials, rare earths, and nanotechnology developments in Western Australia.

7.2 Environmental issues

The pursuit of sustainable development provides fundamental challenges to the future potential and direction of the Western Australian economy. The State needs to ask some

hard questions about what it thinks is possible, and desirable, as well as what it thinks is probable at the international level in greenhouse/global warming negotiations.

Western Australia faces a paradox. On the one hand, we are considered in many respects to be well behind other rich industrial societies in several aspects of sustainable development. From this perspective, *it appears that we are not pursuing sustainable development hard enough*. On the other hand, we are environmentally world class, especially by comparison to most of our competitors, in the key industries of mining and mineral processing that dominate our economy. These competitors, however, are being given a potentially large boost in their competitiveness because they are not being asked to meet the Kyoto GHG targets that are being placed on Western Australia. From this perspective, *it appears that we are pursuing sustainable development too hard*.

7.2.1 Future study options (Greenhouse and Sustainability)

Boldness in shifting Western Australia's economic strategy towards substantial green industries and jobs and greening existing industries may be called for as there will be a huge demand for such industries, but widespread support for such radical change would need to be developed first. In the meantime, there are several avenues for investigation which the State Government might consider.

They include:

- looking urgently and seriously at the potential environmental and economic impact of climate change in Western Australia, and at the requirements of an adaptation strategy;
- investigating the potential for stricter and/or more imaginative application of EIA regulations relating to GHGE in major project approvals;
- investigating the potential for pushing the Commonwealth Government to seriously consider the establishment of a differentiated 'bubble' of GHGE targets between the Australian states, with due recognition being given to Western Australia's greater dependence on GHGE;
- looking at a similar bubble philosophy within Western Australia, with attention to sectoral shares of GHGE;
- investigating more deeply the implications of the various flexibility mechanisms of the Kyoto protocol with a view to educating Western Australian industry and influencing Australia's negotiating position concerning these mechanisms;
- exploring the benefits of arguing strongly for ecological factors (rather than trade and development) to take priority in climate change negotiations, and for policy measures which ensure a better environmental outcome on a global basis in relation to GHGE;

- looking dispassionately at the relative merits of a global carbon tax or emissions trading scheme, compared to proposed flexibility mechanisms which may penalise energy efficient Annex 1 producers;
- considering the potential of the flexibility mechanisms from the point of view of technology transfer and economic diversification, rather than (simply) as carbon credit mechanisms;
- exploring the potential of the hydrogen economy in Western Australia as a long-term solution to the current GHG constraint on further processing of minerals in Western Australia; and
- analysing the potential for green industries and jobs in the Western Australian economy, particularly those with a GHG benefit.

7.3 Broader questions for study

In addition to diversification and environmental issues, there are a number of areas in which greater understanding is required and further study would be beneficial. To support policy development we need:

- Greater understanding of the mechanisms for, and implications of, shifting the structure of production in Western Australia towards higher growth, higher value-adding activities, be it through building on history and strengths or developing new activities from scratch.
- Greater understanding of regional inequality, exploring its dynamics, causes and possible solutions.
- Greater understanding of the mobility of human capital, including the importance of lifestyle for location, services 'trade' by telecommuting, and fly-in/fly-out employment.
- Greater appreciation of the real opportunities available to Western Australia through increased linkages, cooperation and partnering with Asian countries (esp. China), and of the potential risks involved.
- Greater understanding of the importance and current effectiveness of local, state, national and sectoral innovation systems – focusing on potential mechanisms for building institutions, capabilities, organisations and linkages.
- Greater understanding of the nature of the current phase of globalisation, and the implications of investment location decisions, global competition and the death of distance.
- Greater understanding of education and skills development needs for the knowledge-based economy.

- Greater understanding and awareness of emerging business models for the knowledge economy.

All of these provide fertile ground for future study and the opportunity to develop greater understanding of the dynamics and wealth creating potential of the emerging global knowledge-based economy of the 21st century.

Notes

- ¹ For a brief introduction to these issues see Houghton, J.W. and Sheehan, P.J. (2000) *A Primer on the Knowledge Economy*, paper prepared for the National Innovation Summit by the Centre for Strategic Economic Studies, Victoria University, Melbourne. www.cfses.com
- ² Hatzichronoglou, T. (1996) *Globalisation and Competitiveness: Relevant Indicators*, STI Working Paper 1996/5, OECD, Paris, p7.
- ³ See, for example, Oman, C. (1996) *The Policy Challenges of Globalisation and Regionalisation*, Policy Brief No. 11, OECD Development Centre, OECD, Paris; Dunning, J.H. ed. (1997) *Governments, Globalisation and International Business*, Oxford University Press; and Yoffie, D. ed. (1993) *Beyond Free Trade: Firms, Governments and Global Competition*, Harvard Business School Press.
- ⁴ See Oman, C. (1996) *The Policy Challenges of Globalisation and Regionalisation*, Policy Brief No 11, OECD Development Centre, OECD, Paris; and Hatzichronoglou, T. (1996) *Globalisation and Competitiveness: Relevant Indicators*, STI Working Paper 1996/5, OECD, Paris, p9.
- ⁵ See Cantwell, J. in DTI (1999) *Economics of the Knowledge Driven Economy*, Conference Proceedings, Department of Trade and Industry, London.
- ⁶ DeVol, R.C. (1999) *America's High-Tech Economy: Growth, Development and Risks for Metropolitan Areas*, Milken Institute, Santa Monica, p9.
- ⁷ Porter, M.E. (1998) 'Clusters and the New Economics of Competition,' *Harvard Business Review*, November-December 1998, pp77-90. See also Porter, M.E. (1990) *The Competitive Advantage of Nations*, Free Press, New York.
- ⁸ DTI (1999) *Economics of the Knowledge Driven Economy*, Conference Proceedings, Department of Trade and Industry, London, p5.
- ⁹ Industry Canada (1997) 'Towards a Society Built on Knowledge,' See <http://strategis.ic.gc.ca/SSG/ih01644e.html>
- ¹⁰ DTI (1999) *Economics of the Knowledge Driven Economy*, Conference Proceedings, Department of Trade and Industry, London, p6.
- ¹¹ Charles Sigismund (1995) 'The New Knowledge Organisation', *SRI International*, p11.
- ¹² DTI (1999) *Economics of the Knowledge Driven Economy*, Conference Proceedings, Department of Trade and Industry, London, p6.
- ¹³ Often know as twin peaks dynamics. See, for example, Quah, D.T. (1996) 'Convergence Empirics Across Economies with (Some) Capital Mobility,' *Journal of Economic Growth*, 1(1) pp95-125; and Quah, D.T. (1996) 'The Invisible Hand and the Weightless Economy,' *Occasional Paper No 12*, London School of Economics.
- ¹⁴ Sheehan, P. and Tegart, G. Eds. (1998) *Working for the Future: Technology and Employment in the Global Knowledge Economy*, Victoria University Press, p100.
- ¹⁵ Soete, L. (1997) 'Macroeconomic and Structural Policy in the Knowledge-based Economy,' in *Industrial Competitiveness in the Knowledge-based Economy: The New Role of Governments*, OECD, Paris, p136.
- ¹⁶ OECD (1996) *The Knowledge-Based Economy*, OECD Paris, p14. See also David, P. and Foray, D. (1995) 'Accessing and Expanding the Science and Technology Knowledge Base,' *STI Review*, No 16, OECD, Paris.

- ¹⁷ OECD (1996) *The Knowledge-Based Economy*, OECD Paris, p16. See also OECD (1997) *National Innovation Systems*, OECD, Paris; and Edquist, C. Ed. (1997) *Systems of Innovation: Technologies, Institutions and Organizations*, Pinter, London.
- ¹⁸ OECD (1996) *The Knowledge-Based Economy*, OECD Paris, p16. See also OECD (1997) *National Innovation Systems*, OECD, Paris.
- ¹⁹ Houghton, J.W., Pappas, N. and Sheehan, P. (1999) 'New Manufacturing: One Approach to the Knowledge Economy,' CSES Working Paper No 12, Victoria University.
- ²⁰ See Drucker, P. (1990) 'The Emerging Theory of Manufacturing,' *Harvard Business Review*, May-June 1990. Quinn, B.J. (1992) *Intelligent Enterprise: A Knowledge and Services Based Paradigm for Industry*, The Free Press, New York; Drucker, P. (1998) 'The Future of Manufacturing,' Interview for *Industry Week*, September 21st 1998; Drucker, P. (1992) *Managing for the Future: The 1990s and beyond*, Truman Talley, New York; Deloitte Consulting (1998) *1998 Vision in Manufacturing: Global Report*, New York; Houghton, J.W., Pappas, N. and Sheehan, P. (1999) 'New Manufacturing: One Approach to the Knowledge Economy,' CSES Working Paper No 12, Victoria University; etc.
- ²¹ For Western Australia this suggests one possible strategy which emphasises, *inter alia*, engineering and technical services in the linked mining and construction product systems.
- ²² Ores and Metals in this chart does not include gold.
- ²³ TradeData (see <http://www.tradedate.net>).
- ²⁴ World Bank (1999) *World Development Indicators: 1999*, World Bank.
- ²⁵ World Bank (1999) *World Development Indicators*, World Bank; and Tradedata (see <http://www.tradedata.net>).
- ²⁶ World Bank (1999) *World Development Indicators: 1999*, World Bank.
- ²⁷ ABS (1999) *State Accounts*, Cat No 5220.0; ABS (1999) *International Merchandise Trade: Australia*, Cat No 5422.0.
- ²⁸ TradeData (see <http://www.tradedata.net>).
- ²⁹ Sheehan, P. & Tegart, G. (1998) *Working for the Future*, Victoria University Press, p41.
- ³⁰ BCA (1993) *Australia 2010: Creating the Future Australia*, Business Council of Australia, Melbourne, p3.
- ³¹ World Bank (1999) *World Development Indicators: 1999*, World Bank.
- ³² ABS (1999) *State Accounts*, Cat No 5220.0.
- ³³ ABS (1997) *Manufacturing Industry: Australia*, Cat No 8221.0.
- ³⁴ ABS (1999) *State Accounts*, Cat No 5220.0.
- ³⁵ SITC 79: 'transport equipment excluding road vehicles'.
- ³⁶ SITC 75: 'office and ADP machines'.
- ³⁷ Budde (1999) *Telecommunications Strategies in Australia, 1999/2000*, Paul Budde Communications; ABS (1999) *Australia Now - A Statistical Profile*; CSES analysis.
- ³⁸ For example, IPCC (1990) *Policy-Makers' Summary of the Potential Impacts of Climate Change*, UNEP.
- ³⁹ For example, IPCC (1990) *Impact Assessment of Climate Change*, UNEP.
- ⁴⁰ Paraphrased from Soria, R. (1999) 'Technology Options for the Kyoto Carbon Emission Targets and European Competitiveness', *IPTS Report*, No. 38, October 1999, European Commission, Seville, pp.29-30.

- ⁴¹ IPCC (1996) 'Summary for Policy Makers: The Economic and Social Dimensions of Climate Change', UNEP.
- ⁴² Measures for which the benefits, such as reduced energy costs or pollution emissions equal or exceed their costs, regardless of the benefits of climate change mitigation; often referred to as 'measures worth pursuing anyway'.
- ⁴³ The EU has agreed to internal variation among members to meet the collective target.
- ⁴⁴ The Protocol will not come into force until 55 parties to the UNFCCC ratify it, and parties representing at least 55 per cent of total CO₂ emissions for 1990 ratify it.
- ⁴⁵ These include McKibbin, W.J. (1998) 'Global emissions trading: a post-Kyoto proposal', *Agenda*, Vol.5, No.3, pp.299-309; McKibbin, W.J. and Wilcoxon, P.J. (1997) 'A Better Way to Slow Global Climate Change', *Brookings Policy Brief No. 17*, Brookings Institution; and Nordhaus W.D. and Boyer, J.G. 'Requiem for Kyoto: An Economic Analysis of the Kyoto Protocol', www.econ.yale.edu/~nordhaus.
- ⁴⁶ ABARE (1999) 'Economic Impacts of the Kyoto Protocol: Accounting for the Three Major Greenhouse Gases', Commonwealth of Australia, Canberra.
- ⁴⁷ Australian Greenhouse Office (1998) *The National Greenhouse Strategy*, AGO, Canberra.
- ⁴⁸ See for example, 'Climate Change: Australia's National Report under the UNFCCC, Commonwealth of Australia (1994) and UNFCCC, 'Report on the in-depth review of the national communication of Australia', FCCC/IDR.1/AUS, 1995.
- ⁴⁹ Brundtland Report (1987).
- ⁵⁰ InterGovernmental Agreement on the Environment (1992). Agreed to by the Council of Australian Governments (COAG).
- ⁵¹ CofA (1996) *Australia: State of the Environment 1996*, Canberra.
- ⁵² Maurice Strong, Chairman, Earth Council.
- ⁵³ For example, World Business Council for Sustainable Development - <http://www.wbcsd.ch>
- ⁵⁴ See for example John Elkington (1997) *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*, Capstone Publishing.
- ⁵⁵ <http://www.environ.wa.gov.au/pubs/soe>
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- ¹⁰⁶ If, for example, China's human rights record becomes a major trade barrier.
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- ¹¹³ See <http://www.dola.wa.gov.au>

- ¹¹⁴ See <http://www.commerce.wa.gov.au/business/jervoise/jervoifr.htm>
- ¹¹⁵ ERG accounted for approximately 75 per cent of Western Australia's ICT equipment exports in 1998.
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- ¹¹⁷ DEET 1996, quoted in "A Strategy for Western Australia's Education and Training Industry Sector", Department of Commerce and Trade, Perth, undated
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