
Industrial Land Development in Western Australia Stage 1 Report

A Review of Global Trends,
Innovation and Best Practice

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Executive Summary

The following report forms the first stage of a four stage project undertaken on behalf of LandCorp and the WA Department of Planning and Infrastructure (DPI) designed to assist the State Government of Western Australia in effectively validating the commercial relevance of the forthcoming Industrial Land Strategy (ILS).

The specific questions this study was designed to address were the current status of world trends, policies and governance that may impact or shape industrial land use in the future. The current best practice for industrial land development at a global level and emerging innovations in the planning and design of industrial estates.

Also to be investigated in this study is the forecast of which industries might be emerging or declining in the future and their likely impact on industrial land requirements in WA. Finally, the study will investigate the current forces driving industrial land development, their impact on future industrial land development at the state, national and international level, and the current and future needs of the WA industrial land market.

Overview of the report and methodology

This report is structured around seven chapters. Chapter 1 examines the global trends currently influencing economic growth and the impact of the current global financial crisis (GFC). Chapter 2 reviews trends in key export markets important to WA. Chapter 3 examines the nature of regional industry clusters and the emergence of global trading hubs and production/supply chain networks. In chapters 4 and 5 the report reviews trends in key industries relevant to industrial land use and WA in particular. Also the issue of environmental sustainability as a major driver. Chapter 6 addresses the different needs of large and small firms before reviewing best practice trends in industrial land design and planning. Finally, in Chapter 7 the report examines the current trends and future outlook for industrial land development in Australia and Western Australia.

The methodology used in this report comprised a major review of academic and professional literature and interviews with a panel of international and national experts who provided case studies material for the report. Some interviews were also held with local WA based experts including a round table discussion with the Industrial Property Committee of the Property Council of Australia.

Chapter 1: Key findings – Global Mega-Trends and the GFC

There are six “mega-trends” shaping the future of the world economy: i) globalisation; ii) the changing demographics of the global workforce led by rising urbanisation in China and India and aging populations in Japan and Europe; iii) the continuing rise of information and communications technologies (ICT); iv) the pressure for greater corporate social responsibility and environmental sustainability; v) the rise of the “omni-consumer” plugged into a world wide online community via Web 2.0 technologies; and vi) the growth of globally integrated enterprises or trans-national corporations (TNC's).

The Global Financial Crisis[GFC] is likely to impact differently depending on the industry sector. For example, tourism and travel industries, housing and construction, education and training, plus leisure and entertainment sectors may do well. This will also be driven by lower costs or greater free time due to unemployment.

Industrial land was previously seen as an attractive sector in the property market, but it is now viewed by many as a low growth, volatile sector. This may result in institutional property owners being less willing to invest in this sector in the future. Combined with this, the impact of the GFC on share prices and market confidence is likely to have serious impacts on the ability to raise equity and debt for several years.

A key driver of future change will be the continuing development of ICT which is set to accelerate the level of competition within markets. It enables faster, real time distribution within supply chains and enhanced responsiveness to consumer demand. This is changing the face of industrial warehousing, distribution and transportation logistics.

There is a focus on returning to core business within both corporations and countries. Cost reduction in labour, transportation and energy use will continue to be a major focus of industries. Major TNC or globally integrated enterprises are seeking to consolidate their operations and enhance the efficiencies of their worldwide production networks and supply chains.

Many of the developing and transitional economies are now destinations for most of the major investment projects. These economies now host over 55% of new projects and more than 60% of the estimated jobs created in recent years. Partnerships, collaborations and co-operative alliances are key business models through which businesses now add value. This will impact new warehousing and distribution mega-complexes.

The anticipated decoupling of major economies such as China from the USA has not occurred and greater international trade or cross-border investment is now only serving to lock world economies more tightly together.

Chapter 2: Key findings – Trends in Key Export Markets

WA is a major player in Australia's international trade comprising 38% of all merchandise exports and 14% of all merchandise imports during 2007/2008 (ABS, 2009). The Middle East is emerging as an important global trading hub and becoming an important export market for WA. Globalisation will continue to intensify with some regions such as Australasia and South America becoming more dominant in the supply of particular commodities or produce (e.g. grains, dairy products).

South East Asia is one of the fastest growing consumer markets in the world. Its geographic proximity to Australia and particularly to WA makes it an important trading partner. Thailand is one of the other major markets in South East Asia and an important trading partner for WA. The forces of globalisation and demographic change are shaping the face of world's economies and also driving changes in the main export markets into which Western Australia will trade.

China will be a key market in demographic trend changes and India is forecast to surpass China as the world's most populous nation. Joint ventures with overseas partners are seeing the emergence of a diversification of Chinese exports, with greater value adding, R&D and high technology investments.

Chapter 3: Key findings – Clustering and Global Trading Hubs

At the heart of the world's major production networks are a small number of trans-national corporations (TNC). Six industries dominate the list of Top 100 largest TNCs. These include: i) motor vehicles (13 firms); ii) petroleum products (10 firms); iii) electrical and

electronic equipment manufacturers (9 firms); iv) utilities (8 firms); v) telecommunications (8 firms); and vi) pharmaceuticals (7 firms). These six industries account for around 55% of the largest TNCs. Another 23% comprise metals, non-metallic products, chemicals, retail and wholesale trade, and food and beverage manufacturers. The majority (72%) of these Top 100 TNCs come from the same five countries: the USA, France, Germany, the UK and Japan.

Economic development requires integrated, multi-modal transportation systems and in regional economies this involves collaboration across multiple jurisdictions. This type of infrastructure investment has now become typical across Asia, Africa and Latin America.

As major corporations begin to expand into trans-national organisations they create global supply chain networks moving outside national boundaries. This has typically seen them move operations offshore from their home countries to areas that offer competitive labour costs, tax regimes and other incentives, or access to markets, resources and skills.

Increasing levels of population within massive regional cities will create concentrations of labour for the development of new industries, as well as a significant consumer markets for the products and services generated by them.

A critical issue for attracting TNC firms into WA regional economic clusters is the provision of adequate levels of infrastructure. This includes power, utilities, telecommunications, and transportation services, in particular efficient sea, air, road and rail logistics hubs that serve to reduce freight handling costs critical within global production networks.

Levels of economic development likely to emerge from the WA region through global production networks are contingent on the configuration and coordination of four key elements encompassing the firms and their respective industry sectors, the government and non-government institutions engaged in the network and the network itself.

Western Australia has the mining and energy sector providing the export driven focal point for an industry cluster, supported by a range of linkage industries that in turn support more numerous population driven sectors. However, locally owned Western Australian firms, particularly small to medium sized enterprises (SMEs) are likely to be more embedded in the region than “footloose” trans-nationals.

Chapter 4: Key findings – World Industry Trends in Supply Chain Logistics

The emergence of the major regional trading hubs will be significant shapers of industrial land use. For supply chains to work efficiently it is important for member organisations to be highly flexible and to ensure that each is focused on its own operational efficiency. The relationships that exist between the various organisations comprising the supply chain not only need to be efficient, but must also have strong inter-firm relationships built on trust, loyalty and a sense of common purpose.

The efficient management of supply chains is now one of the most important aspects of modern business. In Europe the trend has been towards retailers abandoning warehousing operations and leaving this problem to manufacturers. Supply chain management is now being driven by the application of ICT. In many consumer markets, accurate and timely data is now available on customer purchasing behaviours and preferences with the ability to respond quickly to market demands with relatively low volumes but a high variety of products that are tailored to end user requirements.

Technology is also a key driver of change within the logistics supply chain sector. Warehouse automation is requiring larger floor plans and higher ceilings. Radio Frequency Identification (RFID) technology is now becoming common place within major logistics systems.

“Green supply chain” concepts are emerging that will see attempts to reduce waste and carbon emissions throughout the entire product lifecycle, from raw materials sourcing to the recycling of discarded products. As governments take action to reduce carbon dioxide emissions significantly out to 2050, there will be substantial pressure on logistics firms to reduce energy consumption and also costs. The need to lower operating costs through more efficient use of transportation networks and subsequent fuel economies will be joined by growing pressure for more environmental sustainability.

Innovation in the transportation sector has traditionally been low compared to other industries. For example, innovation intensity (as measured by investment in new technologies or ways of doing business) represents around 8.5% of the total budgets for manufacturers in the motor vehicle industry in Europe, compared to 7.2% in the electronics industry and 5.6% in software and telecommunications. For transportation industries this figure is only 2.1%.

Third Party Logistics (3PL) specialists will be planning the location of warehouse distribution sites as well as offering economies of scale and scope in logistics operations. It may be prohibitively expensive for a single operator to set up systems offering an opportunity for large 3PL firms to service multiple clients within a specific industry or group of industries. Manufacturers may collaborate with each other to create a combined warehouse model that may be managed by 3PL specialist service providers.

Containers have been the fastest growing sector of maritime industries during the past twenty years and this trend is anticipated to continue. Trade liberalisation, globalisation and outsourcing by globally integrated business; have resulted in bulk cargo now being increasingly carried in containers. Container terminals are playing a critical role in this logistics supply chain, and the overall competitiveness of port and regional logistics networks are likely to be heavily dependent on how efficient these terminals are.

The main container trade corridors are where the greatest volume of traffic is from Asia to either North America or Europe. Port efficiency is now a critical aspect of a national economy and best practice requires the use of the latest loading, unloading technologies, as well as well regulated dockside employment not prone to militant industrial action. China looks set to grow as a major logistics hub, but there is also an emerging trend towards “near-shoring” in which supply chains are being directed towards countries with closer geographic proximity to focal firms. This helps to reduce transportation costs and may provide faster response times.

The viability of smaller ports is now heavily dependent on the traffic flowing into the larger hub ports. The port also needs to be well serviced in terms of infrastructure, facilities and services. Many ports are now public-private partnerships involving either public land or port functions regulation with privately owned cargo handling, or publicly managed port functions regulation and privately provided land and cargo handling.

Chapter 5: Key findings – World Industry Trends and Sustainability

The main industries reviewed for this study were warehousing, logistics, transportation and storage, manufacturing, agribusiness, commodities and alternative fuels as these were deemed to be the most relevant to the future industrial land use in WA.

Warehousing, logistics, transportation and storage:

For many retailers the need to provide customers with a wide assortment of products under a single roof is becoming a key trend. The trend towards the “big box” stores or hypermarkets is not new and has been developing throughout the past twenty years.

In the United States the trend has been towards “power centres”, or a site containing three or more large big box “category killer” stores covering from 25,000 square metres to over 100,000 square metres. This trend towards large retail ‘bulky goods’ sites has also been taking place in Australia and comprised around 40% of all new retail construction in 2006.

The emergence of bulky goods retail sites within Australia emerged from the early 1990s and has shown a number of trends that are likely to continue into the future. **There has been a focus on precincts**, with bulky goods retailers clustering together within the same areas. A move for cheaper rents by the large big-box retailers remains a challenge to many industrial estates as it may create problems for traffic flows and congestion around warehouse distribution centres.

There is now a nexus between technology and societal demands that allows the customer to play a greater role in the design and development of products, and for global production networks to be closely integrated via modern telecommunications systems.

Manufacturing:

One of the key trends in manufacturing is the drift of production from the developed to the emerging economies. By 2015 the share of global petrochemical production taking place in Asia is expected to grow to 34% with North America and Europe’s share falling to 29% and 23% respectively (Ramesh, 2007). Some predictions suggest that by 2020 much of the world’s petrochemical and plastics manufacturing will take place in the Middle East.

If significant improvements in energy efficiency are not made as a result of the introduction of new technologies, global demand for energy is forecast to rise by over 120% by 2030, with around 75% of this demand coming from emerging economies such as India and China.

Mining and Resources:

The mining and resources boom that has seen significant investment in Western Australia over recent years was driven in part by the demand for mineral ores from China and the rising prices for minerals and energy caused by a lack of supply due to insufficient investment in the 1990s. This boom is now ended and the outlook over the period to 2030 is for more subdued growth. Much of the demand for mineral ores was due to the rapid industrialisation of China and the medium term outlook is for demand to increase from the period 2010/2011 to 2015 before slowing in the years to 2030. Demand for LNG will continue to grow as alternative sources of energy other than locally produced coal rises in China. Future investment in the WA mining sector will be contingent on the demand from

China and while this may continue to be strong over the medium term, the prices for such metals may not be as high as has been experienced in recent years.

Agribusiness and Food:

International trade in agricultural produce and food ranks alongside manufacturing, minerals and energy as one of the most significant global industries. It is also one of the most important export industries for Australia and a potentially important user of industrial land. Rising demand for food within the increasingly affluent but urbanised populations of China and India will drive international trade in world food supply because these nations will not be able to supply their domestic consumption with local production. Around 75% of demand for food between now and 2030 is anticipated to come from developing economies.

Value adding to the food chain via processing is also likely to become an important opportunity for Australia. The ability to plug into the global food supply chain, particularly in servicing the needs of markets such as China and India, augurs well for industrial land use. This would be allocated to the processing and storage of food and agricultural produce.

Alternative fuels:

The need to address climate change is expected to have a transformative effect on all types of business. One area that is likely to become important over coming decades is the introduction of clean technologies (Clean-Tech). The concept of **Clean-Tech** is an umbrella term for a range of technologies, goods and services that aim to minimize or eliminate the environmental impact of economic activity and form the basis of corporate responses to global climate change.

Investment into renewable energy sources is increasing rapidly across the globe and is set to further increase as more countries set carbon emission targets, introduce carbon trading schemes and set targets for the production of renewable energy. In Australia, the bio-fuels industry is still in an early stage of development. Both ethanol and bio-diesel are produced with Federal Government targets set at around 350 million litres by 2010.

There are also some ocean based renewable power options that could have potential for WA, such as ocean based wind farm or wave power.

Chapter 6: Key findings – Best Practice in Industrial Land Use

A variety of factors influence the demand for industrial land and attract potential tenants to an industrial estate including access, lot size, utilities and proximity to business services. Industrial estate development involves a generic four stage planning process that should include the following key objectives: i) anticipate the future demand; ii) act for the future by appropriate land assembly; iii) actualise the estate through development and marketing; and iv) assimilate the estate into the wider economic hinterland with a capacity to ensure that it is maintained as a competitive business environment for occupants.

Strong governance involvement within the initial stages of a land development project is essential for the successful delivery of an industrial estate in addition to smooth cohesion and agreement between relevant government agencies. A healthy balance between public and private sector participation is critical during the industrial land development

process with a long term strategy and clear vision required to ensure a sufficient supply of land and infrastructure is realised and delivered over the project cycle.

The “Global Transpark” evolution has evolved from the need by multinational companies seeking a competitive edge in an aggressive and fast paced global market. Industrial clustering is an effective mechanism to boost economic growth and stimulate international competitiveness. However, a mix of flexibility and diversity in regards to planning, building design, zoning and allowed uses is being implemented globally to attract tenants to industrial developments.

Sustainability is a key trend for the future and is now emerging as an important focus for businesses. Attention is now given to the creation of sustainable supply chains that can reduce waste and environmentally harmful spill-over effects. “Industrial Symbiosis” engages traditionally separate industries in a collective approach to create competitive advantage by involving physical exchange of materials, energy, water and or by-products.

Effective industrial clustering presents the ability to innovate under globalisation and adds to the key competitiveness of an economy. “Eco Industrial Estates” have emerged as a result of increasing pollution of the environment, growing pressure on natural resources and the resulting demands for sustainable industrial development. In planning for sustainable industrial estates, a long term strategic horizon must be developed that can ensure the needs of industrial land users are being catered for.

In regards to Western Australia, careful attention to strategic planning and the ability to provide adequate infrastructure for the type of industries that will occupy the site is required. Planning for industrial estates must be both long term in nature and sufficiently flexible to allow for adaptation and change to meet market conditions.

Chapter 7: Key findings – Australia’s Property Sector and WA in Context

Demand for industrial property is influenced by drivers and shapers. Key drivers are market influenced and include the performance of major export oriented industries and the overall growth in the national economy. Key shapers are government policy and investment driven and include investment in infrastructure, policy and planning guidelines.

Over recent decades there has been a major shift in the nature of industrial land in Australia away from smaller lots dominated by manufacturing, towards larger, lower cost sites in major growth and transport corridors dominated by warehousing and distribution. The same trends in supply chain and logistics management taking place around the world can be found in Australia, including the importance of ICT deployment and the role of 3PL service firms. Warehouse construction across Australia has risen sharply in the past 6 to 12 years with a similar trend found across most capital cities.

WA is a regional economy heavily dependent on the export focused mining and resources sector which are linked into global supply chains servicing China, Japan, Korea and India. Major imports are fertiliser, petroleum, motor vehicles, construction and household goods sourced from Singapore, Japan, the UK, USA and China. Major industrial land use, particularly heavy industries, will be dependent on trends in these major export and import sectors. As with other countries Australia has seen a significant growth in container traffic through its ports, however much of this growth is driven by increases in imports, and WA has experienced more growth in exports than other states due to the mining and resources sector’s boom period over the past decade.

Significant investment has taken place across Australia in ports and rail facilities; however, much of this has lagged the growth in the economy and internationally the country rates poorly in terms of such key transport and logistics infrastructure. WA has performed no better than the rest of Australia and many property developers and industry have concerns that road, rail and port access is inadequate to meet the needs of industry.

A major development in industrial land estate development and management is the “own-develop-manage” model in which the developer becomes a property manager taking care of the needs of tenants. This is epitomised by Goodman in Australia and Asia and ProLogis and Gazeley in the USA and UK. This has seen many Australian industrial estates (which are mainly controlled by major developers) more focused on attracting tenant pre-commitment than selling land. This type of development is common elsewhere in Australia but has not taken hold as strongly in WA.

Much of the manufacturing in WA is focused on servicing the main population driven industries such as housing and construction. WA has experienced significant growth in these sectors over recent years as the resources boom has taken hold. However, most of the general and light industrial land in Perth is allocated to storage, distribution (32%) rather than manufacturing (24%). This reflects the relative decline of manufacturing and the emergence of logistics and warehousing. Commercial offices, retailing and other users are becoming an increasing proportion of the industrial land use in these estates suggesting a trend towards mixed use as found elsewhere in Australia, Europe, the UK and USA.

Industrial land values in Perth have moved upwards to similar levels found in other cities. WA will need to adopt a more integrated approach to the development and management of industrial land if it is to remain competitive into the future. Overcoming planning and infrastructure bottlenecks will be a key challenge.

Chapter 1

Introduction and Context of the Report

An Overview of the Report

The following report is Stage 1 of a larger study into the current and future global trends that are likely to impact on industrial land development over coming decades. It focuses on current best practice in industrial land planning, estate design and governance, as well as forces driving demand for industrial land. In addressing these trends, attention was given to the major developments influencing industries and world trade, including innovation and emerging sectors.

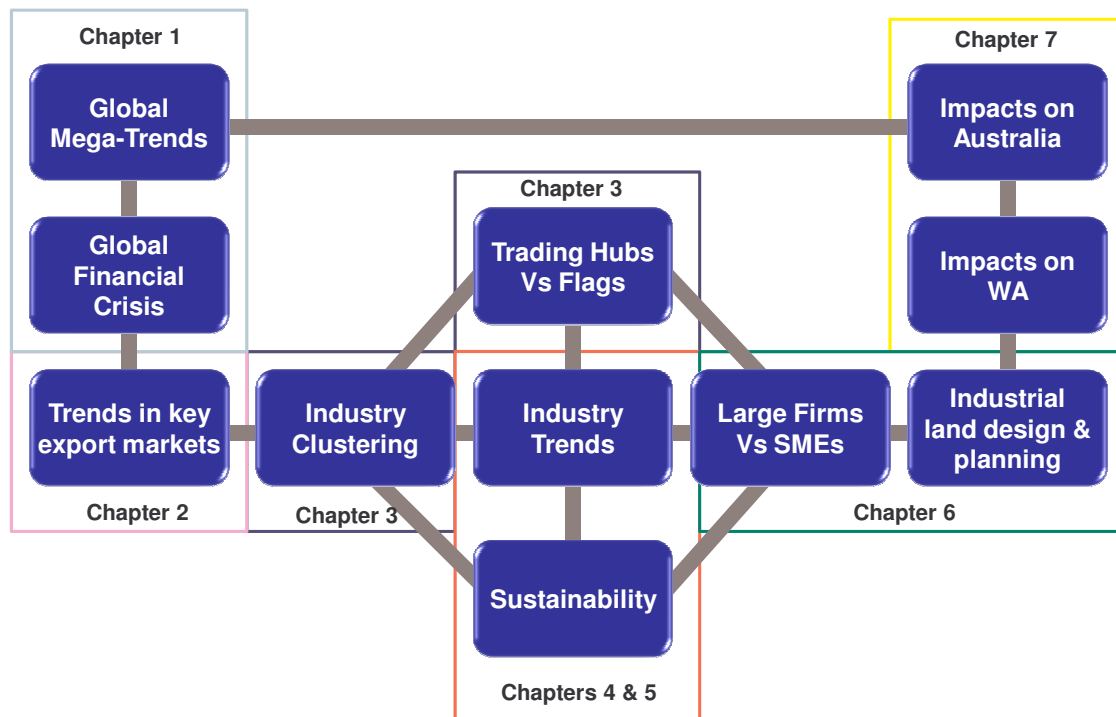


Figure 1.1: The General Structure of the Report

Figure 1.1 illustrates the layout of the report, which commences with a review of the global “mega-trends” likely to drive change in the world’s economy over the coming decades.

The impact of the Global Financial Crisis (GFC) is briefly considered before an overview of trends in the key export markets of Western Australia in Chapter 2. Attention is then given in Chapter 3 to several areas considered important to understanding the major international trends likely to impact on industrial land. These relate to the emergence of trading hubs being developed by various governments around the world seeking to attract inbound investment plus the related issues of industrial clustering. In Chapters 4 and 5 we examine specific industry trends likely to drive the development of such hubs, the likely emerging and declining industries and the quest for environmental and social sustainability. In Chapter 6 the differing needs of large and small firms in such environments are examined along with the best practice trends in industrial land design and planning. Finally, in Chapter 7 we examine these trends in terms of their likely impact on industrial land planning, development and usage on the Australian and Western Australian industrial land market.

Mega Trends Influencing World Markets

While the GFC has dominated media and government attention in recent months, the longer term outlook for the world economy is likely to be driven by major trends that have had their antecedents in past decades. At least six “mega-trends” have been identified as likely to shape the world economy out to 2020 (IBM, 2008). These forces have been emerging for several years prior to the eruption of the GFC and are likely to continue into the future.

Mega Trend 1 – Globalisation

The first of these trends is the globalisation of industries and markets. Globalisation has been an emerging trend for much of the past twenty years, however, its pace and scope is anticipated to increase dramatically in coming decades. According to the World Bank, the proportion of goods and services that are traded rose 40% to almost 60% between 1990 and 2005. Statistics from the United Nations and the IMF indicate that in the same period, the number of trans-national companies doubled to 70,000; and in 2005 global capital flows increased to more than \$600bn, the highest amount ever.

Mega Trend 2 – Changing Nature of the Global Workforce

The global labour force is changing profoundly in age and location. In 2008, for the first time in history, more people will live in cities than rural environments. Between 2000 and 2020, 94% of the 1.8 billion growth in the world’s population will be in developing countries. New technologies are spreading faster and across wider geographic areas than previously with a greater penetration into national economies. The average consumer now has more spending power across most economies with rising affluence in such countries as China and India. They also have access to more information on which to base their spending decisions. This is likely to accelerate the level of competition within markets.

Mega Trend 3 – The Continuing Development of ICT

A key driver of future change will be the continuing development of information and communications technologies (ICT). During 2006 and 2007, world internet usage more than doubled to almost 1.2 billion people. This is anticipated to rise to around 2 billion people by 2010. One in five workers throughout most of the OECD countries are employed in the ICT sector or related occupations (IBM, 2008). The convergence of

mobile telecommunications and the internet will transform the nature of global consumer markets, but it will also have significant impact on supply chain management and logistics (Gordon, 2004).

Mega Trend 4 – Corporate Social Responsibility and Sustainability

Corporate Social Responsibility has evolved from a voluntary add-on to a corporate imperative. Businesses now face increased scrutiny from consumers and workers. This is reflected, for example, in the growth of the Fair-trade Label which, according to the Cooperative Bank's Ethical Consumerism Report, grew by 40% per annum between 2000 and 2007. It is also being reflected by the increased focus from corporate entities on triple bottom line reporting. Also pushed by companies to be rated for their efforts in sustainability such as by inclusion in the *Dow Jones Sustainability Index* and the move towards green building ratings. Investors are also paying more attention to environmental and social responsibility factors that affect long-term returns. Unpredictable risks, in particular political uncertainty, loom in the background of decisions that will shape the world out to 2020. Perceptions of how a country manages the risks of violence are of utmost importance. Almost two in five respondents in a Lloyd of London and Economist Intelligence Unit (EIU) survey said that they had avoided investments in specific territories due to their concerns over violence (Dirks, Keeling & Lyons, 2008).

Mega Trend 5 – The Rise of the “Omni-Consumer”

Linked to globalisation is the application of the Internet as a key source of communication that will empower consumers through access to greater information. The use of social networking technologies such as Web 2.0 is now more prolific amongst Chinese consumers than Americans. The future is likely to see increasing use of mobile internet technologies enabling consumers to have significantly greater access to information than has previously been the case. This will empower consumers who are expected to use this information to search for value and lead to the rise of online shopping and marketing.

Web 2.0 technologies are expected to morph into Web 3.0 systems that will anticipate consumer tastes and pre-select information and product/service offerings. Consumers will engage more both with each other, and with business. In emerging markets such as China and India, many consumers will leapfrog into these new technologies (Euromonitor, 2009c).

Mega Trend 6 – Globally Integrated Enterprises

Rapid innovation in business models is also heralding the era of the globally integrated enterprise. The production process of globally integrated enterprises is being spread to the best production locations, resulting in worldwide integration of production and value delivery. Companies are retaining the activities they do best, but are looking for new locations for them. According to the 2008 United Nations *World Investment Report*, the number of green-field projects increased by more than 25% to around 12,000 during the period 2003 to 2006 (UN, 2008). IBM's Plant Location International Global Investment Location Database, shows that developed countries remain the source of the bulk of projects, but the rate of growth in projects coming from developing countries is as fast as those from the United States (e.g. 23%). Developing and transitional economies are now the destination for the majority of investment projects, hosting more than 55% of new projects, with more than 60% of the estimated jobs created in 2006. The typical project is also changing, with service activities now rivalling manufacturing (Dirks, Keeling & Lyons, 2008)..

Partnerships, collaborations and cooperation are now the key channels through which businesses can add value. For example, in a recent EIU report, more than half of senior executives surveyed said that they had changed their business model in the past three years to take greater advantage of collaborative partnerships (IBM, 2008). Businesses are increasingly using research and development (R&D) internally, and mergers and acquisitions (M&A) externally to expand their core competencies. Over the period 2000 to 2005, R&D spending by firms in developed countries increased from \$370 billion to around \$500 billion (OECD, 2009). The EIU's *World Investment Prospectus* shows that M&A activity has grown steadily since 2003, and exceeded \$1,000 billion in 2007 (IBM, 2009).

The Impact of Mega Trends on Global Investment

These “mega-trends” are therefore shaping the future of the global economy out to 2020 and beyond. They are likely to impact on global investment in a variety of ways. As businesses focus more on ways to secure lower operating costs and enhanced global market access, key decisions will revolve around whether to retain, shed, or outsource, or partner in order to expand or maintain market position. Global outsourcing already rivals offshore investment and is likely to increase as supply chains become more tightly integrated with the assistance of ICT. Government agencies seeking to attract inbound investment or regional economic development must recognise these trends. Also, provide an environment with the right mix of hard and soft infrastructure, market access, supporting & related industries and regulatory frameworks.

OBSERVATION

Government agencies seeking to attract investment or regional economic development must recognise these trends and provide an environment with the right mix of hard and soft infrastructure, market access, supporting and related industries and regulatory frameworks.

The Global Financial Crisis of 2008-2010

Any consideration of current world industry trends cannot ignore the Global Financial Crisis (GFC), which emerged in late 2008 following the collapse of several major financial institutions in key financial centres around the world. However, the GFC was beginning to emerge in 2007 with weakening of investor confidence in mid-2007 on the back of concerns of the value of securitized mortgages underpinned by sub-prime mortgages.

The United States remains the key

The United States remains the main engine of world economic growth, despite the emergence in recent years of the so-called BRIC emerging economies of Brazil, Russia, India and China. While there was some initial hope that the economic malaise emerging within the US economy as a result of the collapsing banking and property sector could be

contained, this was not to be. Analysis by the IMF suggests that the anticipated decoupling of other major economies such as China from the USA has not occurred and that greater international trade or cross-border investment will only serve to lock the economies of the world more tightly together (Helbling et.al., 2007). Until the US economy starts to recover, the worldwide economic recession is likely to continue to dampen investment and keep unemployment rates high (Davis & Aliaga-Diaz, 2009).

Table 1.1: Growth has collapsed within the OECD

	1996-2005	2006	2007	2008	2009	2010	2008 Q4	2009 Q4	2110 Q4
	average								
Real GDP Growth ¹	2.7%	3.1%	2.7%	0.9%	-4.3%	-0.1%	-1.5%	3.4%	1.1%
United States	3.2%	2.8%	2.0%	1.1%	-4.0%	0.0%	-0.8%	-3.5%	1.1%
Euro Area	2.1%	3.0%	2.6%	0.7%	-4.1%	-0.3%	-1.4%	-3.5%	0.8%
Japan	1.1%	2.0%	2.4%	-0.6%	-6.6%	-0.5%	-4.3%	-4.4%	0.4%
Output gap ²	-0.2%	0.7%	1.0%	-0.4%	-6.5%	-8.5%			
Unemployment rate ³	6.6%	6.0%	5.6%	6.0%	8.4%	9.9%	6.5%	9.3%	10.1%
Fiscal balance ^a	-2.2%	-1.3%	-1.4%	-3.0%	-7.2%	-8.7%			
<i>Memorandum items</i>									
World real trade growth	7.0%	9.5%	6.9%	2.5%	-13.2%	1.5%			
World real GDP growth ^{aa}	3.4%	4.3%	4.1%	2.2%	-2.7%	1.2%			

¹ Year on year increase; last three columns show the increase over a year earlier

² Per cent of potential GDP; Estimates of potential have not been revised and may fall

³ Per cent of labour force

^a Per cent of GDP

^{aa} OECD countries only plus Brazil, Russia, China and India – approx 82% of world GDP

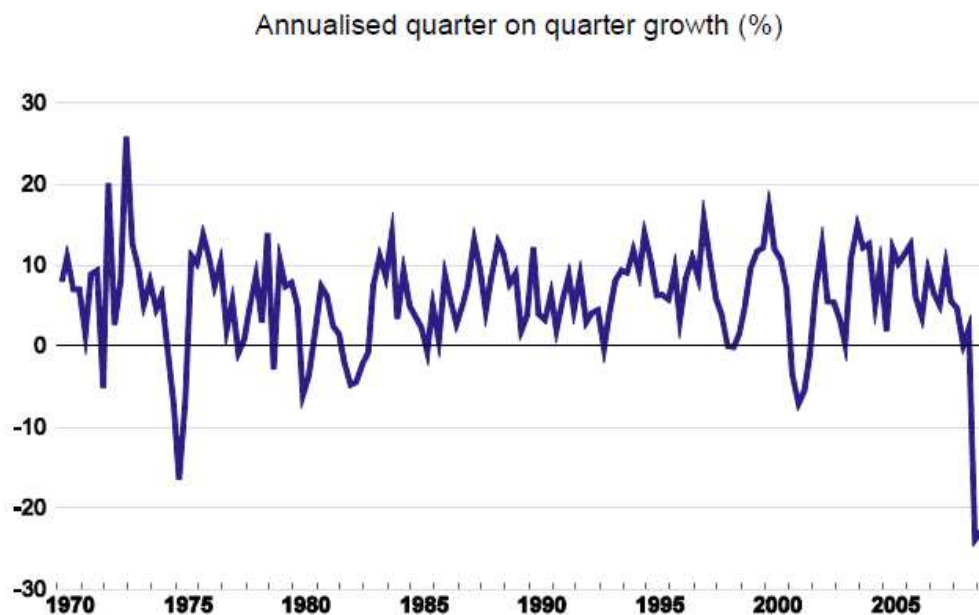
Source: OECD (2009)

The likely impact on World Economic Growth

In 2009 the International Monetary Fund (IMF) updated its *World Economic Outlook* forecasting that real GDP growth throughout the global economy would be 0.5%. Advanced economies were predicted to shrink by 2% this year with China and India experiencing significantly diminished levels of growth. However, world economic growth was predicted to recover by 2010 with a forecast of around 3%, although many analysts suggest that the recession may continue well into 2011 (Euromonitor, 2009a).

As the GFC progresses the forecasts for the extent of the slowdown continue to grow. The latest OECD forecasts show that growth in OECD countries is forecast to fall significantly in 2009 and continue to be negative in 2010. This will lead to a significant increase in the unemployment rate (OECD, 2009a).

The extent that this economic slowdown will affect world industrial markets can be seen from the magnitude of the slowdown in world trade. This is the largest slowdown in world trade since the post war period and is likely to have some ongoing affects for a number of years. This will mean that new factory and production facilities are likely to be deferred until world trade levels recover and get back to 2007/08 levels.



Note: 2009q1 is an estimate.

Source: OECD.

Figure 1.2: World Trade Growth has plummeted

There may be some winners

The duration of the GFC is difficult to predict, however, there are some potential opportunities likely to emerge from it. Property prices and interest rates have fallen along with the cost of fuel and many consumer goods. This offers some opportunity for investors and the pattern of activity that emerged in previous recessions saw an increase in new entrepreneurial ventures.

Some sectors that are likely to experience the impact of the GFC are tourism and travel industries; housing and construction; education and training; entertainment and leisure (Euromonitor, 2009b).

Scarcity and Competition for Capital

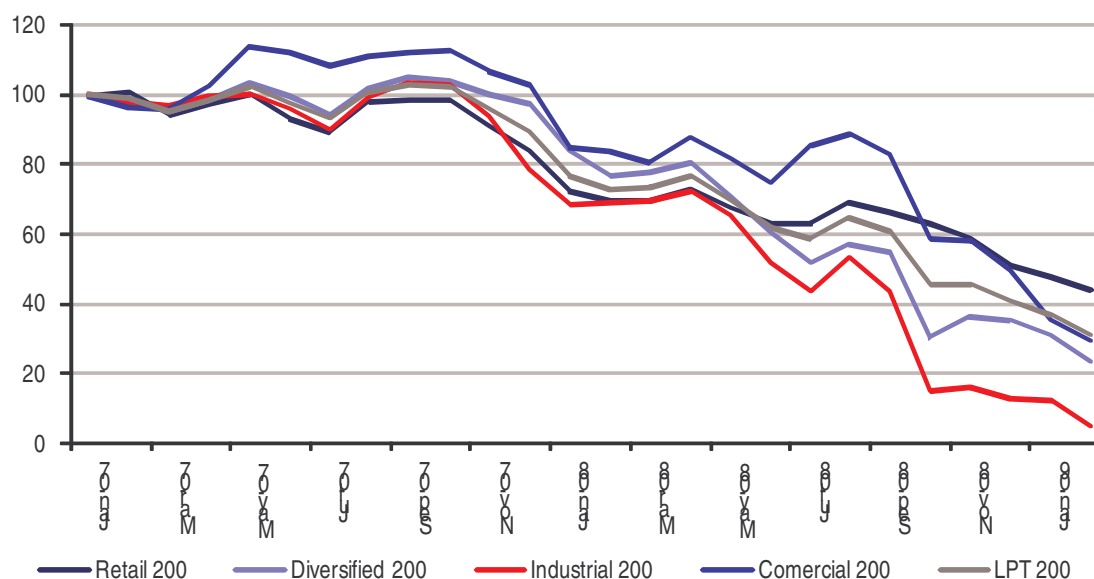
The GFC and falling energy and commodity prices are seeing many billions of dollars of investment scaled back, deferred and in some cases abandoned across the globe. While the world economy will recover from the GFC a longer lasting implication is likely to be a scarcity of capital for large investment projects and a higher level of competition for capital. This has significant impacts for the WA economy which has seen boom conditions in recent years, largely driven by the impacts of over \$50 billion in major investment projects being developed. Competition for capital is likely to mean that companies will be looking increasingly hard at what projects are proceeding and in the case of industrial projects where in the world these are being located.

GFC impact on industrial property markets in WA

Nevertheless, the GFC is predicted to have a negative impact on industrial property markets within Australia over the short term. Growth in this sector is closely linked to overall economic growth and is sensitive to domestic retail consumption. Demand for warehousing and storage space may weaken as manufacturing inventory levels decline along with imports. The ANZ has predicted a weakening of rental growth for industrial property across Australia over the course of 2009 and 2010 (Joiner, 2009). While hopefully the GFC only has a short term implication on the financial markets and economy, its implications on the Perth industrial market are likely to be more long term

A key factor leading to the GFC was the miss-pricing and underpricing of risk. The pricing of risk has now swung a full circle and is being priced at a very high price. After a number of years where growing land values and rents and falling cap rates meant that industrial was seen as an attractive property market sector. It is now seen as a low growth and volatile sector by many and this will mean that for institutional property owners industrial as a sector will struggle to attract capital.

The change in sentiment towards investment in the industrial market can be seen from the fact that the A-REITS (Australian Real Estate Investment Trust) which only focus on the industrial market have seen the greatest fall in value of all LPT sectors as shown in the following chart. This shows that the industrial A-REITS total returns have fallen by 95% over the last two years; primarily due to a fall in their share price. An example of this is that Goodman's share price got to slightly over \$6 in November 2007 but as at March 2009 is around 30c. The magnitude of the change in share prices and sentiment will have serious impacts on the ability of these companies to raise equity and debt for a number of years. This is likely to affect the amount of development that they undertake for some years to come not just in the short term.



Source: S&P, UBS estimates

Figure 1.3: Australian LPT/REIT Sub-sector Total Return Index

OBSERVATION

There is a high cost of gearing up and down for a national player when entering a market like Perth. The sentiment towards the industrial sector and competition for limited capital resources is likely to last at least a couple of years. This together with gearing up costs and a greater focus on existing business is likely to mean that we do not see much focus on Perth, from the A-REITS and other national developers over the next two years and it may take as much as five years or more before this situation starts to see any significant change.

This change in sentiment towards the industrial sector means that while many REITS were building industrial land banks this type of activity is now likely to be far more limited, particularly in remote locations like Perth. Even the capital available to do industrial development is now far more limited and a major local industrial developer has indicated that they have turned away a number of major requirements and potential development opportunities during 2009, due to a lack of available capital.

While before the GFC more A-REITS were viewing Perth as a growth opportunity there has now been a significant pull back from this. Australand had set up a commercial office here with a focus on industrial development but this has now been closed and Goodman has indicated that in the current environment that they would be unlikely to purchase any additional large land holdings in Perth. However, feedback from the REITS now shows that Perth is not on the radar for most developers in any large way as a place to invest generally and those that would certainly would not be looking to do industrial land development in Perth.

Chapter 1: Key Points

- Some WA sectors likely to experience a more positive impact of the GFC are tourism and travel industries; housing and construction; education and training, entertainment and leisure.
- Industrial was previously seen as an attractive property market sector investment but now it is seen as a low growth volatile sector by many and this will mean that for institutional property owners industrial as a sector will struggle to attract capital.
- The magnitude of the change in share prices and market confidence will have serious impacts on the ability of industrial land companies to raise equity and debt for a number of years.
- A key driver of future change will be continuing development of information and communications technologies (ICT). Information technologies uplift will accelerate the level of competition within markets enabling faster real time distribution chain responses to consumer spending.
- Companies and Countries retaining core activities they do best, but are also looking for new lower input cost locations for them.
- Production processes of globally integrated enterprises being spread to the best production locations, resulting in worldwide integration of production and value delivery.
- Developing and transitional economies now the destination for the majority of investment projects, hosting more than 55% of new projects, and more than 60% of the estimated jobs created in 2006. Partnerships, collaborations and cooperation are key business models through which businesses now add value.
- The anticipated decoupling of other major economies such as China from the USA has not occurred and greater international trade or cross-border investment only serves to lock world economies more tightly together.

Chapter 2

Synopsis of Current Trends in Key Export Markets

Key International Market Trends

The forces of globalisation and demographic change that are shaping the face of the world's economies are also driving change in the main export markets into which Australia seeks to trade. Just as consumers are now connected globally via the internet, the rise of globally integrated enterprises has seen the emergence of industry clusters on an international level, with production supply chains that span across national boundaries.

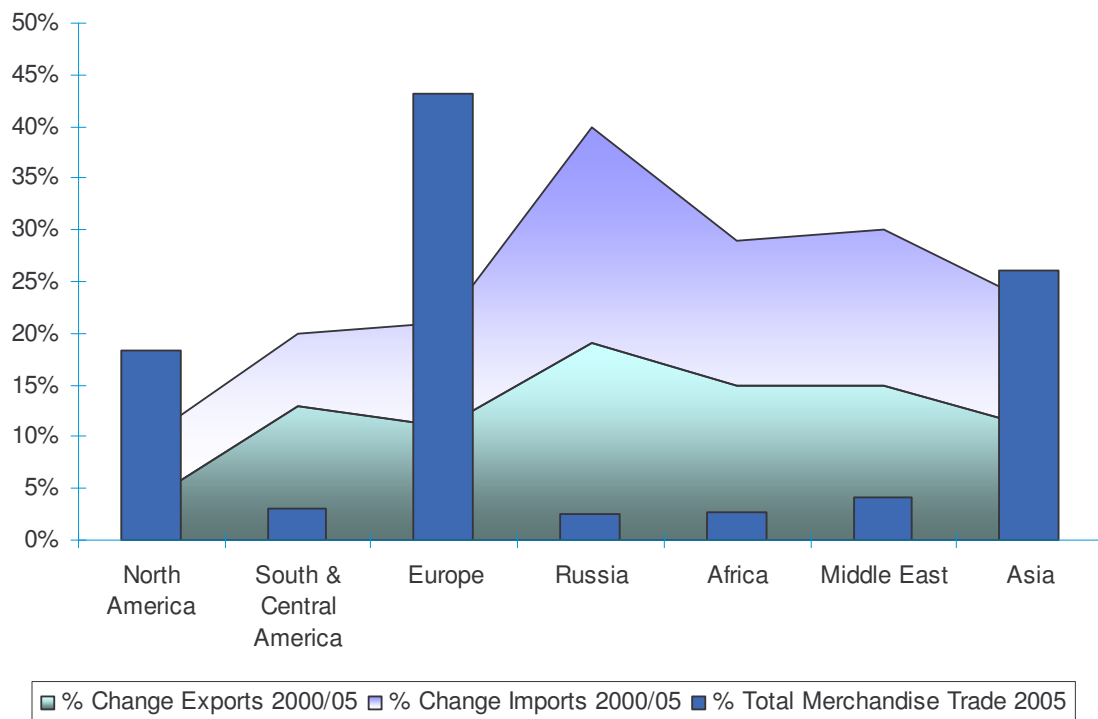
Industrial land development in Western Australia is influenced by the level of imports and exports that flow to and from the state. Such trade activity requires a range of industrial land uses for processing, manufacturing, storage and warehousing of products and related raw materials. In this chapter we examine the general outlook for key international markets likely to impact on WA. We also examine the role played by clusters in the shaping of industrial land use, and the emergence of regional trading hubs that provide a focal point for major industrial land developments.

General Trends in World Trade

The past decade has seen a significant growth in world trade as globalisation of international markets takes hold. Figure 2.1 shows the proportion of total world merchandise trade (e.g. non-services) for the seven key geographic regions. Also shown are the percentage changes in exports and imports over the period 2000 to 2005. As can be seen the main focal points for world trade are Europe, Asia and North America which comprise the largest proportion of merchandise exports and imports. However, it is also worth noting that the fastest growth in trade over this same time period has been in Russia, Africa and the Middle East.

According to the World Bank (2007) the main drivers of global trade over the next 25 years will be the demographic composition of the world's key markets. By 2030 the population of the world will have risen from 6.5 billion to over 8 billion with 97% of this growth taking place in emerging markets. China will be a key part of this demographic trend and India is forecast to surpass China as the world's most populous nation. Developing economies will see household income levels rise and with a growing affluent middle class emerging as key market opportunities in these regions.

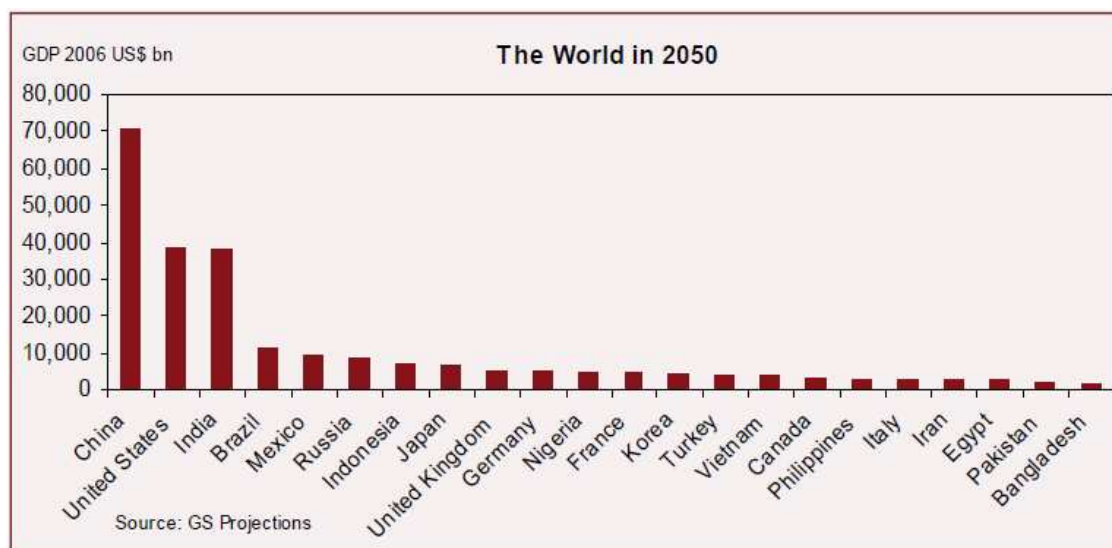
Global trade is anticipated to increase rapidly with around half the total volume coming from emerging markets. Globalisation will continue to intensify with some regions such as Australasia and South America becoming dominant in the supply of particular commodities or produce (e.g. grains, dairy products, sugar). The two Asian mega-markets of China and India are forecast to become major hubs of trade in both goods and services. This will also potentially benefit other countries with who they trade, or who may benefit from their geographic or cultural proximity to these nations (World Bank, 2007).



Source: WTO (2006)

Figure 2.1: World Merchandise Trade by Region 2005

The extent of the potential changes in world trade and size of economies was highlighted by Goldman Sachs (2003). This paper showed that the BRICs (Brazil, Russia, India and China) economies are likely to become a much larger force in the world economy. In less than 40 years, the BRICs economies together could be larger than the G6 in US dollar terms. By 2025 they could account for over half the size of the G6. Of the current G6, only the US and Japan may be among the six largest economies in US dollar terms in 2050. The following graph 2.2 shows the potential order of the largest economies in 2050 based on Goldman Sachs (2007) revised scenarios.



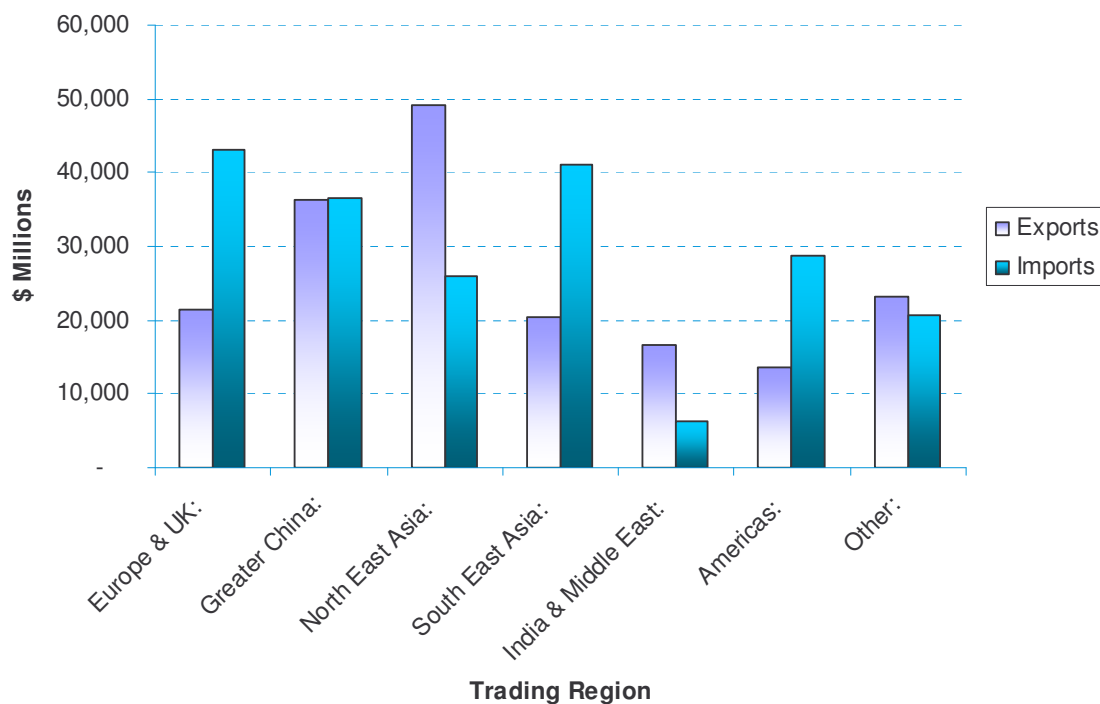
Source: WTO (2006)

Figure 2.2: Forecast GDP Levels by Country for 2050

Australia in a Global Trading Context

Throughout its history Australia has been a trading nation and its economy depends on a free flow of exports and imports throughout the world. In 2007-2008 the main trading relationships for Australia in the area of merchandise exports and imports were with Asia, specifically the North East Asian states of Japan and South Korea, and the “Greater China” region comprising China, Hong Kong and Taiwan. Figure 2.3 illustrates these relationships, where it can be seen that Australia predominately exports commodities to Asia the Middle East, while importing from Europe and the UK, the Americas (mainly the USA), and South East Asia. WA is now a major player in Australia’s international trade and comprised 38% of all merchandise exports and 14% of all merchandise imports during 2007/2008 (ABS, 2009).

The WA Department of State Development (DSD) noted that China is now the State’s top export market, accounting for around 27% of WA goods exports in 2008. Hong Kong and Taiwan were also important markets. In North East Asia, Japan ranked as the state’s second most important export market, followed by South Korea in third place. India ranks in fourth place. Other key markets are found in South East Asia, where Singapore ranks as our sixth largest export market, followed by Thailand in seventh place (DSD, 2009).



Source: ABS (2009)

Figure 2.3: Australia's Key Trading Relationships 2007-2008 for Merchandise Trade

Emerging trends in Greater China

China, including the Hong Kong special administrative region and Taiwan comprise one of the major hubs of global trade. Since commencing the opening up of its economy in the 1980s, China has experienced a remarkable period of growth. It is now the world's second largest market for petroleum products after the United States and is forecast to be the most important energy market out to 2025 (Euromonitor, 2009d). Despite the dampening of consumer sentiment as a result of the GFC and rising unemployment, the outlook is for China to experience a consumer boom during the next ten years. The number of urban households with annual incomes over US \$5,000 is anticipated to grow by 24% creating a strong domestic consumer market.

Although, a major importer of commodities and exporter of manufactured goods, China is also likely to become a key market for consumer products. Already there are 5.8 million Chinese households with over US \$10,000 in annual disposable income, and this is set to grow. Government investment in infrastructure is also significant. The Chinese Government will spend around US \$200 billion by 2010 on upgrading the national railway network a four fold increase on the previous five years. It will also build around 300,000 kilometres of new roads in rural areas. Joint ventures with overseas partners have also seen the emergence of a diversification of Chinese exports, with greater value adding, R&D and high technology investment (Euromonitor, 2009d).

The medium term outlook for China is generally very positive. A stable political environment and strong investment in education, infrastructure and business partnerships will see China continue to be a key trading hub for the foreseeable future. However, some causes for concern exist. There are rising disparities between rich and poor, particularly between the rural and urban populations. China's population is also aging rapidly. The working age population in China is set to fall by 2015 and by 2040 there are likely to be around 100 million people over the age of 80 years living in China. Environmental problems will also become more pronounced. The air pollution that beset the Beijing Olympics in 2008 highlighted these challenges. It has been estimated that over 10% of all crops in China are contaminated by heavy metals or other pollutants, over half of all municipal waste is discharged without adequate treatment, and many areas are subject to severe water shortages (Euromonitor, 2009d).

The special administrative region of Hong Kong continues to remain an important trading and services hub for Southern China. Excellent port facilities and modern telecommunications infrastructure make it Asia's key financial centre. Hong Kong is a major offshore capital raising centre for mainland China and is closely integrated into the adjacent Guangdong region where it serves as a shop window for many of the manufacturing industries located there. The relative political and economic freedom enjoyed in Hong Kong help to maintain its entrepreneurial business climate. Corruption is relatively low and this has served to attract many foreign investors. However, Hong Kong suffers from a relatively low level of investment in education and fairly low level of overall education amongst its population. Skills shortages have been common in recent years. Infrastructure remains excellent and future investment is planned for the future.

Emerging trends in North Asia

The two key markets of North Asia are Japan and Korea. Both these countries have become very important to Australia, particularly WA in recent decades. Japan is the world's second largest economy after the United States and has over 127 million consumers. It is a major exporter of manufactures as well as a major importer of food products and raw materials. Apart from its well educated and skilled labour force, Japan has invested strongly in its transportation and communications infrastructure. This has enhanced economic growth and provides the country with some of the world's best rail, road, air and sea transport networks (Euromonitor, 2007a).

Manufacturing is the key to the Japanese economy, accounting for around 20% of national GDP. However, over the past two decades the relative importance of manufacturing within the Japanese economy has fallen. The 1990's was a decade of economic stagnation for Japan, and the GFC has adversely affected what was an emerging recovery. Over the longer term Japan's economic outlook is uncertain. The small business sector remains weak and subject to vulnerability from international competition. The workforce is rapidly aging and it is anticipated that one in four Japanese will be aged 65 or older by 2025. Unless something intercedes to alter this trend, the Japanese workforce will fall by around 13 million by 2030. Many foreign workers currently keep the labour pool topped up within the lower paid occupations, but Japanese society homogeneity is expected to see most remain outsiders within the mainstream society.

Like Japan, the Republic of South Korea has emerged as a major centre of trade, particularly in the field of manufacturing. Key industry sectors have been textiles, steel, automobile manufacturing, electronics and shipbuilding. Korea was the largest producer of semi-conductors in the world in 2007. The Korean Government has also invested heavily in the national infrastructure, with roads, rail, ports and ICT networks now amongst the

best in the world. Such investment helps to significantly enhance the global competitiveness of Korean industry by reducing costs and improving efficiencies. Korea has begun to attract large scale foreign investment in its food, property, financial and business services sectors. The nation's banking sector has also been substantially reformed. Korea also boasts the highest level of university enrolment in the world, producing a strong pool of well educated labour.

However, South Korea is not without its problems. The labour market is rigid and labour unions are very strong. As in Japan, the population of South Korea is rapidly aging and fertility rates are falling. Many large manufacturing firms have been rehiring retirees as younger, university educated workers have shown a lack of desire to take jobs on the production lines. Labour supply and skills shortages are predicted to be a problem for South Korea from 2010 onwards. The Government is seeking to address this with their "Vision 2030" plan, which aims to shorten mandatory military service periods and increase the retirement age from 57 to 62 years (Euromonitor, 2007b).

The general outlook for both Japan and South Korea over the next twenty years is the consolidation of their place as sophisticated centres of advanced technology and manufacturing. Increasing globalisation is likely to see major Japanese and Korean firms continue to locate their factories around the world. However, the production of high-end manufactures in these home markets is likely to continue. As the populations of both countries age, the shift is likely to trend towards a greater focus on products and services targeted at the older consumers. This may include financial services for retirement incomes, health care, travel and entertainment for this demographic. Healthier eating and increase use of the internet for online shopping, information and education are also likely areas of growth. In Korea there is an expected growth in large scale retail centres and hypermarkets designed to provide 24 hour service for busy families and workaholic employees.

Emerging trends in India

With a population of 1.1 billion India is emerging as one of the principal mega-markets for the future. There are currently three cities in India which have a population in excess of 5 million and by 2025 there will be 13 cities of this size. Over the same time period the urban population of India will be around 40% of the nation's population. Based on current demographic trends, India's population is set to overtake that of China's by 2050. India is likely to become an increasingly attractive investment and trading hub as it offers a large, skilled but low cost workforce. For example, in 2006 51% of the population were below the age of 25 years giving it one of the youngest workforces in the world (Euromonitor, 2007c).

However, India suffers from a lack of infrastructure in both transportation and power generation networks. While some investment in key cities such as Delhi, Mumbai, Chennai, Bangalore and Kolkata have helped to alleviate some of the worst aspects of this problem, most second tier cities and rural areas remain poorly served. The pace of future investment required to keep up with India's economic growth is so great that the Government has commenced seeking increased participation from the private sector. In 2003 a UN study placed India's freight costs at 10.3% of total import value, compared to 3.9% for developed economies, or 8.6% for the rest of Asia (Euromonitor, 2007c). Over the longer term India will need a massive investment in strategic infrastructure, particularly roads, ports, airports and rail networks if it is to realise the full potential of its economy.

While the Indian population contains around 300 million rural poor and illiteracy rates of 40% there is also a growing middle class within the country's urban centres. By 2015 there

are estimated to be around 342,800 Indian households with annual income levels of US \$10,000 or higher. This is rapidly translating into one of the fastest growing retail markets. This is already attracting major international retail chains and a relaxation of Foreign Direct Investment (FDI) regulations has enhanced this trend. Domestic firms such as the Reliance Group are also increasing their investment in retailing operations, including chains of supermarkets. India is likely to see the transformation of its retailing sector with modern supermarket and hypermarket stores becoming a feature of most cities. Middle class Indian consumers are also expected to provide a ready market for imported branded goods.

Emerging trends in the Middle East and Africa

The Middle East is emerging as an important global trading hub and is becoming an important export market for WA. The region is a highly diverse one in which political tensions have created a high level of sovereign risk for investors. It is a major source of energy with most of the world's oil and natural gas reserves concentrated there. Key export markets for Australia have been the United Arab Emirates (UAE) and Saudi Arabia.

Africa is equally diverse and suffers from political instability and violence. Low level tribal conflicts, diseases such as AIDS and government corruption or inefficiency are major problems holding back the economic growth of many countries in the region. South Africa is the major economy in the region and the most significant in terms of trade with Australia. Many states in Africa have significant natural resources, including oil and gas reserves. Agricultural production from Africa has significant potential, but most farming takes place on a small scale and lacks adequate investment. East Africa has suffered in recent years from drought, political instability and rising costs of inputs. Many countries in North Africa possess oil and gas reserves, and sufficient resources to provide the necessary infrastructure and investment to secure its extraction.

The outlook for the Middle East and Africa is contingent on political security factors. The population of much of the region is young and there is only one person over 65 years of age for every 20 people of working age, and that ratio is not expected to change until after 2020. Growth in the Middle East and North Africa is expected to continue with significant investment in the energy sector and related industries and infrastructure. The outlook is less clear for the rest of Africa. The spread of AIDS is a major factor affecting the productivity of the region's workforce along with poor levels of education and infrastructure.

Emerging trends in South East Asia

South East Asia encompasses the ASEAN group of nations comprising Indonesia, Malaysia, Singapore, the Philippines, Brunei, Cambodia, Thailand, Laos, Myanmar and Vietnam. It is a large and diverse area with a population of over 575 million people and a per capita income level of around US \$5,962 making it one of the fastest growing consumer markets in the world. Its geographic proximity to Australia, particularly to WA makes it an important trading partner.

Singapore is one of the most important countries in the region from a trade perspective. While only a tiny island state, Singapore has one of the best business environments in the region with a political stability, low levels of crime, an effective legal system and a reputation for being one of the least corrupt countries in the world. The Government invests heavily in infrastructure and education providing excellent port, transport and telecommunications facilities, as well as a strong R&D base and well educated workforce.

Over the longer term Singapore will face a number of key challenges. Its high labour costs and shortages of land mean that it will struggle to maintain competitiveness as a manufacturing centre. Manufacturing has declined as a proportion of GDP and many local firms are now moving offshore. Singapore is now seeking to negotiate with Indonesia and Malaysia to allow it to develop and manage industrial parks on some of the smaller islands in the Singapore Straits or South China Sea. Over the next 15 years Singapore hopes to diversify its economy while integrating its economy with regional neighbours and a wider Asian production network focusing on China and India. However, the economy remains dependent on foreign labour and fertility rates amongst Singaporeans is low. A third of the population were born overseas.

Indonesia is the largest and most populous nation in South East Asia. Despite its size and abundant human and natural resources, Indonesia's economy remains mired in a range of problems. Corruption within the government sector is amongst the worst in the world and 78% of Indonesians polled expressed the view that paying bribes was a necessary part of doing business. Foreign investors must have local partners in order to articulate through the maze of bureaucratic and social customs crucial to doing business. The taxation system is also a major disincentive for overseas companies with requirements for monthly returns. Compliance costs associated with filing taxation claims are significantly higher than other Asian countries. Legal protections for intellectual property rights are also very weak in Indonesia, which is a further disincentive for foreign investors. Despite these problems Indonesia is continuing to develop its middle class and has been one of the strongest growing consumer markets in the region in the past decade.

Thailand is one of the other major markets in South East Asia and an important trading partner for WA. Tourism has been a major sector over the past twenty years and a growing middle class within the major cities has seen significant investment in housing construction and retailing. As with Indonesia, the level of protection over intellectual property rights in Thailand is very poor and this has resulted in the loss of millions of dollars in royalties for pirated software, movies, music, fashion labels and consumer goods. The country also suffers from major bottlenecks in infrastructure. Weaknesses exist in road, rail, ports, power generation and telecommunications networks. Although much of the Thai transport system is well built, it is simply unable to cope with the demand and requires significant investments over the next 10 years.

These infrastructure problems are common throughout much of South East Asia with governments across the region set to invest in upgrading their transportation, telecommunications and power generation systems to maintain competitiveness. Skills shortages are another problem facing the region, either due to lack of population as in Singapore, or a lack of suitable education and training systems as in many other countries. Further investment in education and training is likely to be a major area of focus for these states over coming years.

Emerging trends in Europe

As shown in Figure 2, Europe is the most important hub for world trade. However, it is a highly mature market and Western Europe has one of the fastest aging populations in the world. In 2020 it is estimated that 18.5% of the population of Western Europe will be aged over 65 years. This is expected to see the size of the workforce shrink and additional burdens to be placed on government expenditure to fund pensions, healthcare and related services. Despite this the region remains a major focal point for global trade and the European Union creates another mega-market of affluent consumers.

Transportation and communications infrastructure in Europe is generally excellent and the deregulation of the European airline and telecommunications sectors has significantly reduced costs. Investment in ICT systems has been significant for much of the past decade and Western Europe now has the highest per capita broadband usage. The financial and banking sectors are also become closely integrated within the Euro-zone. This investment in transportation and ICT infrastructure has made Western Europe a major trading hub for Asia, Eastern Europe and Russia.

The main economies of Germany, France, Italy and the United Kingdom are all strong in the fields of manufacturing and services. Over the longer term Western Europe's economic position may change as the population demographics result in an aging workforce. Unless this is corrected through immigration, the rate of economic growth by 2050 may decline by half a percentage point due to shortages of skilled workers. It also lags behind other regions in terms of investment in R&D, innovation, and labour productivity in countries such as France and Italy is impeded by restrictive labour laws and unionisation.

By comparison Eastern Europe comprises a diverse number of states with a mix of economic strengths and weaknesses. As with their counterparts in the West, many East European countries are experiencing falling birth rates and shrinking populations, caused in part by emigration, with the population expected to decline from just over 330 million in 1980 to around 319 million by 2020. Labour shortages are likely to emerge in some economies as a result. The integration of many Eastern European economies into the EU has seen the growth in consumer markets with the growth of financial services, retailing and fast moving consumer goods segments. Corruption and complex labour legislation remain a problem for foreign companies seeking to invest in Eastern Europe.

Over the next 10 to 15 years the GDP of Eastern Europe is forecast to grow rapidly as those states who are now part of the EU are brought up to the same level as their counterparts in the West. Growth will be led by high rates of investment and the expansion of inter-European trade, particularly within the EU. The need for structural reforms to enable countries to comply with the EU regulations will also help to drive future economic growth. A shift within Eastern Europe from heavy to lighter industries and services sector businesses is forecast. Tourism is anticipated to become a major industry for many of these countries as their infrastructure is enhanced.

Emerging trends in the Americas

The Americas comprises the two North American states of Canada and the USA, and the 43 countries that make up Latin America. The United States remains the most powerful economy globally and its population of 300 million are amongst the most affluent consumers in the world with an annual expenditure of around US \$9.5 trillion. Canada's economy is now closely integrated with that of the USA and under the North American Free Trade Agreement (NAFTA) inter-regional trade and investment remains significant.

North America remains a focal point for manufacturing, aerospace, telecommunications, electronics and computing and is a leader in R&D, innovation and educational services. Labour productivity levels in both the United States and Canada are also amongst the best in the world. Despite this economic dominance the infrastructure of the United States is poor and deteriorating. Many major cities face the challenge of poor or deficient transportation, telecommunications and power generation infrastructure, and a lack of adequate funding to provide for it. US Federal estimates suggest that there is a

requirement for annual investments of approximately US \$225 billion to maintain economic growth.

The population in North America is also aging, although not as rapidly as in Europe or Japan. Over the next twenty years the baby boomers will move into their senior years and will place increasing demands on health care, housing and retirement incomes. The United States is particularly ill-prepared to meet this challenge. Consumer markets in North America are likely to be focused in future years on environmentally sustainable products and those that offer a healthy lifestyle. Financial services, health care, travel and leisure industries are also likely to benefit from such demographic change.

Latin America has a population of 560 million and substantial natural resources and growing consumer markets. Brazil, Argentina and Mexico are among the most significant economies with both strong mining, agricultural and manufacturing sectors. The region's economies experienced rapid growth during the 1980s and 1990s, driven mainly by rising commodity prices. Chile offers the best environment for business in the region with low taxation, an effective legal system and low levels of corruption.

Over the longer term Latin America will continue to attract investment in resource projects particularly in the areas of mining and oil or gas extraction. However, politically imposed restrictions on foreign direct investment are likely to impede future growth within many states. Free Trade Agreements between the Latin American nations and those in other countries are likely to drive an increase in trade, with China, North America and Europe, particularly in commodities.

Summary of international market trends and implications for WA

Although predicting future trends is problematic the pattern emerging from the above analysis is that the key drivers shaping the longer term outlook for international markets are demographic, political and technological in nature. The demographic changes taking place in many of the world's economies are resulting in an aging population and declining workforce. As outlined above, Japan, Korea many nations in Europe and the United States are seeing their population's age. Even China has rising proportion of older people likely to emerge in the coming decades. Some countries are likely to deal better with this challenge than others. Revitalising the workforce through open immigration programs is one solution, but this may prove socially and politically challenging for some. Infrastructure remains another key determinant of economic growth. Investment in transportation and ICT systems will remain critical to the successful growth of the world's economies. Investments in education and training, plus R&D will also shape the skills and productivity of future workforces throughout the world.

The Western Australian economy is highly export focused and the state is well placed to take advantage of these global market trends. The proximity of WA to both India and China positions the state to continue its role as a major supplier of commodities such minerals and LNG to these growing mega markets. There would also appear to be good opportunities for WA in the Middle East and Africa. Population demographics across the Asian, South Asian, African and Middle Eastern regions will drive economic growth and open up new market opportunities for WA export industries. The challenge will be for WA to maintain its economy at international best practice with investment in infrastructure and maintenance of an open and globally competitive business environment.

Chapter 2: Key Points

- WA is a major player in Australia's international trade comprising 38% of all merchandise exports and 14% of all merchandise imports during 2007/2008 (ABS, 2009).
- The Middle East is emerging as an important global trading hub and is becoming an important export market for WA.
- South East Asia is one of the fastest growing consumer markets in the world. Its geographic proximity to Australia and particularly to WA makes it an important trading partner. Thailand is one of the other major markets in South East Asia and an important trading partner for WA.
- The forces of globalisation and demographic change that are shaping the face of world economies are also driving changes in the main export markets into which Western Australia seeks to trade.
- Globalisation will continue to intensify with some regions such as Australasia and South America becoming more dominant in the supply of particular commodities or produce (e.g. grains, dairy products, sugar).
- China will be a key part of demographic trends and India is forecast to surpass China as the world's most populous nation.
- Joint ventures with overseas partners have also seen the emergence of a diversification of Chinese exports, with greater value adding, R&D and high technology investments.
- Increasing globalisation is likely to see major Japanese and Korean firms continue to locate more of their factories around the world.

Chapter 3

Industry clustering and the rise of global trading hubs

Global Production Networks and Industry Clustering

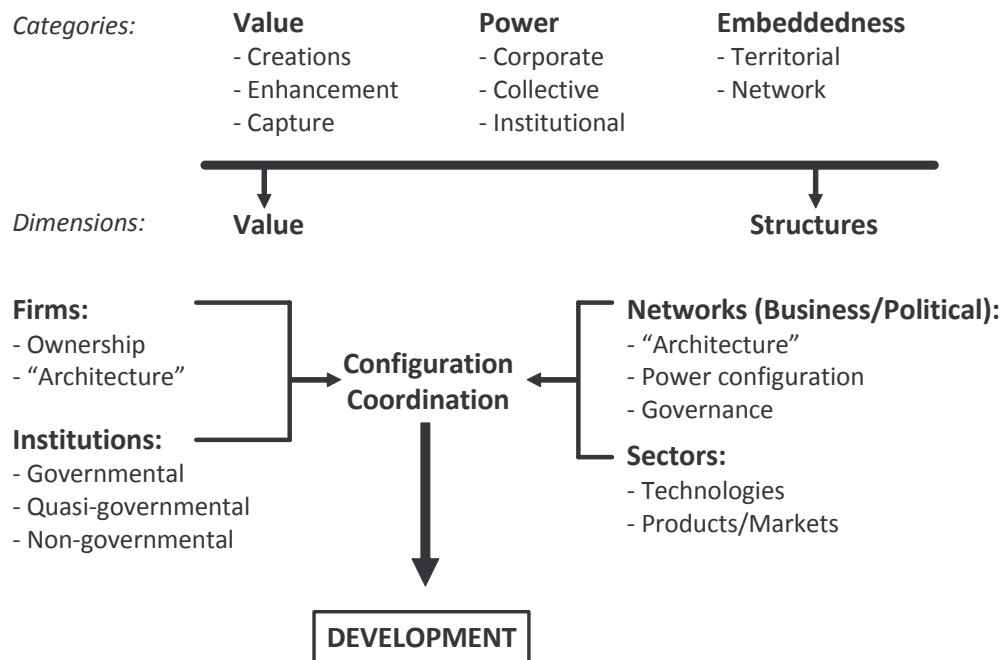
In this chapter we examine two important trends that are shaping the future of industrial land use. The first of these is the creation of global production networks driven by the emergence of the globally integrated enterprises identified in Chapter 1. These production networks operate within major industry clusters that are increasingly international in nature. Such clusters have in turn been driven by the emergence of a series of global trading hubs which are focused a series of major cities and sea ports, but which span across national borders. These trends have been developing since at least the 1990s but are anticipated to accelerate as the emerging economies of China and India build up their massive urban centres over the course of the 21st Century.

The Nature of a Global Production Network

A production network is defined as a “nexus of interconnected functions and operations through which goods and services are produced, distributed and consumed” and a global production network is one that transcends national boundaries (Henderson *et.al.*, 2002). Key issues influencing global production networks are the value, power and level of “embeddedness” that takes place within the network. Value refers to the generation of wealth by firms and other institutions operating in the network. Power is the level of influence or authority that can be wielded by corporations, labour or other collective bargaining groups and institutions such as national or regional governmental authorities. Embeddedness refers to the extent to which these firms or institutions are linked to the region. For example, locally owned firms, particularly small to medium sized enterprises (SMEs) are likely to be more embedded in the region than “footloose” trans-nationals. This structure is illustrated in Figure 3.1.

The level of economic development likely to emerge from a region through global production networks is contingent on the configuration and co-ordination of four key elements. These comprise the firms and their respective industry sectors, the government and non-government institutions engaged in the network, and the network itself. How the network is designed (e.g. its “architecture”), the power relationships and governance within it are critical to its success.

By the end of the 20th Century global production networks had concentrated in three primary regional trading hubs comprising North America, Europe and Asia, specifically focused on North Asia. Together these comprised around 70% of the world’s economy. During the past twenty years the world trading system has also been characterised by the signing of a large number of regional trade agreements. These aim to enhance the structure of the regional production systems through enhanced governance. In 2009 there were over 200 regional trading agreements in place around the world and dozens more under negotiation (Baldwin and Low, 2009).



Source: Henderson *et.al.* (2002)

Figure 3.1: A Framework for Global Production Network Analysis

The "Architecture" of the Asian region consists of political and economic rivalry and webs of economic cohesion and interdependent production networks. While North American and European production networks were largely open and vertically integrated in nature, those of Japan and Korea which emerged in the 1980s were largely vertically integrated and closed. This closed nature of such production networks refers to their tendency to exclude non-affiliated local and foreign suppliers. In more recent years the emergence of mainly Chinese dominated Taiwanese and South East Asian (e.g. Singaporean) business conglomerates introduced horizontally integrated production networks. More entrepreneurial in nature, these networks were either open or closed and strongly reliant on cultural and linguistic ties (Zysman *et.al.*, 1996).

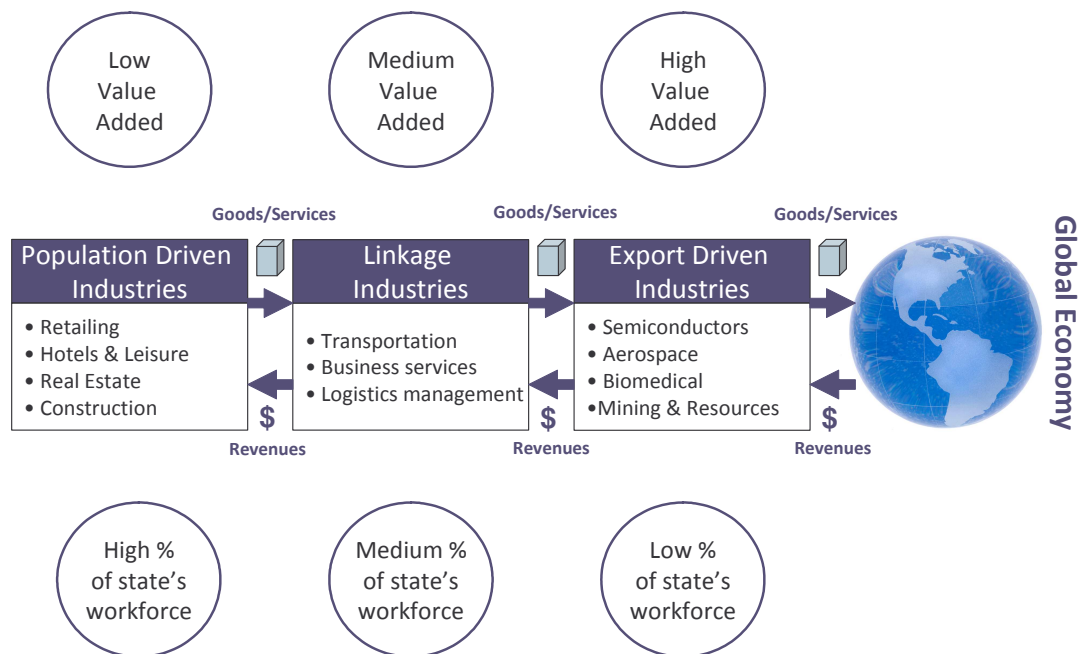
The Role of Trans-National Corporations

At the heart of the world's major production networks are a small number of trans-national corporations (TNCs). Six industries dominate the list of Top 100 largest TNCs. These include: i) motor vehicles (13 firms); ii) petroleum products (10 firms); iii) electrical and electronic equipment manufacturers (9 firms); iv) utilities (8 firms); v) telecommunications (8 firms); and vi) pharmaceuticals (7 firms). These six industries account for around 55% of the largest TNCs. Another 23% comprise metals, non-metallic products, chemicals, retail and wholesale trade, and food and beverage manufacturers (UNCTAD, 2008).

The majority (72%) of these Top 100 TNCs come from the same five countries: the USA, France, Germany, the UK and Japan. Their production networks are concentrated in the North America, Western Europe, Japan, China, Brazil, Mexico, Australia and Singapore. Matching these TNCs from developed countries are a Top 100 from developing economies. As with those from the advanced nations, the list from emerging economies has not changed substantially in the past 10 years. The largest of these come from China/Hong Kong, Malaysia, Korea, Mexico and Singapore. These are also concentrated in similar industries such as motor vehicles, petroleum, telecommunications, electrical and electronics (UNCTAD, 2008).

Clusters in a Global Economy

The role of clusters in enhancing the economic growth of a region has been well recognised by policy makers since at least the 1970s (Baptista, 1998). Clusters operate as the focal points for global production networks and within regional economies they serve to provide an economic development framework as illustrated in Figure 3.2. As shown the essential elements are a set of core, export driven industries that are internationally competitive and linked to the global economy. These are typically high value added but only employ a relatively low proportion of the workforce in a state or region.



Source: Waits (2000)

Figure 3.2: An Economic Development Framework for Industry Clustering

Next in line are a series of linkage industries which provide essential services or support to the supply chains of the export oriented industries. Transportation and logistics industries,

telecommunications and business services are often the most common types. These industries employ more of the region's labour pool, but may only add a medium level of value to the export sector. Finally there are the so-called "population driven" industries. These are tertiary sectors such as retailing, hotels and leisure, real estate, construction and such areas as restaurants and food service providers. These industries employ the largest proportion of the region's workforce, but only provide a relatively low level of value adding from a global perspective.

This pattern of activity was modelled on the behaviour of industries found within the state of Arizona, USA (Waits, 2000). However, it is a similar pattern to that found within Western Australia with the mining and energy sector comprising the export driven focal point for an industry cluster, supported by a range of linkage industries that in turn support the more numerous population driven sectors. The mining and resources sector is the largest in the state and in our most significant export industry. It is a major source of inbound investment, as well as a significant user of heavy industrial land.

Linkage industries are found in the areas of construction and manufacturing, as well as those sectors supplying specialist services to the mining sector. While the mining and resource sector of WA generates 30% of the total state economic output it only employs around 5% of the total workforce. By comparison the manufacturing sector generates just over 8% of the state's output and employs over 9% of the workforce. Construction generates around 8% of output and employs about 8% of the workforce. The services sector, by contrast, generates 41% of state economic output and employs 67% of the workforce (CCIWA, 2009).

Factors Influencing Spatial Proximity Clustering

Industry clustering is important within the context of industrial land development as this type of activity is often the cause of a major demand for such real estate, and has been the focus of government agency planning for projects such as the Australian Marine Complex (AMC) at Henderson in WA. Whether or not industries concentrate in a particular geographic area is contingent on several factors (Steinle and Schiele, 2002):

1. **Divisibility and Transportability of the Product** – where a product or physical goods cannot be easily divided up and transported across large distance there the opportunity for geographic clustering as industrial activity is forced into areas that are spatially proximate with each other.
2. **Long value-chain** – where the activities involved in the industrial process require a relatively large number of complex interactions between different actors or organisations it is more likely that clustering will occur. Geographic proximity is important in these conditions because actors within the value chain (production & supply chain) need to maintain regular and in-depth contact with each other.
3. **Multiple competencies** – where the activities, skills, resources and competencies required by each member of the value chain are distinct and separate from the others a cluster is likely to emerge. Where such activities are routine and can be easily supplied by others outside the cluster these can and probably will be outsourced.
4. **Network innovation** – where the entire production or supply chain process is enhanced from interactivity between actors within the network

so as to generate innovative new ideas, clustering will be facilitated. Close geographic proximity is not essential for this to occur, but most innovation is generated from informal, social exchange rather than routine official contacts. Convivial environments that foster such social activities, e.g. the presence of cafés and other social infrastructure within a region or estate can enhance clustering innovation.

5. **Market volatility** – where a market is a particularly volatile value chain actors who work closely together are more likely to achieve a faster response time to market shifts, or to transfer market information rapidly to each other. This enhances collaboration and competitiveness as well as strengthening clustering.

This pattern of activity was identified in a study of export oriented SME manufacturers in WA undertaken by the *WA Technology Industry Advisory Council* (TIAC, 2006). This found that most firms did not have a strong focus on the local market and the majority had considered moving their production offshore. However, they had not done so because they had built their international reputation around innovation, product differentiation, customisation, niche marketing and premium pricing. They did not feel that these qualities could be retained if production was moved offshore as they were able to secure the necessary skills and supplier inputs within their local production network.

The Importance of Infrastructure

A critical issue for attracting TransNational Corporations (TNCs) firms into regional economic clusters is the provision of adequate levels of infrastructure. This includes power and utilities, telecommunications, and transportation services. In particular, efficient sea, air, road and rail logistics hubs that serve to reduce freight handling costs so critical within global production networks.

Infrastructure development is a major issue for developing economies, but as noted above, it is also a challenge for many of the world's most advanced nations. For example, the transportation system in the United States is in need of significant investment with a reported 500 bridge failures reported since 1989 and major problems with many of the 600,000 bridges that exist in that country (Le Patner, 2009).

According to UNCTAD (2008) infrastructure is the key determinant of economic development and integration into the global economy. Good transportation, communications and public utilities infrastructure assist a country to attract foreign direct investment, house internationally competitive industries generate jobs and alleviate unemployment and poverty.

Figure 3.3 illustrates the context into which infrastructure industries operate, with reference to those sectors that either feed into them from upstream or which they support downstream. It can be seen that the transportation sector requires supplier industries such as heavy construction and the provision of specialised equipment such as railway tracks. Once built, the downstream sectors in road, air and sea transportation can operate efficiently.

Infrastructure		Supplier industries and activities	Infrastructure sectors		
			Infrastructure industries		Services relying directly on infrastructure
			Facility operation and maintenance	Infrastructure services	
Transport	Seaports	...	Marine cargo handling (4491)	Towing and tugboat services (4492)	Deep sea transportation of freight (441–442)
	Railroads	Railway track equipment (part of 3531)	Railroads, line-haul operating (4011)	Railroad switching and terminal establishments (4013)	Local and suburban transit (4111)
	Roads and highways	Heavy construction other than building (16, exc. 1623)	Terminal and joint terminal maintenance (423)	Terminal and service facilities for motor vehicle (417)	Motor freight transportation and warehousing (421–422)
	Airports		Airports, flying fields, and airport terminals (458)		Air transportation (451–452)
	Other	Parts of heavy construction, not elsewhere classified (1629)	...	Parts of miscellaneous services incidental to transportation (4785)	
Telecommunications		Telephone and telegraph apparatus (3661)	Telephone communications (481)		Radio broadcasting stations (4832), Television broadcasting stations (4833)
		Telephone interconnect systems (7385)	Telegraph and other message communications (482)		
Water		Water, sewer, pipeline, and communications and power line construction (1623)	Water supply (494)		Irrigation systems (497)
			Sanitary services (495)		
Power	Electric services (491) (generation and transmission)		Electric services (491) (distribution)	...	
	Natural gas transmission and distribution (4922), gas production (4955)		Natural gas transmission and distribution (4923) and distribution (4924)		
	Combination electric and gas, and other utility (493)				
	Steam and air-conditioning supply (496)				

Source: UNCTAD.

Note: The classification used here is based on the SIC codes indicated in brackets.

Figure 3.3: Infrastructure Industries and Related Activities

Most infrastructure projects are of a scale that necessitate the intervention by Government. While some private sector investment is being encouraged it is not always politically desirable or financially possible. For example, the power sector involves at least three sub-sectors: generation, transmission and distribution. Electricity generation is now subject to major environmental pressures for greater sustainability. Generation can be privatised and subject to competition, but transmission and distribution are natural monopolies, which make private investment and control problematic.

Economic development requires an integrated, multimodal transportation system and in regional economies this may involve collaboration across multiple jurisdictions. This type of infrastructure investment has become typical across Asia, Africa and Latin America (UNCTAD, 2008). For many countries the GFC is an opportunity to invest in infrastructure to stimulate the economy and lay foundations that will take advantage of future growth. For example, Saudi Arabia is to invest significantly in the expansion of its two main industrial cities of Jubail and Yanbu. The first is on the eastern coast adjacent the main oil fields and located to take advantage of the rising economic activity from India. Yanbu is on the Red Sea Coast with close proximity to the Suez Canal and focused on the European market. Major new gas and oil pipelines are being constructed along with water supplies, transportation links, telecommunications, housing, schools and hospitals (Bains, 2009).

CASE STUDY – JUBAIL, SAUDI ARABIA



Jubail Industrial Area, evening view Bechtel photo

Jubail Industrial City and Port City in Saudi Arabia are located in Ash Sharqiyah Province on the Persian Gulf coast, 100 km northwest of Ad Dammam. A planned industrial city, Al Jubayl contains an oil refinery, a steel mill, and one of the world's largest desalination plants, which also generates electric power. In addition to refined oil products and steel, petrochemical products such as plastics and fertilizers are manufactured and exported. Other industries were created to manufacture consumer goods and support the activities of the primary oil- and gas-based ventures. Al Jubayl is one of Saudi Arabia's most important ports. This massive industrial complex on the Arabian Gulf, along with Yanbu, its twin on the Red Sea, is testament to the Saudi Arabian government's vision of future development.

The development of the extension of Jubail, Jubail Industrial City 2 is divided into four phases, which are to be undertaken during the next 20 years. The Phase I is already completed, Phase II will begin during 2008-2012, Phase III during 2013 to 2018, and finally Phase IV during 2019 to 2022 (Cobb, 2008).

In 2009 Jubail encompassed 55 square kilometres and was home to major petroleum companies such as Saudi Aramco, Shell and Chevron while also attracting major manufacturers of paints and titanium-dioxide. Around 7% of the world's petrochemicals are produced from Jubail (Bains, 2009).

Protection of the environment has been a major focus at Jubail and it has won a number of awards for this including the United Nations Sasakawa Award (Highest Award For Environmental Protection) and the Regional Organization for the Protection of Marine Environment - Environmental Award.

A key characteristic that Jubail has in common with WA is that it was built based on the ready availability of natural resources.

KEY LESSONS:

Key lessons from planning and governance for this estate are covered in Chapter 5.

Provision of infrastructure – the early and well planned provision of infrastructure allowed massive levels of foreign investment into these areas. Key to the projects was the deliberate policy of geographically concentrating the substantial investments in infrastructure needed to support industries around the already existing natural resources.

A key to the success of Jubail and Yanbu has been the provision of infrastructure by the Royal Commission for Jubail and Yanbu (RCJY). Jubail has been described as “the biggest civil engineering project in modern times”.

Much of this infrastructure was provided up front and in Jubail II the establishment and relocation of utilities and infrastructure is also being done in parallel with the site preparation. The provision of infrastructure was not only the infrastructure within the industrial precincts but also included housing. In

the early phases of development the strategy recognized the significant national manpower demands which would be needed for construction and later project operations and resulted in major national program investments in advanced training to provide increased employment opportunities for the growing Saudi population.

The establishment of these two industrial cities came about as part of the government's 1970's plans to diversify their economy. They used the basic concept of industrial linkages to produced plans which stressed initial development of petroleum-based industries for producing petrochemicals, fuels and other feedstock. These outputs not only increased value-added oil exports but also provided critical raw material feed stocks for development of downstream secondary industries, including agriculture fertilizers, cement, steel and various consumer products for domestic and export markets. A major component of the industrial strategy was the deliberate policy of geographically concentrating the substantial investments in infrastructure needed to support these industries.

The RCJY has developed and constructed a number of utility and other systems that provide the needed services to the industry and the community. These include the Seawater Supply Systems, the Potable and Waste Water systems, transport and telecommunication network, the community and other associated services. In the city of Yanbu, the RCJY generates and supplies electrical power in addition to the other services. The establishment of Jubail II included the expansion of King Fahd Industrial Port, pipeline refurbishment, increasing capacity of the cooling system, and new desalination plants.

From an early stage, there has been a high focus on providing incentives for industry to locate into these industrial areas. This has included the provision of physical infrastructure. These packages included land at very low rents for investors with approved industrial licenses. The graded lots of various sizes in the estate have paved access to roads with full on site utility hook-ups. The services that are heavily subsidised for industrial part users are portable and fire-fighting water, cooling water supply and discharge, sanitary and industrial waste and effluent disposal, electricity, telephone and industrial gas.

The planning of the industrial cities has also ensured that they have effective and economic transport of manufactured goods to domestic and world markets. The government is also able to provide companies locating in these areas financial incentives in the form tax relief and financial loans.

The overall development of Jubail and Yanbu accomplished with an investment of US\$20 billion has witnessed the creation of over 200 industries that have invested over US\$42 billion, providing employment for over 85,000 workers. The 157,000 residents of the two cities enjoy world class amenities and security.

The development of Jubail and Yanbu is expected to continue through to 2022 and major TNC investors in the petroleum sector are being offered 30 year fixed and renewable leases within these two industrial cities. Secondary industries that use the feedstock generated by the primary industries such as chemicals, plastics and synthetic polymers manufacturers are being offered 20 year leases. Smaller firms in the fields of light manufacturing and packaging are able to access 10 year leases. In 2009 Jubail encompassed 55 square kilometres and was home to major petroleum companies such as Saudi Aramco, Shell and Chevron while also attracting major manufacturers of paints and titanium-dioxide. Around 7% of the world's petrochemicals are produced from Jubail (Bains, 2009).

Trading Hubs versus Trading Flags

In his book *End of the Nation State: the Rise of Regional Economies*, Kenichi Ohmae (1996) suggested that globalisation had led to the erosion of the nation state as the principal actor in world trade. As the world economy becomes more tightly interconnected, national borders will no longer have the capacity to easily contain the flows of communication, people, businesses, capital and goods that are required to maintain future economic growth. Rather than a world of nation states operating under “trading flags”, the world economy is best viewed as a series of region states or “trading hubs” focused on specific cities and their key industries.

Regional Economies in a Borderless World

According to Ohmae (1995) a series of key economic zones emerged during the 1980s that challenged the traditional concept of national sovereignty within economics. The European Union is an example of a common market with a single currency. The Hong Kong and Guangdong region of China, Kansai region of Japan and Singapore’s “Growth Triangle” region were all cited as examples of such economic regions spanning multiple jurisdictions.

As major corporations begin to expand into trans-national organisations they create global supply chain networks that move outside national boundaries. This has typically seen them move operations offshore from their home country to areas that offer competitive labour costs, tax regimes and other incentives, or access to markets, resources and skills. Regional economies are comprised of industry supply-chain networks that form industrial clusters (Isaksen, 1998).

The main factors driving the formation and success of regional industry clusters are (Rosenfeld, 1997):

- **Specialisation** – these economic regions concentrate economic activity around a few specialised industries allowing the development of a pool of skilled labour and the emergence of a strong network of related and supporting industries (Porter, 1990).
- **Local Networks** – another feature of these local regional clusters is the creation of local supply-chain networks comprising integrated production systems. This can involve both vertical and horizontal production networks consisting of key suppliers, sub-contractors and lead customers (Jarrillo, 1993). Many local networks if geographically proximate will encourage the flow of knowledge and ideas thereby strengthening innovation (Seufert *et.al.*, 1999).
- **R&D and Educational Institutions** – the provision of skilled labour and the need for R&D to help drive further innovation also sees such regional clusters involving one or more major educational institutions or research centres. Public investment in education and research has indirect effects on industries, but such institutions appear to play a key role in the success of these clusters.
- **Qualified Workforce** – another feature of such regional clusters is the presence of a large pool of suitably skilled and qualified labour. For this

reason most regional trading hubs are found in areas of common culture and language, or where the “psychic distance” between communities is such that culture and language will not provide a barrier. These regional clusters are also typically built around a number of major cities that house the workforce and their families. The cost of living, availability of housing, plus the education and training systems of a region are therefore of importance.

- **Access to competent financial institutions** – investment is a critical driver of any regional industry cluster and there must be present a range of financial institutions such as banks and insurance companies with the competence to support the industries located in the region. Government rules relating to financial transactions across national boundaries are also of importance.
- **Collaboration between firms and other institutions** – in addition to local production networks a feature of successful regional clusters is the ability of firms within them to collaborate with a range of other institutions. This can take many forms but is often found to take the form of a free-flow of business managers and other senior staff who network outside the conventional production supply chain, and participate in forums designed to enhance the regional economy. This might involve working with government and other organisations to put in place infrastructure or international agreements to facilitate trade and cross-border investment.
- **Contacts with knowledgeable milieus globally** – a final characteristic of such regional economic clusters is the ability of firms and institutions within these industries to remain globally connected to centres of best practice. For multinational or trans-national firms it is common to see the transfer of technologies from one global trading centre into another. While there may be some adaptation of these technologies to satisfy local market requirements, the flow of ideas and technology across global communities of practice is a key factor in sustaining competitiveness.

The rise of major trading hubs in emerging markets

As illustrated in the case study of Jubail, Saudi Arabia there is a move within some countries to secure through investment the creation of a global trading hub. The significant level of investment taking place within Saudi Arabia around Jubail and Yanbu aims to capitalise on the comparative advantage that country has in oil reserves, but to build a specialisation around petrochemical industries. It is a trend taking place elsewhere in emerging markets.

The outlook for the Chinese and Indian economies as the focal point for one or more major trading hubs is likely to be driven by the emergence in these two countries of a number of massive cities. By 2020 the population of China will grow by over 94 million. The majority of Chinese major cities are located on the coast and are already heavily export oriented in their economies. Over the next twenty years the level of urbanisation within the Chinese population will rise significantly and there will be a continuing drift of people from the rural areas to the cities. A similar trend is expected to take place in India, whose population is forecast to rise beyond that of China's by 2035.

Table 3.1: Population of 10 largest cities in China and India by 2020

CHINA 10 LARGEST CITIES	2020	INDIA 10 LARGEST CITIES	2020
Shanghai	12,972,574	Mumbai	17,551,004
Beijing	8,818,818	Delhi	16,255,105
Guangzhou	8,177,798	Bangalore	6,831,962
Tianjin	6,685,238	Calcutta	5,668,302
Chongqing	7,617,727	Madras	5,612,493
Wuhan	6,720,081	Ahmedabad	5,130,736
Shenyang	4,125,873	Hyderabad	4,567,207
Nanjing	5,009,627	Pune	4,737,888
Xi'an	3,676,806	Surat	4,531,115
Harbin	3,055,314	Kanpur	4,152,150
Total population 10 largest cities	66,859,856	Total population 10 largest cities	75,037,962

Source: Euromonitor (2007)

As shown in Table 2.1, by 2020 the top-10 largest cities in China and India will be home to around 142 million people. Cities like Shanghai or Guangzhou already form the centre of major regional trading hubs linking China's inland centres such as Chongqing, Wuhan, Nanjing and Xi'an to other international trading centres. These major urban agglomerations will also create a network of trade flow internally within China.

A similar pattern is forecast for India. Mumbai on the west coast is already a key gateway for trade between India and the Middle East, Africa and Europe. It connects to inland centres such as Ahmedabad or Pune. On the east coast is Madras, which also serves as a gateway for Bangalore, or Calcutta, which provides a gateway for Delhi and Kanpur located in the northern inland areas of the country.

Increasing levels of population within such massive cities will create a concentration of labour for the development of new industries, as well as a significant consumer market for the products and services generated by them. Rising income levels will see such urban centres become major engines of economic growth within these countries and their wider regional economies. Heavy investment in infrastructure

will be required to keep pace with the rising population and accompanying growth in imports and exports that will flow through them.

Summary and implications for WA

Australia's economic fortunes and in particular those of WA have benefited from the rise of Asia's emerging economies. Throughout much of the second half of the 20th Century the WA economy developed in response to the significant growth in demand for minerals and other resources by Japan and other Asian "tiger" economies such as Korea and Taiwan. In recent years the rise of China has led the export growth of the State's mining and resources sector. Despite the economic slow down caused by the GFC of 2008-2010 the longer term outlook is for continued growth in these key markets.

The longer term outlook for the mega markets of China and India is for the growth of their urban populations into massive cities that will form the core of a series of major regional trading hubs. Such cities will be significant engines of economic growth as well as the focal point of production networks that will span well beyond their national borders. These cities will require significant investment in infrastructure over the coming decades and then the ongoing flow of commodities such as LNG for power, minerals to supply their industries, and food products to feed their populations.

OBSERVATION

While the mining and resources industries are critical to the overall financial strength of the WA economy, they employ only a small proportion of the workforce and utilise relatively little of the industrial land. It is the key linkage industries such as manufacturing, construction, transportation, storage, and warehousing that are the main users of industrial land and which employ more people. Future industrial land needs are likely to be dependent on the fortunes of the State's main export, and to some extent import led industries.

As outlined in this chapter the "Architecture" of much of Asia's regional economies are built around integrated production networks in which Japanese, Korean and now Chinese conglomerates are dominant. The State's key export industries in mining and resources are well placed to take advantage of any return to growth within these production networks once the global recession passes. Significant investment by these Asian conglomerates is already a feature of the WA mining and resources sector and future investment is to be expected. While such investment may give rise to concerns within Australia of a loss of sovereignty over key resource firms, this type of shareholding also serves to draw these Australian firms into the Asian production networks.

Chapter 3: Key Points

- Locally owned Western Australian firms, particularly small to medium sized enterprises (SMEs) are likely to be more embedded in the region than “footloose” trans-nationals.
- Levels of economic development likely to emerge from the WA region through global production networks are contingent on configuration and coordination of four key elements encompassing the firms and their respective industry sectors, the government and non-government institutions engaged in the network, and the network itself.
- Western Australia has the mining and energy sector providing the export driven focal point for an industry cluster, supported by a range of linkage industries that in turn support the more numerous population driven sectors.
- A critical issue for attracting TNC firms into WA regional economic clusters is the provision of adequate levels of infrastructure. This includes power and utilities, telecommunications, and transportation services, in particular efficient sea, air, road and rail logistics hubs that serve to reduce freight handling costs so critical within global production networks.
- At the heart of the world’s major production networks are a small number of trans-national corporations (TNCs). Six industries dominate the list of Top 100 largest TNCs. These include: i) motor vehicles (13 firms); ii) petroleum products (10 firms); iii) electrical and electronic equipment manufacturers (9 firms); iv) utilities (8 firms); v) telecommunications (8 firms); and vi) pharmaceuticals (7 firms). These six industries account for around 55% of the largest TNCs. Another 23% comprise metals, non-metallic products, chemicals, retail and wholesale trade, and food and beverage manufacturers. The majority (72%) of these Top 100 TNCs come from the same five countries: the USA, France, Germany, the UK and Japan.
- Economic development requires integrated, multimodal transportation systems and in regional economies this may involve collaboration across multiple jurisdictions. This type of infrastructure investment has become typical across Asia, Africa and Latin America.
- As major corporations begin to expand into trans-national organisations they create global supply chain networks that move outside national boundaries. This has typically seen them move operations offshore from their home countries to areas that offer competitive labour costs, tax regimes and other incentives, or access to markets, resources and skills.
- Increasing levels of population within massive regional cities will create concentrations of labour for the development of new industries, as well as a significant consumer markets for the products and services generated by them.

Chapter 4

Synopsis of Current World Trends Part 1 – Supply Chain Logistics

Developments in Global Supply Chain Logistics

The emergence of the major regional trading hubs outlined in the preceding chapter will be a significant shaper of industrial land use. Large scale industrial land developments are dependent on the provision of infrastructure to facilitate the global supply chain and logistics operations that are vital to the success of industries. Despite the importance of such operations there is relatively little academic research that has been undertaken into global supply chain dynamics (Guinipero *et.al.*,2008). In this chapter we examine the current trends taking place in industry with an initial focus on the global supply chain logistics and how these might impact on the use of industrial land.

The Nature of Supply Chain Management

Supply chain management is a strategic activity focused upon seeking to develop a competitive advantage through lowered costs, enhanced speed of delivery, or improved quality. A definition of supply chain management has been provided by Christopher (1992) as follows:

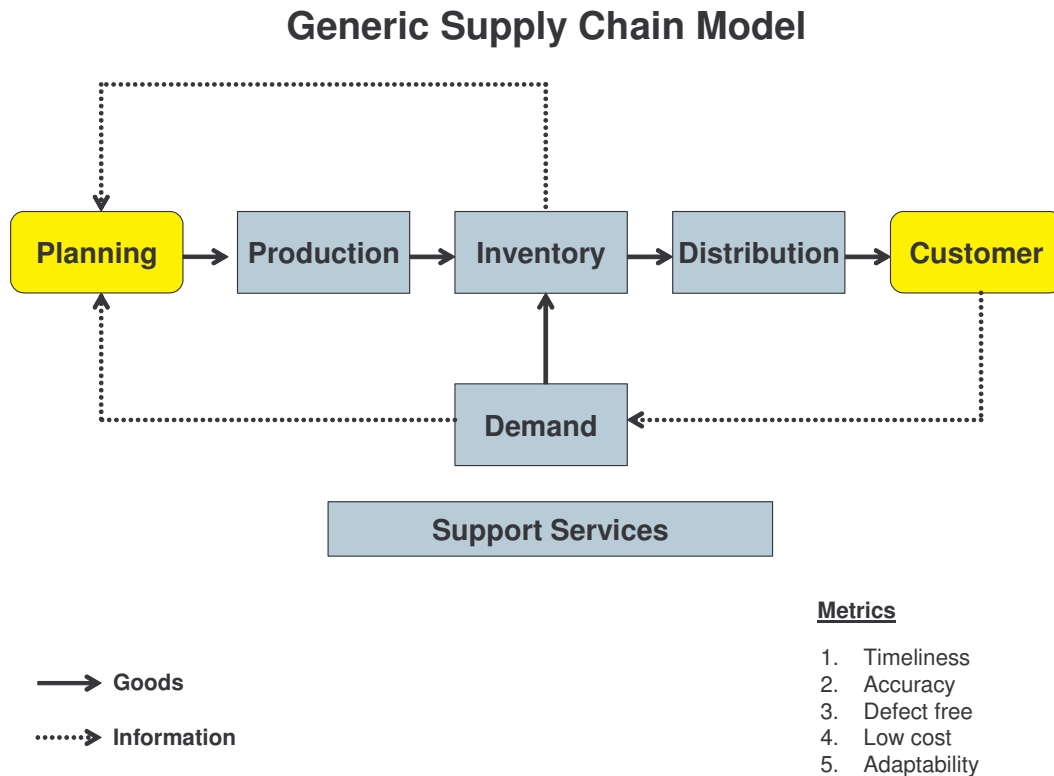
“The supply chain is the network of organisations that is involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer” (p.12).

Until the 1990's supply chain management was an embryonic discipline and practiced without the strategic focus that it enjoys today. During the 1960's and 197's most large firms were vertically integrated and international supply chains were rudimentary. However, during the 1980's a growth in total quality management (TQM) and a trend toward international standards of quality (ISO9000) began to take hold throughout most industrialised economies (Chandra & Kumar, 2000).

Over the course of the 1990's the expansion of global trade was accompanied by increasing competition and the need for lower costs of production. Faced with these pressures, many firms began outsourcing supply to lower cost producers, many of which were located in other countries. With the availability of information and communications technologies (ICT) to facilitate data capture and analysis, a new field of logistics or supply chain management was spawned (Motwani, Larson & Ahuja, 1998).

A study by Deloitte and Touche found that 98 percent of firms considered logistics and supply chain management to be critical or highly important (Lau, Pang & Wong, 2002). One of the key issues associated with supply chain management was the ability to source components from a range of suppliers who have been selected on the basis of their cost or quality, and who can deliver on a timely or just-in-time (JIT) basis. The JIT concept has become a major focus of manufacturers which involves configuration of the supply chain

to ensure that all activities are synchronized to provide a timely flow of inputs when required. Use of information technologies involving bar coding and automated reorder software allows the creation of a Quick Response (QR) system in logistics management with each activity mapped through the value chain to ensure delivery when and where required (Svensson, 2002). This assists the firm to reduce inventory carrying costs and lower costs of production.



Source: Juran & Dershin (2000)

Figure 4.1: Generic Supply Chain Model

Juran and Dershin (2000) outline a generic supply chain model based on their experience of working with industry groups. This is shown in Figure 4.1 and shows the need for monitoring demand along the entire value chain commencing with customer demand and using the monitoring of inventory levels to facilitate planning activities. As they point out:

"A supply chain is not a single process but is, rather, a system or collection of processes. The processes that make up the system are dependent on one another and must work in a highly coordinated way to meet customers' needs effectively and efficiently. The process of assessment involves identifying the various activities that make up the supply chain, including identifying the customers of each activity. The assessment also includes evaluating the activities with respect to effectiveness and efficiency" (Juran & Dershin, 2000).

Principles of Effective Supply Chains

For a supply chain to work efficiently it is important for member organisations to be highly flexible and to ensure that each is focused on its own operational efficiency. The relationships that exist between the various organisations comprising the supply chain not only need to be efficient, but must also have strong inter-firm relationships built on trust, loyalty and a sense of common purpose. According to Chandra and Kumar (2000) there are eight key issues that all supply chains must address:

1. **Organisational Structures and Flexibility** – all members of the supply chain must be agile and responsive to the needs of the others both up and down the chain, with the ability to increase or decrease production as demand rises and falls.
2. **Organisational Relationships** – a strong sense of common purpose needs to emerge among the supply chain members, with all firms seeking to assist in the enhancement of the overall production process. This can be assisted by the creation of preferred supplier relationships and even the use of key suppliers for services (e.g. transport and shipping), to ensure quality and efficiency are maintained.
3. **Total Supply Coordination** – a large firm serving as the focal point for this supply chain, will have multiple supply chains and these should be coordinated to ensure maximum efficiency and economies of scale. Attention should be given to market demand rather than size of purchase order when configuring these arrangements.
4. **Communications** – the effectiveness of a supply chain is likely to depend on how smoothly information can flow up and down the channel “within and between” members. Where relationships are soundly based it should be possible for ideas to emerge about ways to improve the product or process.
5. **Outsourcing non-core competencies** – as supply chain relationships strengthen it should be possible for firms to outsource those activities that are non-essential to their operations or which are not the basis of their distinctive competence. These tasks can be outsourced up or down the supply chain, or given to new members of the supply chain who can demonstrate their capacity to specialise in this activity.
6. **Build to Order manufacturing strategy** – through the careful use of JIT and QR systems, it is becoming possible for firms to follow a strategy of build-to-order (BTO) whereby the production system does not commence to produce until the customer order is placed. This has always been a feature of smaller batch producers, but was not feasible with large manufacturers until recently. Dell Corporation has used this strategy in computers and Ford Motor Corporation in the United States adopted a BTO strategy in the late-1990s.
7. **Inventory Management** – as noted above, a key focus for supply chain management is to reduce inventory or carry costs so as to improve cost performance within the production system. Modern systems of logistics management allow much more control than before.

8. **Cost Control** – for most firms the key issue for good supply chain management is to keep costs low by out-sourcing production to other firms that are better placed to undertake certain activities, lower the amount of inventory to be held and increase cycle times.

To address these issues requires the firm to overcome uncertainty in supply and demand variables operating either side of it within the value chain. Managers need to accurately predict demand, specifically the size of any future orders and also their timing. Not all demand is driven by customer or market factors; frequently it can be affected by institutional factors or even random events. On the supply side it is important to know what quantity is to be supplied, the lead times between order and delivery, and the quality of material to estimate wastage rates. What is required is accurate data on products demanded and supplied, pricing, delivery points and timings (McGuffog & Wadley, 1999).

Supply chains that seek to integrate the various actors throughout the entire business activity system and successfully develop strong partnerships between suppliers and customers are able to benefit from the flow of ideas and information up and down the pipeline. Under these circumstances the supply chain emerges as a potential learning system, with information on market trends or new technologies being exchanged by channel participants.

Cost Control and Concentration

The efficient management of supply chains is now one of the most important aspects of modern business. Rising fuel and storage costs mean that transport efficiencies and just-in-time logistics are now of prime importance. The risk associated with global supply chains is now being assessed in terms of such things as the location of the supplier's plants or factories. Those that are located in areas at risk to political turbulence, natural disasters, terrorism or labour unrest are considered unattractive. The ability to deliver through the supply chain on time is also critical, so transportation bottlenecks or bureaucratic delays will see some regions bypassed. Social responsibility in supply chains, including environmental standards and treatment of the workforce are also now major areas of focus (Blanchard, 2009).

A survey of senior managers from leading logistics and warehousing companies in Europe identified a range of trends in the management of supply chain networks over coming decades (Clift, 2007). One trend was the shortening of supply chains with the move towards retail warehousing as tenants chose to share space, defer stock from local manufacturers and import more from low cost producers such as India and China. There was also an anticipated shift from Western to Eastern Europe, and an expected rise in the shipment of manufactured goods from Asia, which already accounts for over half the world's 50m container freight movements.

In Europe the trend has been towards retailers abandoning their warehousing operations and leaving this problem to the manufacturers. For many major logistics firms labour skills shortages have forced them to build warehouses away from major competitors to avoid excessive competition for workers. Rail transport in Europe, including the UK was criticised for being inefficient and slow. Where a truck could take around two days to travel from Milan in Italy to England, the same journey could take up to two weeks by rail. Rail freight was also viewed as involving excessive bureaucracy. Pressure within Europe was also rising over environmental issues as governments sought to reduce the carbon footprint associated with transportation.

For those seeking to develop major warehouse facilities the advice was for flexibility as one panellist put it:

The property industry has got to understand that it is an intermediate operator for end users...It needs to research commercial and technological alternatives to what it is doing...if you are building a warehouse you had better build one you can adapt and change. In most cases, the operational viability for a warehouse constructed today is about five years. It doesn't mean it will be obsolete, but it is very unusual for occupiers to plan and assume they will need the same facilities in five years' time. This can be due to anything from company mergers to changes in stock. (Clift, 2007).

Similar trends are taking place within North America with a shift towards larger retail distribution centres located at strategic sites around the United States. A typical development encompasses a site larger than 20 hectares and utilises fairly square building configurations of over 1 million square metres. Warehouses are also growing in size. The average warehouse under construction in recent years has been around 20,000 square metres. These large warehouse sites must be close to major highways and within easy access to sea container ports as they are receiving goods shipped in from offshore manufacturing areas. There is also a noticeable trend within the United States towards large industrial land users to choose to buy rather than lease these sites. This appears to be driven by falling interest rates. The need for larger sites has also seen a move to re-configure smaller lots into larger ones to meet market demand (Qualman, 2007).

An example of these trends is the United Postal Service (UPS) distribution hub in Louisville Kentucky which was upgraded in 2007 at a cost of US \$1 billion, and will link to its air distribution hub at Shanghai's Pudong International Airport in China which opened in 2008. This facility covers an area of over 93,000 square metres. There is also a trend towards a significant investment in inter-modal freight transportation systems in North America. For example, Canada's national rail operator Canadian National Railway (CNR) is developing its inter-modal freight services to offer "seamless" transport solutions across Canada and the United States over the coming decade (Bearth, 2007).

The Louisville International Airport that houses the UPS distribution hub is now the tenth largest air cargo centre in the world. It is located within 900 kilometres of around two third of the US population and close to major rail and road infrastructure. Key industries in the region include motor vehicle manufacturers such as Toyota and Ford, plus electrical and electronics manufacturers like General Electric. In addition to the UPS site at Louisville, there is a 5,900 square metre DHL distribution centre. Louisville is typical of the type of major logistics hubs emerging across the United States in smaller cities which have good transport infrastructure, but lower priced and more available land areas for the development of large scale industrial parks (Sowinski, 2007). As one logistics specialist explained:

The proliferation of very large, million-square-foot distribution centres is a direct result of the increased importance of imports and container traffic on the supply chain...Strategically located distribution centres near ports or highways can lead to substantial savings by reducing two critical linkages – port to distribution centre and distribution centre to highway. This is especially true for larger retailers that have volumes of goods from multiple vendors. In many cases, the efficiencies realised from super-sized centres result in a net cost saving even if an additional step is being added to the supply chain (Sowinski, 2007).

Logistics as an ICT driven industry

Supply chain management is now being driven by the application of information and communications technologies (ICT). In many consumer markets, accurate and timely data is now available on customer purchasing behaviour and preferences with the ability to respond quickly to market demands with relatively low volumes but high variety of products that are tailored to end user requirements (Christopher, 2008).

Technology is also a key driver of change within the logistics supply chain sector. Warehouse automation is requiring larger floor plans and higher ceilings. Radio Frequency Identification (RFID) technology is now becoming common place within major logistics systems such as used by Wal-Mart and the US Department of Defence. The future should see almost every box containing an RFID chip that will allow all material to be quickly tracked throughout the production and supply chain, thereby making inventory control and management more efficient (Qualman, 2007).

RFID technologies offer the ability to make the entire supply chain process visible and to reduce the level of human error while providing a complete history of the movement of virtually every item in the system. Use of RFID within the supply chain will significantly change the nature of ICT usage within the logistics management process. It generates a substantial quantity of data that must be transmitted, stored, retrieved and analysed in a timely and efficient manner (Taghabori-Dutta & Velthouse, 2006). Warehouse and logistic management is therefore set to become a major user of ICT and a high tech sector.

An example of this trend is the case of *Dale and Thomas Popcorn* a manufacturer and distributor of gourmet popcorn and confectionary in Englewood New Jersey, USA. Their logistics operations are housed in a 9,754 square metre warehouse that employs state of art ICT systems for inventory control. A wireless, scalable communications infrastructure provided by Siemens has been designed into the warehouse that enables the company to track all material arriving, being stored and leaving the facility. The technologies employed include RFID, voice and barcode scanning connected by a wireless mobile computing network. Antennas are built into the ceilings allowing Motorola hand held computers to be connected easily to the facilities host server. All aspects of the warehouse operations (receiving, put away, replenishment, and picking) are reported and stored into the company's data management system (Schiavo, 2008).

This type of high technology solution is set to become the norm for modern warehouse operations. It not only reduces human error and enhances efficiency, but it enables the business to closely monitor all aspects of the operation to assist with future planning. This type of technology will also require future industrial estates that seek to accommodate such firms to possess state of art telecommunications infrastructure in addition to the conventional transportation infrastructure. The regions hosting such businesses will also need to have a well educated and technology capable workforce to operate, manage and maintain the systems.

CASE STUDY – MAGNA PARK, LUTTERWORTH, UNITED KINGDOM



Birds Eye View of Magna Park

Magna Park is considered Britain's first and Europe's largest dedicated distribution industrial park with a total area of 202 hectares and approximately 2,347,000 square metres of distribution space. The park is strategically located on Citywest Road (N82) and is in close proximity to the N7 Naas dual carriageway which is approximately five kilometres from the M50 / N7 motorway intersection providing motorway access to all key arterial routes from Dublin. The Business Park has direct access onto the N81 Tallaght / Blessington Road and is well provided for by public transport (77 route) which provides direct access to the city centre every 15 minutes at peak times.

KEY LESSONS:

Key learning from Chapter 4 "The Nature of Supply Chain Management"

The emphasis on supply chain efficiencies within the Magna Park Industrial Park has seen the implementation of state of the art technology and innovative distribution techniques that have lead to the minimisation of costs, improving speed and quality of the product delivered by the tenants to their respective clients and total supply coordination being experienced.

This has been clearly demonstrated by an existing tenant - Primark who were looking for a technology solution which would facilitate its increase in volumes projected to grow by 36% increase in volume per annum. "A new material handling solution was designed which was able to handle existing volumes whilst having the flexibility to factor in future projected growth. The technology has increased pick rates, provided greater accuracy and enhanced the overall productivity. As a result, staffing levels at the distribution centre have remained the same despite a 500 per cent increase in warehouse capacity." Stated Darcy de Thierry (Managing Director, SDI Greenstone)

Magna Park has also been recognised as an example of "best practice" in regards to managing the risk of light pollution. Light pollution from the site has been minimised by the selection of lanterns with full cut-off shrouds, the use of lighting columns that are as short as possible keeping lamps low, placing lights on brackets on the building walls and ensuring that all direct light is directed in a principally downward direction, thus avoiding spillage into surrounding offsite areas.

Leaner, Greener more Cost Efficient Supply Chains

In addition to technology, other major trends likely to shape modern logistics management in the future are a trend towards leaner logistics with tighter levels of inventory control designed to reduce freight and transportation costs. This will be assisted by the growth of RFID technologies. China's role in global supply chains will also continue to grow, particularly around major shipping hubs such as Shanghai. Major international logistics firms have been investing strongly in China over the past five years seeking to secure a foothold there (Gordon, 2004).

China looks set to grow as a major logistics hub, but there is also an emerging trend towards "near-shoring" in which supply chains are being directed towards countries with closer geographic proximity to the focal firm. This helps to reduce transportation costs and may provide faster response times (Mulani, 2008).

While logistics movements between Asia and North America are anticipated to grow, inter-regional transport within North America has also been growing over the past decade, facilitated by the NAFTA agreement. This has necessitated the improvement of cross-border customs handling between Canada, the United States and Mexico to avoid bureaucratic inefficiency. Finally, there has been a trend towards consolidation within the logistics industry in North America. This has seen a succession of mergers and takeovers creating fewer, but much larger "one stop solutions" (Gordon, 2004).

Within North America the outlook for supply chain management according to some analysts is for stronger controls over customs and safety compliance, as well as adherence to more stringent quality and environmental regulations. A "green supply chain" concept is emerging that will see attempts to reduce waste and carbon emissions throughout the entire product lifecycle, from raw materials sourcing to the recycling of discarded products (Hart, 2008). Innovation in the transport sector has tended to lag that of other industries in past decades; however this is likely to change as the need for enhanced productivity and efficiency increase (Wagner, 2008).

As governments take action to reduce carbon dioxide emissions significantly over the period out to 2050, there will be substantial pressure on logistics firms to reduce energy consumption and also costs. In 2006 a report by the Council of Supply Chain Management Professionals (CSCMP) noted that logistics costs in the United States as a percentage of GDP had risen by over 15% in the previous two years. In response, best practice companies were adopting network design technologies aimed at lowering transportation and storage costs. What this means in future developments is fewer, larger distribution sites, making maximum use of ICT systems to ensure efficiency of freight movement and storage. In Europe this has seen major distribution hubs, based in key logistics centres such as Belgium, which can service the entire Western European region. Similar sites are now being developed in Eastern Europe, for example the Czech Republic. Within North America, major distribution centres are being built close to sea ports on both the East and West Coast to service the growth in international traffic from offshore manufacturing sites (Ironsides, 2007).

3PL specialists as an evolving industry

An important issue in logistics management is the balance that must be struck between carrying costs (e.g. the holding of material in inventory and storage) and ordering costs (e.g. the movement of goods through the logistics supply chain). The rising cost of transportation due to higher fuel prices has seen a rise in inventory carrying costs as a

percentage of GDP in many countries (Hoffman, 2008). As the logistics and supply chain management process becomes more complex and high tech there is a growing level of sophistication within the Third-Party Logistics (3PL) providers.

With the advent of ICT driven systems that span a number of international centres, 3PL firms will need to evolve into highly sophisticated service providers with the ability to offer clients both cost efficiencies and added value. No longer will it be necessary to simply ensure that goods are delivered on time where and when they are needed. The future will require 3PL businesses to become business consultants able to offer strategic advice to clients over risk management, logistics optimisation and planning. The analysis of data drawn from the use of RFID and related ICT systems will make such firms key actors in the development of future business models (Lummus *et.al*, 2007).

Part of the role of 3PL specialists will be planning the location of warehouse distribution sites as well as offering economies of scale and scope in logistics operations. The investment required in state of art warehouse management systems (WMS) and transport management systems (TMS) is significant for major logistics supply chain operations. As such it may be prohibitively expensive for a single operator to set up such systems offering an opportunity for large 3PL firms to service multiple clients within a specific industry or group of industries (Karolefski, 2009).

The application of ICT systems to logistics has started a major change in the management of food industry supply chains, particularly cool chains that involve perishable produce. As data capture, management and reporting systems improve, managers are in a position to quickly provide accurate forecasts of future demand. Distribution centres for fast and slow moving items located close to retail outlets reduces the previous requirement that retailers commit to minimum order quantities. This reduces spoilage and lowers the final cost to customers (Casper, 2009).

According to Chris Sieberg, Vice President Logistics for *Tree of Life*, a US \$1.2 billion distributor of food products with 10 distribution centres servicing the United States and Canada:

More people will evolve to a kind of super-regional concept, deploying more, smaller distribution centres closer to customers, serviced by larger supply centres for certain pools of inventory. Ten years from now, we'll also see new transportation networks in the U.S. that replicate elements of today's European networks, with third-party transportation providers delivering stops for pools of customers, the way dedicated 3PLs currently provide customised warehousing services (Casper, 2009).

Future Supply Chain Developments

The above sections have highlighted the many forces which will effect transport and logistics and supply chain management in the future. A potential model for how supply chain management will evolve has been outlined in a discussion paper by the Global Commerce Initiative in Europe called "2016: Future Supply Chain". This report focuses on the new kind of business models needed to accommodate the challenges in the next decade, including economic, ecological, demographics, technology and other changes. The Australian Logistics Council is planning to contextualise this report for Australian use in 2009.

Characteristics of the 2016 Future Supply Chain (Capgemini, 2008a)

- The future model will be based on multi-partner information sharing among key stakeholders: consumers (the originators of the demand signal, either from home or from a store), suppliers, manufacturers, logistics service providers and retailers.
- After production the products will be shipped to collaborative warehouses in which multiple manufacturers store their products.
- Collaborative transport from the collaborative warehouse will deliver to city hubs and to regional consolidation centres.
- Warehouse locations on the edge of cities will be reshaped to function as hubs where cross-docking will take place for final distribution.
- Non-urban areas will have regional consolidation centres in which products will be cross-docked for final distribution.
- Final distribution to stores, pick-up points and homes in urban and non-urban areas will take place via consolidated deliveries using efficient assets.

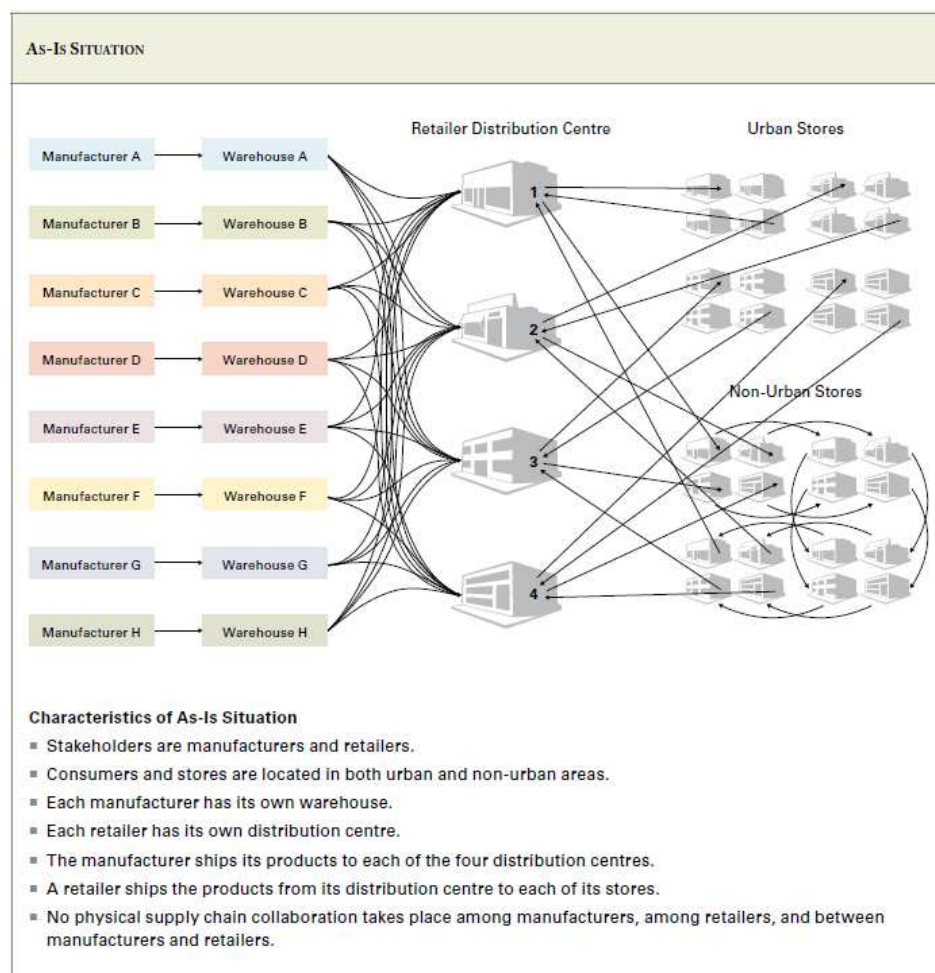


Figure 4.2: Supply Chain “As-Is Situation”

Graphically displayed the Future Supply Chain model would see supply chains moving from the “as is situation” shown in Figure 4.2 to the “to be integrated model” outlined in Figure 4.3. This would involve a huge level of consolidation in the transport and logistics market and shows that potentially the level of consolidation that has already occurred in Australia is just the start of what is likely to be a dramatic change in this market.

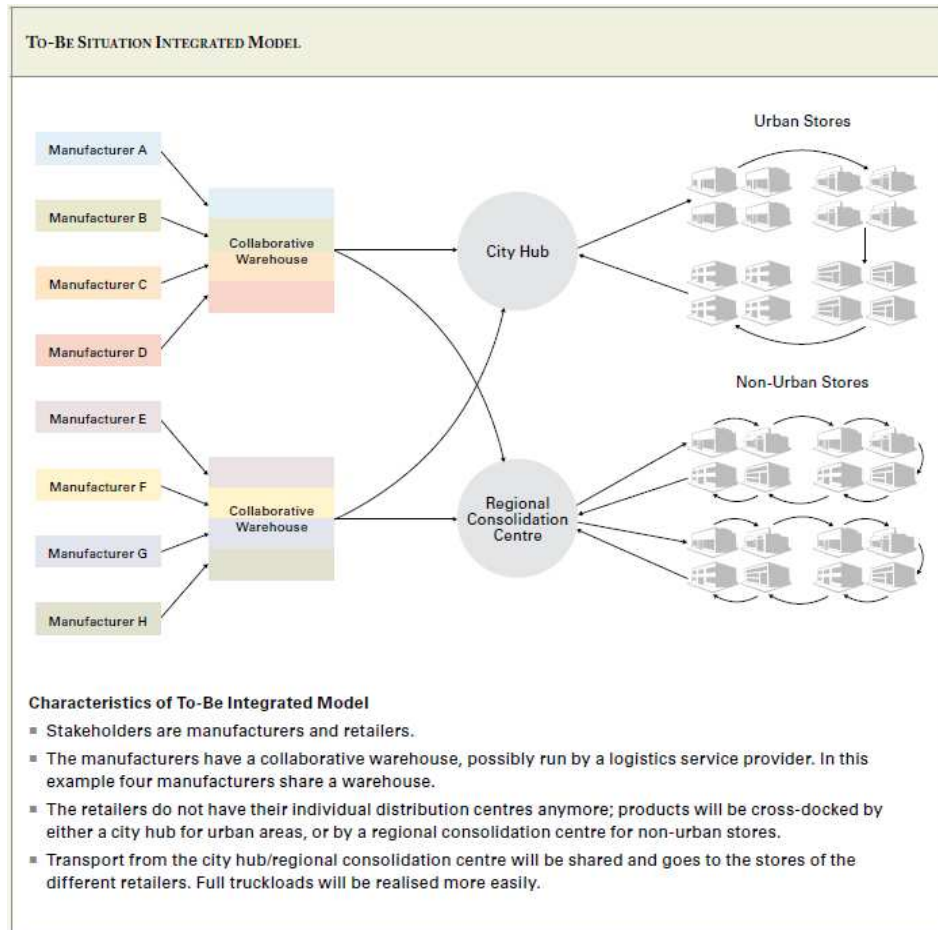


Figure 4.3: Supply Chain “To-Be” Situation Integrated Model

As shown in Figure 4.2 the main characteristics of the “As-Is Situation” is that the key stakeholders are the manufacturers and retailers at either end of the supply chain. Consumers and stores are located in both urban and non-urban areas and each manufacturer has their own warehouse, while each retailer has their own distribution centre. The manufacturers ship products from their factories to the various distribution centres in the retailer network. The retailers then ship these products from their distribution centres to each of their various retail stores.

There is no physical supply chain collaboration among the manufacturers and retailers. Each has a separate network and as a result there is a significant level of duplication between the supply chains as manufacturers supply to multiple retailers and each retailer has to build a separate supply chain for the transfer of goods regardless of the level of

volume they carry in each product line. This creates some inefficiencies and therefore added costs to the supply chain system.

By contrast the situation found in Figure 4.3 of a future integrated model suggests that manufacturers collaborate with each other to create a combined warehouse model that may be managed by a 3PL specialist service provider. The retailers also abandon their previous system of multiple distribution centres. In their place is a major distribution centre that operates as a city hub or regional consolidation centre. Transportation from the city hub or regional consolidation centre is shared and flows directly to the retail stores of the different retailers. Transport costs are reduced as vehicle loads are larger and more efficiently managed.

The 2016 report was followed up by “2018: The Future Value Chain” (Capgemini, 2008b), this report identified and explored eight major global trends which would effect global supply chains.

- The **declining economy** is given added impetus by the recent credit crisis, which will restrict consumer spending and reduce the availability of funds for company expansion.
- **Social structures** will significantly change. For example, the emerging middle-class consumers in Asia, growing urbanisation as well as ageing populations.
- The **cost and availability of raw materials** will disrupt our supply chain and impact our consumers.
- Consumer and corporate **awareness of sustainability** is growing, with companies responding with both internal and consumer programmes.
- We will see further mass adoption of **consumer technologies**, which will change the way consumers communicate with each other and the companies that serve them.
- **Business models** and routes to market will change, particularly in Asia with the emergence of hybrid models.
- **Information in the supply chain** will be crucial as supply chains will be increasingly driven by collaborative information.
- Finally, there is the concern of **product safety** as an increasing number of food safety scares put pressure on the industry to secure supply chains.

Many of these have similar themes to the mega trends identified in Chapter 1 of this report. The need to lower operating costs through more efficient use of transportation networks and subsequent fuel economies will be joined by a growing pressure for more environmental sustainability. This is likely to seen an increase in the demand for supply chain and logistics operations to comply with emissions trading targets and carbon offsets, depending on the regulations in the given jurisdiction.

The Role of Ports and Inter-modal Transport

The ability of logistics hubs and supply chain networks to function effectively is contingent on efficient transportation systems. While road, rail and air transportation is important, the role of sea ports in the facilitation of trade remains paramount. There are over 2,000 ports around the world and they serve as the gateways or bottlenecks to exports and imports that ultimately drive the demand for much of the industrial land used within a region.

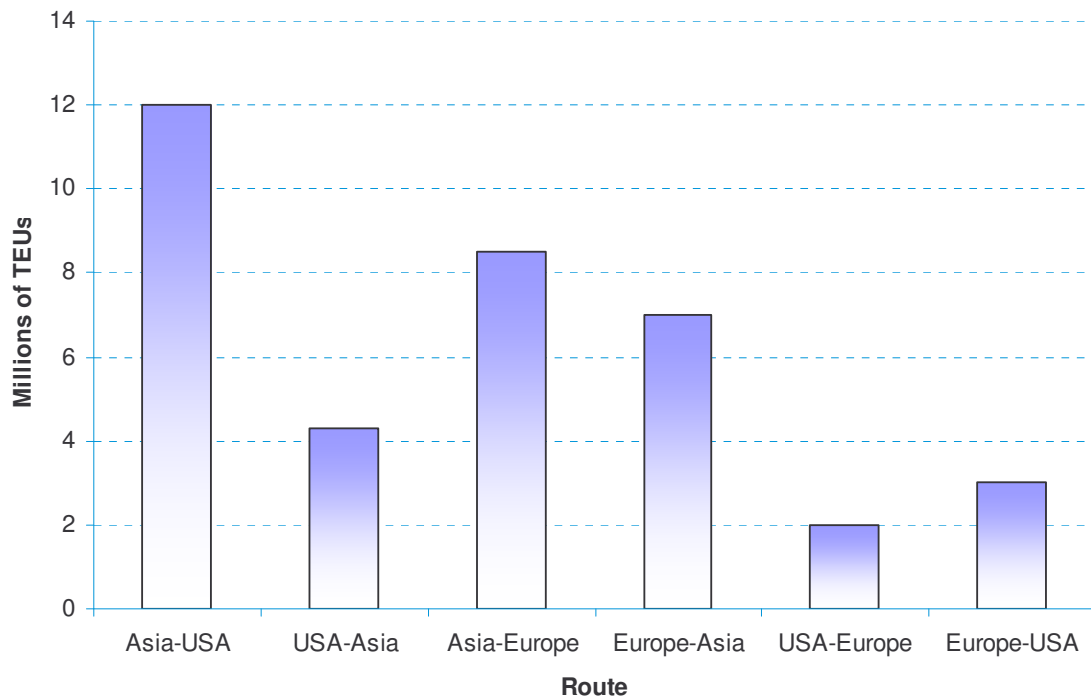
Trends in Maritime Freight Transport and Shipping

Globalisation has resulted in an increase in the volume of international trade and the inter-connectivity of the world's economies. In response to this rising demand for shipping, vessels are getting larger and faster with more sophisticated loading and unloading technologies. Cargo vessels are now larger than ever. An example is the "Emma Maersk" which was the world's largest container ship in 2007. Part of a fleet of five mega-ships, they can carry around 14,500 twenty-foot equivalent unit (TEU) sea containers (Mangan *et.al.*, 2008).

These ships are too large for most ports and this has resulted in the development of hub and spoke structures similar to that found in airline systems. Major ports such as Shanghai, Singapore or Rotterdam serve as the centre of the hub with mid-sized ports linking feeder routes to them as the spokes. The viability of smaller ports is now heavily dependent on the traffic flowing into the larger hub ports. For a port to be attractive to the major shipping firms it must offer a good location relative to other ports to facilitate ship transit times, and should also be close to major markets. The port also needs to be well serviced in terms of infrastructure, facilities and services. There also needs to be some flexibility for the port to deal with ships that get delayed and therefore do not arrive on time (Mangan *et.al.*, 2008).

The main container trade corridors are shown in Figure 4.4 where it can be seen that the greatest volume of traffic is from Asia to either North America or Europe. Port efficiency is now a critical aspect of a national economy and best practice requires the use of the latest loading, unloading technologies, as well as well regulated dockside employment not prone to militant industrial action. Many ports are now public-private partnerships involving either public land or port functions regulation with privately owned cargo handling, or publicly managed port functions regulation and privately provided land and cargo handling. In some cases all functions are fully privatised while others are totally government run.

Singapore and Rotterdam are traditionally the world's largest container ports in terms of total TEU flows. However, Shanghai is now rapidly closing the gap. Other major ports are Hamburg, Dubai and Los Angeles. The port of Jebel Ali, Dubai was ranked as the world's sixth largest port in 2006 and is part of a global trade corridor between Europe and Asia. Government plans aim to promote the port as a key trading hub with the development of a new airport, industrial or business park and residential areas to position it as an integrated, multi-modal logistics platform (Mangan *et.al.*, 2008).



Source: Rodrigue & Hesse (2007)

Figure 4.4: Major Sea Container Trade Corridors

Shipping firms are also investing heavily in other freight transport systems. For example, Maersk Line owns the European Rail Services (ERS) operation and a major shareholding in Box Xpress. This provides them with control over a major European wide network of rail freight services out of the port of Rotterdam. In 2006 ERS over 200 rail shuttles a week and moved around 620,000 TEU of container rail freight. Other major shipping operators are moving in the same direction (Notteboom, 2008). This trend is also taking place against a background of global alliances between shipping and logistics firms who share logistics data, techniques and resources. Negotiations with suppliers are now being driven by consortia comprising these alliance partners.

Containers have been the fastest growing sector of maritime industries during the past twenty years and this trend is anticipated to continue. Trade liberalisation, globalisation and outsourcing by globally integrated business, has resulted in break bulk cargo now being increasingly carried in containers. In highly intensive markets such as Europe or Asia, the competition taking place between seaports is being driven by the development of inter-modal freight transport networks within the regional hinterland. Container terminals are playing a critical role in this logistics supply chain, and the overall competitiveness of the port and the regional logistics network is likely to be heavily dependent on how efficient these terminals are (Notteboom, 2008).

CASE STUDY: SUBIC BAY FREEPORT – REPUBLIC OF THE PHILIPPINES



The Subic Bay U.S naval base was converted to the Subic Bay Freeport (SBF) in 1992 and is now designated as a special economic zone whose purpose is to attract foreign investment from around the globe. Subic offers a deepwater pier, an airport, a 118-megawatt power plant, water and sewerage treatment facilities, almost 2,000 housing units, modern telecommunications infrastructure and an 80 kilometre network of roads.

KEY LESSONS:

The site's excellent infrastructure, its strategic location on the Pacific Rim, the community's quality of life, and economic incentives offered by the Subic Bay Metropolitan Authority (SBMA) – the public agency created to develop the site – have attracted domestic and foreign companies. Special economic zones were designed to attract domestic and foreign investment.

The SBMA strategy is to use the site's infrastructure and strategic location and the area's skilled, english-speaking labour force to attract investment and economic development. Subic's Pacific Rim location and its status as a free port make it a prime site for a global transpark, which in concept is the provision of a 21st century setting – multimodal transportation, advanced telecommunications, and links to suppliers and customers far and near – in support of global manufacturing and distribution operations. SBMA plays a key role in the national government's efforts to achieve international competitiveness and provide for its integration with the global economy.

Port-centric Logistics and Supply Chain Dynamics

Sea ports serve as gateways for logistics supply chains and they are now viewed as part of an integrated transportation and distribution network for inter-modal logistics handling. In both the UK and USA, ports are seeking to attract major freight distribution centres with the argument that freight must first pass through the port before it passes to the distribution centres which are often located inland. For example, Kansas City's *SmartPort* concept aims to provide a port hub able to service traffic from the West Coast, East Coast and NAFTA corridors (Sowinski, 2007).

The emerging trend towards containerisation and the increasing size of container vessels has been identified as a key factor in the rise of major seaport “gateways” that serve as the entry or exit point for a regional hinterland within a supply chain. Economies of scale force the concentration of such container operations into fewer but larger firms. Shipping firms also seek competitive pricing between ports and equalisation of costs transported via

inland corridors of varying lengths. This has in turn placed pressure on inland inter-modal transportation networks seeking to integrate road, rail or river/canal systems into the supply chain traffic. Inter-modal transport corridors designed to service major seaport hubs have emerged as a critical area for development within Europe (Notteboom, 2008).

Research into the location and planning for major logistics hubs and distribution centres highlights the importance of first developing a well considered long term strategy for the site. This should consider the general geographic location of the new facility, level of local government support, level of community support, availability of support services, tax or freight charges, physical infrastructure, and proximity to supplier and customers. Key issues are transportation and ICT technologies. Land costs, availability of a workforce and the proximity to major sea ports can also play a role. However, the overall cost of site operations is the most critical issue. This is primarily driven by the cost of transportation, both inbound and outbound. In most cases this comprises around 50% to 60% of the total cost of distribution (Thai & Grewal, 2005).

The selection of a specific site for a major logistics distribution hub is likely to commence with review of the general geographic area and the application of a “centre of gravity” principle (Thai & Grewal, 2005). The main considerations for the general geographic area will involve an examination of population demographics and trends. Forecast population growth, socio-economic and GDP forecasts, telecommunications and transportation infrastructure, unemployment levels, labour force quality and supply will also be assessed.

Once these issues have been examined a number of alternative sites will be identified and these are generally examined against their relative proximity to the customers, labour force skills and supply, availability of infrastructure, cost of transport, local government regulation and support, and capacity to expand within the site. The cost of accessing inbound and outbound transport to and from air or sea ports, or rail freight terminals will also be considered and each alternative site compared to the others. Where competing sea or air ports exist (as in the USA or Europe), the merits of each will be considered. This might include cost of shipment and time taken to ship via each port. Union disruption and such issues as damage, theft or delays due to congestion will also be given attention prior to making the final site selection (Thai & Grewal, 2005; Kunadhamraks & Hanaoka, 2008).

In busy supply chain and logistics environments such as Europe the key factors that drive the competitiveness of seaports are the ability of the port to fully exploit synergies with other transportation nodes within the logistics network. Ports must be integrated into other transport systems and need to employ technology, value added services and inter-modal transport channel integration. These networks are much wider than the port area and can flow many hundreds of kilometres inland. The major seaport is thus the focal point of a regional transport system that links major distribution centres

Innovation in the transportation sector has traditionally been low compared to other industries. For example, innovation intensity (as measured by investment in new technologies or ways of doing business) represents around 8.5% of the total budgets for manufacturers in the motor vehicle industry in Europe, compared to 7.2% in the electronics industry and 5.6% in software and telecommunications. For transportation industries this figure is only 2.1% (Wagner, 2008). This relatively low level of R&D investment in the transportation industry has been due in part to the outsourcing of innovation within the sector, and the lack of pressure from customers for innovation. However, with transport costs now comprising such a high proportion of total costs in many businesses, the pressure for new technologies is likely to rise. This will see the introduction of new, more fuel efficient vehicles, and a significant increase in the use of ICT systems to track the movement of vehicles. Analysis of data from “black box” recorders in

vehicles and RFID chips in their cargo will enable firms to examine transit times. This will allow firms to identify any potential disruptions or bottlenecks in road, rail, port or air transport infrastructure and seek remedy from governments.

Summary and implications for WA

Industries and the firms that operate within supply chains are best understood as part of production networks. Efficient supply chains comprise a series of participants who understand their role in the process and can add value both up and down the channel. In the modern supply chain the most valuable resources is knowledge that is secured with the ability to capture data and analyse it in order to enhance the efficiency of the production system or supply chain. ICT systems are now a critical element in this process and it will be important for WA to support future industry needs in this area with sufficient skilled ICT employees and the infrastructure required maintaining and networking their computer and telecommunications systems.

OBSERVATION

WA will need to ensure that it invests sufficiently in the maintenance of its infrastructure to allow its industries to participate competitively in these global production networks. The efficiency of sea port container handling terminals or bulk loading terminals will be of critical importance. However, the airport, road, rail and ICT systems within the state must also be maintained to the highest level. Failure to do so will risk making WA less competitive and therefore attractive to national or international firms seeking to invest in or operate from the state.

The future of supply chains is likely to see larger, more consolidated warehousing and storage facilities and the emergence of major urban and regional distribution hubs. These will require state of art ICT systems to enable the use of modern logistics management practices. The drive for reduced costs of transport will continue as will the need to reduce greenhouse gas emissions under future emissions trading schemes (ETS). The size of container shipping is anticipated to rise along with the need for enhanced port facilities and inter-modal transport systems within the hinterland.

Chapter 4: Key Points

- The emergence of the major regional trading hubs will be significant shapers of industrial land use. For supply chains to work efficiently it is important for member organisations to be highly flexible and to ensure that each is focused on its own operational efficiency.
- The relationships that exist between the various organisations comprising the supply chain not only need to be efficient, but must also have strong inter-firm relationships built on trust, loyalty and a sense of common purpose.
- The efficient management of supply chains is now one of the most important aspects of modern business. In Europe the trend has been towards retailers abandoning warehousing operations and leaving this problem to manufacturers.
- Supply chain management is now being driven by the application of information and communications technologies (ICT). In many consumer markets, accurate and timely data is now available on customer purchasing behaviours and preferences with the ability to respond quickly to market demands with relatively low volumes but high variety of products that are tailored to end user requirements.
- Technology is also a key driver of change within the logistics supply chain sector. Warehouse automation is requiring larger floor plans and higher ceilings. Radio Frequency Identification (RFID) technology is now becoming common place within major logistics systems.
- China looks set to grow as a major logistics hub, but there is also an emerging trend towards “near-shoring” in which supply chains are being directed towards countries with closer geographic proximity to the focal firm. This helps to reduce transportation costs and may provide faster response times.
- “Green supply chain” concepts are emerging that will see attempts to reduce waste and carbon emissions throughout the entire product lifecycle, from raw materials sourcing to the recycling of discarded products.
- As governments take action to reduce carbon dioxide emissions significantly out to 2050, there will be substantial pressure on logistics firms to reduce energy consumption and also costs.
- 3PL specialists will be planning the location of warehouse distribution sites as well as offering economies of scale and scope in logistics operations. It may be prohibitively expensive for a single operator to set up systems offering an opportunity for large 3PL firms to service multiple clients within a specific industry or group of industries.
- Manufacturers may collaborate with each other to create a combined warehouse model that may be managed by 3PL specialist service providers.
- The need to lower operating costs through more efficient use of transportation networks and subsequent fuel economies will be joined by a growing pressure for more environmental sustainability.
- The viability of smaller ports is now heavily dependent on the traffic flowing into the larger hub ports. The port also needs to be well serviced in terms of infrastructure, facilities and services. Port efficiency is now a critical aspect of a national economy.

Chapter 5

Synopsis of Current World Trends Part 2 – Emerging/Declining Industries and Sustainability

Emerging and Declining Industries

The future of the world's industries is going to be shaped by the six “mega-trends” outlined in Chapter 1. Globalisation and the development of globally integrated enterprises will see a consolidation across many industry sectors with mergers and acquisitions creating larger enterprises. The impact of the GFC is likely to accelerate this process as some firms find it harder to maintain their autonomy in a tightening financial market and global recession. The growing power of the internet as broadband technologies penetrate further into the world's economies will strengthen the marketing impact of the “omni consumer”.

Web 2.0 technologies have changed the nature of online consumer behaviour from one of “visiting” to one of “participation” with countries such as China and India now emerging as key growth markets for online marketing. The rising affluence of consumers in many developing economies is also transforming the urban landscape in these countries. Asia, South America and Eastern Europe are now seeing the development of shopping centres and other retailing and leisure developments that are impacting how people live and work. Over time these changes to the social, economic and physical landscapes of the world's most populous nations will generate new consumer markets for goods and services.

Tracking the trends across all global industries is an impossible task within the limitations of this report. Furthermore, not all industries are likely to have a significant impact on the demand for industrial land in Western Australia. In addressing the need to map these emerging and declining industries we have focused on six industries: i) retailing, including bulky goods; ii) manufacturing; iii) mining and resources; iv) agriculture and food; v) renewable energy; and vi) clean technologies. Each of these is experiencing major shifts in its future development as a result of the “mega-trends” with each likely to have an impact on the future shape of industrial land use in WA.

Each of these industries is also going to be impacted by the need to meet environmental guidelines for sustainability. The majority of the world's nations have now signed the Kyoto Protocol of the UN Framework Convention on Climate Change. This commits them to a series of reductions in greenhouse gas emissions with European Union states targeting around 8% and the United States 7%. The introduction of carbon emissions trading systems across most of the OECD will begin to drive change in many industries. This is already taking place in the European airline industry where airports, airlines, aircraft manufacturers and the travelling public are being asked to participate in meeting the EU standards for emissions reduction. However, there is a need for this sector to consider the effect of international flights that take place between EU and non-EU countries, which currently comprise around 60% of all emissions (Taverna, 2005). This is a further illustration of the global nature of industry in the 21st Century.

Retailing, Bulky Goods Distribution and Industrial Land Use

The advent of online shopping and consumption have seen a trend towards what has been referred to as “the long-tail theory” of retailing. Developed by Chris Anderson (2006) it suggests that as consumers have greater access to online distribution channels markets will transform into a series of niches in which the volume of sales from products that might otherwise be uneconomical to distribute via conventional bricks and mortar stores, can be increased via online stores. However, research by Elberse (2008) suggests that the retail store is far from dead and that there is still a market for “blockbuster” products.

For many retailers the need to provide customers with a wide assortment of products under a single roof is becoming a key trend. The trend towards “big box” stores or hypermarkets is not new and has been developing over the past twenty years. It first emerged in the United States during the 1980's. The busy, dual income family was no longer willing to spend hours shopping around amongst smaller stores or even department stores, particularly for household items. The desire for lower prices and better margins saw the rise of major warehouse club stores and “category killer” retailing. This involved big box stores with a narrow but very deep range of products able to offer significant cost savings to consumers. The “bulky goods” segment – comprising items such as furniture, electrical and white goods soon became the next area to attract larger stores.

In the United States the trend has been towards “power centres”, or a site containing three or more large big box “category killer” stores covering from 25,000 square metres to over 100,000 square metres. The trend in the USA and UK in recent years has also been towards the development of “retail parks” comprising three or more large retail warehouse stores built as a single entity with share parking and road access. These can also contain non-retail areas such as office space or hotels (Towart, 2004).

This trend towards large retail ‘bulky goods’ sites has also been taking place in Australia and comprised around 40% of all new retail construction in 2006, although, it declined to around 22% in 2008 (Towndrow, 2008). These big box retail sites and category killers are dominated by a few very large retailers and this trend has been placing pressure on department stores. These are generally located in the CBD and are therefore more difficult for customers to access. However, David Jones and Myers have started to pull back some customers with more innovative approaches to their store layout and merchandise (SGS, 2006).

The emergence of bulky goods retail sites within Australia emerged from the early 1990s and has shown a number of trends that are likely to continue into the future. **There has been a focus on precincts**, with bulky goods retailers clustering together within the same areas. Sites have also begun to reduce in size. Initial sites were between 15,000 and 30,000 square metres, but there has been a growth in “mini-centres” of between 7,000 and 10,000 square metres in recent years. **Bulky goods retailing is also merging with other highway retailing.** This sees fast food outlets, equipment hire and self-storage businesses co-located with bulky goods retailers because all these firms require good road access (Towart, 2004).

One observation that can be made is that, in general, precincts that have good exposure and access to their main highway have been growing faster and have lower vacancy levels (once established) than centres that are modelled on traditional shopping centres with an inward focussing design. This is especially true where the bulky goods precinct can “infect” the surrounding (usually industrial) properties (Towart, 2004 p. 4).

Bulky goods retailing requires sites to have specific requirements. First, there must be a substantial surrounding population that is growing with high levels of home ownership. Age levels are typically in the home-building 35 to 45 year range. Locations should be within reasonable driving distance of the majority of their population, their trade catchment area is fairly wide as customers are generally willing to drive across town to visit these major sites for a demand item purchase. Sites need high visibility and good road access as well as large parcels of “affordable” land typically in excess of 30,000 square metres (SGS, 2002).

This requirement for large parcels of reasonably priced land with good road access has resulted in the “retailisation” of industrial land (Towart, 2004). In which industrial estates, particularly along the major arterial roads and at intersections have become home to bulky goods and big-box retailing sites. The boundary between light industrial and retailing has begun to blur. This has caused some concerns in local government planning. In the US the rise of Wal-Mart has seen the emergence of the “power-centre” which has placed severe pressure on the traditional CBD retail areas of smaller cities. However, in Australia this trend has been controlled to some extent by local government regulation and the move by regional shopping centre developers to incorporate bulk goods retailing within their sites.

This move to cheaper rents by large big-box retailers remains a challenge for many industrial estates as it may create problems with traffic flows and congestion around warehouse distribution centres (SGS, 2006). However, the future outlook for bulky goods and big-box retailing remains positive. While there may be some problems facing investment in the sector in the short term as a result of the GFC, over the medium to long term this is identified as an emerging sector that is likely to have a continuing impact on industrial land use in the cities (Towndrow, 2008).

Manufacturing

The forces of globalisation, the rise of ICT, globally integrated enterprises, and the changing nature of international workforce demographics are impacting significantly on the manufacturing sector. Manufacturing encompasses a wide range of industry sectors but is typically focused within eight or nine broad sectors. This includes manufacturing of food, beverage and tobacco products, machinery and equipment, metal products, non-metallic mineral products, petroleum, coal and chemicals, printing, publishing and recorded media, clothing, textiles and footwear, and wood and paper products.

In 2003 54% of the world’s manufactured imports were classified as intermediate goods, or partially completed components that are yet to be assembled into a finished product. This highlights the interconnectivity of global production networks and is a trend that is more common within higher technology industries (OECD, 2008). It reduces the volume of manufacturing that is taking place within national boundaries and illustrates the rise of global trading hubs as discussed in Chapter 3.

Across most of the 30 OECD countries there has been a structural change in the nature of manufacturing. The share of the total workforce employed in manufacturing industries has fallen dramatically since the 1970s. The most significant decline has taken place in two sectors, clothing, textiles, footwear, and metal products. Employment in food, wood and paper, motor vehicles and chemicals has remained fairly stable. These trends are due to a number of factors. Food and beverage products are often produced and sold within regional or national markets thereby protecting local production. Motor vehicles and some pharmaceutical products are subject to tariff protections, patents or similar legal barriers to competition. They also involve some opportunity for technological complexity within the production network, which helps to foster spatial proximity clustering. By comparison some industries such as textiles or metal products can be undertaken more easily in lower cost nations such as China and therefore production operations move towards these areas (Pilat *et.al*, 2006).

One of the key trends in manufacturing is the drift of production from developed to the emerging economies. For example, the United States remains the world's leading manufacturing nation in terms of value of production. Japan ranks second, but China is now third, ahead of Germany and France. As noted, the trend in the past decade has been towards increasing volumes of trade in intermediate rather than finished products, reflecting the growth of global production networks. Trans-National Corporations are a key part of this trade as they move partially manufactured component between their production centres. Innovation remains the key driver for manufacturing. The United States, EU and Japan continue to be the main centres of patents for value added product innovation, yet China is rapidly catching up (Pilat *et.al*, 2006).

The motor vehicle industry is an example of these changes. Automotive vehicle production is one of the most significant manufacturing industries in the world. Historically, manufacturing has been built around a mass-production paradigm epitomised by the Ford Motor Co. in the early part of the 20th Century. Ford's ability to use assembly-line technologies to produce the T-Model at a price and quality competitive within the key target markets of the developed world revolutionised manufacturing. Prior to this revolution factories still largely produced hand made products. By the end of the 20th Century the majority of factories employed machines, often robots, to mass produce products.

Global competitiveness and the rise of ICT based systems that enable more flexible manufacturing have led to the emergence of what is termed a **Post Mass Production Paradigm** (PMPP). There is now a nexus between technology and societal demands that allows the customer to play a greater role in the design and development of products, and for global production networks to be closely integrated via modern telecommunications systems. The ability to embed intelligent systems that can track usage and report over the product lifecycle will change the nature of how manufacturers operate (Kuehnle, 2007).

Motor vehicle manufacturing has experienced all these trends. By the late 1990's the majority of the world's motor vehicles were produced in Europe, North America or Japan. As consumer demand rose in emerging markets the development of motor vehicle plants across South America, Asia and Eastern Europe increased significantly. A global over supply problem emerged in the automobile industry by the end of the last century and was not adequately addressed in recent years by significant industry restructuring. Attempts were made to introduce standard under-body platforms and greater standardisation of parts across different models. This was aimed at reducing production inefficiencies and boosting economies of scale (Sturgeon & Florida, 1999).

This type of manufacturing strategy helped to shape the current trend towards global production networks and the rising level of trade in intermediate goods. Generic vehicle

designs allowing greater production standardisation and the ability to transfer production easily from one geographical area to another to take advantage of lower labour costs were all features of the motor vehicle manufacturing industry's response to globalisation. Other trends included greater outsourcing, joint ventures, contract manufacturing and capacity sharing. Such developments were important drivers in the emergence of the global production networks and trading hubs discussed earlier in this report. For example, within ASEAN, Toyota manufactures engines in Thailand and Indonesia, and transmissions in the Philippines. Parts are sourced from a regional network of smaller suppliers and the final assembly takes place in each country to comply with government tariff protection regimes (Sturgeon & Florida, 1999).

The problem of overcapacity within the automobile manufacturing industry was not solved during the past twenty years and the current GFC is set to drive significant change through the sector. Major manufacturers such as General Motors and Chrysler are in serious financial trouble due to the economic downturn but they will also need to start investing in the new, more environmentally sustainable technologies that are set to shape the future of the car industry over the course of the 21st Century. Challenges from emerging market producers such as India and China will also accelerate changes in this sector.

The longer term outlook for manufacturing is for a continuation of the trend towards global production networks and a shift from OECD developed economies to emerging markets. This can be seen not only in motor vehicle manufacturing but in petrochemicals where Asian and Middle East manufacturers are growing market share. By 2015 the share of global petrochemical production taking place in the Asia is expected to grow to 34% with North America and Europe's share falling to 29% and 23% respectively (Ramesh, 2007). Some predictions suggest that by 2020 much of the world's petrochemical and plastics manufacturing will take place in the Middle East, close to the source of the raw material. Other oil producing economies with lower labour costs may also become significant players in this market. The Saudi Arabian industrial complex of Al-Jubail discussed earlier in this report, and centres in Qatar and Iran may also be significant players (Richardson, 2007).

Australia's manufacturing industry is likely to be shaped by similar trends. Sectors that cannot provide sufficient value adding through technological or production complexity will be forced offshore in order to secure lower costs of production. High technology in the form of computer assisted and robotics production will continue, and the application of ICT based intelligent systems within products will see manufacturers move further downstream and participate in offering services based on data analytics. Manufacturing in Australia has been strongly linked to natural resources with the comparative advantage of needing to be close to the source of raw materials. Other manufacturing sectors are more open to import substitution as trade barriers fall. Where the industries can continue to add value and offer a competitive advantage they are likely to survive. However, those that cannot offer such competitive advantage will be vulnerable to outsourcing to low labour cost areas as has happened within the clothing, textiles and footwear sector. Also, as the labour intensity of manufacturing has declined due to automation of factories the geographic dispersal of manufacturers away from major urban concentrations has taken place (Productivity Commission, 2003).

OBSERVATION

Manufacturing will need to become more export focused if it is to take place on any scale within Australia. Small firms with niche local markets will continue to make up much of the industrial landscape; however, sustainable large scale operations must export and will need to be able to operate at international best practice. Innovation and access to global production and supply chains are likely to be key factors in their long term success.

Mining and Energy Resources

Mining and energy related resources are a significant part of global trade. Mining is typically divided into coal and metal ores, energy is related to petroleum based commodities such as oil and natural gas. There are at least three generic stages taking place within their value chains. The first of these is exploration, which must take place on a constant basis. The second is extraction, which is typically undertaken at major mine sites or via oil field developments either on or offshore. The third is processing, whereby the ore or petroleum product is converted into a form that can be shipped. This can take the form of ore crushing into pellets or the conversion of natural gas into liquefied form (LNG). Production processing of minerals or petroleum products is a major user of industrial land; this can take the form of heavy industrial plants, as well as general and light industrial land for supporting industries.

The GFC has ended one of the longest booms in the global resources industry since the end of the Second World War. Over the long term the future of the resources sector will depend on a series of interrelated factors. According to the World Bank (2009) these factors are GDP growth, changes in the composition of demand and technology. World population growth is forecast to slow from its current level of around 1.2% to about 0.8% by 2015-2030. Growth in per-capita incomes are also forecast to slow with the expectation that demand for commodities such as grains and minerals may fall while demand for energy will rise.

If significant improvements in energy efficiency are not made as a result of the introduction of new technologies, global demand for energy is forecast to rise by over 120% by 2030, with around 75% of this demand coming from emerging economies such as India and China. Demand for oil will more than double unless fuel efficiencies in transportation and power generation systems are applied. However, future scenario planning suggests that by 2050 around 90% of the motor vehicles in the developed economies and 75% of vehicles in developing economies will be using some form of hybrid or alternative fuel technologies such as electric hybrids or hydrogen fuel cells (World Bank, 2009).

Pressure from governments to meet global emissions trading targets will also see a rise in energy efficient vehicles which will account for around 75% of any future demand for oil. If these energy saving technologies are introduced the demand for oil will fall from 1.7% per annum growth to 1.1% annual growth or around 112 to 118 million barrels a day by 2030. Demand for coal will also face challenges in the context of carbon trading schemes that

are expected to be introduced throughout the world over coming decades. At present coal is the main energy source for emerging economies with China accounting for over 40% of global consumption. If “clean coal” technologies cannot be found it is likely that coal will be subjected to significant pressures with the potential for its consumption to fall. Carbon tax and related trading schemes will impact significantly on future global demand for oil and coal (World Bank, 2009).

As shown in Table 5.1, a tax on carbon emissions of around \$21 per ton is likely to reduce demand for energy by around 33% with coal being the most severely effected as a result of its high carbon content. By contrast LNG and other low carbon energy commodities would benefit. An aggressive carbon trading scheme would see oil and coal demand fall significantly in relation to LNG and bio-diesel or other similar fuels (World Bank, 2009). As Australia is one of the world’s major exporters of coal this type of scenario would be a negative for mainly east coast coal producers, but would benefit WA as a key LNG producer.

Table 5.1: Demand for Energy Commodities in the face of Climate Change Policies

ENERGY SOURCE	BASE LINE	STABLE EMISSIONS	AGRESSIVE
<i>% change in energy consumption:</i>			
Coal	198%	-15%	-22%
Oil	57%	10%	-29%
Natural Gas	96%	68%	25%
Biomass, waste	48%	144%	214%

Source: IEA (2008)

In the area of metal ores the key driver of demand in global markets over recent years has been China. The take off point of the Chinese economy has been dated to the period 1979 to 2005. Its rate of growth has surpassed that of India and ASEAN over the same time period. Despite this massive rate of growth, China’s overall share of global trade has been much less than Japan’s at a comparable stage of economic development. China is now in a stage of catching up and will require both significant policy reforms and massive investment in infrastructure by its government to achieve the same levels as have taken place in smaller “Tiger” economies such as South Korea or Taiwan. To date China has enjoyed very high rates of domestic saving, major will by central and local government authorities to invest in infrastructure, and the growth of urbanisation around a few mega cities (Gruen & Kennedy, 2006).

This move towards industrialisation and urbanisation in China has resulted in a significant demand for metal ores. Compared with other world economies, China’s demand for metal ores has been significantly higher over the past decade. In 2007 over 50% of steel and 44% of copper demand in China was used in construction and infrastructure. Compared to other emerging economies such as India or Brazil, the demand for metal ores in China is about 4 times greater, and 7.5 times greater than for OECD nations (World Bank, 2009). The level of demand for metal ores within China’s manufacturing sector is likely to remain high into the future, but demand for such commodities over the longer term is forecast to

fall as the level of infrastructure investment in China reduces as its economy reaches maturity. According to the World Bank (2009):

Overall, global demand for metals is expected to continue to grow somewhat more quickly than global GDP, at about 40 percent through 2015, before slowing to around 2.5 percent in the period 2015-30. A pace significantly slower than that projected GDP growth itself (World Bank, 2009).

According to the World Bank (2009) the sharp rise in commodity prices that has fuelled the mining boom over the past decade is now at an end and the outlook is for a more subdued level of demand. Much of the pressure on commodity prices in the mining and energy sectors was caused by the under investment that had taken place in the 1990s. This has now been corrected and when the world's economy begins to recover from the GFC, the prices that once drove investment in mining and resource projects may not be present.

The demand for minerals is likely to be dependent on the demand for metals within China. Throughout the years from the late 1950's to the early 1990's, demand for metals as a proportion of GDP within the global economy declined. This was due to the transition from manufacturing to service-based economies throughout most OECD economies. However, the rise of China during the 1990's saw this trend reverse, and from 1995 to the present, China's demand for metal ores pushed up mineral prices and led to the demand for mining investment in countries such as Australia.

CASE STUDY – RAS LAFFAN INDUSTRIAL CITY

Situated in the North of the Qatari Peninsula, Ras Laffan Port is the world's largest Liquefied Natural Gas (LNG) exporting port. Designed in the mid-1990's, the port was designed as an export facility for LNG, Condensate and Sulphur and saw multi million dollar investment in construction of port facilities and infrastructure. The port is strategically located at the centre of the Arabian Gulf, between the Far East and Europe on the international shipping route allowing global access to world markets.

Ras Laffan Industrial City was inaugurated on the 24th of February 1997 by His Highness the Emir Sheikh Hamad Bin Khalifa Al Thani. The RLC Directorate (RLC) is responsible for managing and administering, on Qatar Petroleum's behalf, Ras Laffan Industrial City. Ras Laffan Industrial City is a directorate of Qatar Petroleum, which is a multi purpose, multidimensional industrial city, which operates an industrial port and provides integrated services as well as several industrial facilities to existing industries and prospective investors.

The Ras Laffan Industrial City (RLIC) is now a thriving energy industry hub, housing leading companies such as Exxon Mobil, Shell and Dolphin Energy. As a self-contained city, RLIC offers excellent infrastructure, with administrative, support and security services for approximately 200 end users operating within its boundaries. Over a 24 hour period approx. 50,000 employees, construction workers and support staff and pass through the RLIC gates. Ras Laffan Port is considered one of the largest LNG export facilities in the world. The 8.5 sq km port cost more than US\$1 billion and became fully operational in 1996 with LNG export capacity of 30 million metric tons per annum.



KEY LESSONS:

As with other world best practice examples a key lesson from Ras Laffan is the provision of up front infrastructure to add to the natural industry advantages. This has allowed for The Port to be able to handle the anticipated expansion over time. The Port commenced operations in September 1996 and since that time, the Port and its berth facilities have been increased significantly to cater for the exports of new and expanded industries. In an effort to provide a “one stop shop” for its clients and have the ability for downstream processing, RLC has built two dry docks, capable of receiving some of the biggest vessels afloat, a floating dock and ship repair facilities. Ras Laffan have also branched into the processing of petrochemicals in an attempt to further diversify the local economic drivers.

With the increased production of LNG comes an increase in the production of condensate and to facilitate the export of this product, two Single Point Moorings (SPMs) capable of handling tankers up to 320000 dwt, have been installed some 30 miles off the Port of Ras Laffan in deep water to overcome the draft restrictions of the alongside berths.

Presently, with three operational LNG Berths, Ras Laffan Port is the world's largest LNG exporting facility, capable of accommodating a wide range of LNG vessels, including the new generation QFlex and QMax classes. The civil marine works for a fourth LNG is complete and this berth is expected to be operational towards the middle of 2009, whilst construction of two further LNG berths is well under way.

Predicting the future of each mineral within the wide range of metal ores extracted from WA is not possible within the scope of this study. However, the World Bank (2009) notes that Nickel prices have slumped substantially since their peak in 2007 and this has led to the closure of projects such as the BHP-Billiton operation in Ravensthorpe, WA. Similar falls have been seen in the price of zinc and lead prices, which have fallen by around 60% over same time period. The outlook for future pricing remains problematic given the increase in supply from many of the world's producers. Demand for Aluminium remains stable but future prices will depend on the cost of electricity power generation and the level of investment that is taking place in China and the Middle East in new smelters.

Future demand for minerals will be contingent on the growth of the major economies of China and India. Key drivers of future commodities demand are the demographic trends towards rising urbanisation in these two countries and the need to provide housing, manufactured goods and infrastructure to support increasingly more affluent populations. Technological change within industries will also see greater efficiency in the use of metals and mineral products.

Over the next 25 years the growth in demand for metal ores will most likely slow as the relative metals intensity¹ of the Chinese economy eases (World Bank, 2009). This will be a trend mirrored in other developing economies. Prices for minerals may recover in the period beyond 2010 as the GFC induced recession eases. However, the forecast is for the rate of growth of demand for metal ores to rise until around 2015 before slowing in the years to 2030.

The impact of these changes upon the WA mining sector is difficult to predict with any precision from the current depths of a global recession. However, it is likely that investment in mining will recover from 2010/2011 as the demand for commodities in China increases. However, the level of investment experienced over the past decade in the WA mining sector may not be repeated, although the outlook for growth over the medium term seems positive.

Australia is a major exporter of minerals and energy commodities with LNG, Iron Ore and Coal being amongst the most significant. Over the period 2000-2006 LNG exports grew at an annual average rate of 13%, while Iron Ore grew at a rate of 11%. By comparison coal exports only grew by around 4% (Gruen & Kennedy, 2006). The future outlook for mining and energy in Australia, particularly WA is positive, given the focus in this state on LNG and Iron Ore.

Agriculture and Food

International trade in agricultural produce and food ranks alongside manufacturing, minerals and energy as one of the most significant global industries. It is also one of the most important export industries for Australia and a potentially important user of industrial land. Global demand for agricultural products and food is driven by population growth across the world, which grew strongly in the last three decades of the previous century. While the demand for food from key importing countries increased strongly over recent decades, major exporters like Australia, Argentina, Canada, the United States and Europe responded with rising volumes of production (Rosengrant *et.al.*, 2001).

Despite facing significant challenges to their agricultural industries, China and India have managed to provide sufficient grain production over the past thirty years to meet much of their domestic demand. However, this trend is unlikely to continue, particularly as these economies transition from a mainly rural to a mainly urban population. Rising levels of urbanisation and affluence in such countries will result in a significant level of demand for agricultural and food imports to supply the needs of these enormous populations. It has been estimated that 10% increase in per capita incomes in developing nations will result in a 6% increase in demand for food (World Bank, 2009).

Around 67% of global demand for cereals is for human consumption, with 21% allocated to animal feed. This pattern of consumption is expected to remain constant through to 2020. However, the consumption of meat and poultry products is expected to change. Rising levels of household wealth across emerging markets will also see a transition from mainly grain or cereal based diets towards meat products. Global demand for meat is

¹ Metals intensity is a measure of the proportion of trade imports in metal as a proportion of GDP. China has had an above average level of metals intensity at a global level due to its significant investment in infrastructure development.

forecast to rise by over 55% to 2020. China is expected to account for over 40% of this increase with demand in India and South East Asia essentially doubling in the same time period. Pork is expected to comprise around 40% of global meat demand by 2020, with poultry making up 28%, beef 27% and sheep or goat meat 5% (Rosengrant, *et.al.*, 2001).

Rising demand for food within the increasingly affluent but urbanised populations of China and India will drive international trade in world food supply because these nations will not be able to supply their domestic consumption with local production. Both India and China are expected to face problems in increasing their own domestic agricultural production due to degrading of arable land, environmental pollution and the subsuming of farmland for urban or industrial uses.

Although slowing population growth around much of the world will result in a slow down in demand for grains, meat, dairy products and some feed grains for livestock are expected to increase as demand within key export markets such as Asia rises. Around 75% of demand for food between now and 2030 is anticipated to come from developing economies (World Bank, 2009). As a major exporter of food and agricultural products Australia is potentially well placed to benefit from these trends. Value adding to the food chain via processing is also likely to become an important opportunity for Australia. This ability to plug into the global food supply chain, particularly in servicing the needs of markets such as China and India, augurs well for industrial land use allocated to the processing and storage of food and agricultural produce.

Sustainability

Faced with global climate change one of the most significant trends that will shape the future of industries is the need to become more environmentally sustainable. As discussed above, the commitment by most of the world's nations to the Kyoto Protocol will drive change within many industries. Consumers will also be likely to demand more environmental responsibility from companies in the products they sell and the processes used to make them.

Clean Technologies

One area that is likely to become important over coming decades is the introduction of clean technologies (Clean-Tech). The concept of Clean-Tech is an umbrella term for a range of technologies, goods and services that aim to minimize or eliminate the environmental impact of economic activity and form the basis of corporate responses to global climate change.

As climate change moves up the corporate agenda in the face of government regulation over carbon emissions, investment in Clean-Tech is anticipated to rise. Climate change is a challenge that is likely to create opportunities for the next generation of technologies as companies seek to respond to stakeholder expectations, rising energy costs, consumer demand and the pressures of government regulation. In addition, climate-smart firms will view this as an opportunity to make themselves more innovative, efficient and ultimately competitive.

The need to address climate change is expected to have a transformative effect on all types of business. The integration of climate change agendas into the heart of business planning will be a characteristic of successful firms over the longer term. Businesses that aim to be industry and market leaders are expected to embrace this trend. However, it is a

global challenge that will require a transformation of infrastructure and practices that run across a wide range of industry sectors and supply chains. Not only do levels of investment in innovative, clean technologies need to be accelerated, but partnerships and collaboration must be increased.

Renewable energy sector

Investment into renewable energy sources is increasing rapidly across the globe and is set to further increase as more countries set carbon emission targets, introduce carbon trading schemes and set targets for the production of renewable energy.

At a government policy level it is not only environmental concerns that are driving the increasing focus on renewable energy. Key drivers include identified by the Global Market Institute (Global Market Institute 2007):

- Rapid economic growth, particularly in the developing world.
- Demographic shifts, including continued population growth and increasing urbanisation.
- Energy security concerns, including political instability in certain energy-rich nations.
- Climate change and other environmental concerns related to energy production and consumption.

These drivers are meaning that governments around the world are starting to act and set legislation and targets that will see the rapid increase in adoption of renewable energy. Targets for renewable energy are now becoming common and there are now at least 64 countries which have renewable energy targets.



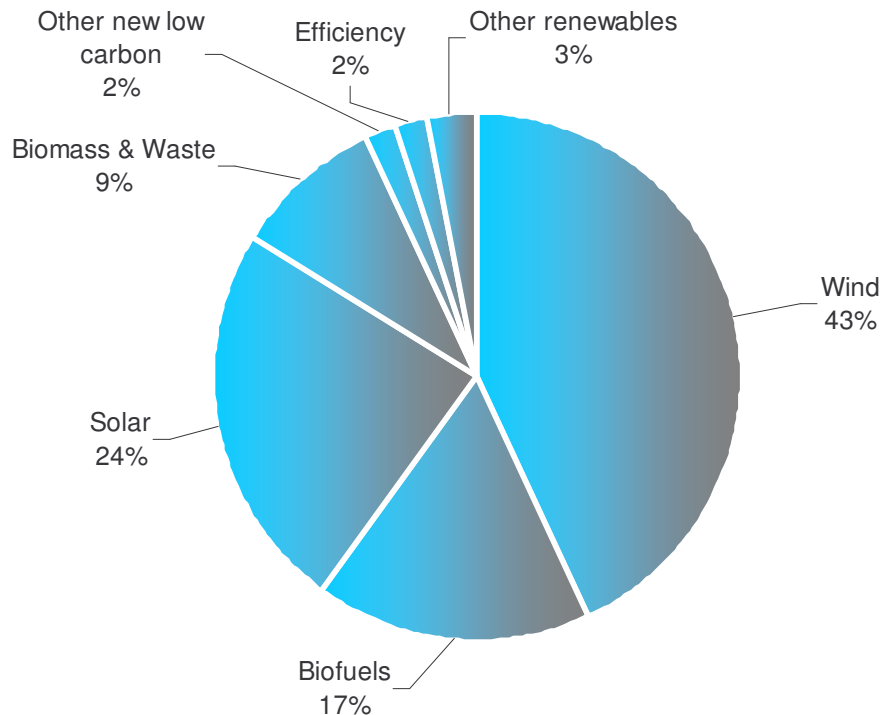
Note: Grossed-up values based on disclosed deals. The figure represents total new investment in clean energy only, and so excludes investor exits made through public market offerings, PE buy-outs, and acquisitions of projects and companies. Total value is adjusted for reinvestment: Geared re-investment assumes a 1 year lag between VC/PE/ Public Markets funds raised and re-investment in projects

Source: New Energy Finance

Figure 5.1: Global new investment in clean energy by asset class, 2004-2007

One of the US states with the highest targets for the use of renewable energy is California which in November 2008 increased there target 33% renewable energy by 2020. Importantly the first Californian target was set in 2002 which was for 20% by 2017 and ever since then the bar has been moved increasingly high. This early adoption of targets meant that in 2007 California has reached 12% renewable energy. California's high standards and ambitious goals have resulted in California leading the nation in renewable energy innovation, receiving more investment funding in clean technology than anywhere else in the United States, and accounting for 44% of all U.S. patents in solar technologies and 37% of all U.S. patents in wind technologies (Schwarzenegger 2009).

Australia introduced a target of 20% renewable by 2020 in 2007 and is now coming to terms with how this will be achieved. It is forecast that to achieve this target \$19 billion will be invested into renewable energy in Australia (Gerardi 2009). This means that internationally the level of investment on renewable energy is growing rapidly. What was only a small industry five years ago is now seeing over US\$148 billion of investment each year (REN21 2008).



Source: New Energy Finance (2007)

Figure 5.2: Global new investment by technology, 2007

To date by far the largest amount of investment is going into wind generated power. However, capacity and investment levels are rapidly increasing in solar and bio-diesel as well as a range of other sources (REN21 2007 & 2008). These results are shown in Figure 5.3. According to the World Bank (2009) the global supply of oil and gas is sufficient to meet world demand for the foreseeable future. However, the overall share of world energy demand that will be met by oil is expected to decline. For example, by 2030 oil is expected to still be the most important energy source, comprising around 31% of world supply. Coal will comprise around 28% and LNG around 22%. The remaining supply will be met by bio-fuels (approx 9%), nuclear (approx 5%) and hydro-electricity (approx 2%) with the balance supplied by a range of other renewable energy sources.

The production of bio-fuels can be traced back to the early 20th Century with maize-based ethanol used to run the Ford Model T car. During the 1970's Brazil commenced the production of ethanol based on sugar cane with heavy government subsidies as a means of generating greater national self-sufficiency in the face of the OPEC oil crisis. Such fuels have been in production for decades, however, rising global oil prices and concerns over longer term oil security provoked the United States to pass legislation in 2007 under the Energy Independence and Security Act designed to increase bio-fuel production fourfold by 2022. In recent years the United States has replaced around 4.5% of its annual gasoline consumption with ethanol. Although it has allocated around 25% of its maize crop to service this demand, there are rising concerns over the impact that bio-fuel production will have on the world supply of food (World Bank, 2009).

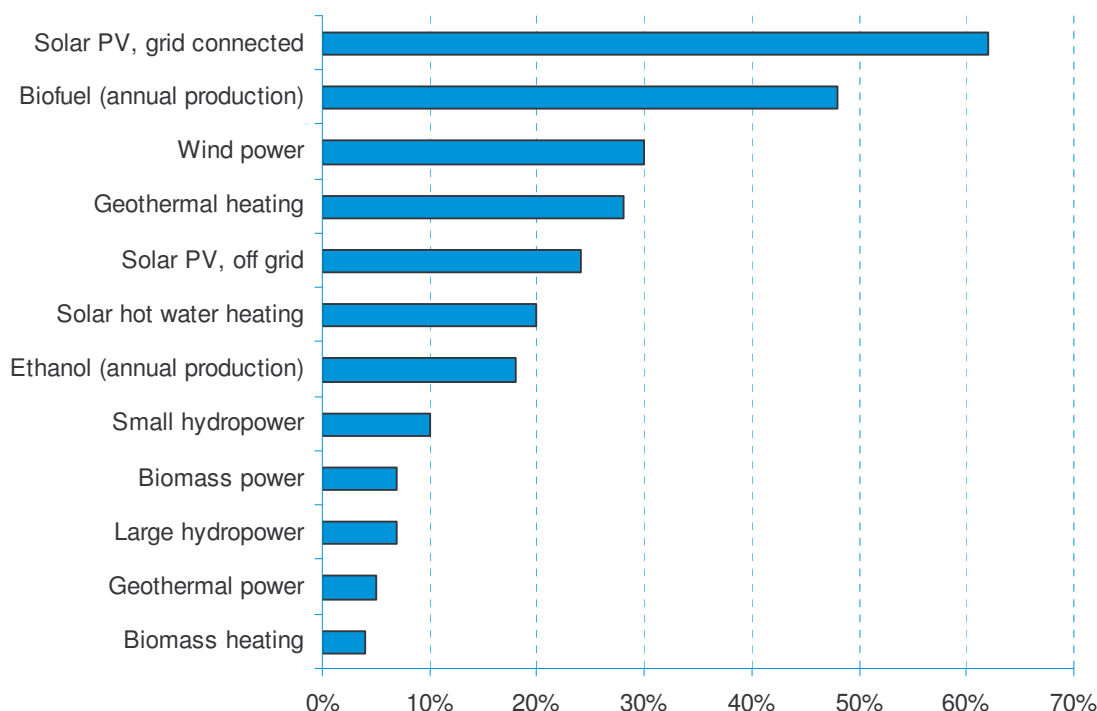


Figure 5.3: Average Annual Growth Rates of Renewable Energy, 2002-2006

In Australia, the bio-fuels industry is still in an early stage of development. Both ethanol and bio-diesel are produced with Federal Government targets set at around 350 million litres by 2010. This level of production will only replace around 1% of Australia's total transport fuel demand and there are concerns over the potentially harmful impacts that such fuel production may have on arable land as well as the capacity for the agricultural sector to supply sufficient biomass in the face of drought and the competing needs for crops. In 2008 there were four ethanol and five bio-diesel production facilities in operation across Australia, located mainly in NSW, Queensland and Victoria. These had a combined output of around 490 million litres. A further 13 ethanol and eight bio-diesel plants were under construction (APEC, 2008).

A number of bio-fuel production operations are currently occurring in WA; however, these are only small capacity projects. As shown in Table 5.2 these proposed projects in WA have generally focused around wind, bio-energy and solar PV projects. To date the solar projects that have been proposed are also of a small scale and the larger scale projects have tended to be more focused on wind.

To put the scale of some of these projects into perspective there is currently a proposal to construct a 850 MW solar project (SES Solar One Project). This would involve 30,000, 25-kilowatt solar dish Stirling systems (referred to as Sun Catchers) which would cover an area of 3,300 ha. Construction is planned to begin in 2010 and take 40 month to complete. The same company also has a proposal for a second project that is only slightly smaller than this one (Californian Energy Commission, 2009).

Table 5.2: New Renewable Energy Projects WA 2009

LOCATION	PROPONENT	CAPACITY	ENERGY SOURCE	PLANNED START DATE	EST CAPITAL COST
Manjimup	WA Biomass Pty Ltd	40 MW	Wood waste	December 2009	\$110 million
Henderson	Waste Gas Resources	1.5 MW	Land fill gas	October 2009	\$2 million

STATUS	ENERGY SOURCE	SWIS	OFF SWIS	CAPACITY	EST CAPITAL COST
Conceptual	N/A		8	426 MW	N/A
Feasibility	Wind	12	1	1,582 MW	\$3,223 million
	Bio-energy	4	1	96 MW	\$240 million
Approvals	Wind	7	1	260 MW	\$519 million
	Bio-energy	6	0	184 MW	\$460 million
	Solar PV	1	2	2.2 MW	\$13.2 million
	Concentrating Solar PV	1	0	1.77 MW	\$12.8 million
Total		31	5	2,551 MW	\$4,468 million

Source: SEDO (2009)

Initial discussions with Department of State Development indicate that there has been a reasonable level of interest in establishing new solar and bio-fuels projects in WA. However, each of these comes with its own problems and land access and approval is often a key issue.

For a large scale solar project with a capacity of 200-300 MW a land area of around 600 ha would be required. This would need to be fenced and cleared and in a location with close access to the main grid, not flood prone, relatively flat and have good solar levels. Locations near Geraldton have been sited as being on the main grid and having suitable properties. In addition to the land for the solar collectors additional land is required for things such as access corridors, supporting infrastructure, transmission lines and servicing areas. The capacity of developers to pay for the land is reasonably low, however, they require long term rights over the land to ensure their security of investment and for financing purposes. Securing suitable parcels of land and then managing the planning and approvals process provides significant hurdles to investment in WA.

Large scale bio-fuels projects have similar issues. For a larger scale project an area of around 40,000 ha would be required to grow the bio-fuel crop. This would need to be marginal land as the crop would not compete financially with other commercial crops, but would also need to be reticulated. Land would also need to be available in a relatively close location for a factory and associated infrastructure.

There are also some ocean based renewable power options that could have potential for WA, such as ocean based wind farm or wave power. While the majority of these operations might be in the ocean it is essential that they are land backed and have access to coastal land. This can often be problematic in WA where development on coastal locations can be highly contentious.

Nationally some other state governments are starting to come up with processes which will simplify access to land and the approvals process for renewable energy projects. The SA Government approach has been a pre-review of prospective sites to exempt or include as potential sites. Pre-protect sensitive areas to reduce the chance of rejections and therefore streamline approvals. In Victorian final approval for wind farms has been moved to a state rather than local government level to help ensure energy security.

Summary and implications for WA

The outlook for industries is difficult to predict with any accuracy. However, as noted in this chapter there appears to be a few key trends that might suggest future directions for emerging and declining industries and their potential implications for WA. The rise of bulky goods retailing and large scale warehousing is already a well recognised trend and seems likely to continue into the future. Such industrial land use will potentially compete with other users if it remains unplanned. Manufacturers may be the most exposed to this pressure. In the future manufacturers seeking to survive in the increasingly open and global markets will have to be export focused and at international best practice. Such firms must be connected to international production networks and supply chains. Industrial sites for such firms will need to offer excellent transport and ICT access as they must overcome the existing tyranny of distance given the relative isolation of WA.

WA seems well placed to take advantage of the predicted rise in LNG demand as well as future demand within key export markets for minerals and food. The ability of WA industry to undertake as much downstream processing prior to export has always been a major vision for WA Governments. The need to reduce transport costs and lower greenhouse emissions seems likely to open an opportunity for enhanced value adding in this way. Onsite processing allows shipping to carry smaller, lighter, boutique loads which can be provided just-in-time to customers in export markets. However, these developments will stall if the infrastructure in the state is inadequate and forces delays or added costs.

Sustainable energy sources such as biomass, bio-fuels, solar and wind are likely to grow in importance over coming decades. However, their likely impact on the industrial land use in the state is still too difficult to predict. Each form of renewable energy source has a different dynamic. Some, like ethanol or bio-diesel may require industrial production on conventional industrial estates. However, others, such as solar and wind may be more likely integrated into existing agricultural or urban environments.

Chapter 5: Key Points

- For many retailers the need to provide customers with a wide assortment of products under a single roof is becoming a key trend. The trend towards the “big box” stores or hypermarkets is not new and has been developing throughout the past twenty years.
- In the United States the trend has been towards “power centres”, or a site containing three or more large big box “category killer” stores covering from 25,000 square metres to over 100,000 square metres. This trend towards large retail ‘bulky goods’ sites has also been taking place in Australia and comprised around 40% of all new retail construction in 2006.
- The emergence of bulky goods retail sites within Australia emerged from the early 1990s and has shown a number of trends that are likely to continue into the future. **There has been a focus on precincts** with bulky goods retailers clustering together within the same areas.
- A move for cheaper rents by the large big-box retailers remains a challenge for industrial estates creating problems for traffic flows/congestion around warehouse distribution centres.
- There is now a nexus between technology and societal demands that allow the customer to play a greater role in the design and development of products, and for global production networks to be closely integrated via modern telecommunications systems.
- One of the key trends in manufacturing is the drift of production from the developed to the emerging economies. By 2015 the share of global petrochemical production taking place in Asia is expected to grow to 34% with North America and Europe’s share falling to 29% and 23% respectively (Ramesh, 2007). Some predictions suggest that by 2020 much of the world’s petrochemical and plastics manufacturing will take place in the Middle East.
- If significant improvements in energy efficiency are not made as a result of the introduction of new technologies, global demand for energy is forecast to rise by over 120% by 2030, with around 75% of this demand coming from emerging economies such as India and China.
- International trade in agricultural produce and food ranks alongside manufacturing, minerals and energy as one of the most significant global industries. It is also one of the most important export industries for Australia and a potentially important user of industrial land.
- Rising demand for food within the increasingly affluent but urbanised populations of China and India will drive international trade in world food supply because these nations will not be able to supply their domestic consumption with local production. Around 75% of demand for food between now and 2030 is anticipated to come from developing economies.
- Value adding to the food chain via processing is also likely to become an important opportunity for Australia. This ability to plug into the global food supply chain, particularly in servicing the needs of markets such as China and India, augurs well for industrial land use allocated to the processing and storage of food and agricultural produce.
- The need to address climate change is expected to have a transformative effect on all types of business. This will emerge in the form of Clean-Tech technologies and alternative fuels such as bio-fuels, solar, wind and wave power.

Chapter 6

Best Practice in Industrial Land Use

Requirements of Small, Medium and Large Firms

This chapter examines the nature of industrial land use from a best practice perspective while drawing upon the key elements developed in the preceding chapters. It also focuses on specific requirements of small to medium sized enterprises (SMEs) in comparison with larger firms. The trends in industrial land design and planning are addressed before moving to the final chapter in which we examine the impact of such developments on Australia and WA.

Industrial estates are defined as a “*Designated landholding that has been zoned for industrial use which has incorporated transportation linkages, utilities and services provided.*”

Industrial land is typically zoned into one of four types:

1. **Heavy Industrial** – major industrial estate incorporating large land parcels with significant port, road and rail access, special requirements for power, water and waste management. Also require significant buffer zones and is not compatible with residential or recreational use. This type of estate development is highly strategic in nature and requires special planning and protection of buffer zones.
2. **General Industrial** – major industrial estate incorporating both large and smaller lots of land also with requirements for transport access but for industries that are not as heavy or likely to emit noise or waste as is the case for heavy industrial sites. May include some light industrial use and some service or commercial users, but is not normally compatible with residential or recreational land use.
3. **Light Industrial** – smaller lots for mainly “nuisance free” industries that can be readily integrated with commercial, retail and even residential and recreational land users. While some control over land use is required it is usually less critical than in the first two cases.
4. **Special Industrial** – industrial estates developed for a particular purpose such as technology or science parks and specialist manufacturing sites. These estates may be located close to major educational institutions such as universities or research centres. Some are developed for defence or aviation science purposes and co-located adjacent to airfields.

Each of these estate types has particular dynamics. Much of the focus of this chapter is on the general and light industrial land use zones.

Factors Influencing Industrial Land Demand

Many factors influence the demand for industrial land, but a number of specific factors have been identified as important to the overall attractiveness of an industrial estate (BAE, 2004):

- **Logistics and transport access** – as highlighted in earlier chapters, the ease of access for logistics to and from the site is usually very important. Particularly, for those firms that require the movement of heavy or bulky materials. The site must therefore have road, rail, sea and air port access and connecting infrastructure.
- **Allowance for operating conditions** – industries that need to make noise or that require 24 hour operations and/or the movement of heavy road transport must be able to operate within appropriate buffers. There should be no pressure from residential neighbourhoods or other non-compatible occupiers.
- **Parcel or lot size** – land sites must be large enough to allow ease of vehicle movements within the site, with appropriate turning, lay down and parking areas. Buildings also need to be sited so as to take best advantage of the transport access and not restricted in space should some additional expansion be required.
- **Utilities** – there should be adequate power, water and gas services, with heavy industrial users requiring particular requirements.
- **Labour force** – firms will also seek reassurance that there is a supply of appropriately skilled workers within close proximity of the site. This may also require the building of suitable road systems and parking areas to facilitate private vehicles, as well as the provision of public bus or rail transport access to the estate.
- **Proximity to customers** – while it may depend on the needs of a specific firm, most businesses will consider how far the site is from key customers as transportation costs comprise a major proportion of total costs to supply.
- **Establishment costs** – the cost of the land, buildings and ongoing costs may also play a key role in the final selection decision. Firms with a need for large parcels of land may be more sensitive to land or lease costs than those requiring smaller lots.
- **Surrounding environment** – businesses are also concerned about the overall amenity of the surrounding area, the estate needs to be well laid out and landscaped. Crime rates within the surrounding community are also likely to be important considerations.
- **Proximity to business services** – there will also be a consideration of the ease of access to business services such as banking, postal and freight services. In some cases – e.g. special zones – the proximity of a university or vocational college may be of importance.

Each industry has a different set of specific requirements, but for most firms seeking to locate within general industrial estates there will be a desire for a modern, single storey building with ample truck docks and clear-span construction, allowing ease of movement of goods. Also important will be a reliable supply of power and water, and also access to state of art telecommunications services such as broadband data transfer. The facility should be protected from future pressures over environmental issues or social interest groups, and permit a degree of growth over time within the existing site (BAE,2004).

Predicting the demand for industrial land is problematic as few governments hold reliable data on the supply and demand situation. Information is usually held by a number of parties including the state or local government authorities, regional and local property agents, and valuers. This data must be first drawn together before an overall pattern of supply and demand can be mapped (Adams & Russell, 1994). Robust models for the estimation of urban land use have emerged in recent decades providing analysts with the ability to more accurately forecast population growth, transportation requirements and planning decisions (Waddell *et.al.*, 1998).

However, industrial land use planning is often constrained by a lack of reliable data and problems with reliable methods of estimating take up rates. For example, a study of conversion of vacant industrial land within the Adelaide metropolitan region was undertaken in order to understand the most appropriate methodologies for estimating industrial land demand. It found that the use of sales volumes as a basis for estimating land demand was inadequate due to the tendency for land to be purchased but not developed. Seventy-three percent of industrial land sites purchased had not been significantly developed up to five years after sale (Rossini, Kershaw & Kupke, 2006).

Industrial Land Selection for Large Firms

The process followed by businesses when selecting an industrial location appears to follow a similar pattern to that of consumers engaged in a purchasing decision. There is an initial period of needs recognition followed by a search process and then the evaluation of alternative sites, a decision to select a given site and then a post-decision evaluation (Zeithaml, 1991).

Large firms in most cases are 'footloose' in nature, meaning that they seek to lease rather than own the land they occupy. A firm is considered "footloose" when "it has relatively few constraints and is not tied to specific resources and would have a relatively wide range of choices from which to select a new location" (Decker & Crompton, 1993). This facilitates subsequent relocation if conditions change. Large footloose firms are generally the most important occupants within general industrial land estates and typically serve as the anchor tenants. Their land requirements will be for larger and more specific lot sizes.

The decision making process of the large footloose firm is illustrated in Figure 6.1 where it can be seen that the process involves at least six stages that are usually managed by a special relocation steering committee that involves identification of the main attributes sought in a new site. These are screened and then given a weighting prior to the final decision being made.

Decision making in the larger firms in relation to operating location is usually undertaken via a buying centre that involves all the key decision makers and may include individuals who are both inside and external to the business. Many firms are influenced by intermediary businesses that help them to select the site and get it ready for occupancy (Tosh, Festervand & Lumpkin, 1988).

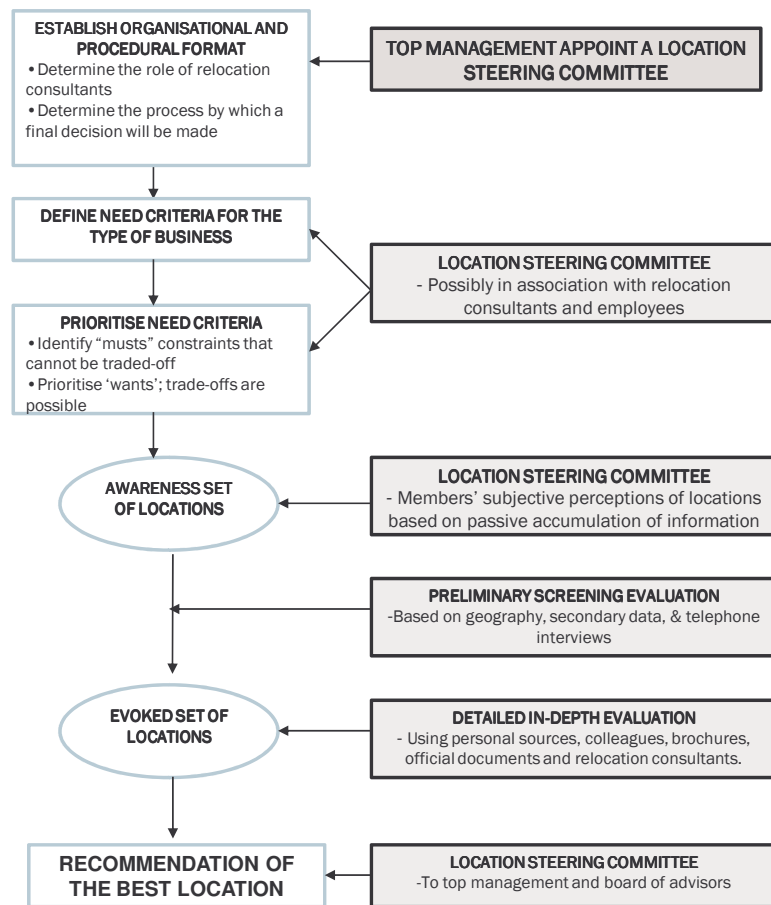


Figure 6.1: A Model of the Business Location Decision Process in Large Firms

The key influencers upon the location purchase decision of large footloose firms are likely to be executives within the company, relocation consultants and economic development personnel from local or state government agencies (Tosh, *et.al.*, 1988). Of these the relocation agent; or names such as logistics specialist, site selection specialist or real estate consultants are used most frequently by large firms. Their services include research into alternative site options, negotiating contracts for lease or purchase, logistics and facilities relocation planning, and cost-benefit analysis for sites (Foster, 1999).

As noted above, the large firms typically undertake detailed analysis in the evaluation of an operating location. They are generally objective and follow a rigorous selection process. As one commentator noted:

The difference between large and small users is that the small firms want to be near to where they live. On the other side big companies spend a lot of time researching the site. For example, Coles Myer track each truck – how many traffic lights that they have to pass through, the wear on their tyres. They apply this to every site they look at. They look at ease of access. To get from the freeway to the industrial estate, there may be six sets of traffic lights – they would look at this. Also important is how

much profit margin do they sacrifice to relocate? Transport is a big issue for large firms. (Mazzarol & Choo, 2003; p. 204)

Large firms also tend to have highly specific requirements and the need for large parcels of land that are unencumbered with excessive zoning regulations that can restrict use.

Industrial Land Selection for Small Firms

By comparison with the large 'footloose' firms the small to medium enterprises (SMEs) are more likely to be seeking to purchase land over the longer term. Decisions made by small firms in relation to their industrial operating location are similar to those of their larger counterparts, although they are strongly influenced by the owner-managers' personal preferences and characteristics.

A study of the decision making of SME owner-managers found that the location to their customers was of critical importance, particularly those that had developed a strong market niche within a given area. Interestingly the proximity of the site to the small business owner's home was a significant factor in the location decision, plus the potential for long term capital gain on the site if they purchased (Mazzarol & Choo, 2003).

This highlights the lifestyle aspects of many SME owner-managers and the need for consideration of these issues in the future planning of industrial estates. Small firms will need to have access to flexible estates with the ability to offer leased sites as well as those for purchase. The ability of the small firm to purchase its land, and to see the land values rise over time is critical to the longer term financial viability of many businesses. Planning that forces industrial land activity out of the urban areas to the fringes of the city is likely to disadvantage smaller firms. As noted by one research study:

Industrial users must compete for resources such as land, labour and capital and to achieve returns on these resources, their businesses must be competitive. For many involved in industrial activity, particularly smaller operators, the returns may be so low that the only long term investment they retain is the land if owned. If the returns to industrial land use are not fostered other users of land such as residential will force industrial activity out (Kupke & Pearce, 2000).

There is a need for smaller parcels of industrial that can be located within urban areas to accommodate the needs of SME occupiers. Zoning policies should aim to enhance industry clustering and economic viability of small firms, this may include mixed use sites that blend residential, commercial, retailing and industrial land use within cities (Kupke & Pearce, 2000).

As outlined in preceding chapters the trend in warehousing has been for larger sites with increased use of sophisticated ICT systems. In Manchester and Sheffield in the UK this trend has been significant in recent years with large, footloose tenants expecting the developers to provide almost all facilities as a turn-key operation. An analysis of the rejuvenation of the industrial estates in these two cities suggests that older industrial zones can be successfully revived with appropriate planning and investment. However, there must be recognition that the key factors are the ability to enable industrial land users to operate successfully in an urban setting in which there is a degree of harmony between residential and recreational land use and its use for industrial purposes (Syms, 2001).

International Best Practice in Planning

The process of planning, designing, developing and managing an industrial development is integrated and coordinated through the effective use of dynamic public and private partnerships. Local master plans and zoning regulations regulate such aspects as the percentage of site coverage, uses, building setbacks and easements. The dynamics of the industrial land market are significantly different to those in the commercial or residential sector. For example, vacancy levels in residential or commercial estates flow in cycles that are typically short term. By comparison the trend in factories is that once they become vacant they often remain so for longer periods of time (Katyoka & Wyatt, 2008). Due to the heavy investment in establishment of a factory or major warehouse an industrial site is likely to be occupied for a long period of time, even during economic fluctuations, but if it becomes vacant it may remain so for much longer.

Industrial Estate Planning Process Model

Figure 6.2 outlines an **industrial estate planning process model** developed for this study. It comprises four primary phases with a series of related objectives and outcomes.

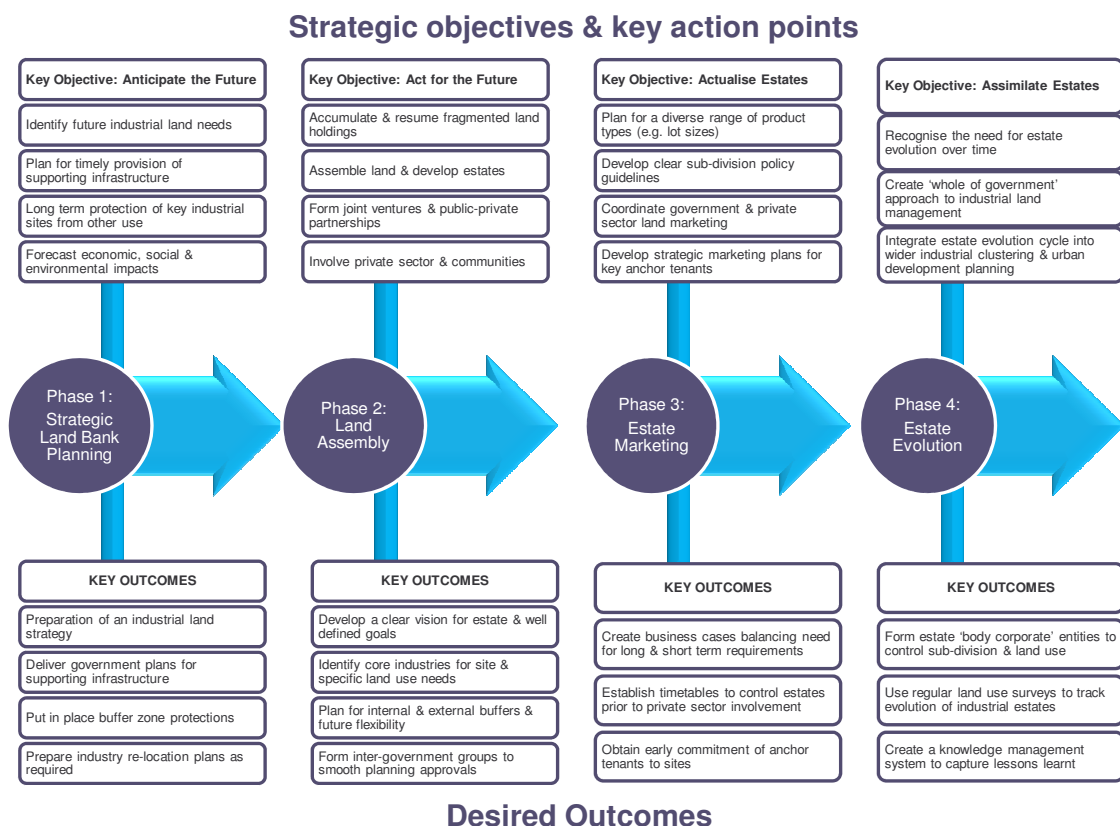


Figure 6.2: Industrial Estate Planning Process Model [Mazzarol & McFarlane,2009]

The first phase of this process involves the identification of industrial land and its reservation for future requirements. The key objective of this phase is to **anticipate the future** and there should be a strategic plan for future industrial land use that ensures such land is appropriately protected against encroachment from future competing land users.

Phase 2 involves the assembly of the industrial land with the key objective to **act for the future** and bring together all the land and appropriate stakeholders. Key outcomes for this phase are the development of a clear vision for the future of the estate with sufficient planning to ensure that the needs of all targeted industries will be catered for over the lifecycle of the estate. Collaboration between multiple government agencies and different levels of government may be required.

During the third phase the key objective is to **actualise the estate** by marketing it to industry. It is important that the land sub-division policy be carefully controlled so as to avoid reducing the flexibility of the estate for different types of industries. The ability to secure key anchor tenants early is likely to be important to success. Finally, once the estate is established and the estate moves through its lifecycle, it will require both management and monitoring. The key objective for phase 4 is to **assimilate the estate** and ensure that it can evolve over time to the mutual benefit of all land occupiers.

There are a range of global “Best Practice” trends that are examined in the following sections that influence the industrial land development process.

Governance and Planning

Strong governance involvement within the initial stages of a land development project is essential for the successful delivery of an industrial estate. Cohesion and agreement between relevant government agencies is required and a need for alignment on the long term financial and economic benefits of the development. In Europe the focus is now on the rejuvenation of mature industrial estates and the planning that is required to ensure their sustainability. This has seen the emergence of the “eco-industrial” estate concept which brings together the planning, design, development and management of the estate in order to “create business communities that maximise added value in both the short and long term” (Louw & Bontekoning, 2006).

Strategies employed to achieve this type of sustainability involve promotion of clusters of businesses that share common services and facilities (e.g. car parks, retail sites, child care and recreational centres), or utilities (e.g. storage, workshops). Collaboration over such aspects requires a high level of active management of the industrial estate. Park management must look forward and plan the evolution of the estate so as to avoid it becoming obsolete. This requires ongoing investment even after the estate has been sold out to ensure that its facilities and services are at a high standard. This role may be played by the local municipal government, or the private sector.

The Dutch have successfully provided a satisfactory supply of industrial land and these offer a strong level of employment within the Netherlands. However, the development of new estates and the relative decline of older ones have seen a shift from the old to the new, with the older estates then moving through a rejuvenation program and attracting back industries. Local governments are the main developers of industrial land in Holland and it is the view of some researchers that the current system is inefficient and economically wasteful. A process of active management and evolution of the estate is considered a more effective solution to decline and revival (Louw & Bontekoning, 2006).

In planning for sustainable industrial estates a long term strategic horizon must be developed that can ensure the needs of industrial land users are catered for within the wider context of the region's social, economic and environmental development. The following case study of Lakeview Corporate Park demonstrates how fluent joint venture and public-private partnerships have been successfully implemented to develop a clear vision for the estate and delivery of a timely and well received industrial development. By building alliances within the local community and involving the private sector and various groups within the local community, the phased development was extremely successful and is considered a “Best Practice” example in regards to governance on an International level.

CASE STUDY – LAKEVIEW CORPORATE PARK

Lake View Corporate Park is a 967-hectare mixed-use development situated 1.6 km north of the Wisconsin-Illinois border and is accessible by three airports, two highways and two rail lines. Lake View is situated along Interstate 94 at Highway 165 midway between Chicago and Milwaukee (one mile north of the Illinois/Wisconsin Border) with over 3.5 million people residing within 45 minutes of the park.

The development accommodates manufacturing, distribution, office and service/retail uses. Lake View is a joint venture between WISPARK, a subsidiary of Wisconsin Energy Corporation and Centre Point Properties, who are the largest industrial property company in the Chicago regional market.



KEY LESSONS – Successful Private and Public Collaboration for Estate Development

The alliance and commitment between private and public enterprises by both public and private sectors was critical in the success of the Lake View project with strong business support being apparent throughout the delivery of the project.

The park is considered a “benchmark” case study in regards to the successful initiation of public and private partnerships. The Kenosha Area Development Corporation, a public/private venture now known as the Kenosha Area Business Alliance was formed to assist in attracting potential new companies to the area.

The Lake View alliance has now expanded and is working to develop a highly skilled labour pool by improving the quality of education in the Kenosha area. Property tax exemptions for machinery and equipment, capital gains tax exemption and discounted rates have attracted tenants to the park.

Protective covenants have been implemented to ensure long-term investment value. Covenant standards include uniform control of setbacks, green space, landscaping, building materials and signage.

A key for the developers was that the project won majority community support early in the phased development, with 90 percent of the 13,000 residents approving of the development. By

the time the business park reached 40 percent of its projected build out, the economic multiplier effect was apparent with 6,400 new jobs created that in turn expanded the county's tax base. Low unemployment of approximately 3.5 percent and identification of the nearby town of Kenosha as a "Boom Town" is indication of a thriving surrounding economy.

Cooperation among public sector entities, private sector participants and the community was essential to the success of this project.

This example of successful public-private collaboration over the Lakeview Corporate Park is the type of development that has been proposed for the Netherlands, where the majority of industrial land is developed by local government. If a business in the Netherlands is seeking industrial land they go to the land department of the local municipality and buy it directly (Needham & Louw, 2006). For this reason the local municipal governments see it as their primary role to make industrial land available. Supply is relatively strong and this has resulted in some inefficiency (Louw & Needham, 2003).

There is a concern that the absence of a private sector in the Netherlands industrial land market is a cause of over supply and a cause of inefficiency. Some analysts suggest that where industrial land is relatively abundant and affordable there is the risk of low spatial productivity and efficiency. The term spatial productivity refers to the production output generated from a given area of land (e.g. added value per square metre). Spatial inefficiency relates to the efficiency of the land's use by a firm and the negative external effects of extensive land use. These might take the form of reduced land values on adjacent land, or the lack of land within a given area for other firms due to the monopoly the existing occupants enjoy (Louw & Krabben, 2007).

This evidence from the Netherlands suggests that a balance needs to be struck between public and private sector participation in industrial land development. Furthermore, the evolution of an industrial estate over time is an important area of focus. A balance needs to be struck between supplying large parcels of land for major users, but also ensuring that these are used efficiently and do not crowd out the smaller firms seeking to make alternative uses of the land. Mixed usage involving non industrial occupants also needs consideration as well as careful management.

However, government plays a critical role in industrial land development throughout the world. This is particularly the case in heavy industrial land use. In this case the size of the investment required and the strategic nature of the estates makes private sector involvement more problematic. The case of Jubail in Saudi Arabia has already been highlighted in this report. Nevertheless, Jubail is also a "best practice" demonstration of governance through the use of a government based development agency who successfully implemented strategic planning and management of the project over an extended period:

CASE STUDY – JUBAIL, SAUDI ARABIA

This case study follows on from earlier information covered on this estate in Chapter 2.

KEY LESSONS:

Governance and Planning - an independent government authority (development agency) that had planning and development capacity ensured the long term strategic planning, implementation and management of these massive projects was correctly handled. The goals of

this development agency were focused on national and regional objectives and it had close links to other government agencies and a common mandate.

The planning for this area encompassed plans that stretched over a 30 year plus time frame and have now allowed for a second state that is planned to continue to see development over the next 13 years. The plans were not focused on the immediate return from the development but on the long term financial benefits to the economy.

A key to the success of Jubail was the successful integration of planning and decision-making among the responsible development agencies. In addition to the RCJY the other key responsible bodies were; the Ministry for Industry and Electricity who was responsible for the formulation and coordination of industrial and electricity affairs and also reviews licensing decisions on all applications by industries planning to operate manufacturing facilities; the General Organisation for Petroleum and Minerals (PETROMIN) and the Saudi basic Industries Corporation (SABIC) were also established and these agencies were involved by directly establishing certain key industries that were either central to national interest or the size of investments were too large for private venture capital, these two agencies have often acted through joint ventures with private industry.

The mandate of the RCJY is to implement the physical and social infrastructure required for the development of Jubail and Yanbu areas as industrial cities as well as the ongoing operation of the cities. Their mandate spread not only over the industrial and port cities but also over the urban cities that were developed to support the industry and house the workforce and support services. One of the important factors for the RCJY were measures taken to ensure speed and autonomy of decisions and actions unhindered by bureaucratic red-tapes, one of these was financial autonomy including powers over existing administrative and financial regulation.

From a very early stage the importance of the RCJY within the Saudi government was established by installing the King as the initial chairman and the Minister of Planning as vice-chairman. Other board members were also high level public servants who were the heads of the ministries and agencies that play significant roles in national development (Benna 1993).

(www.rciyadh.gov.sa)

In the NSW market there is a high level of private sector capital invested in and available for industrial property ownership and development. The government development agency LandCom has chosen not to be heavily involved in the industrial market and is now tailing out of their existing industrial projects. Where they have had an involvement it has generally been through joint ventures. LandCom has a high focus on acting in the public best interest and at times this has meant not developing land in the short term and leaving it till population levels have increased or the market is right to be able to develop the land for employment creating activities such as industrial or mixed use.

CASE STUDY: LANDCOM JOINT VENTURES

LandCom are the NSW government land development agency. They are not currently very active in the industrial land development market as they see it as a sector that is well catered for by the private sector and their focus has been more on employment generating mixed use areas. In NSW industrial development has tended to be focused on office parks which are well catered for by the private sector and warehouse development which LandCom does not see as an easy fit for them given low employment and hence lower public benefit. Much of development that LandCom has done with industrial land and mixed use has been on a joint venture basis with the private sector.

KEY LESSONS:

LandCom has engaged with the private sector as a development partner and has been conscious of not competing with the private sector. They have sought to de-risk the land by way of obtaining correct zoning and planning approvals and then engaged with the private sector in joint ventures. Generally LandCom puts in the land only, but at times also contributes capital into the joint venture. If required to help de-risk the site LandCom has also put in the backbone infrastructure. Through planning or the tender process LandCom also sets out their vision for the project. Once the private sector is engaged as a development partner LandCom's involvement varies from standing back and having no branding through to a more direct involvement.

To help try and streamline the approvals process for parties developing built form on their projects LandCom have produced a Best Practice in Development Assessment for Local Government manual that has been produced in conjunction with the Planning Institute.

As outlined in Figure 6.2 the process of industrial estate planning and development requires clear vision and a long term strategy that can ensure the supply of land when and where it is required with the appropriate infrastructure. The assembly of the land may require public-private collaboration and the development of clear guidelines to ensure that the estate works in the best interests of industry while also being sustainable from a social and environmental perspective. Once it is occupied it must be actively managed with a view to constant renewal and maintenance of leading edge services and facilities. The value of the property stock within a given estate is likely to depend on the level of property development taking place elsewhere in the market (Dunse & Jones, 2005). As such the ongoing management and development of the estate is important.

Innovation in Industrial Land Use and Planning

Innovation in industrial land use and planning can take many forms but the most important in recent years is the concept of sustainability. In this next section we examine the most important trends in innovation in industrial land use planning.

Global Transparks

As noted earlier, a multitude of factors influence the location decisions of industrial park developers and occupiers. Access to transportation networks such as rail lines, ports and highways has always been an important factor in locating industrial and business parks. The “need for speed” means that many manufacturers and distributors must be near their markets or adjacent to a major transportation hub to optimise supply chain flows and delivery response times.

The concept of the “Global Transpark” evolved from the need by multinational companies seeking a competitive edge in an aggressive and fast paced global market. Remaining as a global market leader requires efficient global supply chain management. With new industrial strategies concentrating on speed, agility and efficient supply management are often constrained by existing transportation and logistics barriers.

A “Global Transpark” realises the collaboration of modern manufacturing and distribution facilities with multi-modal transportation, advanced telecommunications, sophisticated materials-handling systems and commercial support services that link tenants to domestic and international suppliers and customers. A well-resourced international cargo airport with runways capable of handling fully loaded wide body air freighters lies at the heart of the GTP system.

In addition to its multi-modal transportation and cargo-handling systems, the GTP system supports its tenants and users with comprehensive e-commerce capabilities. Electronic data interchange and other telecommunications systems using the latest technologies offer tenants superior electronic access to global markets. These systems improve supply chain management as the track, coordinate, and control materials and product flows across domestic and international transport modes.

CASE STUDY – NORTH CAROLINA GLOBAL TRANSPARK

The North Carolina Global TransPark (GTP) is a 2,400-acre industrial/airport site situated in the heartland of Eastern North Carolina near Kinston. The industrial park is located in close proximity to the majority of the state’s major military bases, major ports, interstate highways and rail connections. The on-site Kinston Regional Jetport is the longest civilian runway in the state.

The GTP offers a business-friendly environment, including a highly-trained workforce, favourable tax structure, attractive utility rates, and a low cost of living. The area also promises a relaxing lifestyle with abundant leisure activities, fine restaurants, shopping, and some of the country’s best coastal vacation spots within an easy drive.

The GTP is also close to major colleges and universities, as well as several metropolitan centres, including the state capital, Raleigh. The on-site TransPark Centre is one of the most advanced meeting and training facilities in the state.

KEY LESSONS:

The State of North Carolina has been progressive in their strategic planning and developing a clear vision of a global network for industrial air commerce. They have developed strong incentives.

The GTP offers an ideal location for a variety of business types, especially companies involved in the aerospace sector and logistics. Additionally, the GTP is well-suited for growing companies looking for a competitive cost structure and toward future expansion.

Industrial Clustering

As outlined in Chapter 3, the clustering of industries is an effective mechanism to boost economic growth and stimulate international competitiveness. Effective industrial clustering presents the ability to innovate under globalisation and adds to the key to the competitiveness of an economy. Industrial clusters are favourable for the establishment of such ability and enable SMEs to sustain both their development and innovation capabilities.

Clustering of industrial businesses can provide complementary resources, such as technology and information exchange, management assistance, and so on to enhance the

performance of the firms. Industrial clusters underline the benefits of knowledge sharing, which is the basic reason for firms to congregate together.

With these businesses located in very close proximity to one another, industrial clusters make regional competition that much keener, thus promoting firms' efficiencies. Fierce competition for both clients and suppliers is unavoidable. Industrial clusters also help firms to quickly respond to the demands of the market or to changes in technologies. The ability to leverage resources to adapt to changes in the markets and to fluctuations in technology should be one of the major benefits for firms to stay within a cluster. Finally, the adoption of new information technologies does not threaten, but rather enhances cluster viability and vitality.

On a global scale various governments attempt to drive industrial agglomeration and clustering through regulatory or policy measures during the land assembly stage: These strategies include:

- Financial funding to promote incubator best practice.
- Promoting a venture capital industry, reducing market-entry barriers by simplifying regulatory and tax schemes, and pursuing international technology cooperation.
- Provision of infrastructure items, such as electricity, water, telecommunications, suitable land, living environment and one stop services by the government are all important to pull potential firms and human skills together.
- Geographic location provides a useful set of boundaries within which to organize innovation.

Without the capability to innovate, an industrial cluster will soon be on the decline and firms will begin to disperse and relocate to other regions. Human resources are an indispensable ingredient in the formation of an industrial cluster. Although part of human resources can be obtained from abroad, the availability of locally-sourced human resources is crucial to the operations of a cluster,

A linkage to a growing market is essential to the formation of a cluster. For most developing countries, the major growing markets are often in developed countries, and therefore the ability to export to these markets is critical to the success of an industrial cluster. In this regard, foreign direct investments as well as liberal trade are useful in bringing about the linkage to such export markets. In addition to foreign investment, domestic firms have to be a part of the export drive, making their own linkage to the major markets. Personal connections, such as returning engineers from the major markets, also help.

Vertical disintegration often occurs as a result of competition and the need to cut production costs through subcontracting and out-sourcing. Vertical disintegration allows small-scale specialised suppliers to reap the benefits of economies of scale – an important driving force for agglomeration. There is no apparent effective policy to prompt vertical disintegration in industry. The only meaningful policy in this regard is to ensure that competitive forces are at work in an industry.

In this regards, the government should not attempt to protect incumbent firms or create a situation that creates a potential monopoly. Even if domestic firms have a dominant position in the global market, it is still useful to make them contestable. The prevalence of sub-contracting and out-sourcing arrangements in an industrial cluster not only allow specialized suppliers to emerge, but also reduces the cost of entry. As the entry barrier is lowered, more firms will compete in the industry, which drives the dynamic process of clustering. Government may choose to adopt proactive policies to attract specialized suppliers in a cluster if such suppliers are absent due to location-specific entry barriers. Any missing links in the production chain tends to limit the development of an industrial cluster, which further impedes potential firms' market entry.

CASE STUDY – SHANGHAI CAOHEJING HI-TECH PARK, CHINA



Shanghai, Caohejing Hi-Tech Park is located in the south-west of Shanghai, 11 kilometres from the CBD and 7 kilometres from Hongqiao International Airport. The park encompasses a total area of six square kilometres and has a strong cluster in the electronic industry with 35 factories specialising in the manufacture of electronic components, TV sets, electronic instruments, meters, and equipment for post & telecommunications, etc.

Caohejing Hi-Tech Park is a newly-emerged industrial zone that specialises in the development of computers and computer software, large scale integrated circuits and microelectronics technology, numerical controlled communication, precision instruments, bioengineering, space technology, and advanced-electronic technology. It consists of Caohejing Microelectronics Industrial Park, an instrument industry zone and a reserved land of 160 hectares.

KEY LESSONS:

Shanghai Caohejing Hi-Tech Park is a strong demonstration of the development of regional industry clusters by having an increasing emphasis on developing Chinese firms in its core recruitment areas through functional centres: the R & D centre, the scientific technological innovation centre, the financial data centre, and the network operation centre. The overall mission of the park is to encompass being a high-tech industrial base, a technological transfer and innovation base, an export base for high-tech products and a source for dissemination of high technology and products to other areas of China.

Caohejing Hi-Tech Park Development Corporation is responsible for the construction of infrastructure and the management of the park. The corporation can be contracted to design and implement engineering projects, to provide services with respect to storage, transport, business training and residing, to participate in the establishment of joint ventures and co-operative joint ventures. Also in the provision of facilities and service, to provide consultancy and agency services on introducing foreign technology and capital.

After fifteen years of development, approximately 1700 industrial, commercial, and service companies have established operation in SCHTP. The majority of these are smaller companies, with 330 manufacturing companies. Manufacturing industry clusters and major technologies, including microelectronics, optical electronics, computer & software, new materials, bio-pharmaceutical, meter & instrument, and aerospace exist within the park boundaries (Lowe, 2005).

Design Trends

Flexibility is a major factor implemented by industrial developers globally to attract tenants to their developments. From their past history in the manufacturing-orientated industrial estates and parks of the early 20th century, they have become dynamic workplace settings for business, incubators for new technologies, and employment centres that contribute to the economic life of many communities.

Planning or designing new or renovated facilities with an aftermarket view from the outset assists in protecting a developer's real estate investment and minimises the project risk. In a typical build to suit facility, global developers design facilities to accommodate multiple uses and thus minimise potential obsolescence.

Flexible building designs with buildings having functionality and flexibility to meet changing market conditions and occupiers needs. Flexible building design starts with basic considerations such as the size and depth of floor plates and moves into advanced technical systems that help make buildings smart.

The growth of e-commerce and just-in-time distribution systems have led to the transformation of warehouses into sophisticated logistics centres. The need for flexible work spaces that can house office and industrial activities under one roof has resulted in new hybrid buildings known as "Flex Space". This innovative building design allows for a variety of users, it can be used for offices, showrooms, distribution, light industry and even heavy industry.

A major global trend in warehouse facilities today is consolidation with Nestle for example consolidating 37 warehouses around the United States into eight "giant" warehouses. Building heights are also increasing.

Transfer of Development Rights

Transfer of development rights "is a device by which the development potential of a site is severed from its title and made available for transfer to another location". The owner of a site within a transfer area retains property ownership, but not approval to develop. The owner of a site within a receiving area may purchase transferable development rights, allowing a receptor site to be developed at a greater density." (State of California, Office of Planning and Research, General Plan Guidelines, 2004).

A flexible master plan that anticipates change is essential to serving diverse markets over the long term. Flexibility is maximised by a lot layout that allows parcels of varying sizes to be subdivided or combined based on demand, by a road system that provides access to all portions of the site and by utility systems that can be easily upgraded or modified.

Tenants' needs are changing today, and a warehouse is no longer always just a box for long term storage. Market forces and new management philosophies are changing the

operational requirements of warehousing. The old warehouse development model of constructing large boxes at strategic transportation locations is quickly giving way to modern concepts of distribution networks, inventory velocity and service.

The warehousing industry is addressing the challenge through a fundamental operational shift away from the storage of inventory toward the movement of inventory. As businesses alter their view of storage and distribution, warehouses are evolving from being a cost centre to being a profit centre and criteria for development are changing as well.

While the basic warehouse remains a principal product type, new forms of warehousing that combine storing goods with the addition of other functions have emerged, and we now have the office distribution warehouse. This type of facility responds to the new breed of warehouse user, whose distribution used to be by the pallet and is now more typically by the case lot and not infrequently by the individual item.

CASE STUDY – MERIDIAN PARK, AURORA, ILLINOIS

Meridian Park is an upscale mixed use park that consists of light industrial/warehouse, high-tech and office tenants. The developers have successfully combined and housed a range of multiple uses with flexible design guidelines and options for potential tenants and is a strong case study for the transfer of development rights.

The developers have integrated a dynamic master plan that allows for flexibility in building design and implemented phased development to time cyclical market movements. Land planning and design elements have added value to the property far in excess of the cost of improvements. Continued strict enforcement of the design guidelines assist in maintaining the master-planning concept.

From a building design perspective, light industrial tenants, generally place their assembly or manufacturing uses in the rear of the building and set aside a corner of the front of the building for office use. Certain speculative buildings designed for light industrial uses include windows along two walls, a feature that makes it easy for existing tenants to expand their office-using functions or for tenants with higher office use requirements to move in.

KEY LESSONS – Integration of Attractive Land Assembly Policies

Buildings at Meridian are designed to be flexible and adaptable to a shifting market. The Master plan's land use zones were deliberately flexible, allowing the developer to modify them depending on market demand. Landscape design assisted in making the shifting of zones less problematic. Uniform landscape easements and berms screen parcels from the roads, allowing high-image office areas to be located near light industrial uses without downgrading the overall character of the office areas. The Master plan allowed lot sizes to change to meet market demand and to accommodate tenant expansion needs.

The developers have combined several key principles, multiple uses, phased development, a flexible master plan and flexible buildings designed to accommodate a variety of uses. The project's success is also due to the master plan and landscape design, which has given Meridian a high profile image that have attracted prestigious companies and strong community support.

The greater diversity in tenancy mix has led to risk minimisation of vacancy levels being high when certain segments suffer from market downturns. Buildings are designed specifically to be an easy and attractive transition between different use zones, such as between a warehouse zone and office zone.

There are numerous financing programs which can assist in land acquisition now in existence often keyed directly to small businesses. The funds allotted for these programs, however, are not for land acquisition exclusively; construction is financed through them as well as the purchase of equipment. There is competition for the funds available. A financing program geared specifically to the acquisition and reservation of industrial land, for industrial purposes, is necessary in addition to these other programs to accomplish the objectives of the Industrial Land Use Plan.

CASE STUDY – NORWEST BUSINESS PARK

Norwest Business Park is considered one of Australia's largest master planned business communities with infrastructure and technology designed to accommodate ongoing growth of the development. Service provisions that benefit the occupiers include optic and wireless telecommunications networks, water management infrastructure and an electricity zone sub station. The development became runner up in the "World's best Master Plan development" competition and "Excellence in Property Development" award (API 2006).

KEY LESSONS:

The Norwest Business Park development signified a major shift in Australian land development planning and strategy; instead of developing properties for mainly industrial purposes, a significant proportion of office and retail space became integrated into the development. Companies embraced the changing needs of developers and investors in the area, adding expertise in the commercial and retail sectors to complement the established expertise in industrial property.

Sustainability in Industrial Estates

The movement toward environmentally sustainable development continues to gather momentum and exerts influence on all types of real estate development, including industrial parks and buildings. Greater pressure is being applied on industrial developments to become environmentally responsible.

Considerations for sustainability in industrial development include the cross-functional and cross-organisational issues of implementation. These bring together various business units, functions within a company and the various players in a supply chain with the goal of improving environmental, social and economic performance in parallel. There is a need to develop new methods for technology valuation which integrate the concept of triple bottom line accountability. Existing technology strategies in organisations could be extended to include the wider set of values that underpin the concepts of industrial sustainability. The following strategies are being implemented on a global scale to integrate sustainability measures in industrial development.

Redeveloping Industrial Sites

Commercial sites are important elements of a sustainable city plan, providing work and services to support local economies. But industrial sites deep within cities are often small, surrounded by housing and outdated infrastructure and may be abandoned when

companies decide to expand in out-of-town industrial estates. Derelict industrial sites can be reused, but new tools are needed to define strategies for redevelopment.

The redevelopment of older industrial sites is a well established practice in Europe and the United Kingdom. Cities such as Manchester, Leeds and Sheffield have been at the forefront of industrial estate redevelopment for either industrial re-use or for urban redevelopment to provide housing. Many buildings are considered of historical significance and have not been allowed to be removed. However, consideration must be given to the economic viability of a redeveloped site. Investors will not be attracted if there are excessive restrictions or the initial purchase price of the property is too high. Some sites will also contain potential contamination from former industrial use and the cost of their rehabilitation will also need to be considered (Wilkinson & Blaydon, 2005).

Regenerating Brownfield Sites

In particular, reuse of 'brown field' sites reduces urban sprawl and enhances the inner city environment. But many abandoned sites are contaminated and dangerous. This risk deters private developers, but municipalities often cannot afford to rehabilitate brown field sites. As a result, many remain disused. New cheaper technologies and ways to manage such revitalisation efficiently are important.

CASE STUDY – STRATCHCONA INDUSTRIAL PRECINCT

While key areas of Vancouver, Canada grapple with a shortage of industrial land and the consequent loss of businesses and tax revenues to other municipalities, a combination of environmental strategy and industrial "best practice" knowledge is transforming one of Vancouver's oldest neighbourhoods into an eco-industrial zone designed to foster and support local business development.

Strathcona, a precinct of heritage homes and aging industrial properties too small to effectively serve the needs of the expanding port, is being reinvigorated to create a regenerated industrial precinct.

KEY LESSON – Urban Renewal Policies in regards to industrial development

Strong governance demonstration is apparent in Strathcona with the implementation of urban renewal policies and environmental best practice to regenerate dilapidated areas. Recognising its key position in the city, east of the downtown core, adjacent to the port, and in the path of pending residential development, Strathcona is pursuing a business model that puts local needs first. Those needs include the standard elements of the triple-bottom line of sustainable development: social, environmental, and economic success.

Regenerating Distressed Neighbourhoods

Deprived areas are both a symptom and a cause of inner city decline. Planning can help regenerate rundown areas at a number of levels, from neighbourhood to region. But planning for sustainability is complex because it involves accounting for the environment and social structures alongside economic factors and should incorporate the views of local residents and businesses.

CASE STUDY – SUNSHINE INDUSTRIAL PARK, QUEENSLAND

The Sunshine Industrial Park development forms part of a strategic Queensland Government strategy being implemented to deliver an overall commitment to meet market needs by providing sustainable industrial developments throughout Queensland. The State Government and the Regional council have combined to create a progressive and productive local economy by developing employment hubs and generation such as Sunshine Coast Industrial Park (SCIP).

Designated “Environmental” zones have been designed within the estate which includes 83 hectares for open space/conservation. In the north of the CRBIP, this comprises the open space along the broad drainage line through the site adjacent to the existing perched wetland and associated modified sedgeland comprising the Stormwater Management Area. These zones provide an important ecological corridor, linking areas of high conservation value to the east and west of the CRBIP, and provides for ecological buffering of the wetland.

KEY LESSONS:

The environmental issues that dominated the site were managed in such a way that the natural environment has been greatly enhanced and systems are in place that have captured lessons learnt on the site to ensure environmentally sensitive areas are sustained.

Industrial Symbiosis

Industrial Symbiosis is a form of co-existence whereby a number of industries make use of each other's production residues or by-products for commercial and environmental reasons. It's an application of the broad emerging field of *industrial ecology*, a hybrid of technological, Earth, economical and social sciences aimed at sustainable development and efficiency.

Industrial symbiosis engages traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and/or by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity (Chertow, 1999).

The concept seeks to adopt an ecological perspective to the management of industrial estates, particularly those in the heavy industry sector. An example of industrial symbiosis at work is that of the Chevron Phillips Chemical Co. in Guayama, Puerto Rico. This company purchases steam from an adjacent coal-fired power station rather than generating it from its own oil burning boilers. Collaboration between these two large industrial plants allows a significant lowering of CO² emissions. However, the process is not without its critics. It is claimed that all the planned industrial symbiosis operations in the United States have failed, and even in Europe successful cases have not been due entirely to planning (Betts *et.al.*, 2005).

Kalundborg Industrial Park, Denmark is the original industrial park demonstrating industrial symbiosis. Along with farms, fish farms, construction companies and multiple lakes, Kalundborg boasts an elaborate interconnected system of consumers and producers living together in reciprocal exchange of resources: otherwise wasted energy, material or by products from one facility is processed and utilized by another and so forth.

Political organisations around the world are timidly starting to understand the importance of symbiosis. The National Industrial Symbiosis Programme (NISP), stepping mainly on Kalundborg's norms was recently mounted in the UK, aiming to increase efficiency and reduce CO₂ emissions throughout British industry. It's been so successful that it considered "Best Practice" for potential implementation in and by the EU. Further, NISP has assisted the installation of a similar project in the state of Illinois. Despite the progress being constantly made in Kalundborg, the operation in question still assumes deficiencies. No hazardous chemical control, no common product and industrial safety policy, partial waste management are some. Admittedly it's not perfect; however it's a lot better than what is done conventionally.

An analysis of the Kalundborg Industrial Park's symbiosis suggests that it has been a success, but it is not without its problems. Attempting to link highly complex heavy industrial plants together creates the risk that the failure of one or a significant change in its operations will adversely impact on the other. Symbiosis is founded on similar principles to that of industrial clustering and can provide a highly valuable rationale for bringing firms together to collaborate when there might not be any other justification (Chertow, 1999).

For industrial symbiosis to work there must be a set of enabling mechanisms. These include facilitating structures that can enhance and encourage collaboration among industries that are located in the same industrial estate. Also of importance are operational and contractual arrangements that can facilitate the linking up of the different firms. Finally, there must be some mechanism to track and evaluate the social, economic and environmental benefits of the industrial symbiosis process (Harris *et.al.*, 2007).

A global review of industrial symbiosis undertaken by Curtin University found a number of industrial estates that were considered to be illustrative of industrial symbiosis. Four global "hot spots" were identified that illustrated best practice. Kalundborg was one of these but the others were in Scotland, Thailand and WA (Harris, *et.al.*, 2007):

- **Forth Valley, Scotland UK** – one of the largest industrial estates of Scotland it is home to four large power stations, a cement works, three petrochemicals plants and two paper mills. Energy recovery via the recycling of sewerage sludge generates sufficient electricity to power an estimated 30,000 homes. The reuse of around 500,000 tonnes of ash per year from the power stations is of benefit to cement manufacture and other uses. The cement works also uses recycled tyres and liquid fuel oils in its furnaces to provide power.
- **Map Ta Phut, Thailand** – has a large industrial estate at Rayong Province established in the mid-1980s as a centre for petrochemical production. It has around 89 factories and employs over 11,500 people. This estate has seen five cogeneration plants supplying electricity and steam for the petrochemical factories, and waste oils and solvents are used as alternative fuels in the furnaces. Ferrous chloride and hydrochloric acid are also recycled to manufacture ferric chloride.
- **Kwinana, WA** – at least 47 synergy projects were reported including the CSBP chemical plant sending gypsum and CO₂ to the Alcoa alumina refinery for residue area amelioration. Water recycling and the HISmelt pig iron plant that is able to save CO₂ and reuse waste local by-products such as lime kiln dust were all cited as best practice examples.

In Japan the concept of industrial symbiosis has now blended into urban environmental sustainability. An “eco-town” program has emerged in Japan in recent years and at least 26 cities have been listed as officially recognised in that country.

Eco-Industrial Estates

The global emergence of Eco Industrial Parks (EIP) has resulted from the increasing pollution of the environment, growing pressure on natural resources and the resulting demands for sustainable industrial development (Côté & Rosenthal 1998). The concept of “Industrial ecology” is evolving as an exciting approach to the application of environmentally sustainable economic development.

“Industrial Ecology” as a framework tries to give guidance towards the transformation of industrial systems. The basic philosophy is to change linear production processes (raw materials are converted into products, by-products and wastes) into loops (used products, by-products and wastes of one process are used as resources for another) by imitating the cyclical use of resources in natural eco-systems. Thus the goal is that of “bringing the industrial system as close as possible to being a closed-loop system with near complete recycling of all materials” (Lowe 1993).

An Eco Industrial Park is “... a community of manufacturing and service businesses seeking enhanced environmental and economic performance through collaboration in managing environmental and resource issues including energy, water and materials.”

The main differences between Eco-Industrial Parks and usual industrial parks are that there is typically an enhanced level of co-operation and exchange between companies, park management and local or regional decision makers. These actors are commonly striving towards a vision of industrial activities which are of utmost sustainability in terms of economic, ecological and social aspects of the industrial estate.

CASE STUDY – BURNSIDE INDUSTRIAL PARK, CANADA

The Burnside Industrial Park is a 1200 hectare “Industrial Ecosystem” development which houses approximately 1300 companies and 17,000 employees in total. The estate is 75% developed and is one of the largest industrial parks in Canada. The park incorporates strict development standards to its new tenants to ensure environmental management is maintained throughout its estate.



Since the inception of the “Burnside as an Industrial Ecosystem” project, the municipality has strengthened the standards which apply to the park. The objectives and covenants are:

- The implementation of an eco-business program which includes adopting a code of environmental excellence, targets for solid waste diversion, water conservation, energy efficiency, liquid waste reduction and a competition for awards.
- The promotion of the need for and benefit of reuse, remanufacturing and recycling functions in the Park has resulted in several new businesses being established. Approximately 15% of the businesses in the Park provide rental, repair, recovery, remanufacture or recycling services.

KEY LESSONS – Environmental Management Techniques

Burnside demonstrates the useful implementation of environmental management techniques through the use of strategic governance policies. Businesses in the Park must satisfy federal, provincial and municipal regulations which include requirements to prevent the discharge of pollutants that may be hazardous to fish, restrictions of specified toxic chemicals such as PCB's and Ozone depleting substances, and separation of solid wastes that are compostable or recyclable for diversion from the landfill.

Additionally, companies locating in Burnside must abide by the particular covenants and standards intended for the industrial park. All of these requirements, whether regulation or economic instruments, along with the increasing environmental awareness of people in Canada, have created an atmosphere which is conducive to enhanced networking and the application of new environmental management strategies based in industrial ecology.

In many newly industrialised countries the development of industrial estates is a booming market creating excess capacities. In this context, the concept of EIPs can also create competitive advantages for developers (Hamner 1998; König 2000) and offer an immense opportunity to involve optimising aspects right from the beginning (Stoldt 2000).

Park and cluster approaches included in the EIP concept also offer a great opportunity to improve efficiency of spreading information and consulting services in the context of development co-operation. By bringing consulting and business support services closer to the companies that are actually located in the estate seems to be more successful than having such services within industry federation or associations. These tend to be located at too high a level and are therefore too remote. By bringing such services within the park and embedding them at a local community level as an integrated service within the estate, their effectiveness is enhanced (Schneider, 2000).

Eco-industrial estates have emerged as one of the “hottest” trends in contemporary industrial estate design and management. As a concept it is connected to both the notion of industrial clustering and corporate sustainability, which is viewed as a “triple bottom line” model comprising economic, ecological and social responsibility by the firm. This suggests that management of the business must balance the often competing demands for long term value generation and profitability against the need to maintain energy efficiencies, CO₂ emissions reductions and the need to control and manage waste. Also of importance in the design of the eco-industrial estate is the social welfare of the employees who work in the park, and the wider community that uses their products.

However, the management of such firms are largely pragmatic and will only seek to engage in this type of practice if there is a clear business advantage. Successful design of eco-industrial parks should emphasise the economic benefits of design guidelines that assist the business to reduce costs, waste or emissions. For example, the layout of the estate may assist in reducing transportation costs by more efficient road links or the ability to move large vehicles in and out of loading or unloading docks and parking areas faster.

Controlling the management of waste and recycling, or the sharing of waste water or water recycling and water use reduction initiatives can also yield economic and ecological benefits (van Eetvelde *et.al.*, 2007).

The best practice guidelines for eco-industrial park design suggest attention needs to be given to at least three areas (Potts-Carr, 1999):

1. **Landscape architectural site assessment and planning** – vegetation should be used for shading, screening and windbreaks, with use of native plants to encourage bio-diversity. This can also offer space for nature conservation areas, recreation and sporting land users. Site orientation and estate design can also encourage microclimates that can assist in temperature control with benefits for energy saving.
2. **Planning and design of physical infrastructure** – all infrastructures should be reliable, attractive where visible, unobtrusive and easily maintained. Power and other utilities should be placed below ground and paving materials should be porous to allow water run off and drainage. Water recycling should be developed into the design and where possible this should be deployed as visually attractive ponds or lakes. Public transport access, ideally in the form of rail should be provided along with other facilities such as day care centres to assist employees to reduce use of motor vehicles.
3. **Architecture** – new buildings should be designed with environmental considerations such as low energy use and water conservation. Ideally building materials will be recycled.

The industrial symbiosis outlined above is a key aspect of eco-industrial parks as found at Kalundborg, Denmark. In the United States examples can be found in Brownsville, Texas; Baltimore, Maryland; Chattanooga, Tennessee; and Cape Charles, Virginia. In the case of Brownsville the collaboration took place between a power station, a petroleum refinery, asphalt plant, and manufacturers of wallboard, plastics and textiles to exchange waste to each other's mutual benefits (Potts-Carr, 1999).

While these examples are mostly heavy industrial in nature, the eco-industrial park concept can also apply to general and light industries. An example is that of Hartberg in Austria. This small town of only 6,500 people lies between Vienna and Graz. The estate covers an area of 15 hectares and has drawn the collaboration of local and national governments, the European Union and local industries. The park focuses on industrial land use and also innovation in the form of a research institution, and recreation in the form of an adventure park. A bio-gas plant supplies surplus bio-gas to a co-located power station that supplies energy to a manufacturer of cellulose insulation and paper as well as a manufacturer of wooden houses. These manufacturers also exchange waste and other products for mutual benefit (Liwarska-Bizukojc *et.al.* 2009).

The introduction of eco-industrial estates within Australia is already emerging with guidelines being laid down by various state governments (Department of Environment and Climate Change, 2008). There are similar guidelines for the design of "green" buildings (e.g. Green Star) that provide for reduced energy use via heating, lighting and ventilation. Alternatively buildings can be designed to reduce water consumption or greenhouse gas or ozone depleting emissions. Enhanced design for transport access can also help to lower vehicle energy consumption (Chaiwatanatorn, 2006). Guidelines for the design and construction of eco-industrial estates will also need to be complimented by legally

enforceable tenancy agreements aimed at controlling the environmental behaviour of the industrial site occupants (Goddard, 2000).

Sustainability is a key trend for the future and is now emerging as an important focus for businesses. Attention is now given to the creation of sustainable supply chains that can reduce waste and environmentally harmful spill overs. Energy reduction, recycling and by-product reuse are all key points of focus in this process (Linton, Klassen & Jayaraman, 2007).

Summary and implications for WA

International best practice in industrial land design requires careful attention to strategic planning and the ability to provide adequate infrastructure for the type of industries that will occupy the site. The response of government or private sector planning agencies to the creation of best practice industrial estates is contingent on the type of estate that is being developed. Greenfield sites, as is common in WA, pose different challenges to the rejuvenation of Brownfield industrial areas as are more common in Europe and North America.

Planning for industrial estates must be both long term in nature and sufficiently flexible to allow for adaptation and change to meet market conditions. Agencies and developers tasked with the future planning of industrial estates must recognise that businesses operate within production networks, supply chains and clusters not in isolation. The estate must therefore be planned within its wider social, economic and ecological context, taking into account the physical layout of the buildings, roads and natural vegetation within the park and the wider industrial hinterland surrounding it.

Eco-industrial parks with the ability to achieve enhanced environmental outcomes through the application of industrial symbiosis are an emerging trend within international best practice. Although these concepts remain novel throughout much of the world they appear to be more than a passing fad. The mounting pressure on corporations to achieve higher levels of sustainability are likely to combine with the desire to lower costs through reduced waste or energy consumption to foster their continuation. However, businesses will still need to be shown a financial “bottom line” argument to encourage investment in “green” initiatives.

Planning for industrial estates within WA must take heed of the lessons from its own past and those outlined in the national and international examples cited above. A “whole of government” approach is likely to be required to ensure that future estates have the ability to offer appropriately zoned and configured industrial land, with adequate buffers, infrastructure and environmental clearances. Use of design guidelines to promote ecologically sustainable practices will require careful thought and should be built on a wider framework that is guided by the principles of clustering and supply chain efficiencies, rather than enforcement. Once established the industrial estate must be monitored and its evolution managed against the overall vision outlined for it. Over time the needs of the surrounding industrial hinterland and the industries within the estate are likely to change. The estate will need to be managed in a flexible manner to ensure that it remains relevant in the face of economic, social and technological change and offers its occupants a strong competitive edge.

The development of world’s best practice industrial estates within WA is likely to require a strong leadership from the State and Local Government level if the types of outcomes highlighted in the cases shown in this report are to be achieved. For example, a study

undertaken by LandCorp in 2007 of the future requirements for the Neerabup Industrial Estate indicated that 70% of respondents considered that environmental issues should be left up to the discretion of the architect or builder and not mandated. Opinion was evenly divided in relation to mandated guidelines for environmental sustainability (Mazzarol, 2007).

Whilst there is no doubt that sustainability will continue to gain increasing focus, currently there is a limited willingness of industrial occupiers to pay for it. One of the worlds largest industrial developers, Gazeley (developer of Magna Parks) who have a very high focus on sustainability, notes in their 2008 Sustainability Report:

‘All our eco-buildings integrate environmental features and renewable energy technologies at no extra cost to our customers’.

The Neerabup study indicated that 52% of industrial land users surveyed did not have formal policies or objectives relating to environmental sustainability and 60% did not practice resource recovery, recycling or reuse. Environmental policies and practises were found to be more common among medium to large enterprises with 62% of such firms having them compared to only 52% of small and 29% of micro-enterprises. What this reflects is the large proportion of SME firms that comprise the WA industrial land user community.

OBSERVATION

Any strategy designed to move WA industrial land towards international best practice will require recognition of the need to assist small firms to engage with such practices. Ideally this should incorporate a combination of education, incentives and best practice guidelines that do not impose unnecessary burdens on this type of end user. These principles are relevant to all aspects of best practice development in industrial land in WA not only environmental issues.

Chapter 6 : Key Points

- A variety of factors influence the demand for industrial land and attracted potential tenants to an industrial estate including access, lot size, utilities and proximity to business services.
- An industrial estate development involves a generic four stage planning process that include the following key objectives:
 - Anticipate the Future
 - Act for the Future
 - Actualise Estate
 - Assimilate Estates
- Strong governance involvement within the initial stages of a land development project is essential for the successful delivery of an industrial estate in addition to smooth cohesion and agreement between relevant government agencies.
- A healthy balance between public and private sector participation is critical during the industrial land development process with a long term strategy and clear vision required to ensure a sufficient supply of land and infrastructure is realised and delivered over the project cycle.
- The “Global Transpark” evolution has evolved from the need by multinational companies seeking a competitive edge in an aggressive and fast paced global market.
- Industrial clustering is an effective mechanism to boost economic growth and stimulate international competitiveness.
- A mix of flexibility and diversity in regards to planning, building design, zoning and allowed uses is being implemented globally to attract tenants to industrial developments.
- Sustainability is a key trend for the future and is now emerging as an important focus for businesses. Attention is now given to the creation of sustainable supply chains that can reduce waste and environmentally harmful spill-overs.
- “Industrial Symbiosis” engages traditionally separate industries in a collective approach to create a competitive advantage involving physical exchange of materials, energy, water and or by –products. Effective industrial clustering presents the ability to innovate under globalisation and adds to the key to the competitiveness of an economy.
- “Eco Industrial Estates” have emerged as a result of increasing pollution of the environment, growing pressure on natural resources and the resulting demands for sustainable industrial development.
- In planning for sustainable industrial estates, a long term strategic horizon must be developed that can ensure the needs of industrial land users are being catered for.
- In regards to Western Australia, careful attention to strategic planning and the ability to provide adequate infrastructure for the type of industries that will occupy the site is required.
- Planning for industrial estates must be both long term in nature and sufficiently flexible to allow for adaptation and change to meet market conditions.

Chapter 7

Australia's Industrial Property Sector & WA in Context

The Drivers and Shapers for Industry in Australia and WA

The Australian industrial property market has experienced a number of years of significant growth. This chapter examines the key drivers and shapers that have transformed the industrial property sector at a national level and the implications of these for WA. The relationship between the international trends described in preceding chapters and the future of industrial land use in WA are examined.

Key drivers of industrial land use are those factors that generate demand for industrial land within the economy. These typically include the overall growth of the national economy, trends in key export oriented industries, plus changes and re-tooling in many of the key industries that drive the industrial markets.

Key shapers of industrial land use are those factors that influence the nature and pace of industrial land demand. These can include investment, infrastructure, policy and planning guidelines. In many cases these have not been able to keep up with the rate of growth which has occurred across the Australian industrial property market sector.

Recent Trends in Australian Industrial Property

Industrial property in Australia accounts for over 23% of the national core property assets of \$170 billion (Newell, 2007). Over the past decade there has been a fundamental structural change in the nature of Australia's industrial property sector. Manufacturing has declined as primary occupants of industrial land, while transportation, logistics, storage and distribution sectors have grown significantly. As noted in preceding chapters, there has been a technological revolution taking place within warehousing and distribution industries with significant use of ICT systems. Australia's industrial centres have followed a similar pattern of development. Key shapers of major industrial locations across the country have been investments in major infrastructure by State and Federal Governments (Newell, 2007).

This shift has seen the traditional industrial areas with a lack of new zoned industrial land, small lot sizes, increasing rents and outgoings, and close to city areas losing momentum to the newer industrial growth corridors/areas with available serviced industrial land, larger facilities, lower costs, growing population base and located near significantly improved transportation infrastructure (Newell, 2007) p.362.

Industrial estates are also being changed by consolidation within many businesses to larger, single site facilities that enjoy greater economies of scale. However, this requires larger lot sizes. The increasing importance of ICT systems within industries has also led to estates having to demonstrate a degree of high technology orientation, often resulting in the physical separation of the warehousing and logistics management (e.g. 3PL)

functions. The need to ensure significant cost savings in energy and fuel consumption and the desire for just-in-time distribution has increased the importance of proximity to modern, efficient transportation hubs (e.g. inter-modal). Estates are now being custom designed to meet the needs of end user tenants or occupants, and land banking in growth corridors by institutional investors and property developers are key trends (Newell, 2007).

The strength of the industrial market in recent years is demonstrated by the rapid growth since 2000 in warehouses and other business premises. It has only been since the start of the slowing economy in late 2008 that activity has started to fall. The increase in activity in warehouse construction has affected all states and for the size of the population WA has seen a particularly high level of activity. The industrial property market cycle tends to move in line with the economy and the economic boom in WA has certainly been a key driver for warehouse constructing with the increase in activity most noticeable from 2006. These trends can be seen in Figures 7.1 and 7.2

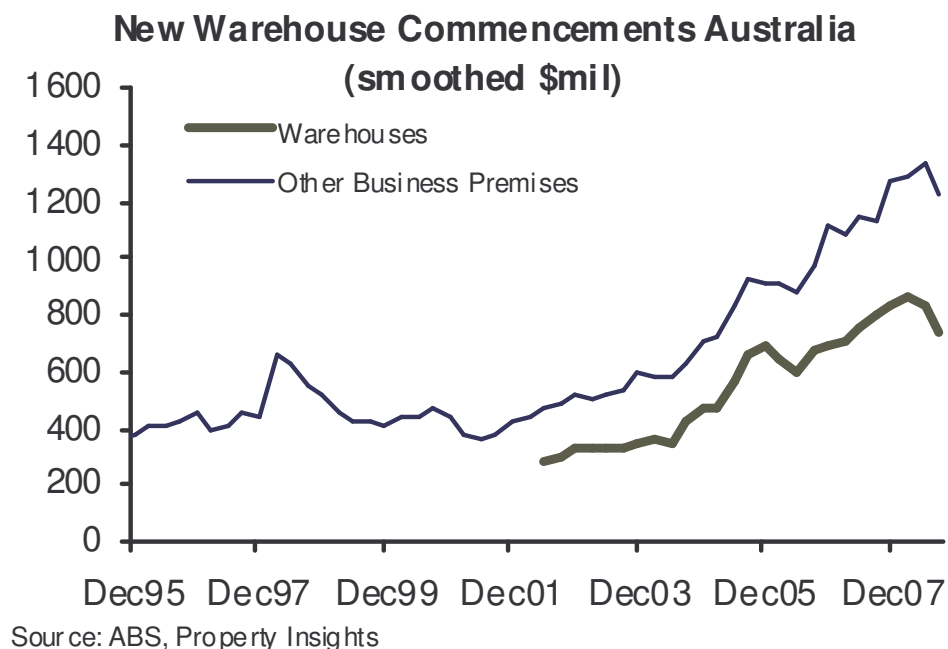
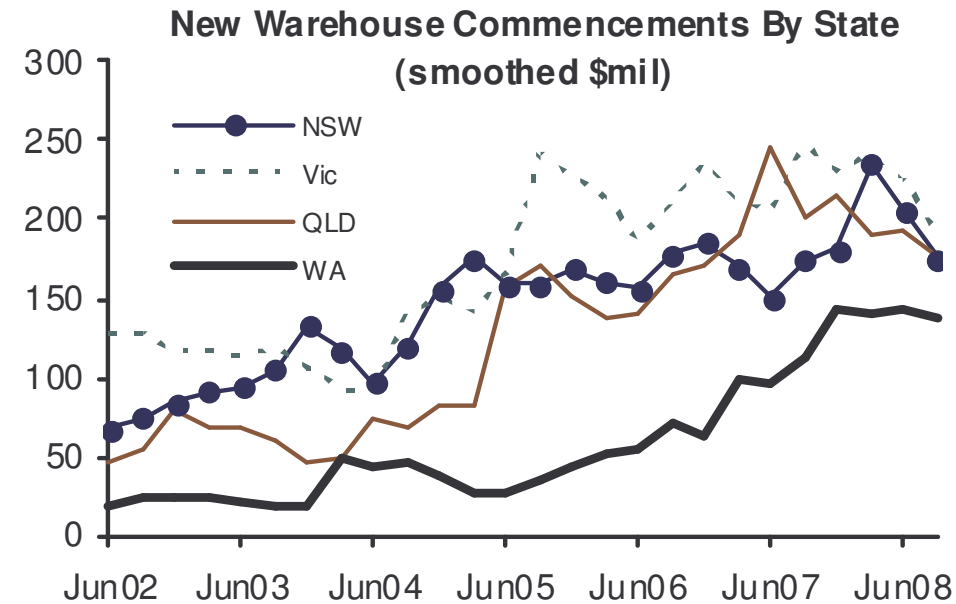


Figure 7.1: New Warehouse Commencements Australia 1995-2007

As shown in Figures 7.1 and 7.2 the overall growth rate of warehousing across Australia in the past 6 to 12 years has been substantial and these trends have taken place across most states. This is a reflection of the long economic boom that Australia's economy has enjoyed in the past twenty years and the developments taking place in supply chain logistics that have been discussed earlier in this report.



Source: ABS, Property Insights

Figure 7.2: New Warehouse Commencements by State 2002-2008

Property investment has delivered good performance for investors across most asset types (Newell, 2005). However, industrial property remains a particularly attractive investment for the private sector. For example, over the period 1985 to 2005 industrial property in Australia was the best performing sector of the property market for around 48% of these 21 years, when compared to retail property or commercial property. Investment in industrial property also outperformed the share market in 52% of these years (Newell, 2007).

The close link between the industrial markets can also be seen by the fact that the increased level of construction activity has been driven by increased profit expectations in the key industries that drive the industrial market. As shown in Figure 7.3 there is a close correlation between the profitability of manufacturing, wholesaling and transportation and storage over time. This is a clear reflection of the linkages that exist in production networks and supply chains, and is a potential manifestation of the industrial clustering effects that take place within these sectors.

In the case of WA the fortunes of the industrial property sector has long been linked to the fortunes of the mining and resources sector (Wakefield, 1999). As the population base of WA, in particular Perth, grows there is likely to be a decoupling of this relationship. However, it will be contingent on the ability of the WA economy to diversify away from mining and resources. Despite a number of State Government policy initiatives to assist this diversification over many decades the State's economy remains heavily linked to the resources sector.

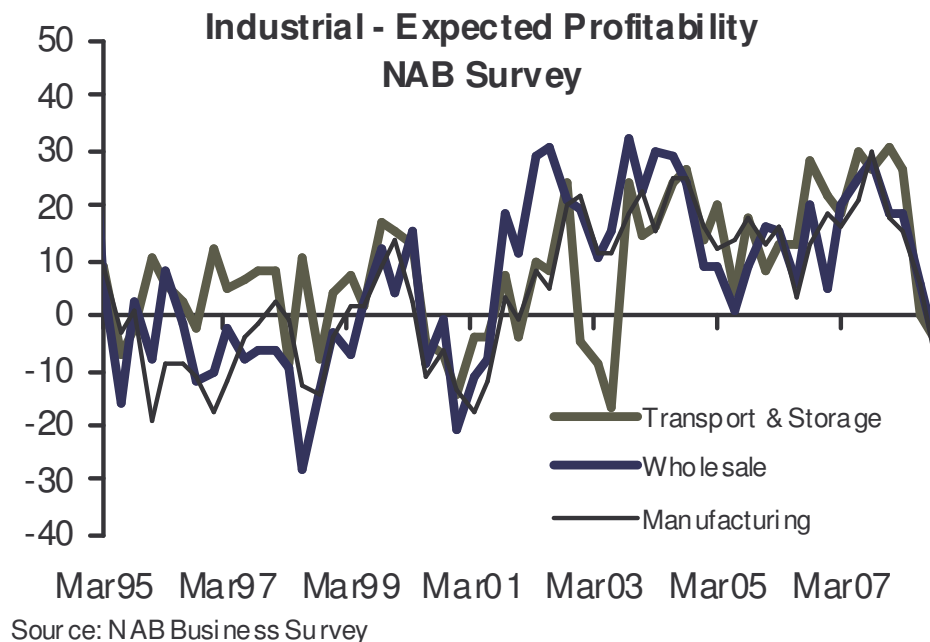


Figure 7.3: Industrial Expected Profitability 1995-2007

Case Study – Over 1 ha Buildings in Perth 2003 versus 2007 Industrial Land Use Survey

Evidence of the consolidation trend resulting in a need to construct larger buildings can be seen in Perth with the development of large new facilities for the likes of Coles and Woolworths amongst many more new developments. In the 2003 DPI Industrial Land Use Survey there were 91 industrial buildings in Perth with a floor area of 1 ha or more and only 5 with 3 ha or more. The preliminary data for 2007 (only covers about 80% of Perth, shows there are now 125 buildings of 1 ha or more and 12 of 3 ha or more (not including the new Coles and Woolworths buildings at the airport which were completed after the survey was done for this area). All of the buildings of over 3 ha in the 2007 survey were occupied by single tenants. In the 2007 survey 40% of space in buildings of 1 ha or more was used for storage, with a further 30% used for manufacturing. Of the manufacturing space usage 31% of this was used by brick makers and other building product manufacturing and a further 25% being metal product manufacturing and fabrication. By location Kewdale / Welshpool and Canning Value were the major locations for larger buildings and together accounted for 36% of floor space in over 1 ha buildings.

Large buildings are obviously an important and growing part of the market, however, floor space in these buildings only accounted for 14% of all floor space in industrial buildings in the 2007 survey. This was up from 11% in 2003 survey.

Recent Trends in Western Australian Industrial Property

It is important therefore to recognise that the demand and supply for industrial land is a strong indicator for the overall health of the wider economy. Forecasting future demand for industrial land is not a precise science. Research undertaken in Australia with funds managers, property analysts and valuers found that forecasting industrial property

demand was more accurately undertaken than CBD office market demand. However, there was a tendency for such forecasts to be conservative. In a growing market there was an under estimation of demand, while in a declining market the trend was towards over estimation. The ability to accurately predict turning points were also problematic (Newell & McFarlane, 2006).

Table 7.1: Drivers and Shapers of Industrial Land use in Australia and WA

	Drivers ¹	Shapers ²
Key Export / Import Driven Industries:		
Minerals & Petroleum / Agriculture & Food / Manufacturing & Shipbuilding / Construction & Civil Engineering	Economic growth in key markets (e.g. China, Japan, and Korea) / Demographic change in key markets / global investment funds availability. Opportunities for downstream processing of raw resources.	State Govt industrial land use planning / Environmental clearances / Native title claims / Port access & capacity / Road, Rail & Air transport infrastructure / ICT network capacity / availability of skilled labour pool. State government industry attraction.
Key Linkage Industries:		
Transportation & logistics / ICT & telecom services / engineering services / wholesaling /	Increase in imports and driving increased levels of container movements and increased level of warehousing space.	Government and to a lesser degree private sector investment into port, rail and road infrastructure.
Population Driven Industries:		
Retailing / building & construction / finance & banking / leisure industries	Rapid development of housing, particularly in WA and Qld. Increasing focus on bulky good retail and the development of these premises in industrial areas.	Government policy on where bulky goods precincts can be developed.

¹ **Drivers** = factors that generate demand for industrial land use

² **Shapers** = factors that influence the nature and pace of industrial land use

Table 7.1 lists a series of “drivers and shapers” of industrial land use in Australia and particularly WA. This framework is built on the principles of industrial clustering outlined in Chapter 3 and recognises that attention needs to be given to key export or import driven industries, key linkage industries and then the population driven industries when seeking to understand the dynamics of industrial land demand.

As noted above, the WA industrial property market is closely linked to the fortunes of the State’s mining and resources sector, plus other significant export industries. These include

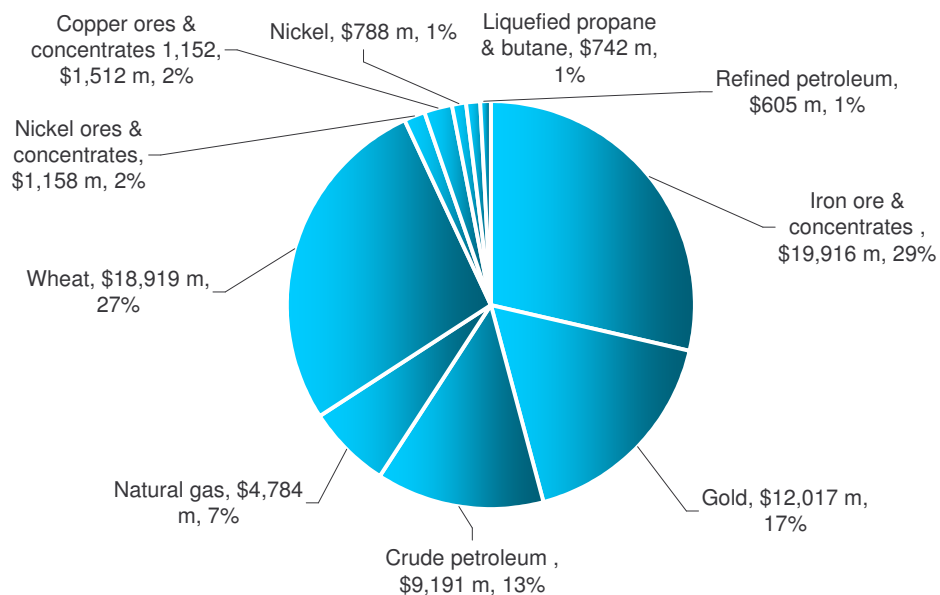
the agriculture and food sector, manufacturing (in particular shipbuilding), plus civil engineering and construction. Long term economic growth in key international markets such as China, Japan or Korea will drive growth within these industries and subsequently demand for industrial land. Key shapers will include state and local government agencies and their ability to set policy and build infrastructure that is attractive to major investors.

In the following sections the dynamics of each of the main elements within this “drivers and shapers” framework are examined with reference to the WA industrial property market.

Export / Import Driven Industries

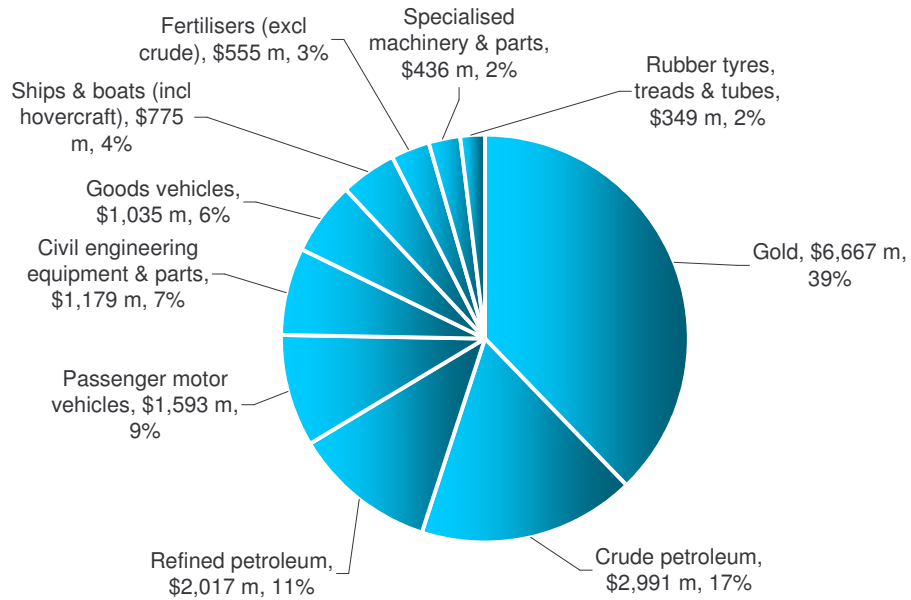
A key driver for the Australian economy and industrial land market has been the increase Australia has seen in imported manufactured goods.

WA has a major focus on exports and accounted for 41% of Australian exports in 2007-2008. Whilst imports have been growing, imports into WA only accounted for 14% of Australia's imports. For WA the majority of exports are raw material and agricultural products. Imports surprisingly are led by gold in value. However, this is due to WA's smelting capacity and the majority of the gold is quickly turned into exports again.



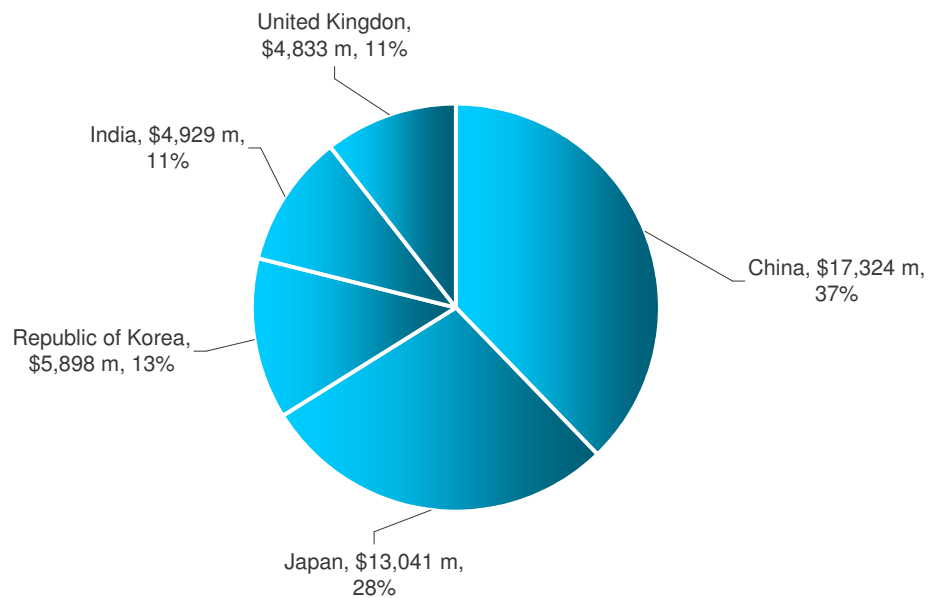
Source: Australian Bureau of Statistics, Department of Foreign Affairs and Trade

Figure 7.4: Western Australia's major exports 2007-08



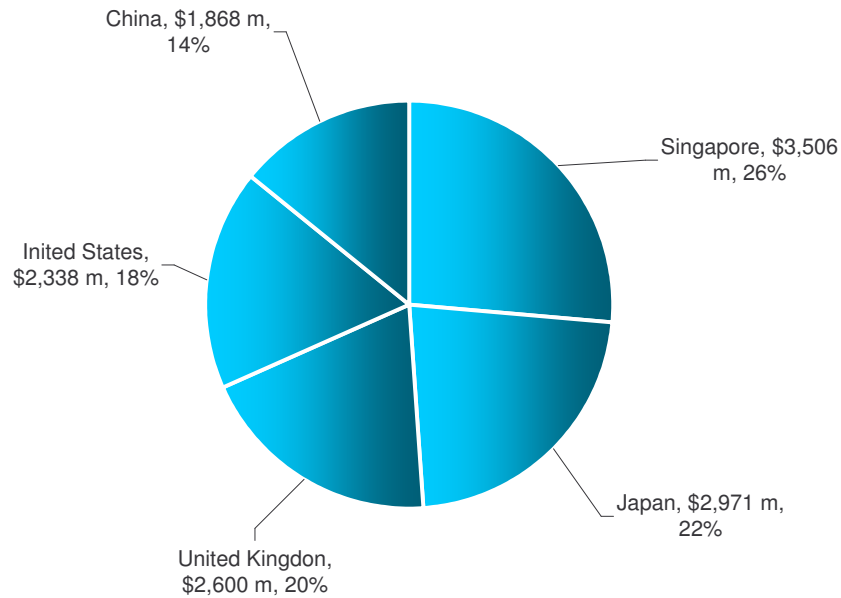
Source: Australian Bureau of Statistics, Department of Foreign Affairs and Trade

Figure 7.5: Western Australia's major imports 2007-08



Source: Australian Bureau of Statistics, Department of Foreign Affairs and Trade

Figure 7.6: Western Australia's principal destination 2007-08



Source: Australian Bureau of Statistics, Department of Foreign Affairs and Trade

Figure 7.7: Western Australia's principal import sources 2007-08

As shown in Figures 7.4 to 7.7 the main export driven industries are those in the mining and resources sector with key markets being China, Japan, Korea and India. By comparison the key import industries are manufactured goods, in particular motor vehicles and components, as well as petroleum and fertilisers. These are imported from Asia, the USA and UK.

The Department of State Development and the WA Government are currently seeking to capitalise on WA's strong resources base and look for opportunities to attract industry which will establish downstream processing plants. There are a number of industry areas where this could occur and examples of industries which would be complementary to WA's mining and farming base could be the establishment of a chemical manufacturing base able to produce fertiliser and explosives.

WA currently imports a large quantity of both products, yet the raw materials are available within the state. To attract these types of industry to WA, just having the raw materials will not be enough. Industry in the modern world is relatively footloose and there is heavy competition for the type of capital required to establish these types of manufacturing facilities. In order to attract industry to WA it will be vital to have infrastructure in place or have firm plans as to how it will be made available.

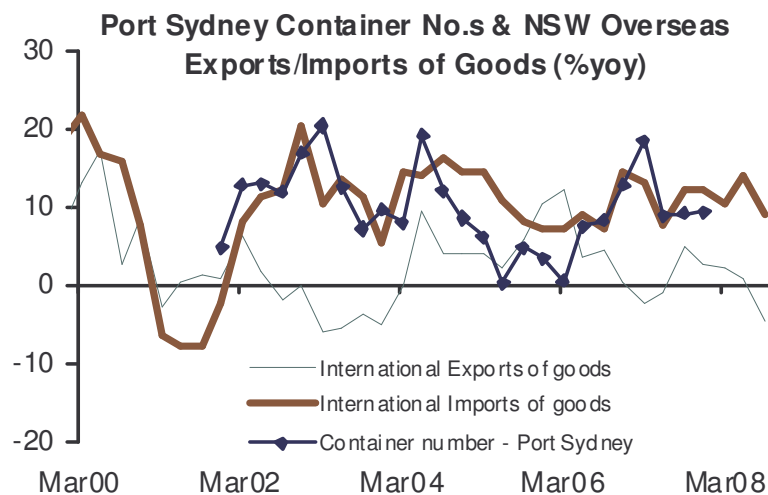
Furthermore, in addition to just identifying potential sites it will be important that these sites have relevant regulatory and environmental approvals in place so that the approvals process for industry is as easy and as quick as possible. Lengthy delays in identifying land, putting in place servicing plans and obtaining approvals are very costly for industry and WA risks companies finding it easier to establish in alternative locations.

A recent example of this is the decision by INPEX to locate its LNG gas facility in the Northern Territory rather than WA. The key reason for this decision was the complications and time it took to secure a suitable location in WA. To ensure that WA does not miss out on similar opportunities in the future it will be important that sites for heavy industry are secured and approved in advance of there being a need for the site by industry.

While the private sector has an interest in providing general industrial land it will not get involved with the provision of heavy industrial land or the development of facilities. Heavy industrial land, particularly in regional areas will almost always be occupied by owner occupiers and in order to attract these companies it is essential to make the process of site establishment as easy as possible. This has been highlighted in several of the case studies and is probably best illustrated by the case of Jubail, Saudi Arabia.

Key Linkage Industries

Across the country container activity is increasing at ports and this is having flow on effects to inter-modal facilities and other forms of transport. However, a key driver of this increase in activity has been the increase in imports, which across the country have been growing at around 10% per annum since 2002. Exports in most states have stayed relatively flat. Western Australia has seen more growth than most states in exports which has been driven by the increase in activity from mining and resource exports. These trends are shown in Figure 7.8.



Source: ABS, BTRE, Property Insights

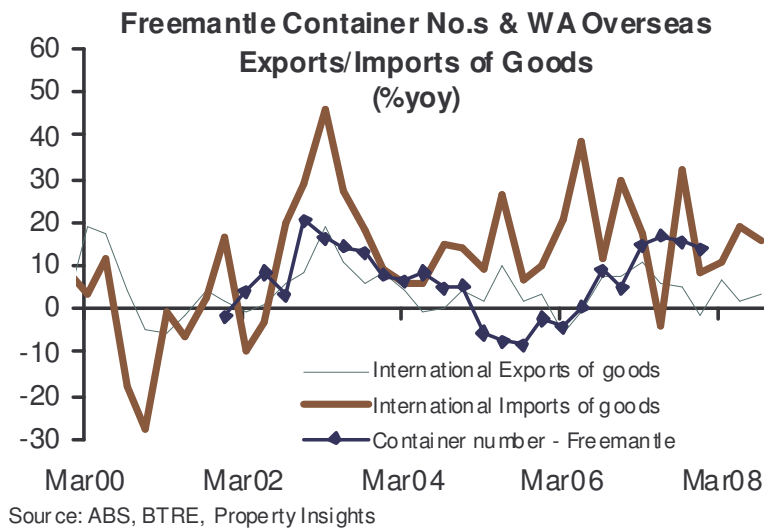
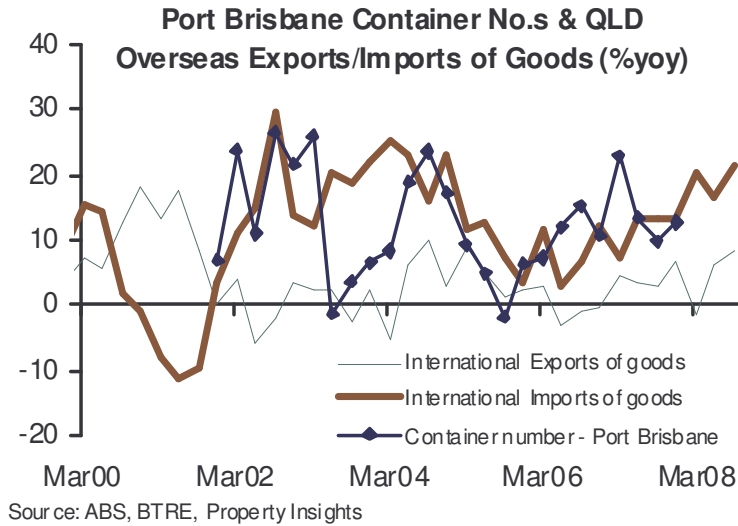


Figure 7.8: Australian Container Traffic 2000-2008

The increase in freight movements in Australia has lead to significant investment into rail and ports in recent years. However, this follows many years where investment was at very low levels. These trends are illustrated in Figure 7.9 where it can be seen that major investment in rail and port infrastructure languished for much of the 1990s and only picked up during the past decade. The timing of this infrastructure investment was often too slow to keep pace with the rapid expansion of the Australian economy.

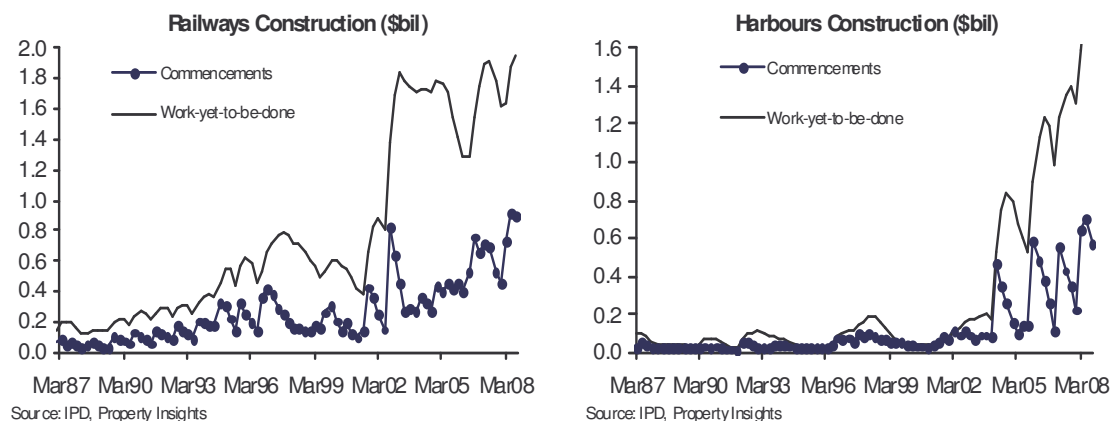


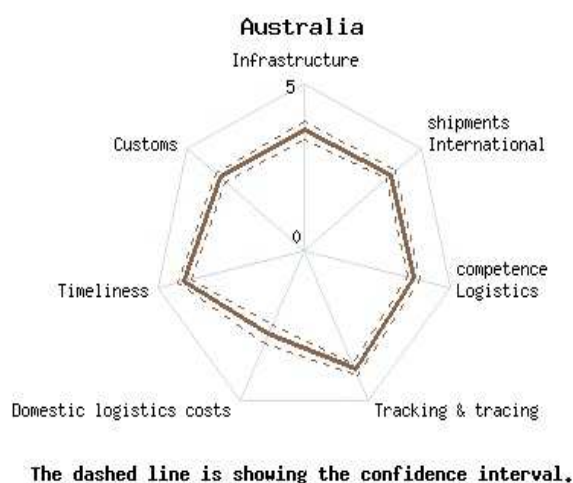
Figure 7.9: Investment in Rail and Port Infrastructure in Australia 1987-2008

As has been highlighted in this report the logistics industry is going through a transformation internationally and this is having effects on the Australian industrial market and will continue to do so for many years. Infrastructure, particularly transportation, is critical to the competitiveness of modern supply chains and production networks. Any lag in infrastructure development will have a direct and negative impact on the global competitiveness of these industries.

A key factor in the logistics market is infrastructure Australia is moving towards a more efficient logistics infrastructure system but at the moment still rates poorly by international standards. The World Bank's 2007 Logistics Performance Index ranks Australia as 17th in the world with a score of 3.79 out of 5. This index basis based on a survey of operators on the ground worldwide (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. Australia rates poorly on key areas but is particularly poor on domestic logistics costs where it ranks 97 out of 100 countries. It also ranks poorly coming in at number 20 for infrastructure and timeliness.

These trends are illustrated in Figure 7.10 that shows the relative performance of Australia in this international context. It is worth noting that some of the best ranked countries in the world are also many of Australia's major trading partners, and others are some of the countries whose developments have been highlighted in case studies in this report. Even China while developing fast has not had the advantage of Australia's well established infrastructure ranks only just behind Australia as number 21 (World Bank 2007).

Australia		
Overall LPI	score	3.79
	rank	17
	conf	0.09
Customs	score	3.58
	rank	17
	conf	0.22
Infrastructure	score	3.65
	rank	20
	conf	0.28
International shipments	score	3.72
	rank	12
	conf	0.22
Logistics competence	score	3.76
	rank	19
	conf	0.22
Tracking & tracing	score	3.97
	rank	12
	conf	0.21
Domestic logistics costs	score	2.8
	rank	97
	conf	0.33
Timeliness	score	4.1
	rank	20
	conf	0.24



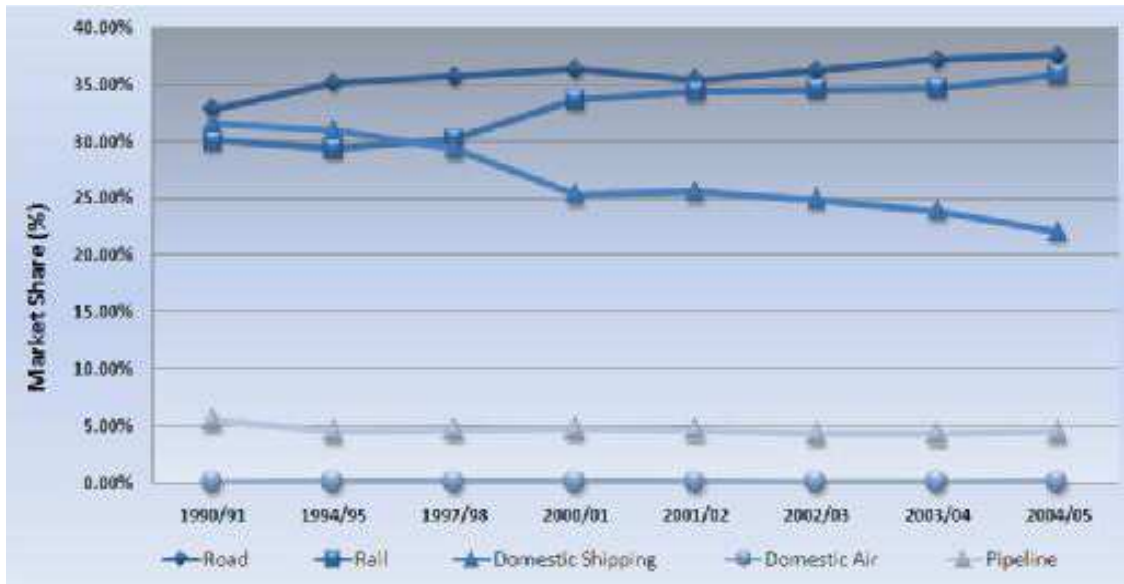
Country	LPI	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Domestic logistics costs	Timeliness
Singapore	4.19	3.9	4.27	4.04	4.21	4.25	2.7	4.53
Germany	4.1	3.88	4.19	3.91	4.21	4.12	2.34	4.33
Hong Kong, China	4	3.84	4.06	3.78	3.99	4.06	2.66	4.33
Canada	3.92	3.82	3.95	3.78	3.85	3.98	2.84	4.19
Ireland	3.91	3.82	3.72	3.76	3.93	3.96	2.65	4.32
United Kingdom	3.99	3.74	4.05	3.85	4.02	4.1	2.21	4.25
Australia	3.79	3.58	3.65	3.72	3.76	3.97	2.8	4.1
United States	3.84	3.52	4.07	3.58	3.85	4.01	2.2	4.11
China	3.32	2.99	3.2	3.31	3.4	3.37	2.97	3.68

Source: World Bank Logistics Performance Index

Figure 7.10: Australia's Logistic Performance Index Country Scorecard and Examples of Best Practise

Transport and logistics is a major industry in Australia and the value added by Australian transport and logistics is equivalent to approximately 14.5% of Australia's GDP. That is the equivalent of an industry worth \$150 billion to our economy each year and this will only increase as the freight task is predicted to double by 2020. WA is the highest of all states when comparing value added with transport and logistics adding the equivalent to 24.1% of Western Australia's gross state product. This means that savings made by increasing the efficiencies of transport and logistics can add up to very substantial amounts.

Within Australia the domestic freight task has grown by 43% since 1994/95 to 517.2 billion tonne-kilometres in 2004/05. Road and rail transport increased their share of the domestic freight task to 37.5% and 36%, respectively, at the expense of domestic shipping, whose market share declined to 22%. Pipelines increased their share of the national non-urban freight task to 4.5% in 2004/05. Because of its export focus WA accounts for 44% of the Australian and international freight task (Transport Logistics Council, 2007).



Source: Australian Logistics Council

Figure 7.11: Australian Domestic Freight Task by Mode 2004/05

Problems with Australia's transport and logistics systems have also been identified by the Australian Logistics Council who identified 23 areas of blockage in Australia's supply chains. These blockages fall into four key areas: preparing the rail system for future challenges, corridor access to ports, airports and inter-modal terminals, clearly articulated freight transport plans and regulatory consistency (Meyrick 2008).

Discussions with local developers and industry bodies clearly indicated that infrastructure in general and particularly transport infrastructure is a major issue. There is a feeling that not only has this area had insufficient spending but that there is a lack of clear planning and timing for major transport infrastructure to proceed and that this is effecting supply chains. It is felt that often transport infrastructure is being built too late and that expenditure needs to be brought forwards to add benefits and costs saving for industry on transport. A good example of this is the Canning Vale estate where key parts of the transport infrastructure to service the estate were only added more recently well after the estate had reached capacity.

Population Driven Industries

The building industry and associated services is a key part of all Australian industrial markets. The high levels of population growth in WA and the strong residential building industry have made it a particularly large part of the WA market. WA's isolation means that bulky components of the building industry (such as bricks) need to be manufactured locally.

The strength of population growth has varied greatly between the states. However, WA has generally been one of the stronger population growth states and more recently has overtaken Queensland as having the highest population growth rates.

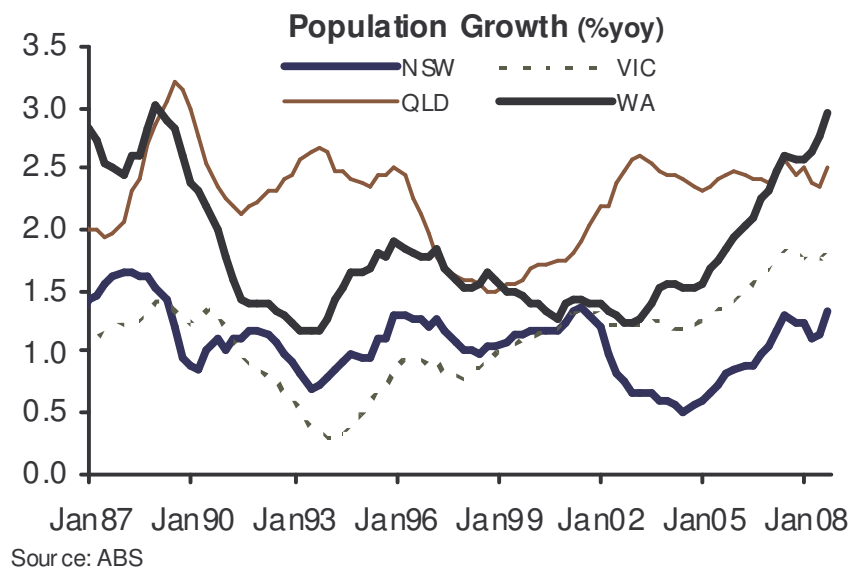


Figure 7.12: Australian Population Growth Trends 1987-2008

The rate of population growth in each state is a key driver for the housing market, which until 2007 had seen very high levels of development in most major states with the exception of New South Wales.

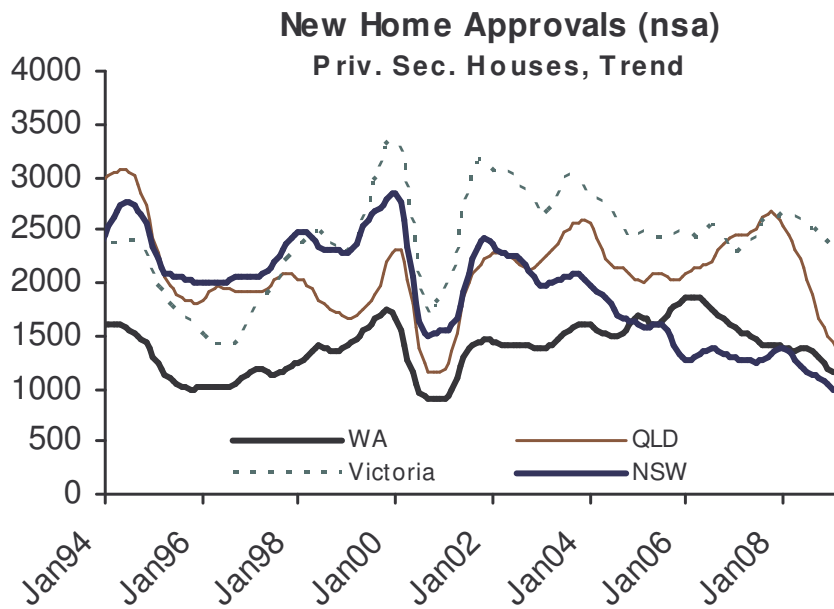
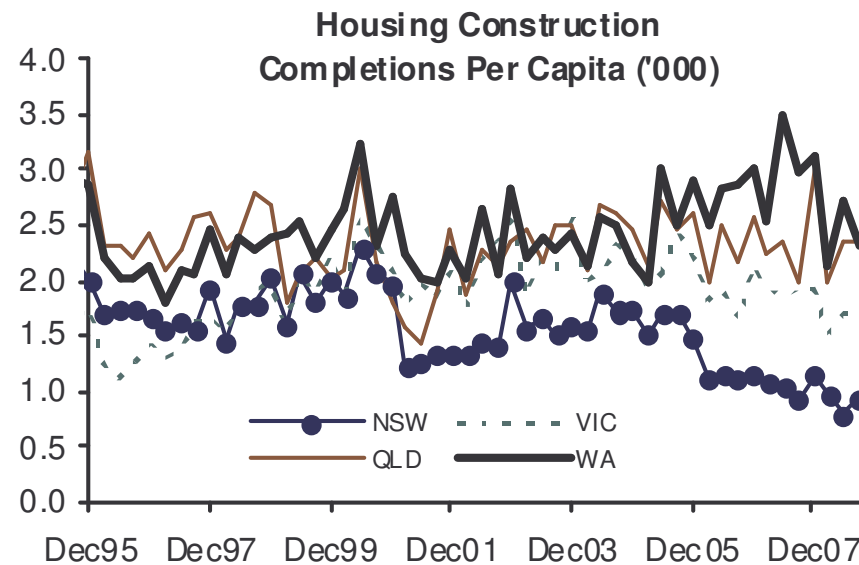


Figure 7.13: Australian Home Approvals Trends 1994-2008

Another key driver of the housing market is the number of completions per capita and in this indicator WA has consistently had a high level of completions per capita. .



Source: ABS, Property Insights

Figure 7.14: Australian Housing Construction Completions Per Capita 1995-2007

Western Australia continuing high levels of population growth will mean that land for building and construction industries and associated services will continue to be in demand in the long term. Additionally, population growth is a key driver for bulky goods retailing. In WA larger bulky goods retailing establishments tend to rely on Bunnings or Harvey Norman and both have a large focus on the new home and renovation markets.

Industrial Development Goes Global

One of the major trends that has been occurring in the development of industrial land is that as the level of activity from TNCs and national companies has increased there is a growing number of developers that have set themselves up to take care of industrial property needs in locations nationally or internationally. Within Australia one of the most prominent firms is Goodman, one of the world's largest industrial property managers, owners and developers.

Goodman describe themselves as *"an integrated property group that owns, develops and manages industrial property and business space globally"*. The company seeks to build strong relationships with companies and to look after their property requirements in multiple locations where possible. Goodman now has 41 offices in 19 countries and 391 properties (10.9 million sq m) under management. The Goodman model is summarised in Figure 7.15. Key features of the Goodman model are that:

- Owning the property which enables them to build an ongoing relationship with the customer as well as providing them an ongoing investment.

- Developing to the customers requirements with each development generally a purpose build project. Owning land in various locations lets Goodman respond to customer needs across a wide operating area.
- Managing the properties in house provides customers with some security that their ongoing needs will be met and that the premises and the estate will be kept up to a high standard. It also allows Goodman to maintain a relationship with their customers and ensure that they get opportunities to help them with future property needs.



Source: www.goodman.com

Figure 7.15: Goodman Customer Service

This model works well for large companies as it out-sources some of their property functions and generally they are not interested in having property assets on their balance sheets. However, this model is certainly not unique to Goodman. Other major international property development companies which have a focus on the industrial market include ProLogis and Gazeley.

ProLogis are North American based and the largest industrial developer in the world with 44 million square metres of industrial space owned, managed or under construction in over 2,500 properties. ProLogis operates in 18 countries spread across North America, Europe and Asia. The ProLogis business model is similar to Goodman's in that they own, develop and manage the property. However, the ProLogis business model varies in that they have been building industrial property on a speculative basis. The buildings are built in a flexible way so that they can be split up to fit customer requirements.

However, the GFC has changed ProLogis development objectives and while they had previously been focusing on building their development pipeline they have cut the development pipeline from \$US8 billion in September 2008 down to \$US5.1 billion by the end of 2008. They are now only developing previously committed "build-to-suit" projects.

Additionally to allow the reduction of debt ProLogis have sold their China operations and part of their Japanese operation for \$US1.3 billion. Despite their current downsizing, the ProLogis model of standardising speculative industrial buildings is the way that some believe will be seen far more frequently in the future and will start to be seen in Australia.

The model offers tenants improved flexibility with the average lease term in the ProLogis portfolio only slightly over three years compared to new developments in Australia where developers are looking for initial lease terms of at least 10 years. It also means that ProLogis is able to offer tenants the ability to expand and contract the space that they occupy through negotiation as the space is not custom built and is more readily let out.

The ProLogis 2008 annual report makes the following pertinent statement that highlights the magnitude of the GFC and the company's attitude towards their future;

"History will document the turmoil that began in 2008 as unprecedented in world economics. As a global leader affected by this crisis, our focus is on learning from the past, adapting and managing for the road ahead."

From a growth focus ProLogis have changed to a focus on de-risking, de-leveraging and rebuilding. The same change in focus is occurring in most listed property companies globally and in Australia

However, ProLogis continue to have strong faith in their business model and future growth opportunities. They make the following comments about world trends in their 2008 annual report:

"Despite the current disruption in global economies, the long-term business drivers that support the need for global distribution space will continue. We expect that low-cost manufacturing will continue to shift to places where labour is relatively inexpensive, and containerized shipping will continue to grow, supported by the steady trend toward more liberalized trade..additionally, many companies need to overhaul and optimize their supply chain networks to make them more competitive in a global environment. This, in turn, drives demand for distribution facilities in locations that minimize transportation costs and provide for high levels of service to end users. Increasingly, it makes more sense for customers to lease from a facilities provider rather than owning their own distribution centres, since leasing provides customers with more flexibility to re-configure their networks in response to changing market conditions."

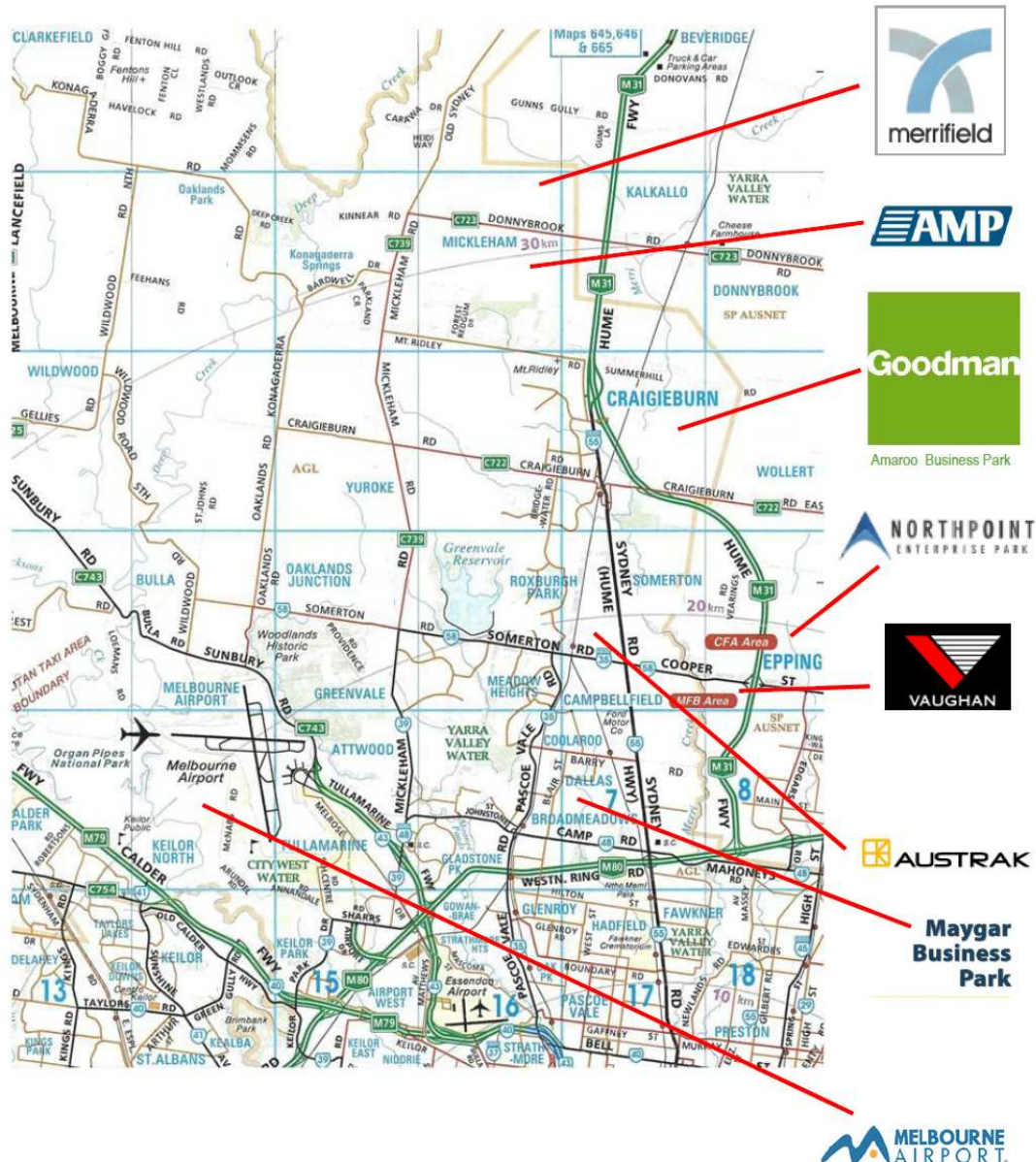
These comments support many of the trends that have been highlighted in this report. As with most major industrial developers (particularly the listed companies) ProLogis have a firm focus on sustainability and ProLogis is committed to being the leading global provider of sustainable distribution facilities and mixed-use developments. There are many ways that this is being addressed but one way they are addressing this is by leasing rooftop space to utilities and independent power producers (www.prologis.com).

Gazeley is an English based company with offices and operations across Europe and in Dubai, China, India, Malaysia, Vietnam and Mexico. Gazeley owns and operates the Magna Park used for a case study in this report as well as a number of other major industrial parks under the same name in other locations. Gazeley's model is that they do everything involved in the development process from acquiring the land through to the leading, development, ownership and management. They have developed over 6 million sq metres of warehouse space. Gazeley have a major focus on sustainability, however, they have recognised that the market is not yet ready to pay additional costs for

sustainable premises and push that “our eco-buildings integrate environmental features and renewable energy technologies at no extra cost to our customers” (Gazeley, 2008).

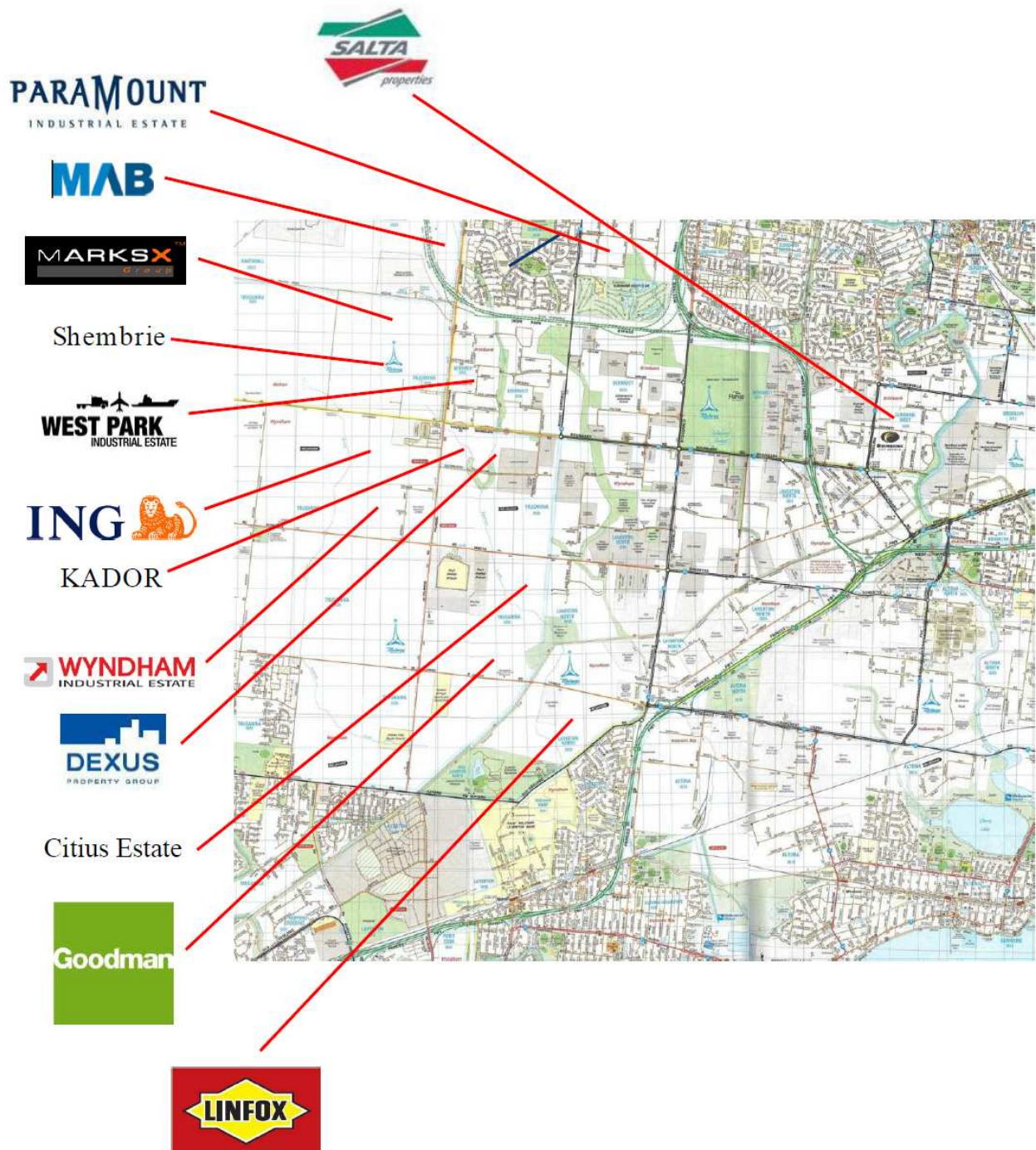
Australia and the Own-Develop-Manage Model

While Goodman is the largest developer solely focused on industrial development in Australia, the “own-develop-manage” model of industrial development is common to many other developers in Australia as well. In the major Australian markets the majority of industrial estates are looking for industrial tenant pre-commitments so that they can develop and own the buildings rather than selling land.



Source: Colliers International (2009)

Figure 7.16: Location of Industrial Estates Melbourne North



Source: Colliers International (2009)

Figure 7.17: Location of Industrial Estates Melbourne West

Figure 7.16 and 7.17 show maps of Melbourne that identify the major active industrial estates in Melbourne's North and West. This highlights the diversity of developers involved in the Melbourne industrial market. The companies vary from major international and national developers such as Goodman, ING and AMP through to smaller but still reasonably substantial local Melbourne developers. The estates vary in size from estates of around 40 ha through to land holding of around 200 hectares. A key focus of the majority of these estates is their close proximity to the major arterial roads servicing Melbourne. In almost all of these examples the developers are primarily looking for tenant pre-commitments rather than land sales. This makes the Melbourne and other capital cities industrial markets quite different from Perth which has traditionally been focussed on land sales with LandCorp the largest provider of industrial land. Only the more recent introduction of Goodman into the market has seen a major developer controlling a large parcel of land and only focused on tenant pre-commitment.

Perth Market in Context

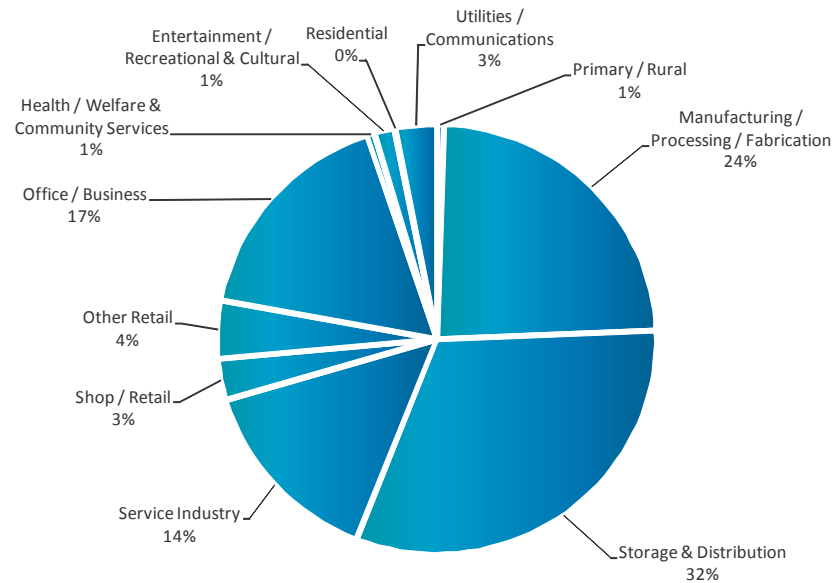
Although, the industrial property sector encompasses all of WA the demographic structure of the state makes the Perth metropolitan area the most significant market and the one in which the greatest pressure for land and infrastructure is likely to take place. Major investment in industrial land will continue to be focused on Perth over coming years and this area will set the trends for future estate design and development. In this sub-section the specific dynamics of the Perth industrial property market are examined.

Analysis of the Perth Industrial Market

The WA Department of Planning and Infrastructure (DPI) carries out the industrial land use survey on a regular basis. The preliminary information has been provided for this report. This information covers around 80% of the metropolitan area. However, some local areas, including Rockingham have not been covered. Nevertheless, this preliminary information gives some good information and insight that show how some of the trends identified in this report are starting to affect the Perth industrial property market.

Analysis of the preliminary data suggests that the four keys areas of industrial land use in Perth are storage and distribution, manufacturing / processing and fabrication, office / business and service industry. These industries all fall into the key industry categories detailed earlier in this chapter.

- **Key Export / Import Driven Industries** – largely manufacturing based and accounts for 24% of floor areas.
- **Key Linkage Industries** – WA's geographic isolation together with the its strong export and import focus means that types of industries account for a very high proportion of all industrial space in Perth.
- **Population driven industries** – as well as accounting for retailing and service industries, a reasonable proportion of manufacturing is also driven by the local building market.

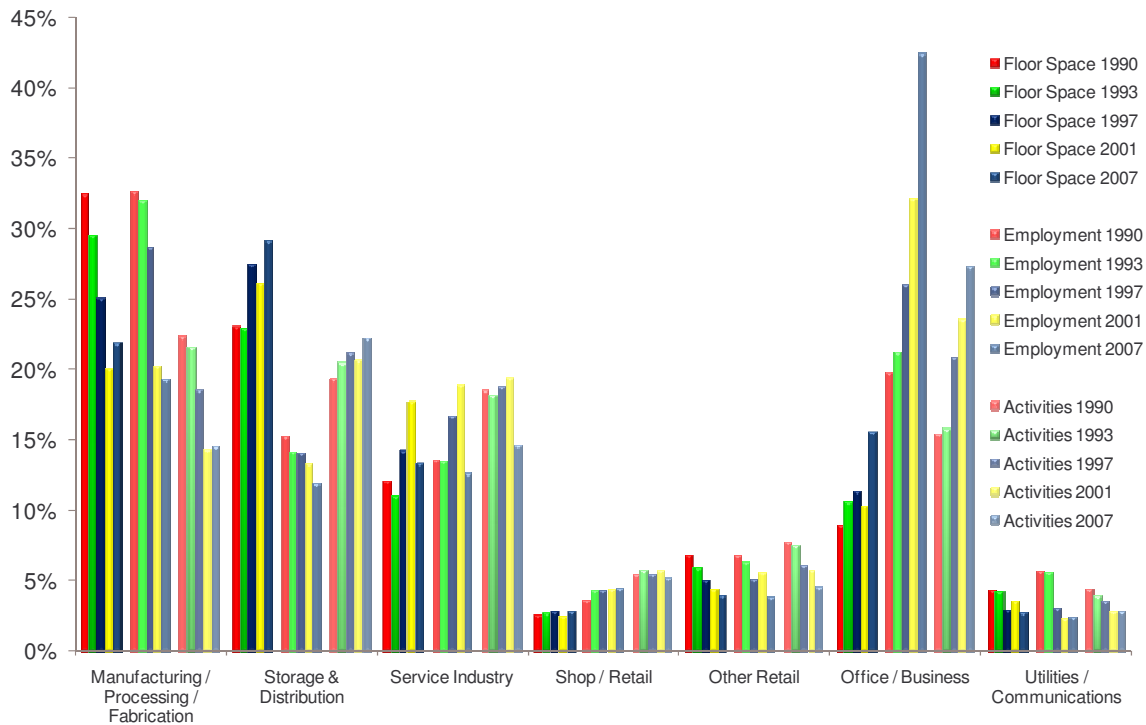


Source: DPI 2007 Preliminary information

Figure 7.18: Perth Industrial Floor Space by Industry Type

Comparing the areas covered so far in the 2007 survey with the same areas from previous years identifies the key areas which have seen an increase and decrease in industrial land use, employment and number of activities.

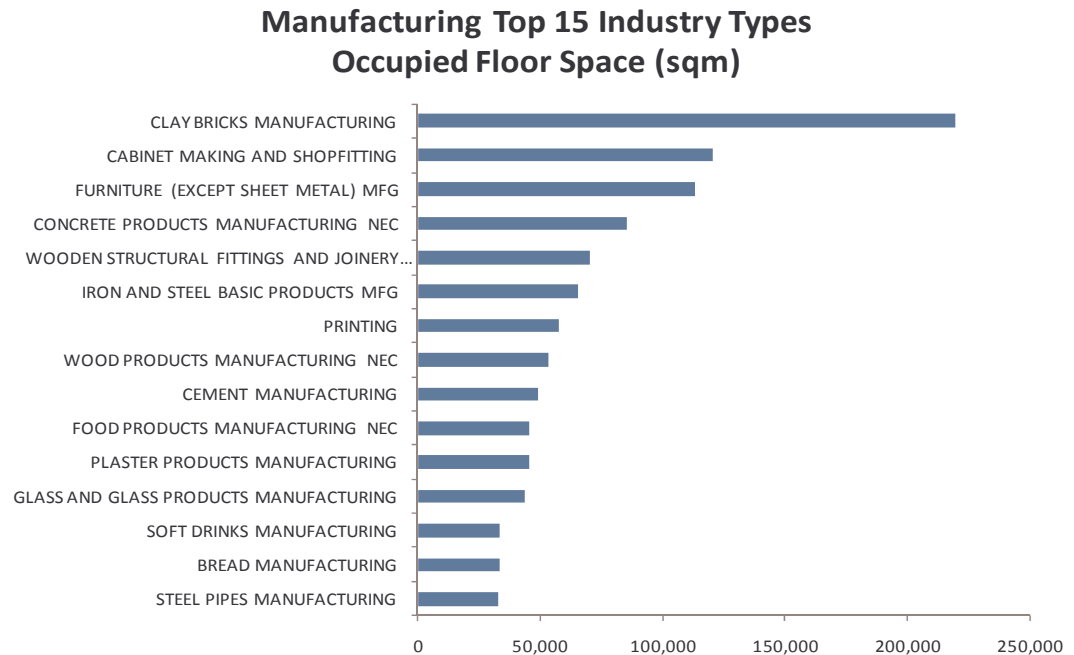
This clearly shows that manufacturing activity has been declining and the largest growth area is office / business which has seen a significant increase in the land occupied, employment and number of activities. The data confirms that there has been consolidation within storage and distribution with an increase in land usage but a fall in employment and a much lower growth in the number of activities. Somewhat surprisingly the proportion of industrial land used for retail uses has been falling.



Source: DPI 2007 Preliminary information

Figure 7.19: Industrial Land use Survey Land use, Employment and Activities Trends % of total

As manufacturing is declining, understanding what sorts of manufacturing is being done in Perth is important. Looking at the top 15 industry types by land use shows that manufacturing is generally focused around servicing the local population in key areas of building trade (even within iron and steel products much of this is associated with the building trade) and food manufacturing (See Figure 7.20). This highlights the importance of the building industries to manufacturing in WA and suggests that any slow down or growth in the housing sector will have a direct impact on the manufacturing sector. This is likely to experience some lag effect as manufacturing typically follows a cycle several months or even years behind that of market trends due to the substantial investment in plant and equipment within industrial sites.



Note: Based on companies where the Western Australian Standard Land Use Classification (WASLUC) and Planning Land Use Category (PLUC) codes indicate that there is a manufacturing use i.e. manufacturing usage within manufacturing based companies.

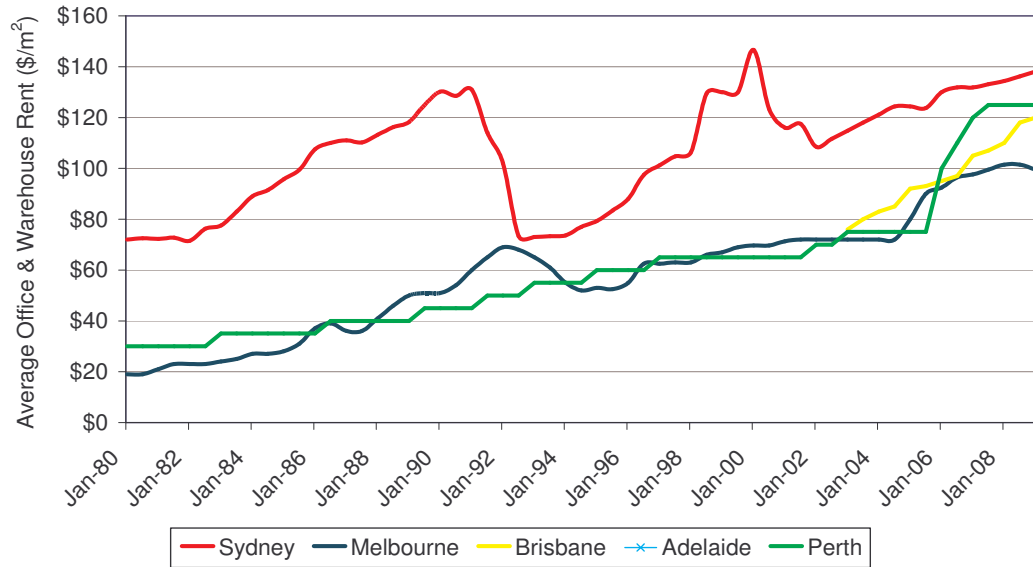
Figure 7.20: WA Manufacturing Top-15 Industry Types by Floor Space

Land Values and Rents Where Does Perth Sit?

More recent years have seen very high levels of growth in both land values and rents. This has been driven by the economic boom as well as a shortage in industrial land that was ready for development.

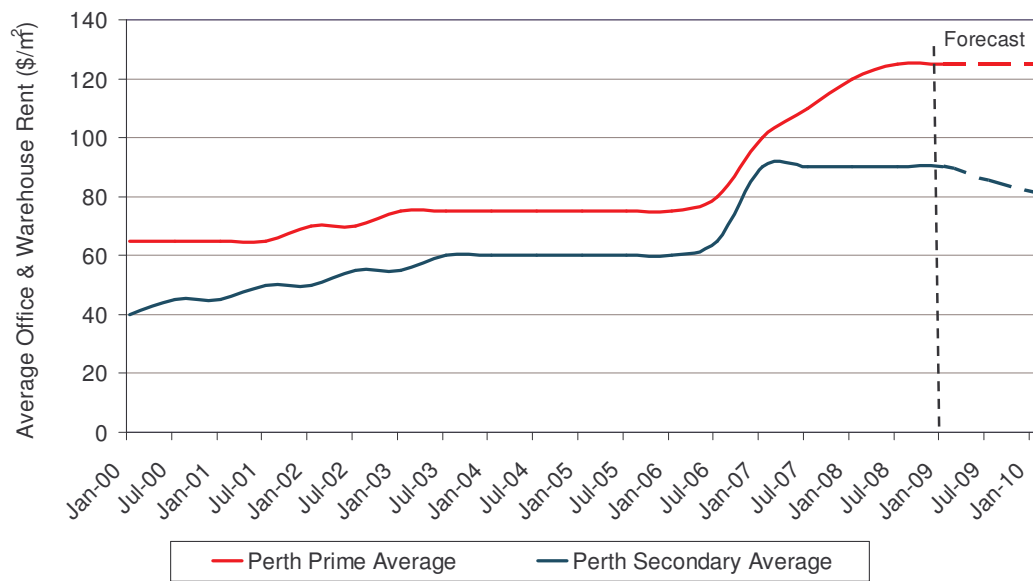
While Perth's industrial land values and rents have traditionally sat well below other states the more recent growth has brought them more in line with other states. The fact that the rents across Australia are now more in line is likely to be a limiting factor on growth for rents in Perth in the future, with national tenants unlikely to pay significantly more in rent in Perth than they are in other states.

Additionally the softening economic climate is likely to exert downward pressure on secondary warehouse rents. The secondary market is also likely to be negatively influenced by the industry drive (particularly in logistics) for efficiencies. This will mean that secondary quality warehouses will no longer be suitable for larger parts of the industry and mean that they have less capital value and are viewed more as development opportunities over time. These trends are illustrated in Figures 7.21 to 7.23.



Source: Colliers International Research

Figure 7.21: Prime National Industrial Average Rent Comparison



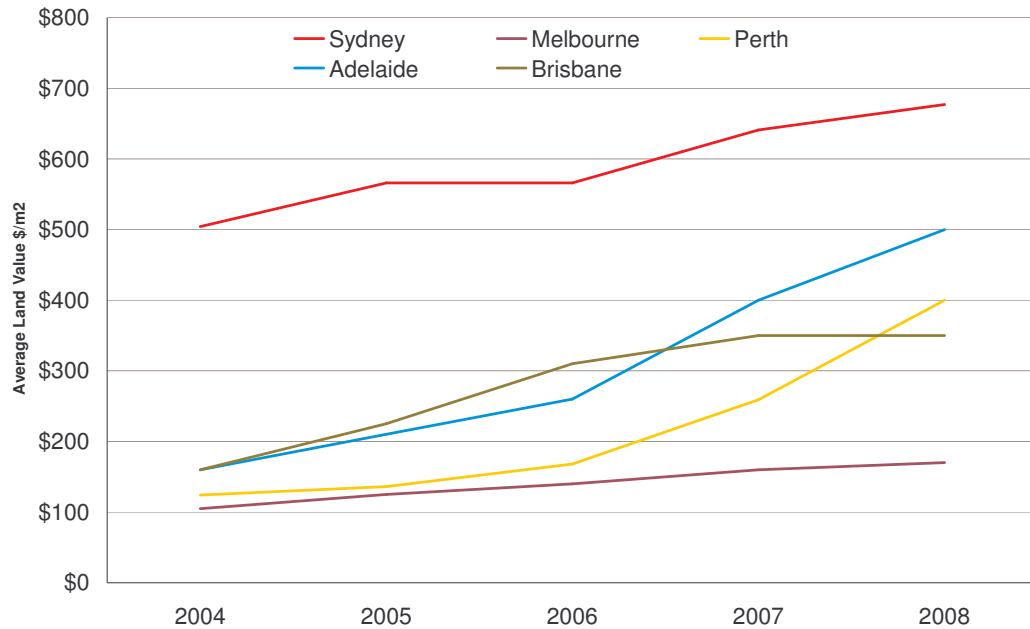
Source: Colliers International Research

Source: Colliers International Research

Figure 7.22: Perth Industrial Average Rents

Like rents land values have also traditionally been cheaper in Perth than in other cities. However, the more recent rapid growth in land values has seen land values come more in

line with other states. The rapid increase in land values in Perth between 2006 and 2008 was driven by the booming economic conditions in Perth, which led to rapid take up in industrial land and a shortage of available industrial land. It is worth noting that at the same time as the increases in land values were occurring in Perth, a similar trend was occurring in Adelaide and to a lesser degree Sydney. Melbourne has large volumes of industrial land available and this together with a relatively flat economy during this period limited growth in land values there.



Source: Colliers International Research

Figure 7.23: Industrial Average Land Value Comparison

The softening of the WA economy and the greater availability of industrial land are likely to see land values fall over the next two years in Perth. This is likely to particularly affect smaller lots which saw a significant level of speculative activity and where demand was also strongly driven by owner occupiers. There continues to be a shortage of strategically located larger lots and at this end of the market land values are likely to be less affected.

Future Directions for the WA Industrial Property Sector

This analysis of recent trends in the Perth industrial property sector confirms the shift away from manufacturing in favour of transportation, storage, logistics warehousing and distribution. These trends are consistent with those found across Australia and elsewhere in the world. It is likely that this type of change will continue within the general industrial sector, with some pressures on light industrial to transform into mixed use zones that can accommodate commercial, retailing and even residential land use. This is a pattern already being observed in the established industrial estates such as Belmont and Osborne Park.

The outlook for industrial land supply and demand across WA will vary from region to region and will be influenced by the drivers and shapers discussed in this chapter. In the following sub-sections we make some final comments on the future directions for industrial land in WA within the main industrial land categories. These are only general observations and Stage 2 of this study will allow for more detailed analysis of these issues and trends.

The Outlook for Heavy Industrial Land Use

Heavy industrial land development is a strategic investment and requires the involvement of the State Government at the highest level. Most of the heavy industry sites within WA are already well defined and require forward planning spanning decades.

Kwinana has long held a position as WA's key heavy industrial location. However, with opportunities for further major industry to locate to this area now limited new location opportunities to cater for the long term development of heavy industry will be required. Although, there are a number of regional locations that have been identified prior to major industry locating to these locations the provision of a definite plan and timing for infrastructure will be important factors. For example, **Kemerton** has been developed for heavy industrial land use in the South West, but the estate suffers from pressures on its buffers and lack of road and rail access. The land is low lying and prone to flooding and plans to develop the Port of Bunbury Outer Harbour for residential and recreational use may create conflicts.

The Outlook for General & Light Industrial Land Use

As outlined in this chapter the demand for general industrial land is driven by the development of industry supply chains and production networks. The trend away from manufacturing towards transportation and storage, warehousing and distribution centres appears set to push for larger lot sizes and estates with adequate road and rail access. Bulky goods retailing will also seek good highway access and visibility.

One of the major issues that Perth will need to deal with in the longer term planning for industrial land is the needs of larger transport and logistics facilities. For companies wanting to service the whole of the metropolitan area, as well as dealing with international and interstate freight, a location close to major roads, rail and access to port transport will always be key factors in deciding where to locate. For these types of companies location decisions are based on a total occupancy cost which includes the incremental cost of all freight movements for each location not just the land and other property costs. Currently this means that a location close to the Kewdale / Welshpool area is preferred. A good example of this is that when Woolworths were considering options for their new premises in Perth their other alternative to the airport was a location in the Forrestdale industrial area. However, the additional freight costs that this site would have incurred meant that it was dropped as an option at a fairly early stage.

While there are some recycling opportunities in the traditional **Kewdale / Welshpool** area there is very little vacant land left and what is left and can be recycled is unlikely to be of the correct lot size for many users. In recent years demand for larger lots in this area has been catered for by the **Forrestfield** area and the **Airport** land. The airport has done particularly well in attracting major tenants in recent years as it has been the only strategically located land parcel in Perth able to offer fully serviced large lots. It has had the added advantage of being able to provide lots that meet the tenants' specifications and

having a long term vision and control over their industrial estate. However, the airport land will not last forever and other alternatives will need to be found. One part of the solution is likely to be the **Hazelmere** area and the development by Goodman in this area is likely to help in opening the area up. However, servicing, infrastructure and approvals are all issues which have been holding back development in this area for a long time and continue to be issues.

The establishment of the proposed new port at Kwinana and associated inter-modal terminal will have major implications for transport and logistics users in Perth and the implications of this on industrial land use need to be carefully examined. However, the existing road infrastructure around Kewdale / Welshpool is likely to continue to mean that it is a preferred location for many users.

Canning Vale is the other location that has been servicing larger industrial land users in Perth. However, this area is now starting to go through a transition and although unlikely to be overtaken by bulky goods retail land uses in the same way as **Osborne Park** has been it is seeing more retailing type uses along with the breaking up of larger lots to service SME's. The changing nature of the Canning Vale area will mean that as part of a strategy to address Perth's longer term industrial land use new areas will need to be found to take over from areas such as Canning Vale as they evolve.

Neerabup is well located to service population driven industries as the North West corridor will service a considerable amount of the metropolitan areas housing needs. However, it is poorly located to service the broader metropolitan area and currently lacks key road connection infrastructure. Additionally, other infrastructure can effect industry's decisions to locate in areas such as this. Neerabup was considered by BGC to locate their new brick works and its location close to the North West corridor housing market meant that it was a preferred option. However, they needed high pressure gas to run their facility and this meant that the best and cheapest location to obtain this was on the airport's land where they have now located.

When looking at the potential for new and expanding industrial locations within the Perth metropolitan area and in regional areas, there are three key areas that need to be looked at. These are land availability and amalgamation of land, approvals (zoned and correctly approved land from all authorities) and the provision of infrastructure needed by industry (the type of infrastructure will vary by location and it will be important that sufficient industry liaison occurs to ensure a clear understanding of the type and level of infrastructure provision that is required). The provision of all infrastructure up front is not always possible or cost effective, however, what is important to attract private capital is a clearly defined plan for the timing and level of infrastructure that will be provided as to minimise risk and uncertainty for private companies and ensure that sufficient investment is undertaken to attract them to the location.

OBSERVATION

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The Outlook for Regional Industrial Land Use

Much of the demand pressure for industrial land within WA was experienced in the Perth metropolitan area over the past five years due to the unprecedented economic boom driven by rising demand for minerals and energy emanating from China. Throughout the remainder of WA a number of industrial estates have been established that are targeted at servicing the needs of specific industries within these regions.

In general, these sites have not experienced rising demand pressures to the same extent.

Although a detailed analysis of each region in WA is not feasible within the scope of this report the following observations can be made:

The Kimberley Region of WA is rich in natural resources and high value products such as diamonds, pearls and fishing (e.g. prawns, barramundi). Industrial development within the region has remained limited but could increase with the establishment of a major LNG hub at James Price Point north of Broome. The successful negotiation of royalty agreements with traditional land owners by the WA State Government in early 2009 has increased the prospects of this project proceeding. However, environmental clearances are still required from the Federal Government. Should the James Price Point project go ahead, the construction and longer term servicing of the LNG production facility will increase the demand for light industrial land in the area. The State Government will need to ensure that there is adequate planning to accommodate the likely demand for commercial and industrial land as well as related transportation infrastructure within the Broome area over the entire lifecycle of the James Price Point development. The area is currently configured as a wilderness tourism venue. As the project moves forward there is the likelihood that the construction will place increasing pressure on the existing air, road and sea port facilities. While this is potentially manageable, there will need to be adequate planning to ensure that the project proceeds without negative impacts on existing industries such as tourism.

The experience of the Pilbara region during the development of the Burrup LNG gas developments should offer useful lessons for this project going forward.

The Pilbara economy has grown strongly on the back of the mining and resources sector. The LNG gas production facilities located on the Burrup Peninsula are already major industrial sites servicing global supply chains. The mining of iron ore and its loading

at the Ports of Dampier and Port Hedland also have significant levels of activity. Industrial land demand in the region is being met with a series of light industrial estates such as Wedgefield near Port Hedland with some 22 lots ranging from 1.500 sq m to 1.1 ha. Similar developments have been undertaken around Karratha and Newman.

It is not clear what additional industrial land requirements will be needed in the area over coming decades as much will depend on the type of industries that are likely to emerge in the region. It is likely that LNG production and minerals (particularly iron ore) will continue to be the main activities. There are moves within major mining companies to automate their operations over time. For example, Rio Tinto is investigating the introduction of robotic trains and future mine sites may see a reduction in the number of employees as advanced technologies and remotely piloted vehicles become more common.

The Gascoyne is not currently showing much prospect as a key industrial land site for WA.

The Goldfields and Esperance region remains one of the main mining areas for WA. Key industrial land developments in the area include ANZAC Drive Industrial Estate and Mungari Industrial Estate. The first is targeted at large logistics and transport users and comprises 37.5 ha of land zoned general industrial. It is close to the rail, road and air transport infrastructure in the Kalgoorlie-Coolgardie area. The latter estate is targeted at heavy industrial users in the Goldfields to Esperance area. It is located mid-way between Kalgoorlie and Coolgardie and has been zoned for special purposes with a 1 km buffer and lot sizes from 1 ha to 100 ha.

Future growth in the Goldfields Region will depend on the fortunes of the mining sector, particularly Nickel, Gold and Lead. The closure of the Ravensthorpe nickel operation due to falling metals prices and the 2007-2008 lead contamination crisis in Esperance place added pressures on the level of industrial development in the region. Consideration will need to be given to the management of industrial supply chain and logistics operations through the Port of Esperance. As demonstrated in the lead contamination crisis, there must be adequate forward planning for the harmonious integration of mining and other industries such as food production and tourism in any future regional industry development. This is likely to require a more integrated “whole of government” response than has been the case in previous years.

The main industrial site within the **Wheat Belt Region** is the Avon Industrial Park located 18 km from Northam. Consisting of 203 ha of land it has been targeted at agribusiness end users. The region has only a very small manufacturing base and all roads and rail infrastructure is designed to service the grains and livestock industries. The closest port to Avon is Fremantle.

The Mid-West has an economy based on fishing, agriculture and mining. The industrial estates of Narngulu and Oakajee represent the main industrial areas within the region. The former, located south east of Geraldton is close to the airport and has been the home of mineral sands processing operations. The Oakjee site is zoned for heavy industrial land use, the estate is located 20 km from Geraldton and has been focused on a future steel works and deep water port. It has a 1,134 ha heavy industrial core and 195 ha general industrial area with 4,000 ha of buffer.

The planning for the Oakjee site has been underway since the 1970s and its future is contingent on the ability of investors to create a viable business case for the establishment of an iron and steel smelter in the region. This development would require the construction of a deep water port and significant investment in power, water and related infrastructure.

The current Port of Geraldton is constrained by the depth of the harbour which does not allow sufficient clearance for a fully loaded bulk ore or grain carrier. However, only the steel works would be likely to require such a major port. Efforts to launch the project in the 1990s with investment from Taiwan did not proceed due to falling steel prices.

In March 2009 the WA State Government signed an agreement with the Oakajee Port and Rail (OPR) joint venture (representing Murchison Metals and Mitsubishi Group) to progress this \$4 billion project. The WA Government would commit \$339 million with additional funding sought from the Federal Government. Current planning would see a feasibility study completed by March 2010 with private investment sought to allow construction to take place in the period 2010 to 2011 and exports commencing from 2013-2014. The development was announced by Premier Colin Barnett as “the single most important project for Western Australia’s economic development over the next 50 years”.

If these plans come to fruition the Oakajee development will become a major industrial site in WA. However, the current economic downturn and lack of investment combined with the reducing demand for metal ores in China over the longer term may serve to derail these plans as has happened in previous decades.

The South West Region of WA has been one the fastest growing areas in Australia in recent years. Its economy is built on a wide range of industries including mining of bauxite and mineral sands. The City and Port of Bunbury are major urban sites outside of Perth, and there are industrial land sites to be found in areas such as Collie, Manjimup and Harvey. Adjacent the Port of Bunbury are the Kemerton Heavy Industrial Estate, and the general industrial sites of the Preston and Picton Enterprise Parks. The Port of Bunbury is also offering around 500 ha for storage and logistics use. Further inland is the Collie Shotts Industrial Park and Collie Industrial Estate, as well as the privately developed Coolangatta Industrial Estate near Collie. Other areas include the Worsley Siding adjacent the Worsley Aluminium refinery, and the Manjimup Industrial Estate near the timber town of Manjimup. Future sites in the South West include Diamond Mill and Palgarrup near Manjimup, and sites adjacent to Bridgetown (e.g. Hester, Yornup), as well as Greenbushes and Boyup Brook.

The future growth of industrial land in the South West is likely to be contingent on the further expansion of the mining sector including mineral sands, aluminium smelting and the coal industry at Collie. There is potential for future industrial development in the South West but competing land use demands from agriculture, forestry, viticulture and tourism will need to be balanced. The rail and road infrastructure in the region remains in need of significant improvement, particularly in terms of east to west corridors able to quickly access the Port of Bunbury.

The Great Southern is predominately an agricultural economy with forestry and fishing as key sectors. The main industrial land use in the area is located around the Port of Albany and the Mirambeena Industrial Park, a general industrial site located 15 km north of Albany. This is currently occupied by sandalwood, grain and fertiliser processing industrials. Future demand is likely to come from the development of agribusiness and fishing.

General Comment:

The overall picture emerging from this review of WA industrial land developments in the regions is that land allocation is generally abundant and supply exceeds demand. The major proposed developments at James Price Point and Oakajee will involve significant

investments and equally significant environmental and planning clearances. Their viability will depend on future demand for LNG and processed iron ore. The prospects for the LNG demand would seem to be better than for steel.

Growth in industrial land demand in other areas is likely to be subdued now that the boom is over. The outlook for growth remains promising over the longer term and if economic growth continues at a less frenetic pace, it should allow for the upgrading of road, rail and port infrastructure in the regions, as well as the forward planning for inbound investment to build upon the key industry sectors within these regions.

OBSERVATION

There is a clear need for an integrated “whole of government” response to industrial planning in the Regional areas of WA. Major projects offer significant potential for stimulating the economic development of these areas, however, the relative isolation of much of the state and its low population base and underdeveloped infrastructure makes planning for such projects particularly complex. Addressing regional industry needs on a short term project by project basis is unlikely to be as effective as a long term economic development strategy for each region that integrates these activities into the longer term industrial development of the State.

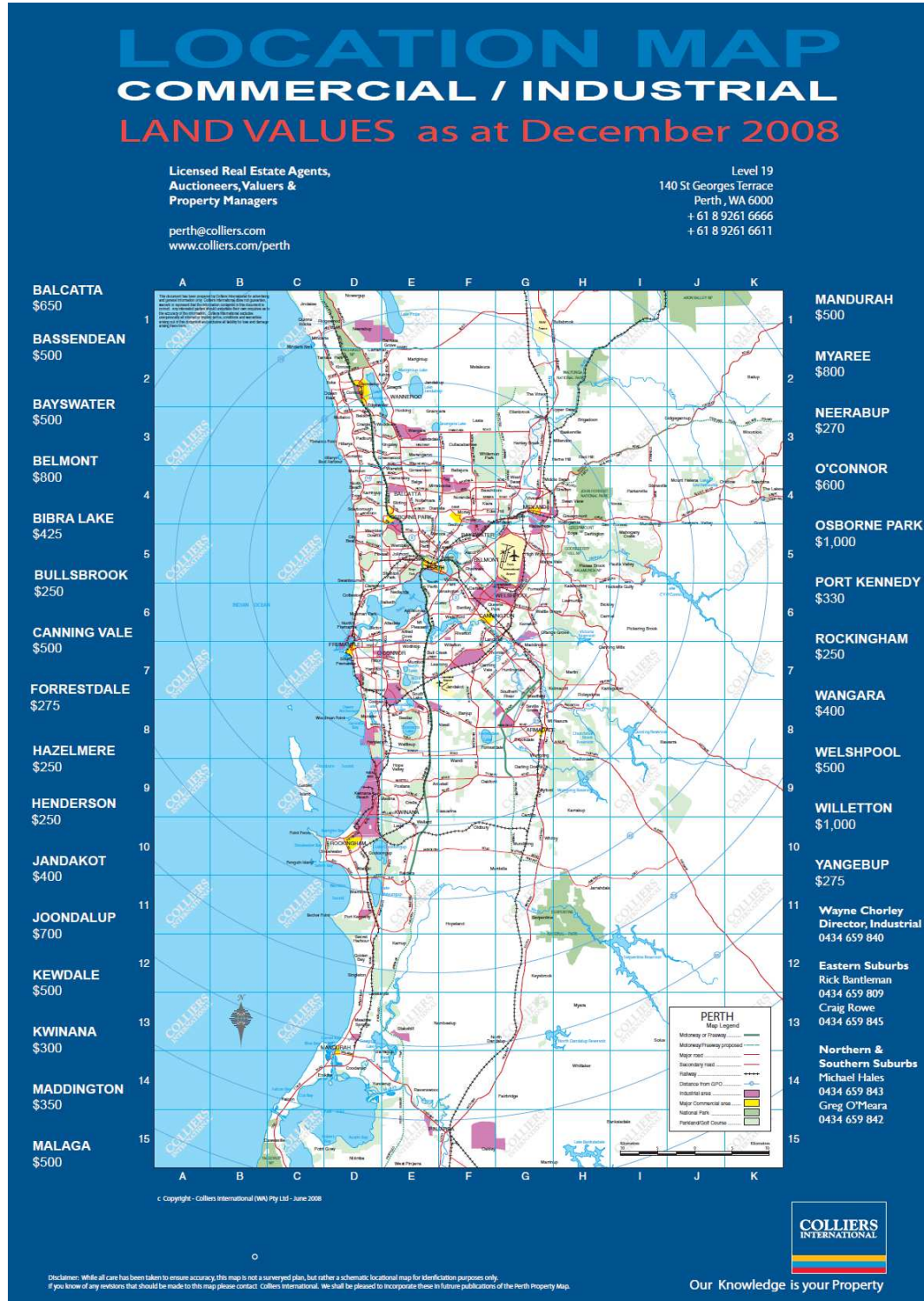
Chapter 7: Key Points

- Demand for industrial property is influenced by drivers and shapers. Key drivers are market influenced and include the performance of major export oriented industries and the overall growth in the national economy. Key shapers are government policy and investment in infrastructure, policy and planning guidelines.
- Over recent decades there has been a major shift in the nature of industrial land in Australia away from smaller lots dominated by manufacturing, towards larger, lower cost sites in major growth and transport corridors dominated by warehousing and distribution.
- The same trends in supply chain and logistics management taking place around the world can be found in Australia, including the importance of ICT deployment and the role of 3PL service firms.
- Warehouse construction across Australia has risen sharply in the past 6 to 12 years with a similar trend found across most capital cities.
- WA is a regional economy heavily dependent on the export focused mining and resources sector which are linked into global supply chains servicing China, Japan, Korea and India. Major imports are fertiliser, petroleum, motor vehicles, construction and household goods sourced from Singapore, Japan, the UK, USA and China.
- Major industrial land use, particularly heavy industries, will be dependent on trends in these major export and import sectors.
- As with other countries Australia has seen a significant growth in container traffic through its ports, however much of this growth is driven by increases in imports and WA has experienced more growth in exports than other states due to the mining and resources sector’s boom period over the past decade.

Chapter 7: Key Points (continued)

- Significant investment has taken place across Australia in ports and rail facilities; however, much of this has lagged the growth in the economy and internationally the country rates poorly in terms of such key transport and logistics infrastructure. WA has performed no better than the rest of Australia and many property developers have concerns that road, rail and port access is inadequate to meet the needs of industry.
- Much of the manufacturing in WA is focused on servicing the main population driven industries such as housing and construction. WA has experienced significant growth in these sectors over recent years as the resources boom has taken hold.
- A major development in industrial land estate development and management is the “own-develop-manage” model in which the developer becomes a property manager taking care of the needs of tenants. This is epitomised by Goodman in Australia and ProLogis and Gazeley in the USA and UK. This has seen many Australian industrial estates (which are mainly controlled by major developers) more focused on attracting pre-commitment than selling land. This type of development is common elsewhere in Australia but has not taken hold as strongly in WA.
- Most of the general and light industrial land in Perth is allocated to storage, distribution (32%) rather than manufacturing (24%). This reflects the relative decline of manufacturing and the emergence of logistics and warehousing. Commercial offices, retailing and other users are becoming an increasing proportion of the industrial land use in these estates suggesting a trend towards mixed use as found elsewhere in Australia, Europe, the UK and USA.
- Industrial land values in Perth have moved upwards to similar levels found in other cities. WA will need to adopt a more integrated approach to the development and management of industrial land if it is to remain competitive into the future. Overcoming planning and infrastructure bottlenecks will be a key challenge.

Appendix A – Perth Industrial Suburbs and Land Values



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