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Signposts for Queensland: An analysis of future pathways

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Contents

Executive Summary	iii
1. Introduction	1
2. Methodology: From global megatrends to Queensland signposts	2
2.1 Background: The CSIRO Global Megatrends	2
2.2 The Project Process	3
2.2.1 Developing a baseline.....	4
2.2.2 The Signposts Workshop.....	5
2.2.3 Aggregation and Synthesis	5
3. Signposts for Queensland’s Future	8
3.1 Summary.....	8
3.2 Accelerating Asia	9
3.2.1 Global Context	9
3.2.2 Queensland’s Opportunities and Challenges.....	10
3.3 Natural Advantage	12
3.3.1 Global Context	12
3.3.2 Queensland’s opportunities and challenges	14
3.4 Hidden Treasure	17
3.4.1 Global Context	18
3.4.2 Queensland’s Opportunities and Challenges.....	20
3.5 Room to Move	21
3.5.1 Global Context	21
3.5.2 Queensland’s Opportunities and Challenges.....	22
3.6 Diligent Diversification	24
3.6.1 Global Context	25
3.6.2 Queensland’s Opportunities and Challenges.....	27
4. Conclusion.....	30
References	31
Appendix A: The CSIRO Megatrends	34

List of Figures

Figure 1: The CSIRO Global Megatrends.....	2
Figure 2: The Queensland signposts research process	3
Figure 3a: An example of workshop output—risks and opportunities arising at the intersection of global trends and Queensland attributes.	6
Figure 3b: Aggregation of workshop outcomes (risks, opportunities and attributes) around the final project outcome.	7
Figure 4: Signposts for Queensland's Future	8
Figure 5: The shifting centre of gravity of the world economy from 1980 to 2030.....	9
Figure 6: Changing shares of global GDP over two decades (Data source: OECD, 2010)	10
Figure 7: Annual urbanisation rates for India and China (Data source: United Nations, Department of Economic and Social Affairs, 2010).	10
Figure 8a: Commodity production and decline in ore grade (After Mudd (2009)	13
Figure 8b: Commodity production and decline in ore grade (After Mudd (2009) Reproduced with permission.....	14
Figure 9: Modelled climate change. CSIRO 2010.....	Error! Bookmark not defined.
Figure 10: Life expectancy at Birth for Australians (Source: ABS, 2008).....	18
Figure 11: Estimates of Australia's superannuation savings gap (Data Source: Rice Warner, 2010)	19
Figure 12: Percentage of Queensland Population Over 65 years (Data source ABS 2011).....	20
Figure 13: Price Instability in differing commodities (data source UNCTAD 2011)	25
Figure 14: World agriculture, minerals and energy prices (Source: World Bank 2011a)	26
Figure 15: Rolling 10 year yield on the S&P 500 Source: Datastream, Illustration: Allianz.....	26
Figure 16: Composition of Queensland exports for 2009-10 in A\$ billions (Data source DFAT, 2011).	29

EXECUTIVE SUMMARY

Queensland's abundant natural wealth, tropical location and strong social system offer potential for a vibrant economy, society and environment in the 21st Century. To capitalise on these attributes in the face of an increasingly uncertain global context, a foresight project has been undertaken by CSIRO for the Department of Employment, Economic Development and Innovation (DEEDI) and the Office of the Queensland Chief Scientist.

CSIRO investigated trends, risks and opportunities for the future of Queensland through a literature review, horizon scanning, data collation, interviews and a workshop that brought together senior representatives of government, industry and the science community. As a result, five interlinked "signposts" have been developed. These signposts are intended to stimulate long range thinking about the future of Queensland—thinking that transcends current jurisdictional and business boundaries.

Two signposts point the way to evolved building blocks of Queensland—its people, culture and infrastructure. Two explore the way Queensland interacts with the world, both as contributors to a global economy and as guardians of significant natural capital. And one signpost indicates a future direction for Queensland that is resilient to an increasingly volatile world. The signposts are underpinned by an extensive evidence base, an assessment of Queensland's important attributes and a thematic analysis of qualitative information from stakeholders.



Signposts for Queensland : Summary Diagram

In this report, each signpost is discussed in terms of its global context and the unique risks and opportunities presented for Queensland. Together, they describe issues that will affect Queensland's economy (Accelerating Asia), its environment (Natural Advantage), its people (Hidden Treasure), its infrastructure and planning (Room to Move).

'Diligent Diversification' showcases the importance of building a Queensland that is resilient to a highly volatile global environment. This signpost transcends the others. 'Accelerating Asia' presents trends supporting an acceleration in Queensland's engagement with Asian markets as they themselves accelerate in growth. The significance of India is highlighted in this signpost. In 'Natural Advantage', the risks and opportunities inherent in Queensland natural assets are presented in terms of a people, planet, profit paradigm. This signpost presents opportunities to sustainably capitalise on Queensland's natural and social assets. 'Hidden Treasure' presents evidence of risks and opportunities inherent in the evolving population of Queensland. How can Queensland capitalise on the wisdom of an older population and the mobility and cultural expectations of its younger talent to support growth in knowledge intensive services and ensure long and productive lives that can fund well deserved retirement? In 'Room to Move', the significance of trends for infrastructure and urban planning to enable connectivity and intensification across the large and diverse state of Queensland is highlighted, together with the implications of social networking in redefining the nature of social identity.

1. INTRODUCTION

Today Queensland stands on the threshold of a highly uncertain and globally interlinked future. The world's economy, environment and society are reshaping. The European sovereign debt crisis, challenges before the United States economy, unstable commodity markets, geopolitical tensions, global food security, rapid income growth in Asia, demographic and cultural change as well as new technologies are all creating great challenges and opportunities. In the face of this uncertainty, planning for the future, and facing the risks it may hold becomes ever more important.

In 2009 CSIRO conducted a global foresight study to identify five global megatrends that would impact on Australian communities, industries and governments over the coming two decades. These interlinked megatrends occur at the intersection of multiple trends and represent particularly significant patterns for economic, environmental and social change.

In late 2011 the Queensland Government Department of Employment, Economic Development and Innovation (DEEDI), the Office of the Queensland Chief Scientist and CSIRO conducted a small research project asking the question: *What do the five global megatrends mean for Queensland?* The research methods involved a series of semi-structured interviews with relevant experts, an environmental scanning process to identify trends and issues and a consultative workshop. This report presents the findings in the form of five 'signposts' for Queensland.

Our usage of the term 'signpost' is analogous to signposts on a highway. A highway signpost presents information to the driver about an obstacle or opportunity ahead. The driver is alerted to the upcoming event and can make a choice and act accordingly. In the absence of the signpost, the driver will not be aware of the need to make a decision. The opportunity may be lost or an accident may occur when an obstacle is unexpectedly encountered.

The signposts identified in this report make no attempt to tell Queensland decision makers what they should or ought to do, but aim to provide information about possible future events for consideration and potential action.



2. METHODOLOGY: FROM GLOBAL MEGATRENDS TO QUEENSLAND SIGNPOSTS

2.1 Background: The CSIRO Global Megatrends

In 2009 CSIRO identified five interlinked megatrends through a global foresight study involving the analysis of hundreds of trends compiled by over 40 business analysts and scientists (Hajkowicz and Moody 2010). This project investigates how five megatrends from this study may shape the future of Queensland.

CSIRO's foresighting work in 2009 (Hajkowicz and Moody 2010) identified five global megatrends that would impact on Australian communities, industries and governments over the coming two decades (Figure 1). These interlinked megatrends occur at the intersection of multiple trends and represent particularly significant patterns for economic, environmental and social change. The megatrends and the interlinked trend evidence on this are described in Appendix A.

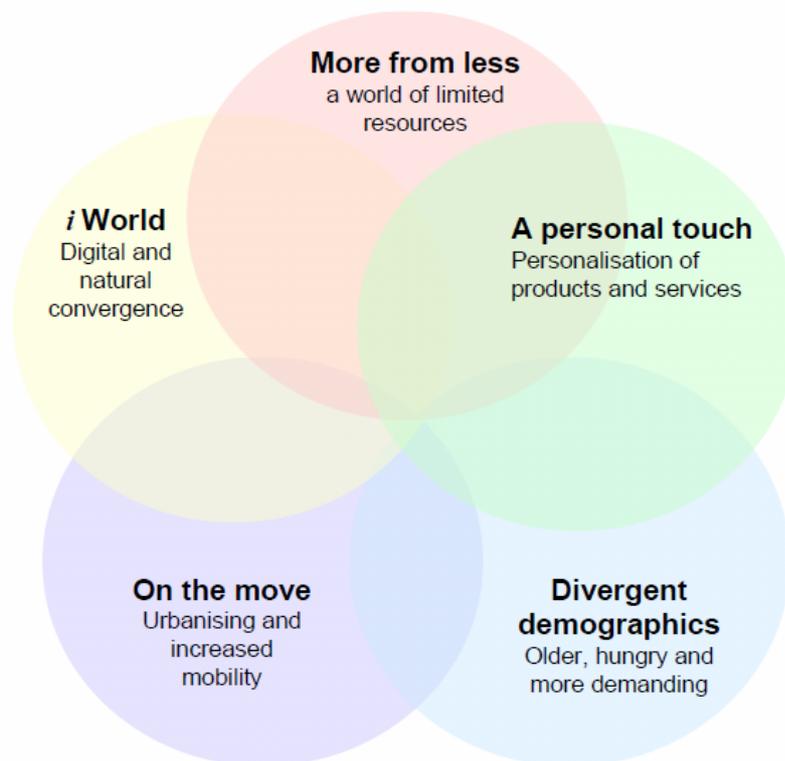


Figure 1: The CSIRO Global Megatrends

2.2 The Project Process

The research process involved three key stages in an analytic-deliberative approach to foresighting for Queensland (Wein and Bernkopf 2007). The three stages are illustrated in Figure 2.

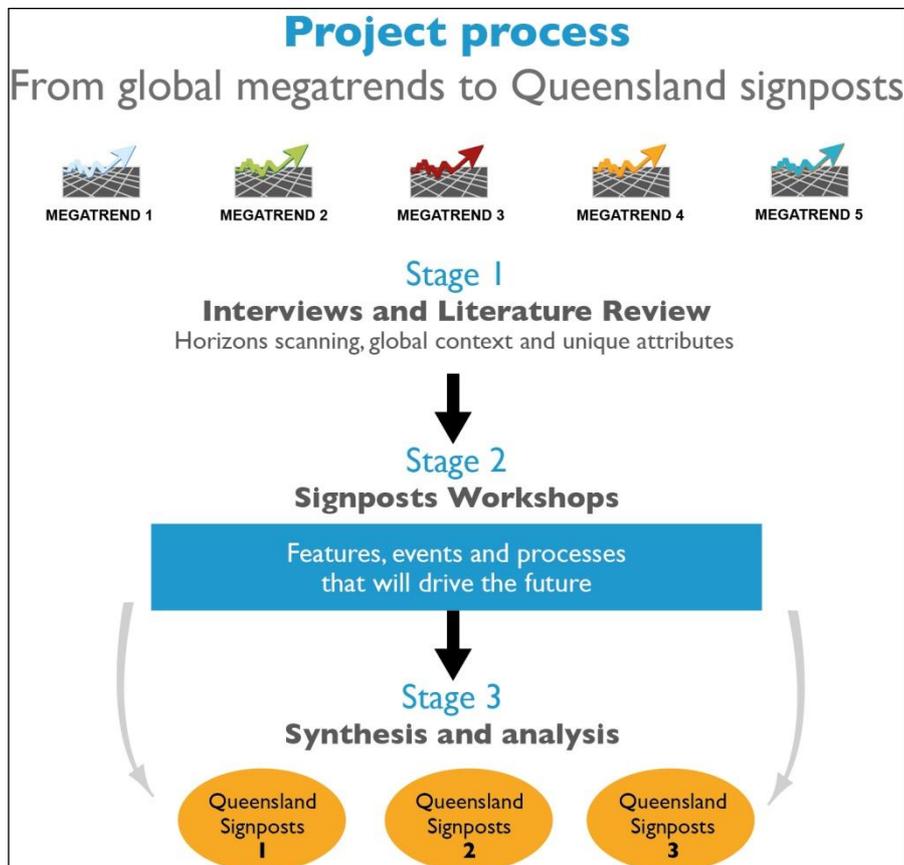


Figure 2: The Queensland signposts research process

Stage 1: Establishing a baseline: by evaluating data, evidence and judgements to describe the global trends affecting Queensland at the moment and the unique attributes of Queensland that will determine the nature of its response.

Stage 2: Development of signposts: through a participatory workshop to tap into judgements about trends, risks and opportunities of representatives of government, industry and the scientific community.

Stage 3: Synthesis and aggregation: into meaningful signposts for the future of Queensland.

2.2.1 Developing a baseline

A baseline for the project was established by considering:

- The changing global context as seen through the lens of the CSIRO megatrends.
- Attributes of Queensland that will determine the nature of its response.

A set of key attributes that make Queensland unique in the world were summarised and tested against evidence gathered in the literature review and through interviews with key Queenslanders. These were loosely grouped into natural, social and economic attributes and were not considered to be either an exclusive or an exhaustive description of Queensland, rather as aids to deliberation and discussion of how the CSIRO megatrends might play out in Queensland. Examples are given below.

Asia-Pacific location: Located in the Asia Pacific Region, Queensland has good connections with both emerging economies as well as OECD nations in Europe and the United States.

Tropical climate: Queensland's tropical location provides it with significant and extended periods of sunny weather as well as variable climatic events.

Significant natural capital and biodiversity: Queensland has a significant natural resource base, large tracts of land per capita and an extensive marine territory. The Great Barrier Reef and the Daintree Rainforest are two iconic World Heritage areas that co-exist in North Queensland.

Significant mineral and energy resource base: Queensland is one of the world's largest energy exporters—unusual in OECD.

Large tracts of remote land: Queensland has one of the highest land masses per capita in the developed world.

Changing population: Queensland's population is growing and ageing.

Heterogenous population distribution: with a concentration in the SE corner, some of the largest houses in the world and one of the highest land masses per capita in the developed world.

Adaptive capacity and resilience: The responsiveness of communities to crises was seen in action in the response to the 2011 January flooding and the mobilisation of the 'mud army'.

Resource intensity: Queensland has one of the world's largest per capita carbon footprints, with negativity towards nuclear energy.

Stability and Neutrality: Queensland is seen as an attractive international partner because of its stable political system, trusted institutions, unique natural environment and relative security.

High Growth Rate (for the OECD): Queensland's average annual economic growth rate in the first decade of the 21st century was 4.2%.

Mature industry base: founded off existing resource industries with mining, agriculture, forestry and fishing collectively representing 17.6% of Queensland's economic output in 2009–10 (DEEDI, 2011).

Vibrant Tourism Industry: Brisbane, the Gold Coast, tropical North Queensland and the Sunshine Coast are the largest producers of tourism goods and services to the Queensland economy and one of the largest shares of international tourism in Australia.

Low levels of Knowledge Intensive Services: services constitute around 70% of the Queensland economy; this is a slightly smaller proportion to that of Australia and the OECD, and the knowledge intensity of services in Queensland is relatively low by national standards.

Favourable Business Climate: highly competitive business sectors, a stable and supportive macroeconomic climate and flexible product and labour market regulation.

2.2.2 The Signposts Workshop

A seminal event in the research project was the delivery of a Signposts workshop on 30 November 2011 (Fung, 2006). Sixty senior representatives from Government, research and industry attended the workshop. Participants were asked to deliberate on global context (as seen through the lens of the CSIRO megatrends) and examine their impact on key attributes of Queensland—the factors and characteristics that make Queensland unique in the world.

The outputs from the workshop arose in a variety of forms which were captured through the workshop process and transferred subsequently to an online forum. Specifically, the workshop was designed to enable participants to collaboratively develop:

- Conceptual frameworks mapping the effect of the megatrends on Queensland's attributes (Figure 3a).
- A set of risk and opportunities cards unique to Queensland.
- An initial aggregation of these risks and opportunities into broad thematic areas for subsequent validation through analysis (Figure 3b).

2.2.3 Aggregation and Synthesis

Following the workshop, thematic analysis developed five broad aggregations of risks and opportunities—significant signposts for Queensland into the future.

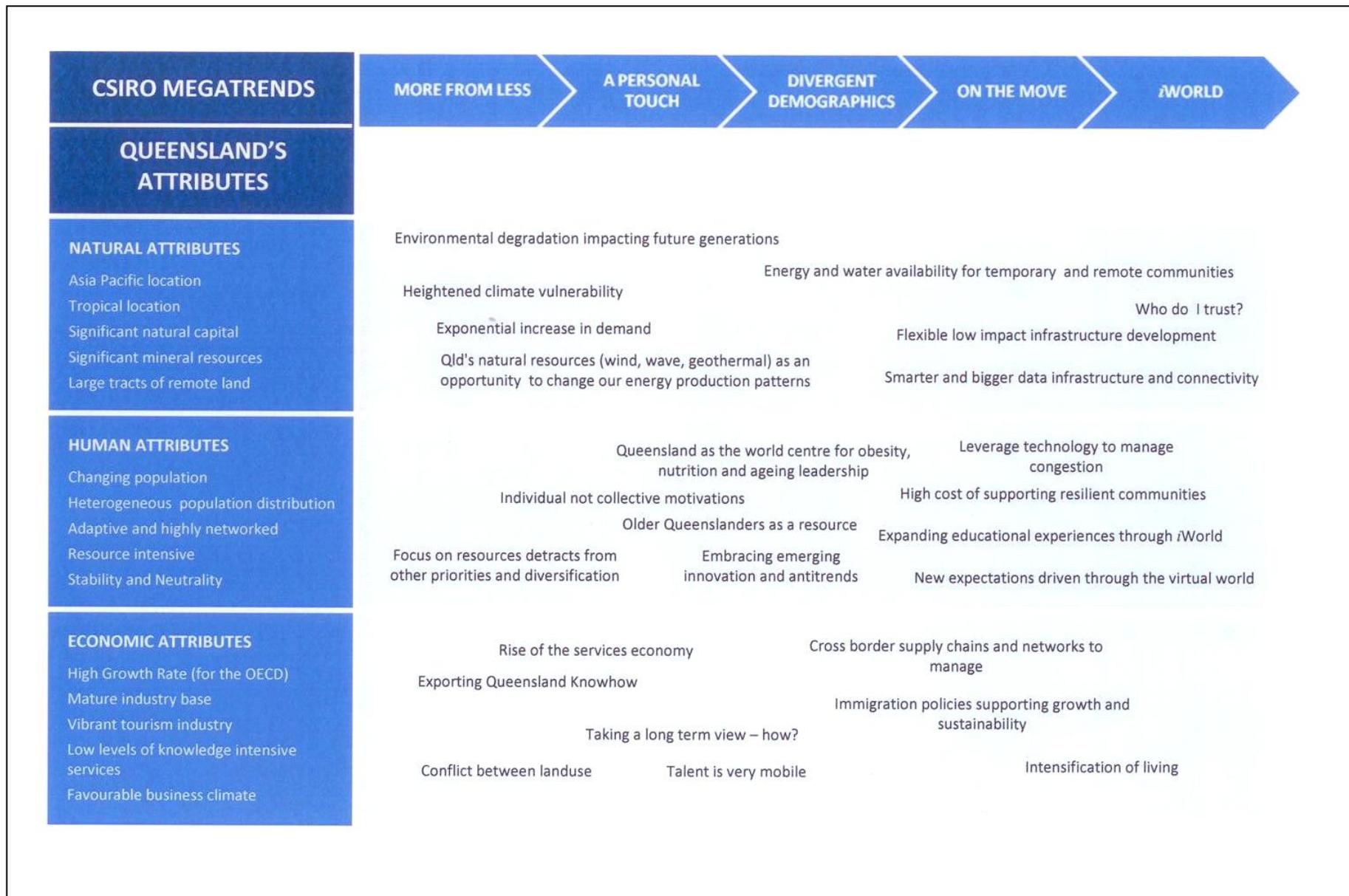


Figure 3a: An example of workshop output—risks and opportunities arising at the intersection of global trends and Queensland attributes.

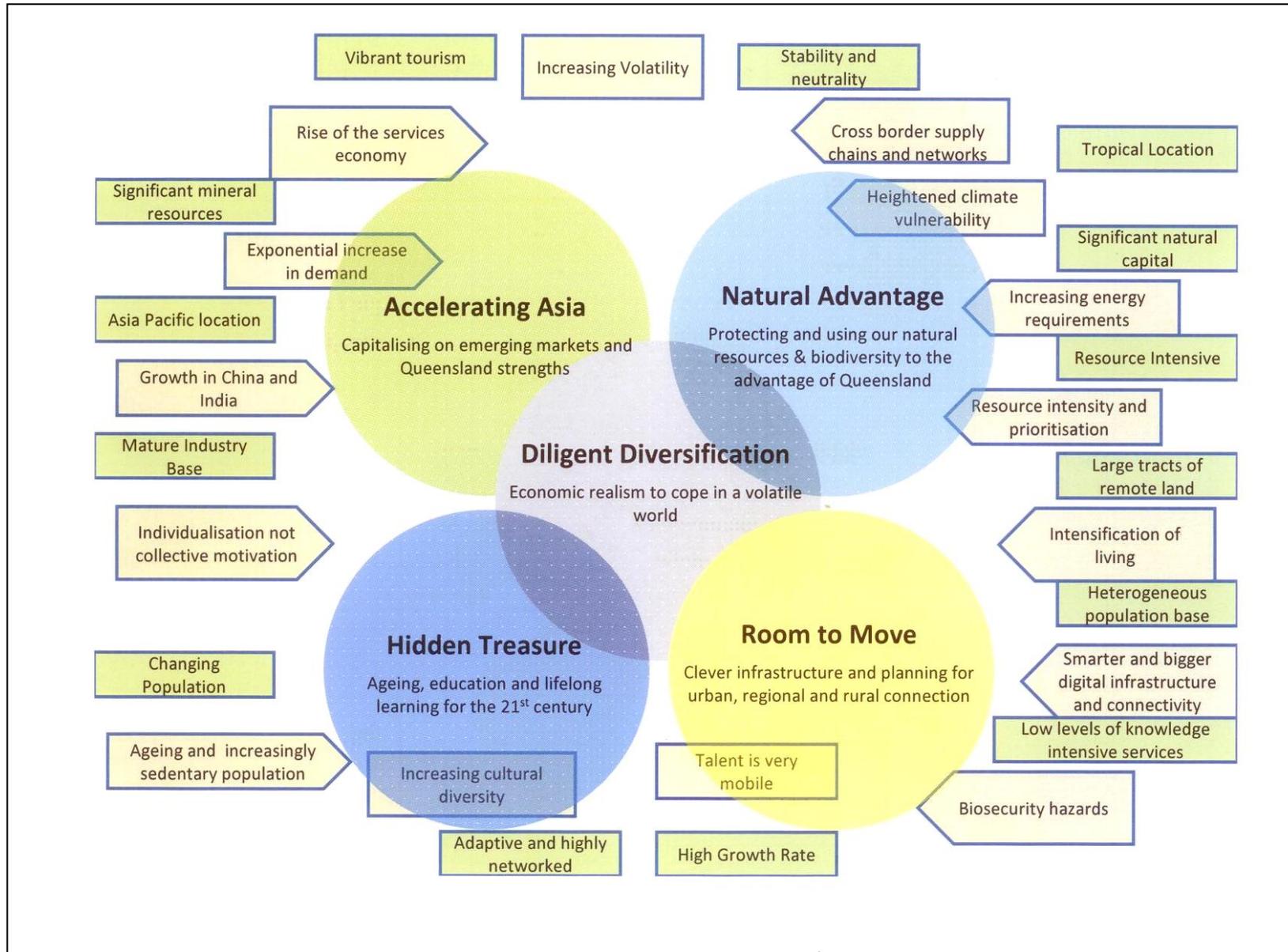


Figure 3b: Aggregation of workshop outcomes (risks, opportunities and attributes) around the final project outcome.

3. SIGNPOSTS FOR QUEENSLAND'S FUTURE

3.1 Summary

The five Queensland signposts that emerged from the analysis and deliberation are constructed in the space where many trends, risks and opportunities converge. These signposts are a critical mechanism for marshalling evidence of trends, risks and opportunities to inform critical decisions. The signposts are summarised in Figure 4.

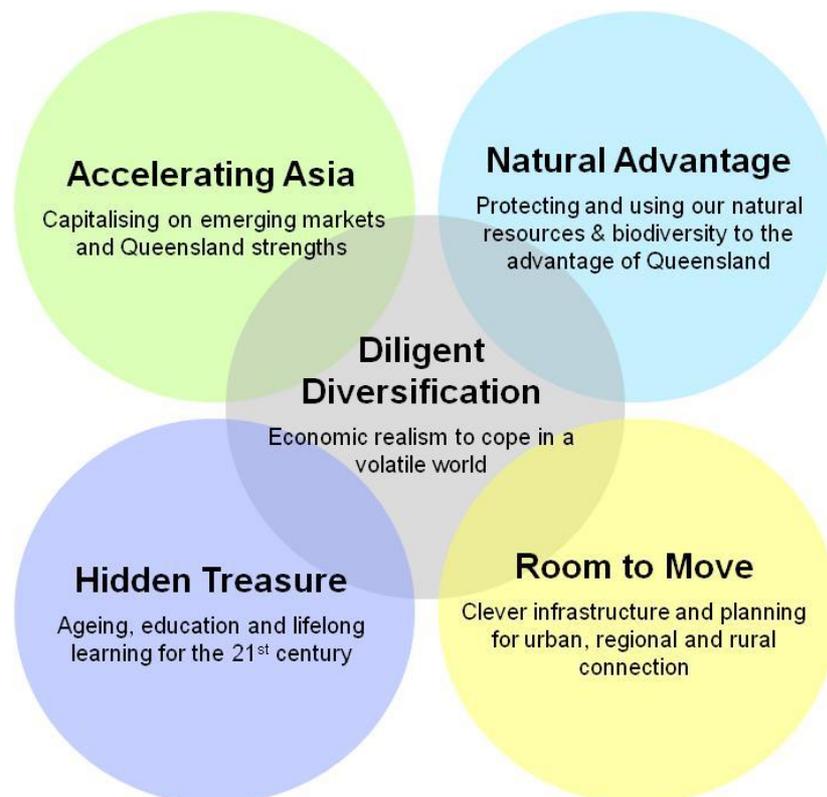


Figure 4: Signposts for Queensland's Future

The trends, risks and opportunities inherent in each signpost are discussed in more detail in the following sections. The narrative of each signpost is constructed around:

- a broad summary of the signpost and its inherent factors,
- the global context setting the direction,
- the unique attributes of Queensland that could be affected.

3.2 Accelerating Asia

Capitalising on emerging markets and Queensland strengths

Once driven by Europe and the United States, the centre of world economic activity is rapidly moving from west to east. Rapid income growth in India and China is creating a new global economic structure. Australian and Queensland industries increasingly depend on export markets in Asia to generate income and with increased trade links there is a rise in social and cultural exchange. Short term arrivals data show a rapid increase in visitors from India into Australia with higher than average international visitor expenditure rates in Queensland.

For example, an analysis of GDP at 700 locations finds the 'Centre of Gravity' of the world's economy will shift from the mid Atlantic ocean in 1980 to a location between India and China by 2030 (Quah, 2011), Figure 5.



Figure 5: The shifting centre of gravity of the world economy from 1980 to 2030

3.2.1 Global Context

The Accelerating Asia signpost responds to trends around transitory migration and knowledge transfer (On the Move), increasing demand for resources (More from Less), population growth driving Asian markets and increasing material aspirations driving demand in Asian markets (Divergent Demographics). Signals of these global changes are summarised below.

- Rapid economic growth in the developing world is reshaping the global economy. In the year 2000 wealthy countries in the Organisation for Economic Cooperation and Development (OECD) dominated global GDP shares. By 2030 non-OECD countries will generate the bulk of global GDP.
- The shifting global economy is largely driven by rapid growth throughout Asia. Forecasts by the Asian Development Bank (Lee and Hong, 2010) show strong income growth out to the year 2030. This study also finds that Asia may account for close to two-thirds of global GDP, a doubling of the current 34% share, by the year 2030 (Figure 6).
- In 2009–10 Australia's exports to China were worth A\$52,219 million. In the following year of 2010–11 it jumped 35% to A\$70,517 million. China is Australia's largest trading partner (DFAT, 2011a).

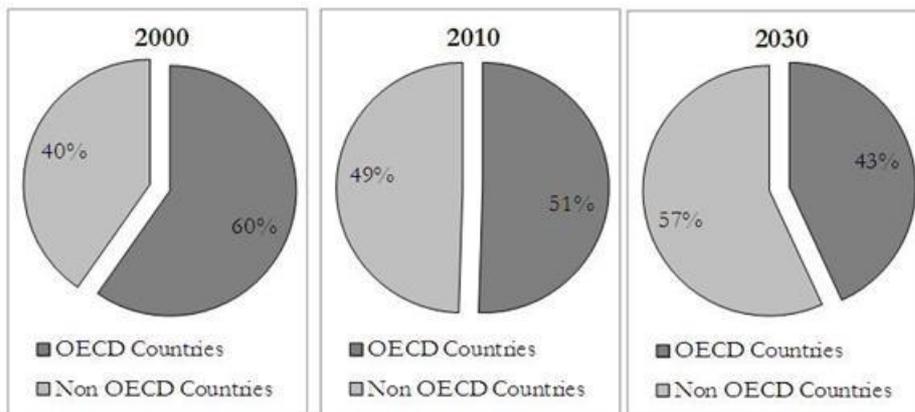


Figure 6: Changing shares of global GDP over two decades (Data source: OECD, 2010)

- Urbanisation is an important source of demand for Queensland mineral and energy commodities needed to build cities and supply energy. The slowing rate of urbanization in China may be compensated by the higher growth rate in India. In either event rapid urbanization in India is likely to increase demand on Queensland commodity exports (Figure 7).

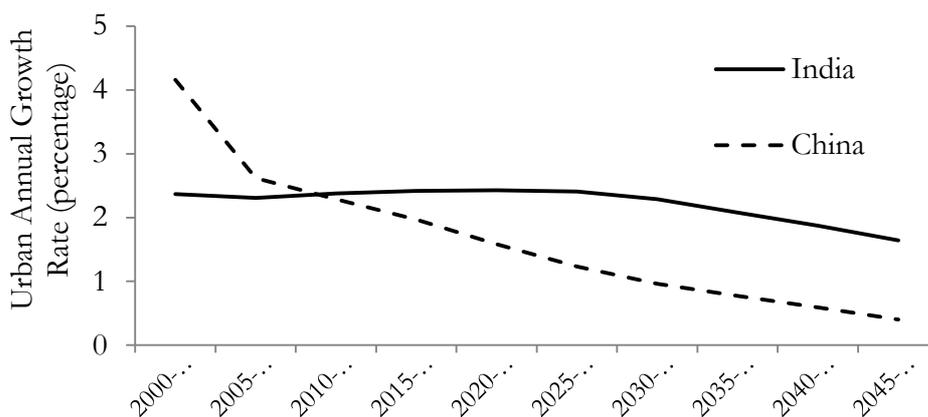


Figure 7: Annual urbanisation rates for India and China (Data source: United Nations, Department of Economic and Social Affairs, 2010).

3.2.2 Queensland’s Opportunities and Challenges

This signpost captures the rapid income growth and industrialization of Asian economies. The world’s two emerging economic powerhouses of China and India are key drivers of the change, with other Asian economies emerging rapidly. As the centre of world economic activity shifts eastwards this signpost prompts questions about how Queensland strategically positions industry to take advantage of new markets. Whilst all of Asia is important to Queensland the data tend to show links to India rising most rapidly.

Accelerating Asia points the way both to the acceleration of the Asian economy and also to an acceleration of Queensland’s engagement with Asia. With its Asia-Pacific location, significant mineral resources and a mature industry base, there is potential to accelerate the export of

knowledge and services as well as primary resources and food. Key factors are summarised below.

- **Existing Asian Markets:** Three-quarters of Queensland's exports are already into Asia. Japan is the largest trading partner, representing just over 20% of total overseas merchandise exports. Supporting this trading activity, Queensland has full-time representative presence in Japan, China, Hong Kong, Taiwan, Korea, India, Indonesia, the United Arab Emirates and Saudi Arabia (DEEDI, 2011).
- **Chinese Boom:** With two-way trade valued at A\$5.8 billion in 2007, China is Queensland's second largest trading partner after Japan. Queensland goods exported to China have been growing at an average of 23% per year over the past decade (DFAT, 2011b). Over 10,000 Chinese students were enrolled in Queensland based educational institutes in the year 2007 (DFAT, 2011b).
- **Indian Connections:** During 2009–10 Queensland exported merchandise to India worth A\$5.2 billion covering 12% of Queensland's total merchandise exports (Trade and Investment Queensland, 2011). Australia is the second most popular country, after the United States, for Indian students studying abroad. In 2009 there were 121,000 Indian students enrolled in Australian tertiary education institutions. This is up 54.2% since the year before (Australian High Commission India, 2011). The arrival of Indian visitors is forecast to grow at the rate of 8% per annum over the next decade with 300,000 anticipated in the year 2020 (Tourism Queensland, 2011).
- **Foreign Direct Investment:** While existing levels of foreign investment are low compared with Europe and the United States, investment from and to Asia is growing. The size of deals with Indian companies is growing. In 2010 the Indian based Adani Group purchased from Linc Energy the Galilee Basin coal deposits in Queensland for an upfront cost of A\$500 million plus a A\$2/ton royalty for the first 20 years. The deal has a net present value of \$1.5 billion.
- **Tourism:** There are also significant tourism opportunities for Queensland. In 2010 some 25,000 (19% of the total) of Australia's Indian visitors came to Queensland. On average an Indian visitor will spend A\$2,346 on a trip to Queensland. This is higher than the average for international visitors at \$1,822. However, despite India being the most rapid growing origin for Australian visitors there are still no direct flights into Australia (Tourism Queensland, 2011).
- **Urbanisation:** Urbanisation is an important source of demand for Queensland mineral and energy commodities needed to build cities and supply energy. The annual rate of urbanization in India will gradually decline in the future. However, it is forecast to remain higher than China's annual urbanization rate from 2015 to 2050. The slowing rate of urbanization in China may be compensated by the higher growth rate in India. In either event, rapid urbanization in India is likely to increase demand on Queensland commodity exports.
- **Other Emerging Economies:** While there is significant focus on China and India, other economies in the region are also promising areas of focus for Queensland. Indonesia and Papua New Guinea are relatively close to Queensland, with Indonesia currently growing at over 6% per annum. Indonesia is also the largest recipient of Australian foreign aid, with Australia its largest donor country (AusAID 2007).

3.3 Natural Advantage

Protecting and using natural resources & biodiversity to the advantage of Queensland.

With its unique biodiversity and tropical climate, Queensland has some of the most diverse habitats in the world. The major drawcards of the Great Barrier Reef, the Daintree Rainforest and Queensland's beaches continue to drive a vibrant tourism industry and the opportunity exists for Queensland to develop world renowned stewardship of natural heritage. This might include a focus on optimising investment into the environment and technologies that decouple resources intensity from productivity. With one of the highest per capita landmasses in the world, one of the largest per capita carbon footprints and a supportive macroeconomic environment, the extensive land available beyond the Great Dividing Range offers potential for new and sustainable supplies of energy for both domestic and international markets.



3.3.1 Global Context

The Natural Advantage signpost responds to a drive to reduce resource intensity (More from Less), opportunities to create niche service business (A Personal Touch) and the opportunities to build business and create opportunities from Queensland's expansive natural capital (On the Move). Signals of change are summarised below.

- Rapidly growing demand for energy, food and materials around the globe is placing scarce natural resources under much pressure. It is estimated by the International Fund for Agricultural Development (IFAD, 2008) that about 12 million hectares of productive agricultural land are lost each year to land degradation and this will displace some 50 million people over the next 10 years and global fish stocks are 52% fully exploited.

- As population grows (UN predictions suggest 9.8 billion by 2050 (UN 2010)) demand for commodities increases exponentially with a resultant boom in the resources and energy sector. Nevertheless declining ore grades in Australia are resulting in exponentially increasing waste from the resources sector and a decline in multifactor productivity associated with this industry (Productivity Commission 2008), Figure 8a.

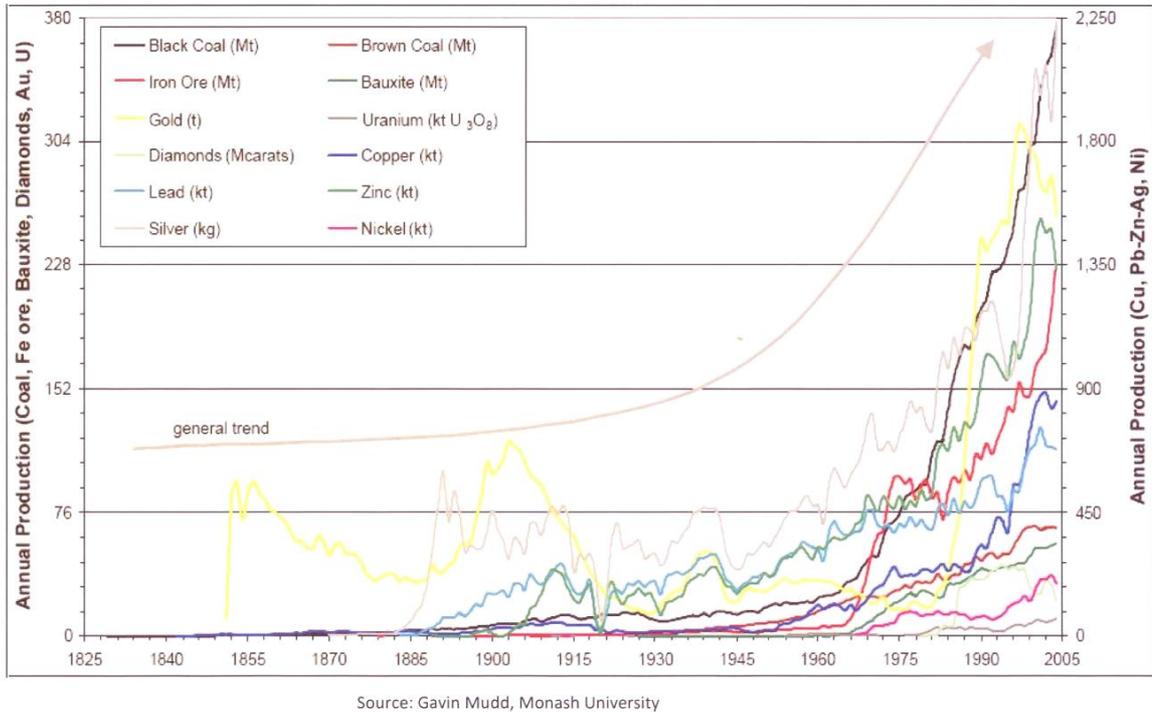
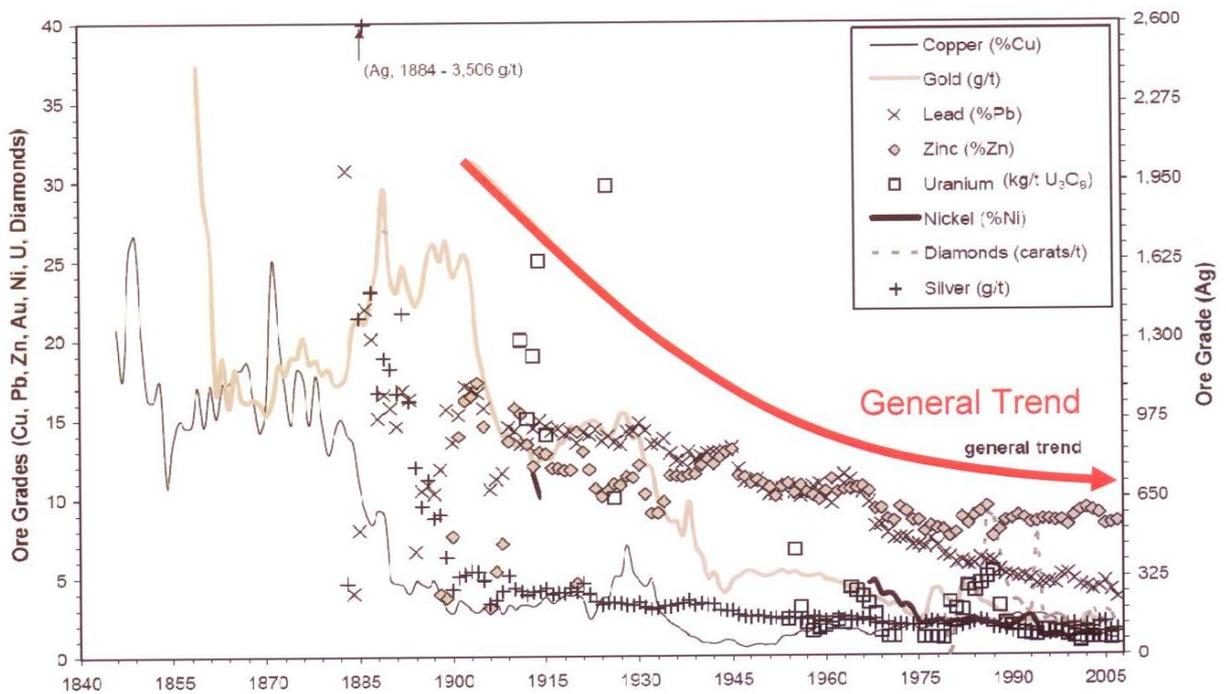


Figure 8a: Commodity production and decline in ore grade (After Mudd (2009))



Source: Mudd GM, 2009. The Sustainability of Mining in Australia: Key Production Trends and Their Environmental Implications for the Future. Department of Civil Engineering, Monash University and Mineral Policy Institute.

Figure 8b: Commodity production and decline in ore grade (After Mudd (2009) Reproduced with permission

- Society now values natural resources not only for cropping, grazing, forestry and fish production, but also for their aesthetic and intrinsic values, biodiversity, and ecosystem services such as sinks for greenhouse gases and water filtration. The coming decades will see an imperative for environmental efficiency driving technological advances for resource efficiencies and ecosystem services which Queensland is well placed to take advantage of.
- Australia's mining resources exports have grown significantly, with the volume of exports of non-rural commodities, having risen strongly over the 1980s and 1990s. Figures in parentheses show the share of each commodity in Australia's non-rural commodity exports in 2001–02. Taken together, the commodities shown accounted for around 70% of non-rural commodity export values in that year.

3.3.2 Queensland's opportunities and challenges

Queensland's stewardship over some of the most diverse habitats in the world, as well as its large land mass per capita, provide an opportunity to develop a domestic economy that promotes environmental guardianship and sustained environmental health. However, Queensland has one of the highest resource intensities per capita and therefore a strong rationale for optimising investment into technologies that decouple resource intensity from productivity. With natural assets that include a large land mass and a tropical location, this too represents an opportunity where Queensland can lead the world. This wide open land also creates future opportunities for the state, from the harvesting of international carbon credits to

the export of solar energy to Asia via 'solar fuels' or high-voltage DC. Specific factors are discussed below.

- **Existing Mineral Resources:** Queensland's average annual economic growth rate in the first decade of the 21st century was 4.2%. Mining, agriculture, forestry and fishing collectively represented 17.6% of Queensland's economic output in 2009–10 (DEEDI, 2011). In 2009–10, the top five overseas exports from Queensland were coal, beef, ores and concentrates of base metals, copper, and aluminium. Among the various industries in Queensland, mining made the largest contribution (14.2%) to the state's gross product in 2009-10 (ABS, 2011).
- **Strong Agricultural Base:** In 2009–10, the gross value of Queensland's agricultural production was \$9.1 billion. Of this, livestock disposals were by far the highest contributor (42.5%), whereas fruit and vegetables combined contributed 20.9% (ABS, 2011). Queensland's agricultural advantages lie in its climatic and horticultural diversity, combined with a reputation for clean, quality-assured food production. Queensland is able to supply the growing and urbanising markets in Asia during the northern hemisphere off-season (DEEDI, 2011). Even in the face of volatility in this market (evidenced by recent halving of beef quotas into Indonesia, Queensland has the ability to export knowledge and services about effective livestock, dairy and cereals industries across the region.
- **Energy Exports:** Exports of coal are projected to nearly double in the next 20 years (DEEDI, 2011, p.10). In the Bowen Basin, 38 new projects are targeted for development in the next six years. The Galilee Basin offers further new prospects for Queensland coal. DEEDI also claims that Queensland has 98% of Australia's proven coal seam gas (CSG), and forecasts that the State will be exporting 28 Mtpa of liquefied natural gas (LNG) within eight years.
- **Leveraging Natural Assets into Tourism:** In 2007–8, Queensland's tourism gross regional product was \$9.2 billion, up from \$8.1 billion in 2003–4. Of this, 31% was associated with tourism in Brisbane, 21% from the Gold Coast, 14% from Tropical North Queensland and 12% from the Sunshine Coast. Approximately 38% of tourism expenditure is from visitors within Queensland, 36% is from interstate and 25% is from overseas. The tourism industry in Queensland employed 122,600 people in 2007–08, up from 103,600 people in 2003–04 (Pham, Dwyer, and Spurr, 2010).
- Different regions of Queensland attract different proportions of domestic and overseas visitors. Brisbane's tourism expenditure is relatively evenly divided among visitors from overseas, interstate, other regions of Queensland and from within Brisbane itself. The Gold and Sunshine Coasts both receive a larger expenditure from domestic than from overseas visitors, plus a small share from their own residents. In contrast, tourism expenditure in Tropical North Queensland derives significantly (45%) from overseas visitors. Smaller destinations receive their main tourism expenditure from domestic visitors (Pham, Dwyer, and Spurr, 2010).
- The State's major drawcards, such as the Great Barrier Reef, the Daintree Rainforest and the Gold Coast's beaches remain attractive to international tourism with numbers forecast to rise from 2.1m in 2009 to 3.2m in 2020. Queensland is forecast to attract 21% of international nights spent in Australia in 2020 representing annual growth of 3.5% and 56.1 million nights.

- **Leveraging economic growth into regional benefit:** Development initiatives, primarily driven by mining, industry and population growth also continue to grow more than the Australian average. In the past 150 years, the area of the catchment that is intensively farmed has quadrupled. Over the same period, 53 000 mining leases have been granted in Queensland, with more than 4000 current as of 2010. The mining industry is also fuelling growth in ports and shipping with proposals for significant expansion in at least seven of the 10 major trading ports along the Coral Coast.
- **High levels of resource intensity:** Queensland's energy demand is projected to increase over the next 10 years at an annual average rate of 3.9% under the medium growth scenario and 6.7% and 1.7% under the high and low growth scenarios, respectively. (Electricity Statement of Opportunities for the National Electricity Market, 2010). Queensland currently has one of the highest resource intensities in Australia, one of the most resource intense countries in the world, creating both a demand opportunity for more energy efficient technologies and a vulnerability to rising global energy costs.
- **Land as an asset:** In 2006–07, the State had the largest estimated land area in agricultural use of any state or territory in Australia—144 million hectares or 83% of the total State land area. Due to poor soils and climatic conditions, 80% of the agricultural land use is for grazing. Only 3.8 million hectares, or 2.2%, of the State is currently used for growing crops for domestic consumption and export. This large extent also provides potential for future industries, such as the generation (and export) of solar energy or sequestration of greenhouse gasses.
- In January 1974 the Brisbane River floodwaters peaked at a height of 6.6 metres above sea level causing widespread damage. In January 2011 the Brisbane River again flooded this time peaking at 4.46 metres above sea level. Soon after, Cyclone Yasi crossed the coastline in February 2011 over Innisfail in North Queensland.
- In the last decade there have been two severe mass coral bleaching events resulting from prolonged elevated sea temperatures. Sea level on the Great Barrier Reef has already risen by approximately 3 mm per year since 1991 and other permanent changes resulting from climate variations and pressure from people, agricultural practices in the hinterland, recreation and commercial fishing are being observed and monitored (Great Barrier Reef Outlook Report 2009).
- **Vulnerability to Climate Change and Extreme Weather Events:** Queensland's tropical location also determines its archetypal weather patterns—extended periods of sunny humid weather, high levels of variability in weather events—and makes it uniquely vulnerable to these risks with anticipated temperature increases of between 1.0 °C and 2.2 °C by 2050, potential decrease in rainfall by between three and seven per cent in differing parts of the State, more frequent hot days and warm nights, less frequent cold days and cold nights and sea levels rising faster than expected by the 2007 Intergovernmental Panel on Climate Change, **Error! Reference source not found.**

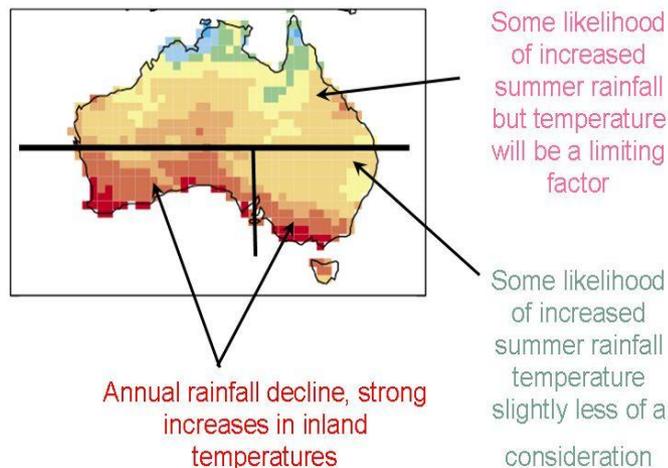


Figure 9: Modelled climate change. CSIRO 2010

- **Tropical Innovation:** As a result of its footprint in the tropics, Queensland has developed a set of skills, technological knowhow and experience around tropical livelihoods, infrastructure management and maintenance, land and water management and health intervention.

3.4 Hidden Treasure

By the year 2050 there will be a much larger population of older citizens, a comparatively smaller part of the population actively engaged in the workforce and growing requirements for a talented cohort of future-savvy young Queenslanders. This signpost points to the challenge and opportunity of linking all these Queenslanders together to shape a healthy workforce of the future.

With the elderly comprising a greater portion of Queensland's population the number of persons productively engaged in the workforce will diminish as a ratio of the total population. The potential labor shortage will create economic challenges as some citizens may struggle to secure sufficient funds for their retirement. Current projections show a sizeable shortfall in superannuation savings with difficulty in identifying sufficient fiscal resources to cover the gap.

Possibly the only source of new wealth is the older population itself—indeed the elderly may be considered a form of 'hidden treasure'. Current social attitudes easily overlook the wealth of skills, knowledge and wisdom held by senior citizens but this signpost suggests they may be a valuable and productive economic resource rather than a problem to be solved.

Health concerns associated with lifestyles and ageing are on the rise and there is growing concern regarding a superannuation gap. Older people are a knowledge resource and the future is likely to see tapered models of retirement and innovative links between productive, healthy and happy older people through younger generations and flexible education systems to ensure a prosperous future.

3.4.1 Global Context

This signpost responds to the ageing population, global mobility of talent and the new generation of learners (Divergent Demographics), financial readiness for retirees and new models of retirement are implicit (A personal touch), and the use of smarter smart phones, e-delivery or services and education and flexible learning through the use of information technology (iWorld). Signals of these global changes are summarised below.

- In 2009–10 people aged 55 years and over made up 16% of the total Australian labor force, compared to only 10% a decade ago. Over the past 30 years the workforce participation rate of older Australians, aged 55 years and above, has risen from 25% to 34%. The rate of increase has been more rapid in the last decade (ABS, 2010).
- Life expectancy for Australians continues to rise (ABS, 2008). In 1900 males lived for 51 years and females lived for 55 years on average. A century later in the year 2000, male and female life expectancy at birth rose to 77 years for males and 82 years for females. By 2006 it was 79 and 84 years. A straight-line projection to the year 2030 gives average life expectancies for males and females of 84 and 90 years. Longer life spans have implications for retirement ages and healthcare services (Figure 10).

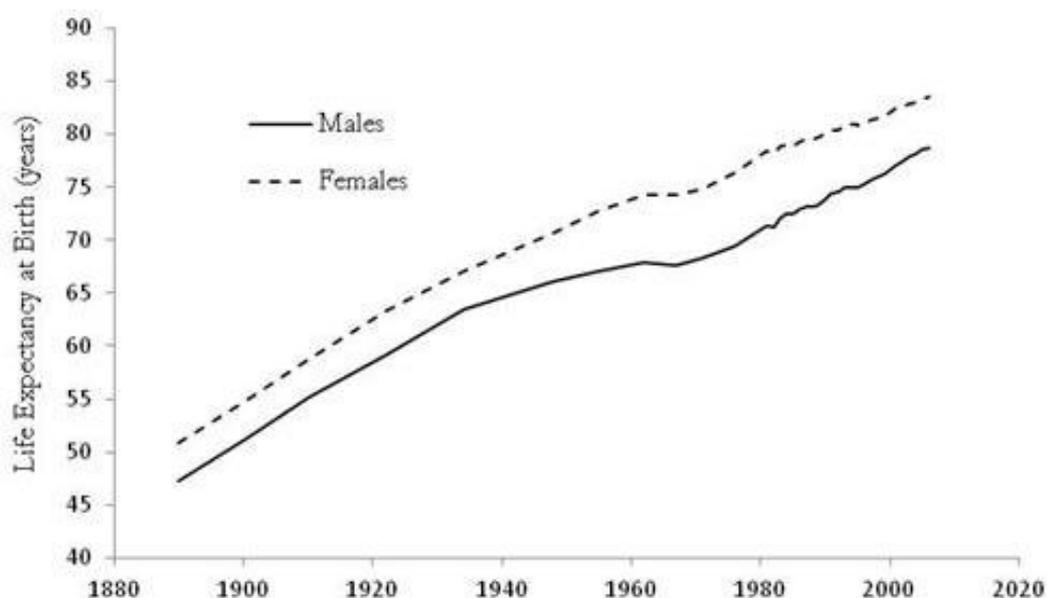


Figure 10: Life expectancy at Birth for Australians (Source: ABS, 2008).

- Whilst there may be more older people in the workforce than before, they struggle more to find a job than younger people. The Australian Bureau of Statistics (ABS, 2011b) reports that one third (33%) of unemployed persons aged 55–64 years actively seeking work, were out of a job for at least one year and considered long term unemployed. This compares with 22% of those aged 35–44 and 13% of those aged 15–24 years.
- The ageing population is predicted to draw heavily on health care services over coming decades with federal government expenditure forecast to rise from 4% of GDP in 2009-10 to 7.1% of GDP in 2049 (Australian Government, 2010). The overall burden of preventable chronic disease in Queensland is predicted to rise by more than 20% between 2006 and 2016.

Research by the actuarial firm Rice Warner for the Investment and Financial Services Association (Rice Warner, 2010) reveals that Australia's retirement savings gap has been increasing over the past decade. In this study the retirement savings gap is the difference between current savings and what would be required to maintain a comfortable standard of living in retirement (

- Figure 11).

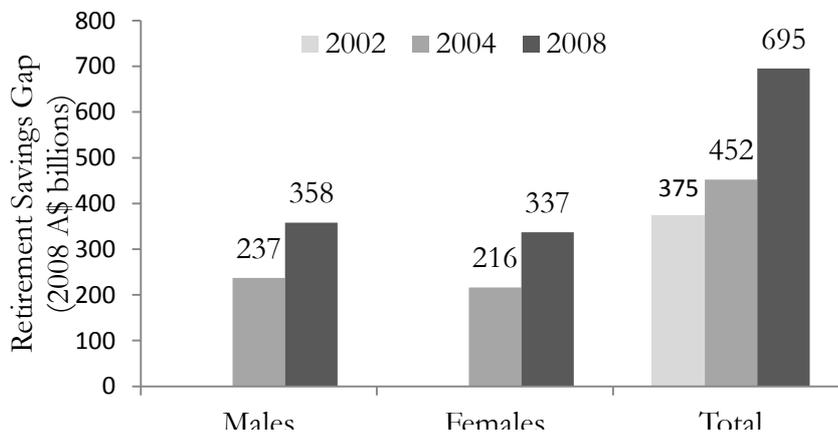


Figure 11: Estimates of Australia's superannuation savings gap (Data Source: Rice Warner, 2010)

- Projections suggest that from 2005 to 2025 the number of obese or overweight Australians will increase from 10.2 million (53%) to 16.9 million (73%) increasing rates of healthcare expenditure. The proportion of Australians with private health insurance rose from 38% in 1998 to 51% in 2001 (ABS, 2005). In 2000–01 Australia spent 8.9% of GDP (A\$68 billion) on healthcare. This rose to 9.8% (A\$83 billion) by 2004/05 (ABS, 2007). There is a possibility that Australians will continue to spend more on health in coming decades and demand more diversified health services.
- Internationalisation of tertiary education is a growing trend facilitating the exchange of ideas and encourages migration of highly skilled people. In 2004, foreign students accounted for 19.9% of all tertiary enrolments in Australia. This placed Australia second only to New Zealand (28.3%) among OECD countries and far above the OECD average (7.3%). The countries with high proportions of foreign students in tertiary education include Switzerland (18.2%), the United Kingdom (16.2%), Austria (14.1%), Germany (11.2%), France (11.0%) and Canada (10.6%).
- Australia's position in knowledge intensive businesses such as research is moderate to good (DIISR 2011), compared with other OECD nations; it had a higher citation rate than the world average in 18 of 22 research fields over 2005–09. In 2008–09, its gross expenditure on research and development was 2.2% of GDP, which is some way below the top five OECD countries.
- The World Economic Forum rates Australia 17th out of 138 on its *Networked Readiness Index*, defined as "the capacity of countries to fully benefit from new technologies in their competitiveness strategies and their citizens' daily lives" (World Economic Forum and INSEAD 2011, p. ix). Datamonitor (2011) notes that Australia has a strong and growing ICT sector, and that the National Broadband Network will expand the e-commerce market.

3.4.2 Queensland's Opportunities and Challenges

Queensland's demographic profile is changing, in line with other developed countries and the rest of Australia. However, with the high levels of immigration into Queensland and recent investment into education infrastructure, the opportunity exists to adopt a leadership position in leveraging both older generations and younger cohorts into a new and productive workforce for the future. Flexible work patterns and modern cultural attitudes to lifelong learning and intergenerational respect could change the relationship between age, intergenerational knowledge transfer and superannuation and generate new economic models for both retirement and education. Specific factors for consideration follow.

- **Ageing Population:** Queensland trends are no different from larger national ones. For example, the proportion of Queenslanders aged 65+ is expected to double by 2051 (ABS 2011) (Figure 12).

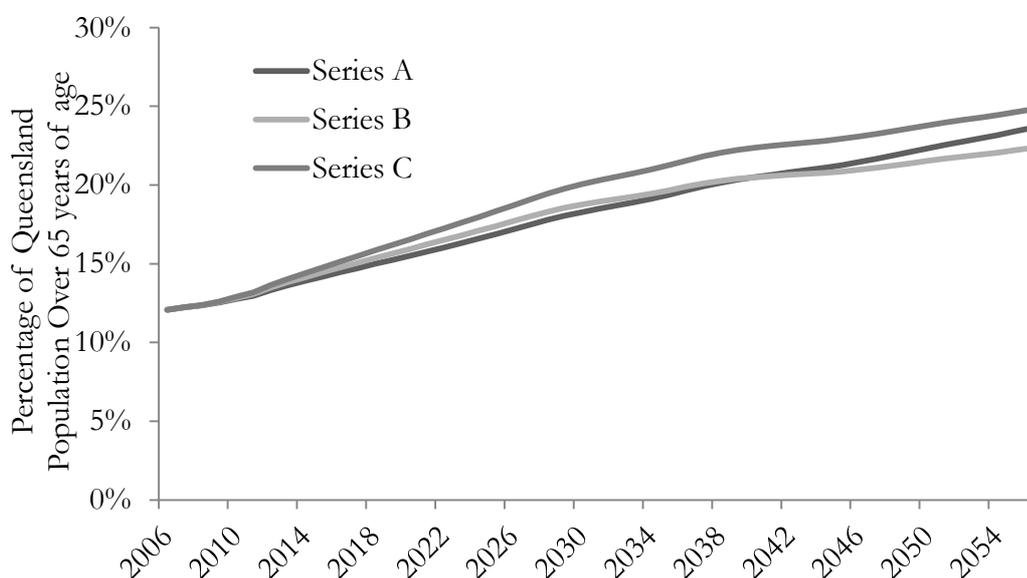


Figure 12: Percentage of Queensland Population Over 65 years (Data source ABS 2011)

- **Participation:** The trend labour force participation rate in Queensland was 67.7%, compared to the national rate. The trend unemployment rate was 5.8%, which was the highest in the nation and compared to a national rate of 5.3%. In 2010, 60.4% of the Queensland population aged 25–64 years had a non-school qualification; this is up from 46.4% in 2000, but is lower than the national average of 63.2% (ABS 2011).
- **Educational Attainment:** The proportion of the Queensland population aged 15–24 years in education in 2010 stood at 51.8%, below the national average of 59.1%. Queensland in 2010 also had the highest proportion (19.8%) of people aged 15–19 years and not fully engaged in education or work, compared to 14.8% nationally (ABS, 2011).
- **Education as export:** Education is Queensland's third largest contributor to export value. Queensland's largest overseas education market in 2010 was China, from where the number of students enrolled in Queensland increased five-fold since 2002 (DEEDI, 2011).
- **The competition for talent:** Growing competition for talent from the emerging economies of Asia and Eastern Europe is set to increase this pressure on the Queensland talent pool.

An estimated 10% of Australians spend their most productive years overseas. The Pew Global Attitudes survey interview asked nearly 17,000 people the question: “Suppose a young person who wanted to leave this country asked you to recommend where to go to lead a good life—what country would you recommend?” Canada and Australia won the popularity contest. However, Australia’s small size and geographic isolation present a significant challenge to our ability to retain and attract world class talent.

- **Leveraging people into knowledge intensive services:** Effective utilisation of older Queenslanders can be leveraged into growing the delivery of knowledge intensive services as an export for Queensland. Services constitute around 70% of the Queensland economy (Independent Working Group report for the Smart State Council 2006); this is a slightly smaller proportion to that of Australia and the OECD, and the knowledge intensity of services in Queensland is relatively low by national standards. Only 4.5% of total Queensland exports came from knowledge-intensive services industries in 2004/05, compared to 10% nationally.

3.5 Room to Move

The Queensland population is widely dispersed through urban, regional, rural and remote locations. Enabling participation from all citizens requires both clever transport infrastructure and effective provision of digitally enabled services. In South East Queensland (SEQ), this calls for smart transport systems that accommodate changing demographics and work patterns, such as community hubs to reduce personal transportation requirements and smart service provision to minimise disadvantage for indigenous and non-indigenous Queenslanders.



Today’s society is more mobile than ever before. People are changing jobs more often, moving house more often and travelling around cities, countries and the globe more often. This is having a profound impact on lifestyles, housing needs, transportation needs and employment markets. This is exacerbated in Queensland by the size of the State and the differing needs of its residents in urban, regional and remote areas.

3.5.1 Global Context

The *Room to Move* signpost responds to global trends around intensification of living and resource use (More from Less), a desire for amenity and convenience (Personalisation of Services), the maintenance of connections within and between communities (On the Move) and the opportunity for the digital provision of education and services (iWorld). Signals of change are summarised below.

- Workforce mobility is on the rise; while people from older generations often progressed their careers vertically by getting promoted within a single company, younger generations tend to be more mobile. They change jobs more frequently and progress their careers by lateral movements to different companies, roles and countries.

- The portion of employees with less than five years of service in the public service rose from 24% to 35% over the ten year period leading up to 2008 (APSC, 2008). In 2008, for the Australian labour force as a whole, 1.2 million employees (21% of the total) had been with their current employer for less than 12 months (ABS, 2008a).
- People in Australia are moving house more often. Between 2001 and 2006 more than one-third of Australians (6.6 million people) changed their address. The areas receiving the most people are Brisbane, the Gold Coast and the Sunshine Coast.
- Growth in cities is increasing work commuting time and distance. In Australia 80% of commuters get to work by car and in 2006 drove their cars an average of 8100 kilometres to get to work. Average distances also increased for motorcycles and trucks (ABS, 2009b). This is leading to increased congestion in cities. Projections suggest that avoidable social costs of congestion in Australian capital cities will rise from \$9.4 billion in 2005 to \$20.4 billion in 2020 (Cosgrove *et al* 2007). Modern information technology is changing the role of geography. Whether it leads to more or less movement is unclear.
- The world's population is becoming increasingly urbanised. In 1950, 30% of the world's population lived in urban areas. By 2050, this will be 70%.
- In parallel with this physical mobility and movement, connectivity through the internet is changing the nature of communities and the structure within them. Impacts are being felt in business, in retail and in the way we build social networks and communities. According to market research firm Forrester, online retail sales (B2C—business to customer) in the United States alone reached US\$175 billion in 2007 and is forecast to almost double to US\$335 billion by 2012. People are increasingly opting to purchase goods online and avoid a trip into a physical retail space. Almost A\$143 billion of internet orders were received by Australian businesses during 2009–10, which represents a 15% increase from the previous year (ABS, 2010; Department of Prime Minister and Cabinet, 2011).
- The popular social networking site Facebook was founded in 2004 and now claims to have 300 million active users with 50% logging into their accounts daily. Facebook, Skype and Twitter now have the largest contributing populations in the world after China and India. The fastest growing demographic is people aged 35 years and above.

3.5.2 Queensland's Opportunities and Challenges

Queensland will be challenged with providing infrastructure and services to a geographically highly dispersed community. The workforce is likely to become increasingly dynamic with greater movement of people between companies and jobs. Modern information technology may create opportunities to manage the transition to a mobile society.

The emergence of regional hubs to support remote and rural communities including the mining workforce is well established and set to grow, with the potential for significant new conurbations in the north and west. The construction of appropriate infrastructure and educational capacity to enable digital service provision and social networking can help to improve the connection of rural and urban areas. Specific factors are discussed in more detail below.

- **Growing Population:** Queensland has a rapidly growing population, with a recorded average of 84,000 additional people each year from 2001 to 2006. This growth is being

driven by net interstate and overseas migration, as well as natural increases. From June 2005 to June 2010, Queensland had an average annual growth rate of 2.5%, which was the second fastest of all states and territories, behind Western Australia (2.6%). Between 2009 and 2010, Queensland's population grew by 2.0%, second only to Western Australia with a growth rate of 2.2%.

- Most local government areas (LGA) outside SEQ experienced population increases in the year to June 2010. The largest population increases were recorded in Townsville (up by 4,000 people), Cairns (up by 3,900) and Toowoomba (up by 3,000). Other LGAs with population increases of more than 2,000 people were Mackay and the Fraser Coast.
- **Highly urbanised:** Queensland is already highly urbanised with around two-thirds of Queensland's population living in the south-east corner. There has been a small but significant resurgence of growth in regional areas. This resurgence in regional areas is strongly influenced by migration. In particular, it includes retirees and others seeking a lifestyle 'sea change' in coastal centres while job seekers are attracted to regional employment hubs (State of the Environment Report 2007).
- **Low overall population density:** In June 2010 the population density of Queensland was 2.6 people per square kilometre (sq km). Most of Queensland had a low population density with 64 of its SLAs (Statistical Local Area)—comprising around 92% of the total area of Queensland—having less than one person per sq km. The population density of Brisbane SD (Statistical Division) was 340 people per sq km, lower than the Australian capital cities combined (370 people per sq km). While the average size of houses is increasing the average number of people per household is declining.
- **High mobility:** In the 12 months to February 2006 Queensland had the second highest job mobility rate compared to other states and territories. Over this period in Queensland, people aged 15–24 were the most mobile group with 86,800 people who changed their employer or business.
- **Infrastructure:** Providing infrastructure for a growing population is one of the biggest challenges before Government. In 2011–12 the Queensland Government will provide A\$5.448 billion for roads and other transport infrastructure. This includes A\$423 million for overhaul, upgrade and major maintenance work and the construction of over 200,000 kilometres of electricity transmission lines to grow the state's electricity network. Powerlink, a Government owned corporation, has approximately A\$300 million in major transmission projects underway in Queensland and it is forecast that an additional A\$1.4 billion will be spent in the State over the next six years. The national broadband network is aimed at providing fast high-speed information connection anywhere in the State.
- **Indigenous population:** Queensland has a relatively large Aboriginal and Torres Strait Islander population representing 28% of Australia's total Indigenous population (Josey, 2009). Indigenous communities experience higher levels of disadvantage compared to non-indigenous Queenslanders. Aboriginal and Torres Strait Islander people are more likely to live in some form of social housing or in overcrowded housing situations, experience poorer health and lower life expectancies, and are less likely to have tertiary qualifications.
- **Income distribution:** Five of Queensland's Federal electoral divisions ranked among the 20% of Australia's poorest divisions. Whilst the proportion of people with significant social

disadvantage in Queensland increased by 0.9% from 2003–04 to 2005–06, the rate in 2005–06 remained 0.5% below the national average (Josey, 2009).

- **The influence of the extractive sector in the regions:** The extractive industries inject substantial economic wealth into remote and regional communities and there is a positive correlation in Queensland between indicators of wellbeing and mineral wealth endowment (Hajkovicz 2008). However, this wealth is not equally distributed between males and females and between professional/trade and support workers (Measham and Reeson 2009).
- Many of Australia's mines are operated via a fly-in-fly-out workforce. In some cases these have been found to negatively impact family and community life (Beach *et al* 2003; Storey, 2001). Mining companies are currently developing technologies that permit remote operation of mines. Many of these technologies are already being used and more may come online in coming years.
- Queensland has a high proportion of extractive industry workers operating on a 'fly-in-fly-out' (FIFO) and 'drive-in-drive-out' (DIDO) basis. Studies in FIFO and DIDO indicate that operational use of FIFO workers has been expanding since its first use in the 1950's. A study undertaken during 2000 by Hogan and Berry showed that of 156 publicly listed mining companies, 47% of mines in Western Australia, 43% in Queensland and 38% in the Northern Territory relied on long distance commuting (Skills Australia, 2010).

3.6 Diligent Diversification

Amidst troubling global market conditions and the European sovereign debt crisis, the Australian and Queensland economies are performing comparatively well. Queensland was the fastest growing State, expanding its economy by 3.4% in the past quarter. This outcome is, in large part, due to mining, energy and agricultural commodity prices rising steeply over the past decade.

However, price growth has been accompanied by an increase in volatility (Figure 13). Unstable commodity markets are creating risk and uncertainty for the future. Although Queensland has a strong economy, the extent of diversification may be argued.

The bulk of Queensland's exports are derived from a handful of commodities with half the State's export income generated from coal alone. Now may be the time for Queensland to explore new industries that could sustain prosperity if commodity markets destabilize or weaken over coming decades.

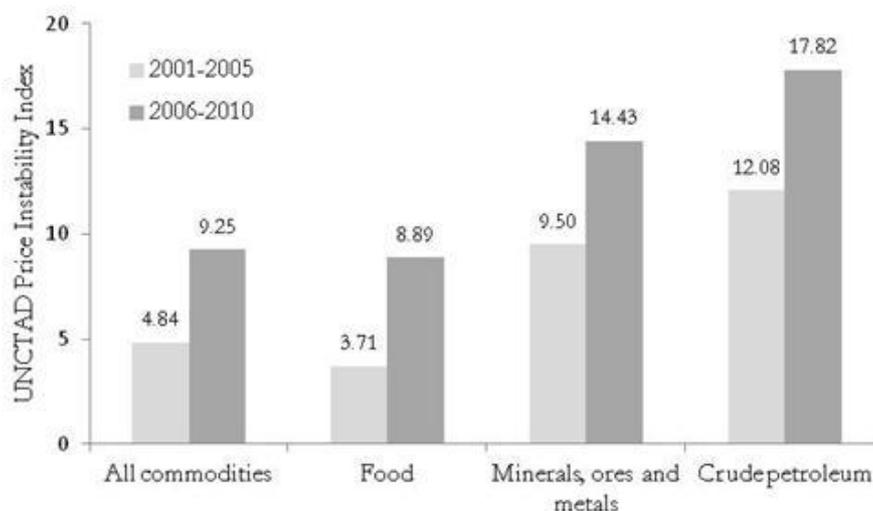


Figure 13: Price Instability in differing commodities (data source UNCTAD 2011)

3.6.1 Global Context

This signpost responds to the potential turbulence in the global market place despite the strong and continuing demand-driven contribution to Queensland's economy from mineral and energy resources (More from Less). Interconnectedness introduces volatility and instability as well as the potential for diversification through knowledge based services and products (iWorld). Signals of change are summarised below.

- The United Nations Conference for Trade and Development (UNCTAD, 2011) maintains a dataset on commodity price instability. This reveals that commodity prices have been much less stable in the second half of the previous decade. Volatile prices create uncertainty and risks for industry and the Queensland economy. A sustained period of price growth and return to stability is possible. However, major corrections and decreasing prices are also possible.
- Economic 'super cycles' are periods of unusually high upswing in demand for commodities lasting for 10–35 years and are associated with urbanization and industrialization of populous countries (OECD, 2010). In an analysis of copper prices over 150 years, Cuddington and Jerett (2008) identify the possibility that high growth in China is associated with a post-1999 super cycle. Historic super cycles ran from the late 1800s to early 1900s associated with industrialization of the US Economy and the second was from 1945 to 1975 fueled by postwar reconstruction and Japanese economic growth (OECD, 2010). If we are within a post-1999 super cycle there are questions about how long commodity prices will stay high.
- The past decade has seen commodity price growth higher than experienced in recent history (Figure 14). For example, the coal price, in real terms, rose by 370% from 2000 to 2010 (World Bank, 2011a; Figure 3). High commodity prices over the past decade are an important factor contributing to Queensland's strong economic performance, relative to other national economies within the Organization for Economic Cooperation and Development (OECD), during the global financial crisis.

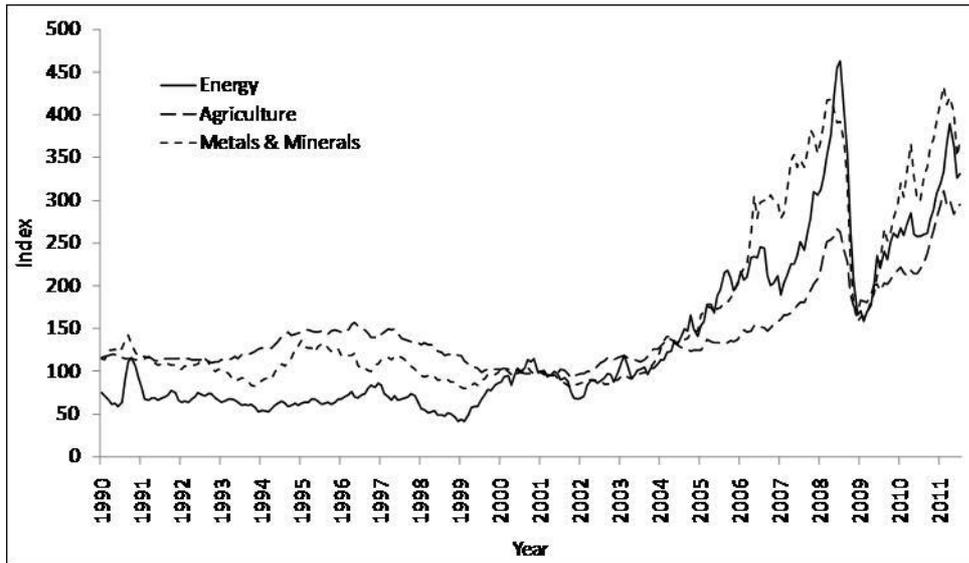


Figure 14: World agriculture, minerals and energy prices (Source: World Bank 2011a)

- Coupled with these changes in commodity price, cycles of productivity ('waves of innovation') have been observed since the industrial revolution with the next anticipated to have a potential emphasis on decoupling productivity from resource intensity (Bradfield Moody and Nogrady, 2009). However, between these different waves are often periods of significant volatility (Figure 15).

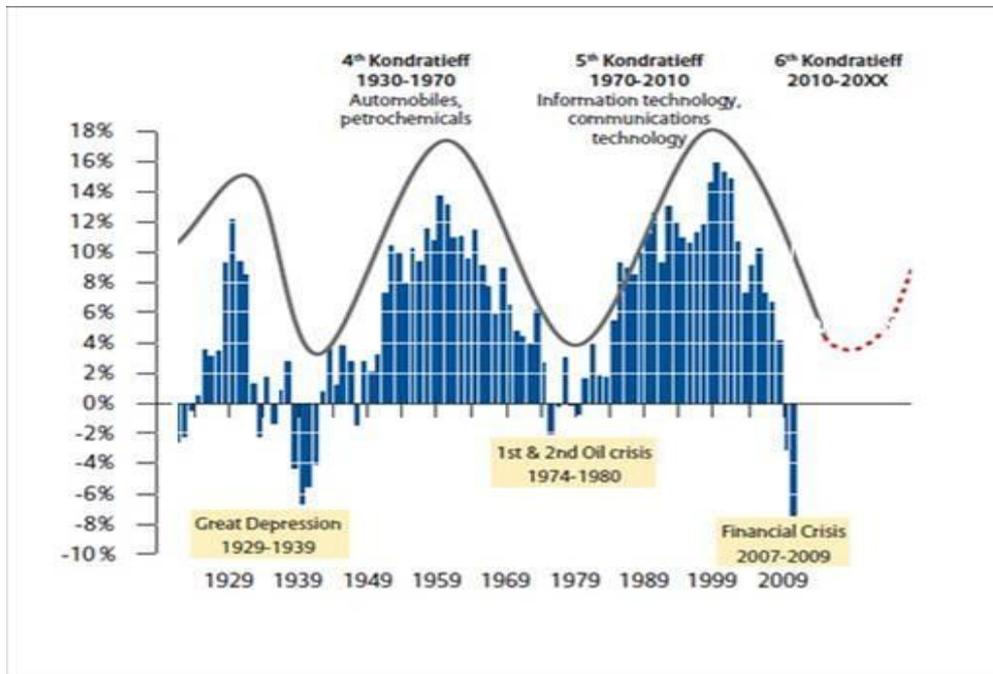


Figure 15: Rolling 10 year yield on the S&P 500 Source: Datastream, Illustration: Allianz

- OECD economies have effectively moved to become service economies where at least 75% of the GDP of major industrialized nations is in the service sector. Services also play an important intermediary role that is not easily reflected in statistics. Well-established

financial, transportation and distribution systems, for example, are critical for the smooth functioning of all businesses and governments.

- Services are those activities in which there is an interaction between provider and client that create and capture value. The majority of this value is intangible rather than residing in any physical product. Services are heterogeneous outputs produced as the result of a request and typically consist of changes in the condition of the consuming units realised by the activities of the producers at the demand of the customers. By the time their production is completed, they must have been provided to the consumers. Services are not separate entities over which ownership rights can be established. They cannot be traded separately from their production (United Nations, 2002).
- Off-shoring and outsourcing are representative of broader trends in the global economy forcing decision-makers to re-think business strategy and public policy at a fundamental level. Through services, companies are developing new sources of strategic advantage, harnessing new operating and organizational mechanisms to build this strategic advantage and even adopting different approaches to creating value.

3.6.2 Queensland's Opportunities and Challenges

This signpost is slightly different to the other four. The volatility and uncertainty to which it responds will affect the other four signposts as well and a strong economy is a prerequisite for addressing a range of other issues facing the state. The mapping of global trends with Queensland attributes prompt a question about the capacity of the Queensland economy to diversify beyond mineral, agricultural and energy exports. What are the alternative export income generating industries that would sustain income growth and job opportunities for Queenslanders in the absence of strong global commodity markets? Two key issues emerge:

Contingency Planning: The increased volatility of commodity prices and period of unusually high growth are causes for concern. The rising world food prices, with forecasts for further growth are cause for optimism in the agricultural sector. There is also the possibility of future demand from China levelling-off as the rate of industrialization slows and competition emerging from other countries with rich agricultural, energy and mineral reserves. Therefore this signpost is characterized by much uncertainty. The questions that arise are likely to relate to the need for contingency planning.

Shift to Services: A report by an independent working group for the Smart State Council (2006) cites services industries as important sources of job creation and innovation as globalisation increases competitive pressures and opportunities. This argument derives from the assumption that 'smart services' are those that: comprise human capital that cannot be easily substituted by physical capital; rely on scientific or technological knowledge; are customised rather than mass-produced; and can meet a global need. The report identifies four knowledge-intensive services sectors that offer potential sources of sustainable competitive advantage:

- Infrastructure and Resources Services (including Mining Services).
- Urban Services (including design, planning, construction, engineering and architecture).
- Environmental Services (including pollution, water and resource management).
- ICT Services (including remote sensing) and distributed data capture.

Some of the factors significant for Queensland's future in building resilience against a changing world are summarised below.

- **Strong Growth:** The stronger than expected GDP growth for Australia in the most recent September Quarter of 1%, for an annual rate of 2.5%, is largely the consequence of the continuing mining boom involving some major current and planned projects. One large pipeline project in Queensland is Waratah Coal's A\$8 billion China First coal development in the Galilee Basin (Financial Review, 8 December 2011).
- **Reliance on commodity exports:** The Queensland economy relies heavily on mineral, energy and agricultural commodity exports (Figure 16). For example, in 2010–2011 Queensland exported A\$24 billion worth of coal products. This represented 50% of Queensland's total exports and 10% of Australia's total exports. A handful of other commodities such as meat products, iron ore, copper, aluminum and zinc comprise a large share of Queensland's exports. This means the Queensland economy, including job opportunities and family income, is sensitive to movements in commodity prices.
- **Urbanisation in China:** One driver of commodity price growth for Queensland mineral and energy exports is the rapid rate of urbanisation in China. During the period 2000 to 2010, China's urban population increased by some 183 million people. For example, the city of Schenzen in China, with a population of over 10 million people, is reported to have grown at the rate of a sky scraper per day and a boulevard per week during the 1990s.
- **Attractive Business Environment:** Within this volatile global environment, Queensland has the potential to be seen as a stable source of foreign investment. According to DEEDI (2011), taxation in Queensland in 2011–12 is estimated to be \$501 less per capita than the average of the other Australian states, with payroll tax 20% below the national average. DEEDI also claims that Queensland has relatively low office rental costs and workers' compensation premiums. Queensland is Australia's second largest trading state by value. To illustrate Queensland's attractiveness to foreign investors, DEEDI cites several overseas-based companies that have invested in Queensland's CSG/LNG resources: BG, Petronas, ConocoPhillips, Shell, Kogas, CNOOC, Tokyo Gas, and Sinopec.

- However, this rapid rate of urbanization will slow down into the future. The annual urban growth rate for China is forecast to drop from 1.82% to 0.81% by 2050 (Department of Economic and Social Affairs, 2010). As the rate of urbanization and industrialization of China slows down the demand for Australian commodities may decline.

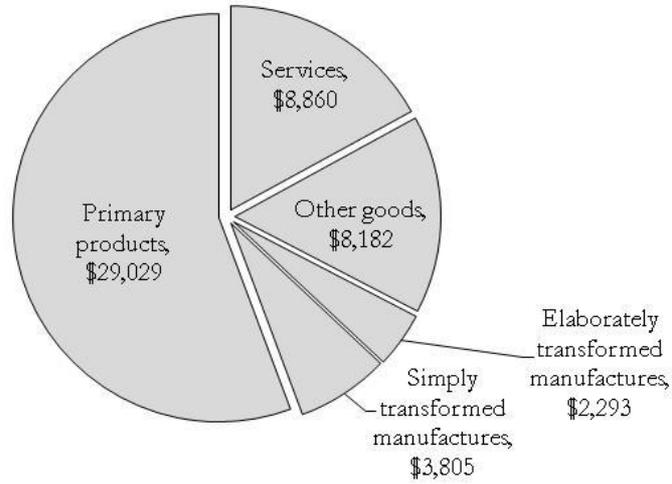


Figure 16: Composition of Queensland exports for 2009-10 in A\$ billions (Data source DFAT, 2011).

4. CONCLUSION

The five Queensland Signposts create both challenges and opportunities for decision makers in community, government and industry sectors. They paint a picture of a highly interlinked global economy with implications for how Queensland invests scarce economic, social and environmental resources. Questions are likely to arise about the role for public sector intervention to maximize the benefits and mitigate the costs of change. In some cases market forces may be the most powerful and responsive mechanism and adjustments will occur autonomously. In other cases some type of public sector investment or policy mechanism will be required to achieve desired outcomes.

Five signposts are presented in this report. Together, they provide evidence of trends, risks and opportunities facing Queensland and affecting its economy (Accelerating Asia), its environment (Natural Advantage), its people (Hidden Treasure), its infrastructure and planning (Room to Move).

'Diligent Diversification' showcases the importance of building a Queensland that is resilient to a highly volatile global environment. This signpost transcends the others. 'Accelerating Asia' presents trends supporting an acceleration in Queensland's engagement with Asian markets as they themselves accelerate in growth. The significance of India is highlighted in this signpost. In 'Natural Advantage', the risks and opportunities inherent in Queensland natural assets are presented in terms of a people, planet, profit paradigm. This signpost presents opportunities to sustainably capitalise on Queensland's natural and social assets. 'Hidden Treasure' presents evidence of risks and opportunities inherent in the evolving population of Queensland. How can Queensland capitalise on the wisdom of an older population and the mobility and cultural expectations of its younger talent to support growth in knowledge intensive services and ensure long and productive lives that can fund well deserved retirement? In 'Room to Move', the significance of trends for infrastructure and urban planning to enable connectivity and intensification across the large and diverse state of Queensland is highlighted, together with the implications of social networking in redefining the nature of social identity.

The analytic-deliberative methodology underpinning this project (originally promoted by the US National Research Council as a way of using scientific information to inform public discourse) typically works through four stages (Stern and Fineberg 1996): 1. Problem formulation; 2. Risk assessment (risk characterization); 3. Alternate risk reduction strategies; and 4. Policy recommendations (risk reduction planning). This project addresses the first two steps. A suite of analytic tools and deliberative mechanisms are available to move forward from this position in order to provide a more specific evidence base to inform long term decision making for Queensland.

In the meantime, the five Queensland signposts presented in this report are intended to catalyse a public policy debate in Queensland that leads the world in terms of long term and evidence driven foresight. The vision of the CSIRO Futures team is to help stimulate such thought leadership and support it with CSIRO science.

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W Wein, A.M. 1, M. Journeay 2 and R.L. Bernknopf: Scenario-Based Risk Analysis within an Analytic-

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APPENDIX A: THE CSIRO MEGATRENDS

In 2009 CSIRO identified five interlinked megatrends through a global foresight study involving the analysis of hundreds of trends compiled by over 40 business analysts and scientists (Hajkovicz and Moody 2010). The five megatrends are:

More from Less: The world's depleting natural resources and increasing demand for those resources through economic and population growth will see a focus on resource use efficiency in the coming decades.

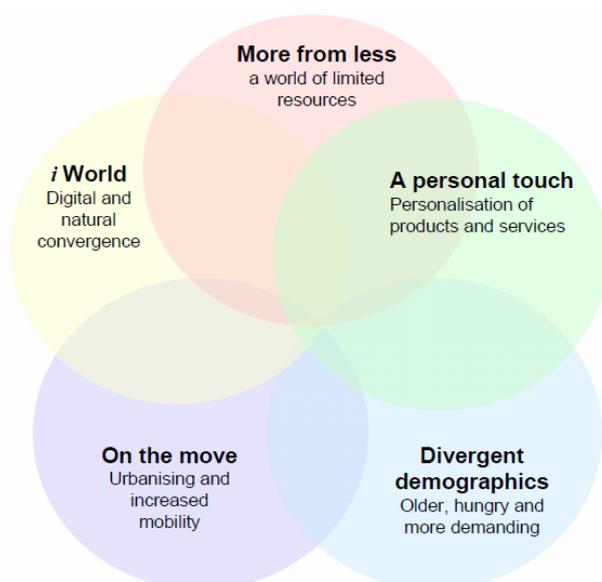
A Personal Touch: Growth of the services sector of Western economies is being followed by a second wave of innovation aimed at tailoring and targeting services.

Divergent Demographics: The populations of OECD countries are ageing and experiencing lifestyle and diet related health problems. At the same time there are high fertility rates and problems of not enough food for millions in poor countries.

On the Move: People are changing jobs and careers more often, moving house more often, commuting further to work and travelling around the world more often.

iWorld: Everything in the natural world will have a digital counterpart. Computing power and memory storage are improving rapidly. Many more devices are getting connected to the internet.

These megatrends, and the interlinked trend evidence on which they are based are described in Appendix A.



More from Less: A World of limited resources

The world has finite natural resources which are being consumed rapidly. At the same time population growth and economic growth are creating increased demand for those resources. In addition waste production is rising whilst the environment's assimilative capacity is being depleted. Humanity is responding via the invention of better ways to extract more value from fewer resources and create less waste. Coming decades will see an imperative for environmental efficiency.

An important, and growing, response by governments is to constrain access to environmental resources which are at risk of over exploitation. Often the regulations are followed by trade in the environmental resources which provides a mechanism for industry to adjust at lower overall cost. This is leading to new laws, new markets and new business opportunities.

Example Trends

- According to the United Nations by 2025 1.8 billion of the world's people will be living in countries or regions with "absolute water scarcity" and two-thirds of the world population will be experiencing "stress conditions" (UN, 2006).
- There is a gradual and permanent decline in mineral ore grades worldwide (Mudd, 2009).
- According to the Food Agriculture Organisation (FAO, 2005) global fish stocks are 52% fully exploited.
- In 2008 the global carbon market (CDM, JI and Voluntary) transacted 463 MtCO_{2e} worth US\$7.21 billion with an average price of US\$15.57 per tonne. One forecast by the World Bank predicts that, for international offsets, by the year 2020 the trade could grow to 3.1 GtCO_{2e} worth US\$150 billion at a price of US\$50 per tonne (World Bank, 2009).
- In Australia the recent Water Act 2007 assigns property rights and regulates trade. In the Murray Darling Basin trades are commonplace with permanent water rights clearing at a few thousand dollars per mega litre (GHD, 2009). Many other countries and regions have water trading schemes.
- It is estimated by International Fund for Agricultural Development (IFAD, 2008) that about 12 million hectares of productive agricultural land are lost each year to land degradation and this will displace some 50 million people over the next 10 years.

A Personal Touch: Personalisation of products and services

Over the past century countries throughout the OECD have experienced growth in the services sector. In Australia in 1900/01 the services sector contributed 30% of gross domestic product (GDP). Today the services sector represents over 70% of the Australian economy (PMSEIC, 2008).

The services sector includes: wholesale trade; retail trade; accommodation, cafes and restaurants; communication; finance; insurance; property and business services; education; health and community services; cultural and recreational services; and personal services.

Societies are making adjustments to this shift in economic activity. This gives rise to a megatrend, which will play out over coming decades, relating to the personalisation of services. Personalisation involves innovative means of understanding, and supplying, the intimate needs of individual customers en masse.

Example Trends

- Rapid growth in the services sector of the economy. In 1970 the services sector represented 55% of the Australian economy. Today it is over 75%. There is a ripple-effect that will be experienced over coming decades about how industry and society adjusts.
- New capabilities for personalisation. In a paper published in the Journal of Services Marketing Ball et al. (2006, p393) write that "The vast increases in computing power, manufacturing robotics, and the rise of the internet over recent decades have now given marketers the power to customize offerings to ever more demanding customers, in ways they could not before."
- Privacy and confidentiality concerns. Modern information technology is allowing governments and companies to capture and store vast amounts of information on people..
- Personalised health products. As consumers become more health aware there is a growing demand for personalised health services which meet the unique needs of an individual.
- Information overload. A survey conducted of 124 managers found that 72% of respondents were experiencing significant time losses associated with searching and processing irrelevant information. About 37% encountered information overload on a daily basis.

On the Move: Urbanisation and increased mobility

People of today are more mobile than ever before. They are changing jobs more often, moving house more often and travelling around cities, countries and the globe more often. This is having a profound impact on people's lifestyles, housing needs, transportation needs and employment markets.

One important aspect of mobility is the rapid pace of urbanisation throughout Asia, Africa and the Middle East. In 1950 around 30 percent of the world's population lived in urban areas. By 2050 this will have increased to 70 percent.

Example Trends

- Rapid urbanisation in South America, Africa, Asia and the Middle East. Based on projections of urban population growth (UN, 2007) China will need to build an additional 2 new cities the size of Shenzhen, or over 3 cities the size of Sydney, every year until 2030.
- International jet travel. According to Boeing jet aircraft passengers worldwide travelled 4,621 billion kilometres in 2008 and this is forecast to rise to 12,090 billion by 2028.
- People are changing jobs more often. The portion of employees with less than five years of service in the public service rose from 24% to 35% over the ten year period leading up to 2008 (APSC, 2008). In 2008, for the Australian labour force as a whole, 1.2 million employees (21% of the total) had been with their current employer for less than 12 months (ABS, 2008a).
- People in Australia are moving house more often. Between 2001 and 2006 more than one-third of Australians (6.6 million people) changed their address. The areas receiving the most people are Brisbane, the Gold Coast (Queensland) and the Sunshine Coast (Queensland)
- Increased work commuting time and distance. In Australia 80% of commuters get to work by car. In 1995 commuters drove their cars an average annual distance to work of 6,600 kilometres. This rose to 8,100 kilometres by 2006. Average distances also increased for motorcycles and trucks (ABS, 2009b).
- Congestion in cities. The Australian Government Bureau of Transport and Regional Economics projects that the avoidable social costs of congestion in Australian capital cities will rise from \$9.4 billion in 2005 to \$20.4 billion in 2020 (Cosgrove et al. 2007).

Divergent Demographics: Older, hungry and more demanding

Global, national and local communities are heading in divergent, and often, conflicting demographic directions. People living in wealthy countries face an ageing population and shrinking workforce. They face diet and lifestyle related health problems with rising rates of obese and overweight people. In contrast the majority of the world's poor face high fertility rates, rapid population growth and high under-employment rates. Developing nations are confronting food security threats highlighted through recent food price volatility.

Into the future hundreds of millions of people will escape from poverty into the middle classes. Many of these people will live in India and China. The new middle class will demand new products and services. Whilst living standards improve there may also emerge environmental challenges of increased consumption of energy, water and raw materials and increased production of waste. The divergent demographics megatrend captures demographic, health and food consumption trends. Governments will be challenged with policy tensions between the needs of the old (e.g. health) versus the needs of the young (e.g. education). There will also be ongoing tension relating to the world's unequal distribution of wealth.

Example Trends

- Ageing population in Australia and other OECD countries. In 2002 13% of Australians were aged over 65 years old. It is forecast to be 27% by 2051 (ABS, 2004).
- Rising rates of obese and overweight people. In Australia in 2004/05 53% of all adults were either overweight or obese. This increased from 44% in 1995 (ABS, 2008). Rates of childhood obesity are also rising.
- Food security threats for poorer countries. The number of undernourished people in the world increased from 848 million to 963 million between 2003–05 and 2008 (IFPRI, 2008, FAO 2008). World food demand will be 75% greater by 2050.
- Increases in the costs of plant nutrients for food production. Food and fibre productivity needs to be sustained or increased (at least 2% a year) but the cost and supply of nutrients will be a significant challenge.
- Increasing rates of healthcare expenditure. The proportion of Australians with private health insurance rose from 38% in 1998 to 51% in 2001 (ABS, 2005). In 2000/01 Australia spent 8.9% of GDP (A\$68 billion) on healthcare. This rose to 9.8% (A\$83 billion) by 2004/05 (ABS, 2007). There is a possibility that Australians will continue to spend more on health in coming decades and demand more diversified health services.

Citizens of the developing world are demanding more protein. Throughout some parts of the developing world the emerging middle class is demanding food products with greater protein such as milk, eggs and meat.

iWorld: Digital and natural convergence

Over the last twenty years the globe has seen rapid growth in internet usage accompanied by a skyrocketing number of connected devices. As the functionality of the internet increases this trend points towards a convergence between the natural and its digital counterpart as social interactions, information systems, transactions and sensory systems are replicated on the internet.

Example Trends

- Exhaustion of internet addresses. Every device or website connected to the internet needs a unique IP address. After 40 years of existence the internet, due to rapid growth, has consumed 90% of just over four billion IP addresses available on the current system known as IPv4. A conversion is planned to move to IPv6 which can accommodate 3.4×10^{38} unique addresses. This trend is evidence of the growth and increased information content and functionality of the internet (ICANN, 2007).
- Growth in e-commerce. According to market research firm Forrester, online retail sales (B2C – business to customer) in the United States alone reached US\$175 billion in 2007 and are forecast to almost double to US\$335 billion by 2012.
- Growth in social networking. The popular social networking site, Facebook, was founded in 2004 and now claims to have 300 million active users with 50% logging into their accounts daily. They say the fastest growing demographic is people aged 35 years and above. Twitter is another social networking tool with rapid and recent growth.
- Remote sensing. There have been vast improvements in the geographic range, resolution and accessibility of remotely sensed data over recent decades. Tools such as “Google Earth” are making satellite information, linked to company data, widely available to the general public.
- Improvements in computing hardware. The improvement in computing hardware is keeping pace with Moore’s law (Moore, 1965; Voller and Porte-Agel, 2002) which says the number of transistors that can be placed on an integrated circuit, at the same cost, doubles every 1.5 years. This trend may continue into coming decades.
- Cloud computing. This involves the provision of virtualised resources over the internet to supply integrated services to customers. There is a growing trend for software firms to use cloud computing solutions to avoid high capital costs of developing all required functionality on a single system.



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