The NSW economy in 2020
A foresighting study

August 2010

Report by Access Economics Pty Limited for
The NSW Innovation Council
The NSW economy in 2020

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<th>Description</th>
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<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>AIHW</td>
<td>Australian Institute of Health and Welfare</td>
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<tr>
<td>COAG</td>
<td>Council of Australian Governments</td>
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<tr>
<td>CPRS</td>
<td>Carbon Pollution Reduction Scheme</td>
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<td>CSG</td>
<td>Coal seam gas</td>
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<td>DA</td>
<td>Development approval</td>
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<tr>
<td>EITE</td>
<td>Emissions intensive trade exposed</td>
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<td>ETS</td>
<td>Emissions trading scheme</td>
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<tr>
<td>FIT</td>
<td>Feed-in tariff</td>
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<tr>
<td>FTE</td>
<td>Full time employment</td>
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<tr>
<td>FTTH</td>
<td>Fibre-to-the-home</td>
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<tr>
<td>GDP/GSP</td>
<td>Gross Domestic Product/Gross State Product</td>
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<td>GE</td>
<td>General equilibrium</td>
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<td>ICT</td>
<td>Information and communication technologies</td>
</tr>
<tr>
<td>IGR</td>
<td>Intergenerational Report</td>
</tr>
<tr>
<td>ITIF</td>
<td>Information Technology and Innovation Foundation</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
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<tr>
<td>LNG</td>
<td>Liquid natural gas</td>
</tr>
<tr>
<td>Mbps</td>
<td>Megabits per second</td>
</tr>
<tr>
<td>NBN</td>
<td>National Broadband Network</td>
</tr>
<tr>
<td>NEM</td>
<td>National electricity market</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PV</td>
<td>Photovoltaic</td>
</tr>
<tr>
<td>RET</td>
<td>Renewable Energy Target</td>
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<tr>
<td>SME</td>
<td>Small to medium enterprise</td>
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Snapshot of the NSW economy

- **Gross State Product (real)**
  AUD$388 billion (2009-10 est.)
  GSP per capita: AUD$54,089 (2009-10 est.)

- **Population**
  7.17 million

- **Labour force**
  3.66 million
  Unemployment rate: 5.8%

- **Economic composition**
  Services: 74.6%
  Industry: 22.9%
  Agriculture: 2.5% (2009-10 est.)

- **Exports (top 5)**
  Coal, travel and education services, non-ferrous metals, professional consulting services, medicinal and pharmaceutical products

- **Key merchandise export partners**
  Japan 28.4%, China 9.7%, South Korea 8.7%, US 6.9%, NZ 6.8%, Taiwan 5.5% (2009)

- **Key merchandise import partners**
  China 23.5%, US 12.3%, Japan 7.5%, Germany 5.5%, UK 4.0%, Singapore 4.0% (2009)

<table>
<thead>
<tr>
<th>Key forecasts</th>
<th>2009-10</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ billion (2007-08 prices)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real gross state product</td>
<td>388.0</td>
<td>506.9</td>
</tr>
<tr>
<td>Business investment</td>
<td>42.8</td>
<td>57.6</td>
</tr>
<tr>
<td>Private consumption</td>
<td>232.8</td>
<td>303.3</td>
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<tr>
<td>Public consumption</td>
<td>60.4</td>
<td>70.4</td>
</tr>
<tr>
<td>International exports</td>
<td>33.5</td>
<td>40.7</td>
</tr>
<tr>
<td>International imports</td>
<td>79.0</td>
<td>149.9</td>
</tr>
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Note: Business investment excludes intangibles. Export and import figures relate to goods only.

Executive summary

The NSW economy is experiencing almost two decades of uninterrupted economic growth, despite the immediate turbulence of the global financial crisis. This growth has driven up incomes and living standards and has helped underpin the development of a modern, globally-integrated and dynamic economy.

The NSW economy currently enjoys a number of strengths. It is highly service and knowledge focused, with services accounting for around three-quarters of economic output. Exports of professional and education services have risen, particularly as strengthening Asian economies have provided opportunities for NSW to develop as a regional hub for high-value services. The large NSW population (and the largest state economy) also provides a base for the ongoing development of information technology, finance and professional services.

The closer integration with emerging Asian markets has also provided significant advantages for the State’s resources sector. Exports of coal in particular have increased markedly over the past decade and are set to rise further over the next few years.

Sydney’s position as a global city also provides significant benefits in terms of international reputation, business and financial networks and in fostering a vibrant and innovative culture. This plays a large part in motivating many domestic and global companies to locate head offices in Sydney.

Looking beyond the current economic climate, the medium term prospects for NSW look favourable. However, in entering the second decade of this century, the NSW economy will be shaped by new and different forces and encounter fresh challenges and opportunities.

These factors have been the focus of this study, which considers the major changes that are likely to occur in the NSW economy to 2020. Among a myriad of influences on the NSW economy, four particular mega-trends are expected to have a considerable impact on the shape and performance of the economy:

- national and global policy actions to address climate change;
- demand and competition from emerging economies, especially China and India;
- the widespread adoption of new information technologies; and
- demographic change, especially a growing and ageing population.

Each of these forces, both individually and acting in conjunction, present considerable opportunities for the NSW economy. They are expected, on balance, to add to overall growth with virtually all sectors of the economy able to benefit at least to some extent.

At the same time, however, significant adjustments within the economy will be required if the challenges are to be best met and the opportunities realised. Skills will have to be developed, regulation and planning decisions will have to be responsive to changing demands, strategic investments in infrastructure will be needed and government and business will have to coordinate to foster areas of greatest potential.
The NSW economy in 2020

The impact of the mega-trends

*Carbon constrained future*

Climate change will affect NSW industry over the next decade through national and international policy action, primarily by establishing a price on carbon emissions, the rules for trading in emissions permits and the treatment of trade-exposed industries. In addition, the establishment of the national renewable energy target (RET) scheme will provide strong incentives between now and 2020 for renewables technologies that are relatively well-developed (especially wind power).

The most pervasive impact of climate change policies on industry will be driven by the carbon price. The carbon price will induce producers to adopt less emissions-intensive technologies and encourage consumers to reduce their use of energy. Assuming that international trading in permits is occurring by 2020, the carbon price in Australia will reflect the world price, with those producers required to purchase permits being able to do so in a global market:

- The world price for carbon emissions will depend on the nature of the commitments made on major emitting economies, and especially on: how tight and how firmly applied are the commitments made by developed economies including the United States; and whether China has a scheme in place by 2020 that is considered suitable for its permits to be accepted in an international market.

Climate change will also have a physical aspect over the decade ahead. There will be reduced and more variable water supplies for agriculture (and maybe mining) both in the Murray-Darling Basin and along the coast. This will affect patterns of land use and production and profitability in the agricultural and related sectors, particularly in regional NSW.

Climate change will create opportunities and challenges for NSW industry over the next decade. It will create opportunities for businesses specialising in carbon reduction technology, consulting services, research and trading. It will also shift incentives towards renewable and lower emission electricity generation technologies, with the largest impact being to rapidly bring on-line commercially proven technologies. It will also encourage ongoing exploration to develop coal seam gas resources in NSW.

*Demand and competition from emerging economies*

The significant shift in global economic weight towards the emerging economies in China and India is set to continue for the next decade at least. Current predictions see China growing at over 8% for the next decade and India averaging between 6-8%.

This growth will result in three main effects on NSW industry:

- Continued strong demand for industrial commodities, especially from China and India, will push up Australia’s terms-of-trade and will, in turn, act to support the exchange rate. Chart i illustrates how Australia’s terms of trade are expected to decline from their current extremely high levels as production and supply chains around the globe gradually are better able to meet demand. However, the exceptional strength of emerging market demand means that commodity prices are likely to remain well above levels seen before 2005 for some years yet.
China and India’s growth will result in burgeoning middle-income classes and, with this, an expansion in the demand for higher valued goods and services. This will present some attractive opportunities for NSW businesses in various services sectors.

Equally, the development of these economies will result in their improved ability to compete with NSW businesses in areas such as information and financial services. This may see a shift in the areas where NSW enjoys comparative advantages.

Chart i: Terms of trade

The strongest impact of the growth in the Chinese and Indian economies on the NSW economies is felt through the impact on demand for Australian resources. Higher prices and increased demand for energy and industrial commodities will:

- directly boost revenue and output for those industries;
- constrain growth in trade-exposed sectors — including parts of agriculture, manufacturing and tourism — that will be affected by a stronger than otherwise exchange rate and greater competition for labour and capital resources; and
- provide some indirect stimulus to the remainder of the economy through the boost to incomes.

These influences will tend to benefit other more resource-intensive states and territories more than NSW — contributing to a ‘two-speed’ national economy effect — but NSW should still fare well from continued robust growth in Asia.

Rapid development of the information economy

Perhaps the most profound changes to the NSW economy over the coming decade will come from the deployment and increasing use of advanced information technologies throughout the economy and society.

The information economy will have both a direct and indirect effect on the composition of the NSW economy in 2020. These changes are being brought about by the rapid development of new products and services around the globe including the introduction of intelligent systems in virtually every part of the economy. While such technologies are already being introduced, the
rollout of the NBN will provide a further catalyst for change, extending these developments through the economy and society.

The NBN will provide a direct stimulus to the NSW economy through increased investment in the ICT sector. However, uncertainty exists over how NSW industry is placed to take advantage of the increased demand for ICT products:

- The fact that there will be a growing domestic market for these services should provide a solid basis for an expanded sector. This along with the technological developments should help the global competitiveness of NSW ICT companies.

- On the other hand, NSW is not alone in pursuing this agenda and the technological developments bring with them a greater openness of markets and reduced entry barriers for interstate and overseas firms to provide ICT services into the NSW economy.

Importantly, ICT developments will act as a platform for innovation in other sectors of the NSW economy. All businesses — and their customers — will have increased access to markets and supplies throughout the globe and will likely change the business model for many NSW industries.

Finally, some of the areas of greatest potential are ones where government has a central direct role. For example, intelligent technologies will provide the potential for radical improvements in areas such as the delivery of health, education, electricity, transport and water services.

**An ageing and growing population**

By 2020, the NSW population is set to grow from 7.1 million in 2009 to around 8 million. The population is also becoming older.

An implication of the demographic shift will be changing service requirements — particularly in health, aged care and housing. A relatively older population will also have different consumption patterns, with increased demand for leisure, tourism and financial services at the expense of more durable products such as cars and whitegoods.

Changing dependency ratios will also give rise to significant fiscal challenges for government. The number of working aged people in relation to those 65 and over declined by around one third from 1970 to 2010, with projections for further declines in the upcoming decades.

Overall population growth will substantially impact the required stock of dwellings and related infrastructure in NSW. According to NSW Department of Planning figures, an additional 390,000 new dwellings may be required in NSW by 2020 to meet projected population growth. To meet these needs, residential building will form a noticeably larger share of the NSW economy in the next decade.

**General structural changes to 2020**

The NSW economy is forecast to grow by over 30% between 2010 and 2020. The sectors driving this growth will be finance and insurance, professional, scientific and technical services, health care, construction and mining.

The high-level compositional structure of the NSW and Australian economies at 2020 is shown in Chart ii. While this composition is broadly similar to that existing today, the structure within
each sector is likely to undergo significant changes — in part through the combined influence of the mega-trends.

In general, NSW has been undergoing a shift toward a more service-oriented economy. This trend is consistent with the change in industry structure seen Australia-wide and in other advanced economies around the world. NSW also relies more heavily on the finance and insurance, and professional, scientific and technical industries than the Australian economy. That compositional difference is expected to be maintained over the next decade and is likely to be of considerable advantage.

Some key compositional changes over the next decade include:

- **Finance and Insurance** accounts for the largest share of the NSW economy at 16.2% and will maintain its share over the 10 years to 2020. Australia’s ability to navigate the global economic crisis enhanced its reputation as a robust and well-regulated financial centre. As such, Sydney is well-placed to leverage off its existing strengths as a provider of regional financial services, including in new financial products and services and through deeper use of information technologies.

- **Manufacturing** is expected to account for a smaller share of the NSW economy over time, falling from 9.8% in 2009-10 to 8.3% in 2019-20. Within the sector, much of the loss of share is likely to be due to a fall in the manufacture of labour intensive products, amid increased competition from low-cost producers overseas. Significant opportunities for highly specialised and technologically advanced manufacturers are expected to develop over the next decade, particularly in gaining access to new markets abroad.
The mining sector is projected to increase slightly as a share of the NSW economy over the next decade, rising from 3.1% to 3.9% of output. Strong demand for coal from China and other developing nations will underpin high prices and provide a favourable environment for growth. An increase in capacity at the coal export facilities at Newcastle will also improve growth opportunities for the industry.

The NSW construction industry’s share of the NSW economy is projected to rise to 8.4% in 2020 compared with 7.6% in 2010. Engineering construction will benefit from greater infrastructure requirements into the future, while strong population growth will support demand for new dwelling construction. In turn, the latter will also present opportunities for more environmentally friendly building techniques and the potential for export of low energy intensive building materials and methods.

Health care and social assistance is likely to account for a growing share of the NSW economy over time, and is projected to increase from 6.9% of state output in 2009-10 to 7.5% in 2019-20. As the State’s demography changes, the health care industry will play an increasingly important role in caring for a larger and older population. The labour intensive nature of this industry means that the projected relative increase in output will also provide a considerable base for future employment growth in NSW.

The professional, scientific and technical services industry in NSW is projected to increase as a share of the economy from 8.2% in 2009-10 to 8.7% in 2019-20. Greater educational attainment and a shift toward high skill services in NSW will provide a platform for growth in this industry. Economic and institutional development in emerging Asian economies may present prospects for growth in new markets over the coming decade.

While NSW is more and less reliant on certain industries in comparison with Australia, an important aspect of the NSW economy is that its industry structure is sophisticated. Indeed, the broad-based nature of economic growth in NSW (and in Australia) is a key economic strength, and will help to provide a solid platform for growth over the next decade. With this in mind, there are a number of sectors and areas in which the medium term prospects for NSW look most encouraging.

These potential ‘sunrise’ sectors are shown in Box 1 below. Given the future is inherently uncertain and new markets and ideas will take off that are not only unexpected but could not have been foreseen, they should be considered as speculative.
Box 1: Where might ‘sunrise’ industries emerge?

Green industries

- The transition to a less carbon-intensive economy will give rise to a number of opportunities. Climate change policies will encourage development of new mitigation or adaptation opportunities, for instance through new building materials and construction techniques. There may be scope to export construction services and innovations into emerging Asian markets.
- Particular opportunities may emerge in the development of carbon capture and storage technologies and the development and manufacture of renewable energy technologies.
- Markets in ecotourism and related accommodation may emerge in response to demands for more niche tourism experiences.

Niche services

- With a strong services base, NSW could reap opportunities in the provision of new and higher-value added services. These could include:
  - expanded business service exports to Asia (such as legal, accounting and management consulting), as well as new opportunities to develop services in and around climate change policies and commitments, such as carbon accounting and compliance; and
  - the export of health services with a focus on growing markets in Asia, in a similar fashion to the education sector.

Higher value manufacturing and agriculture

- Strong international competition will encourage the continued transition to higher value and more complex manufacturing activities which embody new knowledge and technological change. This may generate new opportunities in the following:
  - green building materials and forms of renewable energy;
  - higher value-added processed and semi-processed food, targeting more time-constrained consumers, and likely growing protein demands of emerging economies; and
  - new agricultural service exports, for example in efficient irrigation methods and arid-zone agriculture.

Financial services

- NSW already has a good base as a robust and well-regulated regional financial services hub. This strong position could be used to leverage into new markets, particularly in the Asia-Pacific region. Key areas of potential development include Islamic finance, carbon trading and global middle-office functions.

Smart networks and e-services

- Intelligent technologies offer a large potential to develop new ways of meeting demands for health, education, transport and utility services. There may be considerable opportunities to lead the development of such applications. These might include:
  - Intelligent Transport Systems for urban transport networks, and rail and port infrastructure systems;
  - smart electricity metering and demand side management; and
  - remote controlled forms of agriculture, including irrigation, pasture control and monitoring.
- New opportunities in the development of tele-health and tele-education services and applications could emerge, in particular leveraging off the rollout of the NBN.

Many of these sunrise opportunities represent particular prospects within what may be larger priority areas for the NSW Government and business.
Emerging challenges

Over the next decade and further, the four mega-trends identified will present a range of important challenges for NSW. A key aspect of which will be to promote the deep and sustainable changes needed not only to mitigate the worst impacts of these forces and smooth the transitional process, but to capitalise on the various emerging opportunities.

Importantly, many of the most pressing challenges involve areas where government has a direct role.

- **Regulatory and policy frameworks** — Business believes that regulatory requirements have increased over the past decade in NSW and Australia as a whole. Crucially, investment decisions have been affected by inflexible regulations, and there is a need to reinvigorate microeconomic reform agendas. One area of particular need will be to ensure that planning policies and regulations are able to ameliorate pressures associated with expected population growth. The principles articulated in the Metropolitan Strategy (and which look likely to be preserved as the strategy is reviewed) provide a solid policy framework going forward.

- **Meeting infrastructure requirements** — A responsive, forward-looking infrastructure sector is vital for meeting NSW’s future economic challenges. Over the next decade, developing the State’s productive capacity and modernising key infrastructure assets will be critical. Some of the most pressing areas include:
  - Improving urban transport networks such as the metropolitan rail network and relieving congestion on key arterial roads in Sydney.
  - Ensuring that adequate baseload electricity generation investments can be made in the medium term, especially in the context of some uncertainty on the nature and timing of an emissions trading scheme.
  - Following through on recent improvements in freight networks, particularly at Port Botany and the Newcastle coal ports.

- **Ensuring adequate workforce skills development** — A highly skilled workforce will be essential in addressing both the challenges and emerging opportunities that NSW will encounter over the next decade and beyond. Given expectations for robust economic growth in the years ahead, particularly in the construction, health and aged care, ICT, finance, professional and technical services, education and mining sectors, and an increasing number of retirements, it is likely that related skills shortages may become more acute. It will be important that there is forward-looking attention to skills development in these and other areas and mechanisms are in place to ensure ongoing (lifelong training) and optimal workforce participation.

- **Supporting regional NSW** — A range of pressures will be faced by regional areas in NSW associated with a reduction in water availability from climate change and an ageing workforce. This will have a particularly pronounced impact on agricultural production. Adjusting to the necessary structural changes from these and other forces may be especially difficult for many regional communities.
■ Fiscal pressures — The ageing of the population will substantially increase spending pressure in the areas of health, age-related pensions and aged care. Government spending on health is expected to rise, both as a result of the increased number of older people, and as a result of an increase in demand for health services more generally. Further, climate change adaptation and mitigation will place additional pressure on government finances — particularly related to transitional industry support and facilitating relevant technology development.

■ Greater manufacturing and service competition — The emergence of China and India as economic powers will have the greatest impact on NSW manufacturing and services. In terms of manufacturing, this has increasingly involved products which embody greater levels of skill and innovation. On the services front, there has been a trend of off-shoring services, most notably to India.

Some priority areas
In light of the likely impact of the mega-trends, there are areas where NSW is particularly well placed to take advantage of emerging opportunities in the medium term. These include areas where government can take a leading role in development of a skilled workforce, encouraging new technology applications, and where new approaches offer the potential to reinvigorate vulnerable sectors.

Many of the most prospective areas essentially leverage off NSW’s strong and innovative services base in a range of sectors such as construction, health care, ICT, finance, professional, scientific and technical services and education. This broader service and knowledge foundation appears to offer considerable advantages in the next decade and beyond.

A range of priority areas are presented below where government can effectively:

■ play a direct leadership role through well-targeted policy interventions and regulatory regimes; and

■ provide a more supporting industry development function by establishing clear strategies and goals for those sectors of the economy identified as priorities.

It should be noted that these do not represent specific policy proposals. Detailed examination and analysis of concrete policy actions would be required in each area, and each would warrant a dedicated policy development program.

A direct leadership role for government
These suggested priorities set out areas where direct action by government can be effective in positioning NSW for the challenges ahead and building on its major advantages and strengths.
Priority area 1: Supporting greater connectivity

- **Intelligent technologies** — Intelligent technologies are set to significantly improve the efficiency and functioning of four areas of the economy where government plays a central role — namely in health, education, transport and utility services. In each of these areas, there will be a need for initiatives targeted at the adoption and use of new technologies and complementary policy or regulatory reforms. Effective coordination at the centre of government, applied consistently over the decade, will be needed. Because of this deep involvement, government could effectively facilitate or support a range of adoption initiatives — especially in terms of the direct delivery of government services. This would also provide a focal point for industry in areas where advanced technologies will be important.

- **Supporting small business** — There will be particular challenges for many small and medium sized enterprises that will be presented with both:
  - global reach in terms of customers; and
  - increased competition from around the world.

  Government programs to enable SMEs to take advantage of broadband and other advances in information technologies could make a valuable contribution to the realisation of opportunities across the economy.

Priority area 2: Health and aged care reform

- The information economy will provide an important catalyst for delivering change and driving efficiencies in the sector. In particular, various e-health initiatives will provide the ability to deliver more tailored services in the community reducing the reliance on health facilities. Some workforce issues/challenges may stifle the application of certain e-health innovations and these could usefully be addressed as part of a broader reform program.

- The private sector plays an important role in the sector, particularly in the provision of retirement villages and hospitals. Going forward, and given various social factors, a mix of both public and private providers will continue to be optimal. However, there is likely to be a large potential to increase the role of the private sector in the delivery of health and aged care services. Importantly, greater use of information technologies will play an important role in enhancing productivity in service delivery regardless of ownership. The development of private businesses in parts of the industry could be supported by strategies developed by agencies beyond the traditional health related departments.
Priority area 3: Addressing the climate change challenge

- Natural gas development in NSW looks to have the potential to support electricity generation and local manufacturing in the Hunter over the next decade. It could also contribute to exports of LNG, dependent on the emergence of a viable east coast LNG facility.
  - On the other hand, apart from wind generation, most of the activity on renewable energy for electricity is likely to be of relatively small scale and not useful for base-load generation.
- The long-term fate of the NSW coal industry will be influenced by where carbon capture and storage becomes commercial. This will not be known for some years and research and development in storage resources within NSW is needed. Such activity could leverage off NSW’s strong research base in resource and energy related areas.
- Opportunities will also come through the development of emissions abatement technology; sustainable design and construction; renewable energy; and energy management technologies and consulting services.
- Water scarcity issues could become more pronounced over time, affecting agricultural production in regional NSW including in the Murray-Darling Basin. To minimise the potential impact of reduced water supplies it will be important that productivity improvements in irrigation areas are pursued. This could involve efficiency-enhancing investments in water delivery infrastructure, which also aim to improve environmental flows, as well as fostering new businesses in water management.

Priority area 4: Regional NSW

- Increasing demand from emerging Asia and environmental pressures in the Murray-Darling Basin should encourage high-value agriculture. Combined with Commonwealth support, the NSW Government and regional communities might develop their own version of strategies similar to the ‘food bowl’ in northern Victoria.
- The growth and vibrancy of many rural and regional communities — especially in mining related centres and along the coast — will be highly dependent on the provision of infrastructure and social services which can respond effectively to changed settlement patterns and population ageing.
Priority area 5: Skilled workforce

- **Productivity** — Productivity enhancements will come about through increased participation in the education sector (including life-long learning); and partnerships between industry, the education sector and Government.
  - Our workforce will need to have systems to enable cross-disciplinary collaboration between highly skilled individuals working in disparate fields.
- The NSW economy will be faced with a number of challenges in the future including those arising from the combined influence of the four mega trends. Government and business have a key role in helping to build the State’s knowledge capabilities to meet these challenges through education and ongoing skills development.
- Education providers and employers will need to work closely together to develop and deliver education and skills training which accommodates a workforce that is vibrant and constantly adapting to new drivers and technologies.

Supporting industry development

These priorities identify areas where government can potentially play a more supporting industry development role to harness emerging economic opportunities in the period ahead.

Priority area 6: Export opportunities to dynamic Asian markets

- There are several key areas where export opportunities to emerging Asia look most prospective:
  - **Tourism** — There appear strong opportunities from developing the Chinese and Indian markets to offset declining visitor trends in other international markets.
  - **Financial sector** — Sydney can build on its reputation as a vibrant, well-regulated centre for financial service excellence in the Asia Pacific region. Growth prospects will present themselves in new financial and risk management products.
  - **Professional, scientific and technical services** — There is a strong base in NSW across a range of activities including accounting, management consulting, engineering and architecture. Demand for these types of services is likely to expand as Asian economies go further along the path of economic development.
  - **Education** — The NSW education sector is already a significant provider of education service exports. Increasing middle classes in Asia will provide the potential to greatly expand these services, especially in the university sector. Further opportunities exist for vocational training but will be greatly dependent on making progressive improvements in quality and reputation.
  - **Health services** — A more speculative opportunity exists to increase exports of health services into Asian markets, particularly for higher-end and medical training services. Much will depend on a national policy in the area and new initiatives are likely to be driven by private providers.
- A key aspect of each of these areas is that there will be increased competition from the emerging markets themselves but that demand generated by these economies is likely to be stronger. That said, it will be important that respective NSW sectors are highly responsive and market-focused in order to capitalise on new opportunities as they arise.
- In an overall sense, further economic gains from greater trade integration with emerging Asian markets can be leveraged from Sydney’s position as a global city.
Priority area 7: A dynamic building and construction sector

- The expected strong demand for dwellings in NSW should see the sector expand markedly over the next decade. This provides opportunities in design and construction services, including in regard to:
  - addressing environmental challenges associated with climate change and water scarcity; and
  - the adoption of new technologies in the home such as information technologies, modular building practices and energy efficient materials.

- The strength of the sector could also provide a base for developing construction and building service exports to emerging Asia.

Priority area 8: Promoting creative industries

- There are several reasons that underpin the importance of a strong and vibrant creative industries base in NSW:
  - NSW already has considerable pool of creative talent;
  - there is the potential to leverage off further developments in the information economy;
  - creative activities are highly mobile and competition from abroad will be strong;
  - it can provide broader spillover benefits to the community in terms of supporting our identity and local culture; and
  - design and innovation-related services are important inputs for other sectors.

- The opportunity is to leverage the capabilities of this sector to take advantage of demographic trends — driving increases in leisure time — and ICT trends in emerging platforms.

- Enhanced competitiveness of other sectors can be brought about by creative businesses through such things as design in products, processes and services.

Access Economics
August 2010
1 Introduction

Access Economics was engaged by Industry & Investment NSW (I&I NSW), on behalf of the NSW Innovation Council, to undertake a study of the NSW economy to 2020. A key objective of I&I NSW is to assist in building a robust, dynamic and resilient state economy that creates jobs by attracting investment to NSW and encouraging the development of innovative and sustainable industry sectors.

This report will inform the development of a Business Sector Growth Plan currently being prepared by the NSW Innovation Council. The plan, due for release by late 2010, will outline steps that the NSW Government and business can take to position the NSW economy for strong growth and global competitiveness over and beyond the next decade. Importantly, it will articulate the way forward in order to build on NSW’s existing strengths and competitive advantages, manage attendant challenges and capitalise on emerging opportunities.

A changing economy

This report considers the major changes that are likely to occur in the NSW economy to 2020 and specific economic challenges and opportunities that will emerge from these changes.

Among a myriad of influences on the NSW economy, four particular mega-trends are expected to have a considerable impact on the shape and performance of the economy:

- national and global policy actions to address climate change;
- demand and competition from emerging economies, especially China and India;
- the widespread adoption of new information technologies; and
- demographic change, especially the growing and ageing population.

Over the next decade, the economic effects of the four identified mega-trends are likely to be pervasive and far reaching.

The starting point of the analysis was to develop a central scenario, incorporating realistic depictions of how each of the mega-trends may play out. Uncertainties and the underlying drivers of change associated with each mega-trend are then explored, augmented by specific analysis at a more detailed level. This was used to draw out various strategic and policy implications, the overall nature of the structural adjustment challenge and where the impacts of the mega-trends will be greatest.

Consultations with industry practitioners, ‘thought leaders’ and others were undertaken as part of this study. This included stakeholder workshops, including the NSW Premier’s Business Forum in April 2010, which canvassed a range of industry development issues over the next decade associated with the four mega-trends. These discussions informed development of the central scenario and helped highlight relevant uncertainties and emerging opportunities for the NSW economy.
Modelling approach

To understand the impact of the four mega trends and other powerful forces affecting the NSW economy, it is crucial to place them within a comprehensive and consistent framework of analysis. This analysis is undertaken through use of a general equilibrium model of the economy, complemented by other empirical models designed to explore various aspects of the influences on the NSW economy and their likely consequences. An outline of the modelling framework is provided in Appendix C.

This empirical approach has many advantages. It allows the whole-of-economy impacts of various economic ‘shocks’ (in this case, the mega-trends) to be explored across a multitude of transmission channels. The scale and pattern of relevant effects to industries, sub-sectors and the NSW economy as a whole can then be distilled.

However, there are also a range of limitations with the modelling. Much of the analysis requires qualitative judgements to be applied, especially to identify key uncertainties and risks, as well as future opportunities. Moreover, in some areas there will necessarily be a greater reliance on analysis conducted outside of the model to explore emerging developments over the decade. This is particularly the case with examining the effects of the information economy, which is less about quantifying broad-based productivity impacts on the economy than identifying new areas where businesses and residents might adopt transformational information technologies.

As such, this analysis has adopted a formal macroeconomic modelling approach coupled with targeted scrutiny of specific aspects of the trends and the nature of industry impacts.

Report structure

The report is divided into three parts, reflecting the different phases of the analysis:

- **Part I: The contours and character of NSW economic growth** — This part considers the current structure of the NSW economy, highlighting areas of natural advantage and lessons to be drawn from the previous decade. It then provides an overview of the shape of the NSW economy over the coming decade, incorporating central cases for the mega-trends.

- **Part II: Aspects of the mega-trends** — This part explores the nature and characteristics of the four mega-trends, in addition to associated uncertainties, and how they are likely to impact on the NSW economy.

- **Part III: Challenges and opportunities for NSW** — The analysis in the preceding parts highlights how the NSW economy is well placed to enjoy a decade of reasonably strong growth. However, to do so, various impediments and challenges need to be addressed. This part reviews some of the main challenges and identifies areas of considerable opportunity.

Technical appendices provide further details on the compositional change in the NSW economy to 2020, consultations undertaken by Access Economics in the development of this report and economic modelling for the analysis.
Part I  The contours and character of NSW economic growth

This part of the report focuses on the fundamental shape and dynamics of the NSW economy. It does so firstly by providing some recent historical perspectives. These look at the structural composition of the modern NSW economy — essentially our analytical ‘starting point’ — and its major linkages and strengths. The key macroeconomic events of the last decade such as the 2000 Olympic Games and the housing boom are then overlaid.

Looking forward, the underlying drivers of change and the shape of the NSW economy at 2020 are further explored. The central macroeconomic and compositional projections are outlined including through incorporating the main structural impacts from the mega-trends and the key growth areas for NSW. Also discussed are the important commonalities and differences for the Australian and NSW economies over the next 10 years.
2 The NSW economy in 2010

Prior to identifying and discussing expected changes in the NSW economy over the next decade, it is useful to examine the current structure of the NSW economy and how various influences have affected its structure over the recent past.

To provide context for later analysis, this chapter chronicles the major macroeconomic forces on the NSW economy since the start of the decade and looks at the resultant impacts on individual industries and sectors.

2.1 Some important influences over the past decade

Since 2000, the NSW economy has encountered a range of domestic and external challenges, including managing the post-Olympic Games period, strong residential property cycles, the global commodity price boom and the recent global financial crisis. Overlaid across these specific events have been broader, longer-term influences such as the rising productivity and standard of living in emerging Asian nations, and demographic changes within the State.

Throughout the last decade, NSW has recorded solid economic growth, averaging 1.8% a year (see Chart 2.1). Economic growth in NSW over this period was affected by a combination of:

- a redistribution of national resources in favour of Queensland and Western Australia which have benefited from surging demand for resources;
- the post-Olympic period, which involved a normalisation in tourism activity as well as investment and construction (much of which had been brought forward for the Olympics);
- the timing in NSW housing cycle, which saw NSW enjoy a relatively strong housing market in the latter part of the 1990s as well as the early years of this decade; and
- NSW’s particular exposure to the impact of the global financial crisis.

NSW’s share of the Australian population has been falling over time, partly due to the incentives in other states arising from the surge in international resources demand, and the housing price boom of the late 1990s and early 2000s.

Importantly, relatively slower population growth is not necessarily an issue of itself. While slower population growth is likely to lead to slower output growth, it is output per person which is of most importance. Indeed, living standards (approximated in terms of GSP per capita) should be of most concern. On this measure, living standards in NSW have increased by 7.5% over the past decade.
2.2 Growth drivers and productivity

Two longer term trends have had a particularly strong influence on both the NSW and Australian economies over the past decade:

- the rapid development of emerging economies in Asia, especially China and India over the past decade; and
- the long-term shift to the services sector with less reliance on agriculture and manufacturing. The latter has been influenced by the reduced trade protection over the past three decades which has exposed manufacturing to more intense overseas competition.

The importance of Asia as a key NSW export market has increased notably in recent decades (See Table 2.1). In 2009, Asian countries accounted for eight of the State’s top 10 export destinations, up from six in 1990. Japan remains the State’s major export partner, accounting for more than 28% of NSW exports in 2009, while China and South Korea accounted for a further 19%. China is now NSW’s second largest export market, up from sixth place in 2000.
The NSW economy in 2020

### Table 2.1: NSW export partners

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>2000</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Share</td>
<td>Rank</td>
</tr>
<tr>
<td>Japan</td>
<td>1</td>
<td>29.2%</td>
<td>1</td>
</tr>
<tr>
<td>China</td>
<td>17</td>
<td>1.0%</td>
<td>6</td>
</tr>
<tr>
<td>South Korea</td>
<td>2</td>
<td>8.8%</td>
<td>4</td>
</tr>
<tr>
<td>United States</td>
<td>3</td>
<td>6.6%</td>
<td>2</td>
</tr>
<tr>
<td>New Zealand</td>
<td>4</td>
<td>6.3%</td>
<td>3</td>
</tr>
<tr>
<td>Taiwan</td>
<td>6</td>
<td>4.7%</td>
<td>5</td>
</tr>
<tr>
<td>India</td>
<td>25</td>
<td>0.5%</td>
<td>15</td>
</tr>
<tr>
<td>Indonesia</td>
<td>10</td>
<td>2.8%</td>
<td>8</td>
</tr>
<tr>
<td>Thailand</td>
<td>14</td>
<td>1.5%</td>
<td>10</td>
</tr>
<tr>
<td>Malaysia</td>
<td>13</td>
<td>1.7%</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: ABS 5368.0. Note: Data is based on merchandise (goods) exports and excludes services. Countries sorted on 2009 ranking.

The NSW economy has been affected by macroeconomic shocks and broader economic trends which have been detrimental to growth over the past decade. The measured rate of economic growth has been lower than in other States which have been driven in particular by large capital intensive investments by the mining sector. This pattern of growth largely reflects relative trends in business investment over the past decade.

In NSW, private business investment (excluding intangibles) has averaged 8.7% of GSP over the past decade, below the 11.1% seen nationally (see Chart 2.2), in part reflecting sizeable resource investments in other parts of Australia. This performance suggests less capital accumulation in NSW compared with the national average over the medium term, with important implications for productivity and the capacity for future economic expansion.

### Chart 2.2: Business investment as a share of output

2.2.2 Trends in productivity

Productivity is a crucial driver of economic growth. Nationally, after a period of strong productivity growth in the 1990s, rates of productivity growth have returned to more long-term average levels. However, it can also be traced back to two other key factors — the policy reform agenda of the 1980s and early 1990s and a sharp increase in the uptake of information technology:

- over the 1990s there was a rapid accumulation of a stock of IT assets which have improved supply chains, reduced inventories through just-in-time management and streamlined a range of activities such as procurement, distribution, marketing and recruitment;
- microeconomic reforms encompassed changes in monetary and fiscal policies, capital markets, industry assistance, taxation, government enterprises, regulation, labour markets and industrial relations, competition policy, innovation and training; and
- reform increased productivity by exposing businesses to more competition, both domestically and internationally, and enabling resources to move more freely to where they could be used more productively. While many economies saw the benefits of the spread of IT applications, not all economies had implemented a strong reform agenda, and this is linked to Australia’s strong performance relative to many other developed economies.

Since 2000, labour productivity growth has fallen back in Australia. This slowdown appears to reflect:

- a waning of the benefits of previous microeconomics reforms (in terms of its impact on economic growth rates rather than the absolute level of economic activity);
- capacity constraints in parts of the labour market and infrastructure; and
- the delayed response of productivity growth to the acceleration seen in business investment, especially in the mining sector. That is, labour productivity as measured tends to be weak while additional resources are devoted to developing new or expanded projects, but then tends to rise as the projects come on-stream.

2.3 Sectoral changes in the NSW economy over the last decade

In order to examine the effect of macroeconomic trends and policy changes on NSW industries over time it is useful to aggregate specific industries into five broader sectoral groups — services, manufacturing, construction, agriculture and mining, and utilities.

Table 2.2 shows the changes in NSW industry composition over the last decade. In an overall sense, these compositional changes are rather gradual. The services sector increased by 2.2% over the last 10 years, and now accounts for around three-quarters of the NSW economy. Over this period, manufacturing recorded the largest decline in output share, decreasing from 12.1% to 9.8% of the NSW economy.
Table 2.2: NSW industry composition

<table>
<thead>
<tr>
<th>Industry</th>
<th>1999-00</th>
<th>2009-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and mining</td>
<td>5.3%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Construction</td>
<td>7.5%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>12.1%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Services</td>
<td>72.4%</td>
<td>74.6%</td>
</tr>
<tr>
<td>Utilities</td>
<td>2.7%</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

Source: ABS

The following provides a discussion of the factors influencing each of these sectors over the past decade, including macroeconomic conditions, technology and industry policy, as well as changes which have occurred within sectors and which may not be captured by the economy-wide compositional charts shown below.

2.3.1 Increased service intensity

As with other developed economies around the world, the NSW economy is becoming increasingly service oriented. This shift in economic structure reflects a combination of:

- changing patterns of demand as societies become wealthier with spending on such services as health, entertainment or tourism increasing;

- the comparative advantages enjoyed by more developed economies tending to involve higher valued areas of activity including services and advanced areas of manufacturing and primary production, with developing countries assuming a greater share of many traditional areas of manufacturing; and

- changes in how business is organised that affect the classification of industries. For example, a decision by a manufacturing firm to make more use of external instead of in-house accounting services will show up as a shift towards services even though there has been no fundamental change.

The broad compositional shift in the NSW services over the last decade is shown in Chart 2.3.
Key service industries within NSW include finance and insurance, professional, scientific and technical, and health care. In particular, Sydney is firmly established as Australia’s financial capital, and is home to the Reserve Bank of Australia, two of the four major banks (Westpac and the Commonwealth Bank), the Australian Stock Exchange, the Sydney Futures Exchange and key regulatory institutions such as the Australian Prudential Regulatory Authority. Other Sydney-based financial institutions include many of the large insurers (e.g. IAG, QBE, Allianz, MBF), AMP, Macquarie and St George. The financial services sector has undergone some important changes in recent history, driven in particular by technological and policy change.

The health industry has achieved the largest gain as a share of the NSW economy between 2000 and 2010, increasing from 5.3% to 6.9% of the economy, a relative increase of 30%. That is partly due to implications of population ageing, with a larger proportion of the population now older and requiring greater health services. It also reflects increasing demand for health services as the population becomes wealthier as well as the trend increases in costs relative to other parts of the economy.

The State’s education industry has also undergone some notable changes over the past decade and is currently the State’s second highest export earner. Despite expanding exports of education services, the sector as a share of State output has declined primarily because of demographic trends.

Notably, NSW is more service oriented than the wider Australian economy, with service industries accounting for less than 70% of the latter compared with around 75% of NSW
output. That trend may be maintained over time as the State continues to shift toward the service sector.

### 2.3.2 Manufacturing

Although manufacturing remains one of the largest single industries in NSW, its share of the State economy has been declining over the past half century. The share of manufacturing in the NSW economy has fallen from more than 12% in 2000 to less than 10%, with the share expected to continue to decline over the decade ahead. It is important to note this decline is in relative terms and reflects a broadly flat profile for manufacturing combined with solid growth in other areas of the economy like services.

This trend away from manufacturing is experienced across developed economies (including Australia as a whole) and tends to represent a rise in productivity and income, along with increased opportunities for international trade over time. The largest pressures have been experienced in the manufacture of less complex goods where there is strong import competition — for example, on textiles, clothing and footwear.

At the same time, there are highly successful sub-industries and firms within NSW which have managed to carve out important niches and are well placed to continue to prosper. Particular examples include Dux and Rheem, both manufacturers of hot water systems, which have embraced more technologically advanced production methods and adapted to changing market demand for energy efficient products.

### 2.3.3 Construction

In NSW, the construction sector represents around 7.5% of total industry output and more than 8% of the total workforce, with those shares remaining relatively steady over the past decade as a whole.

However, construction activity tends to be volatile over shorter periods. The sector exhibits exaggerated cycles due to its sensitivity to factors such as interest rate movements, business and consumer confidence, government policy (such as the first home owner grant), and the significant impact of large, discrete construction projects.

Residential construction activity typically accounts for slightly more than half of all construction activity in NSW, though residential building lifted strongly between 2001 and September 2004, when the industry’s share of activity peaked at 63%. Since 2004, the value of residential building work undertaken in NSW has fallen steadily, and is currently at an 18 year low.

Non-residential construction lifted strongly through the 1990s following a decline in activity during the recession earlier that decade. The sector received a significant boost in the lead up to the Sydney Olympics through the substantial expenditure on venues and transport facilities.
2.3.4 Agriculture and mining

The agriculture industry has generally been falling as a share of the NSW economy over time, though is highly influenced by weather conditions in any given year. The significant drought which has affected many parts of the State since the start of the current decade has accelerated a decline in output.

Although agriculture accounts for around 2.5% of the NSW economy, the industry produces a substantial component of the State’s export revenue. In 2008-09, agricultural products accounted for 8.2% of the value of all NSW exports, and 11.4% of exports from Australia as a whole (NSW Government).

Economic development in Asia — especially its burgeoning middle class population — can be expected to contribute to higher demand for many agricultural products over time. To date, however, the main impact of rapid economic growth in Asia has been felt on its demand for energy and industrial commodities, especially in NSW’s case, coking and steaming coal.

Looking ahead, both industries are also likely to be influenced by a move toward a lower carbon-intensive global economy. The introduction of a price on carbon in Australia is likely to be a significant impediment to growth in the NSW coal industry in its current form, though is also expected to produce important opportunities such as the potential development of carbon capture and storage (CCS) techniques and various other forms of carbon sequestration and carbon sinks in the agricultural industry.

2.3.5 Utilities

The NSW utilities sector (comprising the electricity, gas, water and waste service industries) has generally been declining as a share of the economy over the last two decades.

The past decade has also seen a more wide-spread commercialisation of renewable energy technologies, including wind and solar power, along with investments in upgrading urban and rural water systems.

The construction of a desalination plant at Kurnell in Sydney, and the establishment of a number of wind farms around the State (particularly to the west of the Great Dividing Range) reflect the changing dynamics of the sector in NSW. The completion of the Silverton Wind Farm project in the coming years will significantly add to the State’s capacity for renewable energy generation.

The utilities sector is expected to undergo more changes over the next decade, with the likely introduction of carbon pricing in some capacity. This will notably affect the cost of electricity generation in particular, with the change in relative prices likely to provide an even more conducive economic environment for investment in renewable energy technologies.

2.4 Some implications of past economic trends

Throughout the last decade, NSW has recorded solid economic growth and experienced subtle changes in its industry composition. The State maintains relative strengths in a number of service-related sectors, including the financial and insurance industry, business and professional services and parts of the ICT sector. While the State economy does enjoy
particular strengths, the breadth of its industry base and the strength of many services industries provide a solid base for economic growth.

The experience of the past decade allows a number of observations relevant for the following analysis covering the coming decade:

- Unforeseen events can have a profound effect on the economy over a decade, as was seen particularly with the extent of the global commodity boom and the global financial crisis.

- Both domestic and external shocks are expected again to affect the NSW economy over the coming decade. The ability of the economy to absorb and respond to such shocks will be influential in determining its overall strength (as was seen most significantly with the response to the world economic downturn).

- Despite what were some large shocks to the system, for the most part, the relative size of different sectors in the NSW economy only evolved gradually. This may mean that, while the economy will undergo significant change, large shifts in sectoral shares should not be expected over the next decade, notwithstanding the magnitude of some of the mega-trends that will be affecting the economy.
  - This means that many of NSW’s current strengths in areas such as business services or ICT will persist and be seen in the headline statistics for 2020 as they are for 2010.

- NSW’s economic fortunes over the next decade will be affected by certain conditions present in 2010. In particular:
  - The high rate of capital investment in resource rich states relative to NSW — this will have a ‘pipeline’ effect, dampening the rate of growth in labour productivity in the first part of the decade.
  - The NSW (and Australian) economy has responded to the boost to demand from Asia, but the full effect will only be felt with a lag as businesses adjust and investment occurs.
  - Further, the fact that residential investment has been relatively subdued — and, as discussed in subsequent sections, running behind underlying demand — means that construction activity should strengthen in the years ahead.

- Equally, many of the changes that are initiated over the coming decade will have their major impact in the subsequent period. For example, as discussed below, efforts to shift to low carbon emissions technologies will take many years to see their full impact. Similarly, the response to the deployment of advanced information technologies will see businesses and households continue to respond and innovate for many years.
The NSW economy in 2020

3 The shape of the NSW economy in 2020

In 10 years time the NSW economy will look different in many respects to how it looks today. It will be significantly larger and with higher per capita income.

This chapter focuses on the overall shape and composition of the NSW economy at 2020, including major implications for employment and productivity. It discusses the forces affecting the economy in the decade ahead and the chief differences in NSW compared with the broader national economy. Some key indicators for the NSW economy in 10 years from today are also presented.

3.1 Key forces shaping the NSW economy

The NSW economy will undergo important changes in the next decade and will be shaped by various factors. Unforeseeable external and internal shocks may influence the growth and composition of the economy. However, most significantly, major long term trends will create important pressures and opportunities in NSW. Over the next decade and beyond, these ‘mega-trends’ will have considerable impact on both the shape and performance of the NSW and Australian economies.

These trends include:
- policy action to meet the challenges of climate change abatement and adaptation;
- demand and competition from emerging economies like China and India;
- the development and implementation of new information technologies; and
- demographic changes, especially ageing and the pace of population growth.

3.1.1 The impact of the mega-trends to 2020

Over time, these trends look likely to have major structural implications for the NSW economy. Importantly, however, they are also likely to involve considerable opportunities which, if fully realised, have the potential to provide strong net economic benefits and help raise community living standards.

A brief description of the key implications of the mega-trends is provided below. The impact of each of these mega-trends is explored more fully in Part II.

Carbon constrained future

Climate change and especially policy action directed at responding to climate change will force NSW industry to shift towards more renewable and lower emission electricity generation technologies. Inevitably, the cost of energy will rise for households and businesses.

Climate change will also affect water usage and cost, land use and profitability of agriculture and related areas. The burden of climate change and related policies will fall unevenly across the State.
**Demand and competition from emerging economies**

The expansion and development of emerging economies, especially China and India, will increase demand for a range of goods and services produced in NSW:

- Most notable will be the heightened demand for energy and industrial commodities.
- Also, the growth in these countries’ middle classes will continue and, with this, demand for higher value goods and services is expected to rise. This will increase demand for NSW’s exports of goods and services.

The strength of Asian demand is expected to manifest itself in, especially, higher prices for raw materials. This will increase Australia’s terms of trade and exchange rate and draw resources away from other areas of the economy. While the net impact on both the Australian and NSW economies will be clearly positive, the impact will produce elements of a ‘two-speed’ response:

- Western Australia, Queensland and increasingly South Australia are more resource-intensive and will benefit more than the other states.
- Trade-exposed areas, such as manufacturing and tourism, will be challenged, especially if they are not able to take direct advantage of heightened demand from China and India for their product.

In addition to the opportunities for selling into China and India, there will be greater competitive pressures from these economies as they increasingly move from production of less complex goods into higher-value manufacturing and services.

**Rapid development of the digital economy**

Advanced information technologies will have both a direct and indirect effect on the composition of the NSW economy in 2020. While earlier versions of such technologies have had marked impacts on the economy over the past few decades, the change over the next 10 years could be even more rapid and more profound given the preparatory work that has been carried out by the ICT industry, many businesses that stand to benefit as users of the services and government.

These changes will be brought about by the rapid development of new products and services around the globe including the introduction of intelligent systems in virtually every part of the economy. The rollout of the NBN will provide the potential to extend these developments through the economy and society.

**A growing and ageing population**

Overall population growth will have a substantial impact on the stock of dwellings and related infrastructure required in NSW. According to NSW Department of Planning figures, an additional 390,000 new dwellings may be required in NSW by 2020 to meet projected population growth.

The demographic shift, to an older population, will change service requirements — particularly in health, aged care and housing. A relatively older population will also have different consumption patterns, with increased demand for leisure, tourism and financial services at the expense of more durable products such as cars and whitegoods.
3.1.2 Modelling the mega-trends

Each of these mega-trends has been explicitly incorporated in formal macroeconomic modelling of the NSW economy to 2020. The first step was to develop a business-as-usual or reference case for the economy. The reference case scenario incorporates a realistic central case for each of the four mega-trends — which will act in conjunction in the decades ahead — as well as other key growth and development factors.

The main mega-trend assumptions underpinning the reference case are outlined in Box 1. These are discussed in more detail in Part II, along with the impact of plausible variations (or sensitivities) to the mega-trends.

Box 1: Key assumptions for modelling the mega-trends

The main assumptions about the four mega-trends adopted to construct the baseline or central case for modelling the NSW economy are:

- Climate change — incorporates current government climate change policy and international developments. In particular, it assumes a 25% reduction in emissions by 2020 relative to the 2000 base, the Renewable Energy Target and an international trading scheme in emissions permits. The international carbon price is assumed to reach around A$50 per tonne of CO$_2$-e by 2020.

- Demography — demographic change in NSW is based on the latest Commonwealth Treasury population projections and modelling by the NSW Department of Planning.

- Emerging economies — assumes strong growth in China (averaging over 8% pa) and India (averaging 6-8% pa) with commensurate implications for commodity prices (trending down from 2011-12 but still high by historical standards) and Australia’s terms of trade.

- Information economy — assumes the NBN is rolled out well before 2020 and that there are additional advances in the use of technologies and services/applications.

Further information on the modelling framework is provided in Appendix C (see Table C.1).

3.2 The NSW economy in 2020

A realistic scenario for the NSW economy would be for it to achieve average annual growth of 2¾% over the next 10 years, equivalent to overall economic growth of around 30%. This represents a solid pace of growth and would see incomes and living standards steadily improve. In the same period, average annual growth in the broader Australian economy is expected to be 3¼%, partly reflecting strong resource investments and related activities in other parts of the country.

Key macroeconomic forecasts for the NSW and Australian economies are set out in Table 3.1.
Table 3.1: Key economic forecasts, NSW and Australia

<table>
<thead>
<tr>
<th></th>
<th>NSW</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009-10 2019-20</td>
<td>2009-10 2019-20</td>
</tr>
<tr>
<td>Real gross state product</td>
<td>388.0 506.9</td>
<td>1,224.0 1,692.3</td>
</tr>
<tr>
<td>% change</td>
<td>1.8% 2.7%</td>
<td>3.0% 3.3%</td>
</tr>
<tr>
<td>Business investment</td>
<td>42.8 57.6</td>
<td>168.8 243.7</td>
</tr>
<tr>
<td>% change</td>
<td>6.4% 3.5%</td>
<td>10.7% 4.4%</td>
</tr>
<tr>
<td>Private consumption</td>
<td>232.8 303.3</td>
<td>685.7 928.0</td>
</tr>
<tr>
<td>% change</td>
<td>3.2% 2.7%</td>
<td>3.6% 3.1%</td>
</tr>
<tr>
<td>Public consumption</td>
<td>60.4 70.4</td>
<td>214.2 258.6</td>
</tr>
<tr>
<td>% change</td>
<td>2.5% 3.5%</td>
<td>1.7% 2.1%</td>
</tr>
<tr>
<td>International exports</td>
<td>33.5 40.6</td>
<td>183.3 364.8</td>
</tr>
<tr>
<td>% change</td>
<td>1.7% 2.1%</td>
<td>2.0% 7.3%</td>
</tr>
<tr>
<td>International imports</td>
<td>79.0 149.9</td>
<td>214.9 472.5</td>
</tr>
<tr>
<td>% change</td>
<td>7.9% 6.7%</td>
<td>7.8% 8.3%</td>
</tr>
</tbody>
</table>

Source: ABS, Access Economics
Note: All growth rates are the average annual change over previous decade. Business investment excludes intangibles. Export and import figures relate to goods only.

The economic growth differential between the NSW and Australian economy over the next decade is partly due to differences in labour productivity. Chart 3.1 shows labour productivity projections for NSW and Australia.

Chart 3.1: Growth in labour productivity, NSW and Australia

The chart shows that annual labour productivity growth is expected to average 1.4% in NSW over the next decade, compared to 1.7% at the national level. The chart shows that strong rates of (largely mining-related and infrastructure) investment in all States over the last several years will translate into stronger labour productivity outlook in the short term.
Along with differences in business investment (and therefore labour productivity), a slightly lower population growth will also result in economic growth which is modestly lower in NSW compared with Australia.

### 3.3 Structural composition of the NSW economy

The underlying strengths of NSW are reflected in its economic structure. In an overall sense, NSW enjoys strengths in various services industries and is less reliant on mining and agriculture than other states (see Chart 3.2).

Services account for around three-quarters of all economic output in NSW. In part, the importance of services to the NSW economy reflects its larger population which has provided a base for finance and business services and influenced many domestic and global companies to be headquartered in Sydney. Exports of professional services (particularly accounting and legal services) and education services have also been rising as developing Asian economies have created increased opportunities for NSW as a regional business hub.

**Chart 3.2: Composition of NSW and Australian economies in 2009-10**

Such advantages are supported by Sydney’s position as a global city. This provides significant benefits in terms of international reputation, business and financial networks and in fostering a vibrant and innovative culture.

The NSW economy also has key differences within sectors relative to other Australian jurisdictions. For example, mining accounts for a relatively smaller share of the NSW economy (3%) than the broader Australian economy (8%), but is heavily dominated by coal mining. In NSW, coal mining accounts for over 85% of all mining activity but represents approximately a third of mining output at a national level.
While the high-level composition of the NSW economy in 2020 is expected to be broadly similar to the composition in 2010, the structure within each sector is likely to undergo significant changes over the coming decade (Chart 3.3).

Chart 3.3: Composition of NSW and Australian economies in 2019-20

Source: Access Economics

3.3.2 The NSW economy in a national context

An important element of examining the shape of the NSW economy in 2020 is determining the State’s place in the broader Australian economy. NSW is the largest state economy and will continue to account for the largest share of the Australian economy in 2020. However there are important differences between the NSW and Australian economies which influence the State’s growth potential and help to inform the distinct comparative advantages of NSW.

Relevant compositional differences

Given that industry composition is influenced by largely static considerations such as factor endowments, comparative advantage and historical experiences, the industry structure of an economy tends to change gradually.

Chart 3.2 and Chart 3.3 show that, while there are notable similarities between the compositions of the NSW and Australian economies, there are also important distinctions. These distinctions give rise to clear comparative advantages to each state, the influence of which may be heightened to 2020.

In general, NSW has been undergoing a shift toward a more service-oriented economy. This trend is consistent with the change in industry structure seen Australia-wide, and in other advanced economies around the world.
Most obviously, NSW relies more heavily on the finance and insurance, and professional, scientific and technical industries than the Australian economy. That compositional difference is expected to be maintained over the next decade, and is likely to be of considerable advantage to NSW.

Finance and insurance services is the largest industry in NSW, and is a key relative strength of the economy. The State’s advantage in finance and insurance has been borne out over time, and is due to a range of factors, including Australia’s first financial institutions being established in NSW and Sydney’s position as Australia’s ‘global city’. Improvements in ICT are likely to generate greater efficiencies in these industries over the next decade, while growth in China and India will also present opportunities in new markets.

There are also industries which account for a relatively lower share of the economy in NSW relative to Australia. The mining industry makes up around 3% of the NSW economy compared to more than 8% of the Australian economy. Given that mining is projected to grow strongly over the next decade, the relative ‘under-representation’ in NSW is likely to contribute to the modest disparity in economic growth going forward.

While NSW is more or less reliant on certain industries in comparison with Australia, an important aspect of the NSW economy is that its industry structure is sophisticated. Indeed, the broad-based nature of economic growth in NSW (and in Australia) is a key economic strength, and will help to provide a solid platform for growth over the next decade.

Moreover, some of the most important changes to the NSW economy to 2020 will not be in terms of differences in the composition of these broad industry groups. Rather, the changes within each of these industries are likely to be significant, and will be influenced by each of the mega-trends.

**Compositional changes to 2020**

As noted above, the compositional ‘starting point’ for the NSW economy today will heavily influence where it develops over the next 10 years, including in response to the mega-trends and other drivers.

- **Finance and Insurance** accounts for the largest share of the NSW economy at 16.2% and will maintain its share over the 10 years to 2020. Australia’s ability to navigate the global economic crisis enhanced its reputation as a robust and well-regulated financial centre. As such, Sydney is well-placed to leverage off its existing strengths as a provider of regional financial services, including in new financial products and services and through deeper use of information technologies.

- **Manufacturing** is expected to account for a smaller share of the NSW economy over time, falling from 9.8% in 2009-10 to 8.3% in 2019-20. Within the sector, much of the loss of share is likely to be due to a fall in the manufacture of labour intensive products amid increased competition from low-cost producers overseas. Significant opportunities for highly specialised and technologically advanced manufacturers are expected to develop over the next decade, particularly in gaining access to new markets abroad.
The mining sector is projected to increase slightly as a share of the NSW economy over the next decade, rising from 3.1% to 3.9% of output. Strong demand for coal from China and other developing nations will underpin high prices and provide a favourable environment for growth. An increase in capacity at the coal export facilities at Newcastle will also improve growth opportunities for the industry.

The NSW construction industry’s share of the NSW economy is projected to rise to 8.4% in 2020 compared with 7.6% in 2010. Engineering construction will benefit from greater infrastructure requirements into the future, while strong population growth will support demand for new dwelling construction. In turn, the latter will also present opportunities for more environmentally friendly building techniques and the potential for export of low energy intensive building materials and methods.

Health care and social assistance is likely to account for a growing share of the NSW economy over time, and is projected to increase from 6.9% of State output in 2009-10 to 7.5% in 2019-20. As the State’s demography changes, the health care industry will play an increasingly important role in caring for a larger and older population. The labour intensive nature of this industry means that the projected relative increase in output will also provide a considerable base for future employment growth in NSW.

The professional, scientific and technical services industry in NSW is projected to increase as a share of the economy from 8.2% in 2009-10 to 8.7% in 2019-20. Greater educational attainment and a shift toward high skill services in NSW will provide a platform for growth in this industry. Economic and institutional development in emerging Asian economies may present prospects for growth in new markets over the coming decade.

The utilities (electricity, gas, water and waste services) industry is expected to account for 2.8% of the NSW economy in 2019-20, up from 2.4% in 2009-10. A larger population will generate additional demand for utilities over time, while opportunities to invest in cleaner energy sources and create a more sustainable water supply will also influence the growth and composition of the NSW utilities industry to 2020.

As noted, the NSW economy is expected to grow by about 30% over the next decade. The sectoral changes discussed above will each influence this whole-of-economy growth in varying degrees, based on their initial share of the economy and respective growth rates. These sectoral growth contributions are shown in Chart 3.4.

The biggest growth driver is the finance and insurance industry, which contributes around 5.2% of NSW economic growth in the next 10 years. This primarily reflects its current structural significance to the NSW economy rather than its overall expected growth performance over the decade ahead. Other key growth drivers are the construction, professional services and health care industries.
3.4 Jobs and productivity

In line with structural changes in the NSW economy over the next decade there will also be related differences in the composition of employment (see Table 3.2). Overall employment in NSW is projected to increase from around 3.5 million in 2010 to a total workforce of about 3.9 million in 2020. This represents average annual growth in total employment of around 1.3%.

Employment projections for four ‘composite’ industries are also presented in Table 3.3. These industries, which cut across standard industry structures, comprise creative industries, tourism, ICT and education and scientific research. All employment in the composite industries is captured within the broader industry structure and aggregate projections detailed in Table 3.2. The precise make-up of the four composite industries is discussed in Appendix C.

Over the decade ahead, employment growth is strongest in mining (see Table 3.2), with an additional 15,000 jobs projected in NSW, an annual employment growth of 3.7%. Other areas with relatively robust growth are in service sectors such as health care and professional and administrative services. These sectors are each projected to have employment growth of well over 2% in the next 10 years.

Consistent with previous trends, the NSW manufacturing sector is expected to experience a substantial reduction in overall employment. About 83,000 manufacturing jobs are projected to be shed over the decade, an average annual decline of around 3.1%.
As shown in Chart 3.1 above, labour productivity growth in NSW is expected to be 1.4% per annum over the next decade (Australian labour productivity is projected at 1.7%). However, similar to the sectoral composition of employment, there are considerable differences in labour productivity performance across the NSW economy (see Table 3.2).

One of the strongest productivity gains is in the manufacturing sector which is expected to have labour productivity growth of 4.2%. Much of this is expected to come from a continued shift to higher-value and less labour intensive manufacturing activities. It is in the manufacture of less complex goods where import competition is most fierce, most notably from emerging Asian markets.

<table>
<thead>
<tr>
<th>Table 3.2: Sectoral employment in NSW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2009-10</strong></td>
</tr>
<tr>
<td>000's</td>
</tr>
<tr>
<td>Agriculture, forestry, fishing</td>
</tr>
<tr>
<td>Mining</td>
</tr>
<tr>
<td>Manufacturing</td>
</tr>
<tr>
<td>Electricity, Gas, Water and Waste Services</td>
</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>Wholesale Trade</td>
</tr>
<tr>
<td>Retail Trade</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>Transport, Postal and Warehousing</td>
</tr>
<tr>
<td>Information Media and Telecommunications</td>
</tr>
<tr>
<td>Financial and Insurance Services</td>
</tr>
<tr>
<td>Rental, Hiring and Real Estate Services</td>
</tr>
<tr>
<td>Professional, Scientific and Technical Services</td>
</tr>
<tr>
<td>Administrative and Support Services</td>
</tr>
<tr>
<td>Public Administration and Safety</td>
</tr>
<tr>
<td>Education and Training</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
</tr>
<tr>
<td>Arts and Recreation Services</td>
</tr>
<tr>
<td>Other Services</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Source: Access Economics
Note: Growth rates show average annual growth over the decade to 2019-20.
Table 3.3: Sectoral employment in NSW — composite industries

<table>
<thead>
<tr>
<th></th>
<th>2009-10</th>
<th>2019-20</th>
<th>10-year change</th>
<th>Annual growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>000’s</td>
<td>000’s</td>
<td>000’s</td>
<td></td>
</tr>
<tr>
<td>ICT</td>
<td>157</td>
<td>183</td>
<td>26</td>
<td>1.5%</td>
</tr>
<tr>
<td>Tourism</td>
<td>161</td>
<td>178</td>
<td>17</td>
<td>1.0%</td>
</tr>
<tr>
<td>Creative industries</td>
<td>193</td>
<td>238</td>
<td>45</td>
<td>2.1%</td>
</tr>
<tr>
<td>Education and scientific research</td>
<td>242</td>
<td>282</td>
<td>40</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: Employment projections for the four composite industries are indicative. Projections are based on industry and occupational data using a range of sources. Estimates of the level of employment for Tourism and Education and scientific research are based on industry data. Estimates of employment for ICT are based on employment in ICT occupations. For creative industries, estimates are based on employment in creative industries and creative occupations in non-creative industries consistent with approach adopted by the CRC for Creative Industries and Innovation. The methodology and data used is outlined in Appendix C. Labour productivity growth in the composite industries is assumed to be the projected NSW average (1.4%) for the next decade (see Table 3.2). Growth rates show average annual growth over the decade to 2019-20.

Many service oriented activities show more modest productivity growth. For instance, productivity performance in the health sector is expected to be around 1.0% per annum in the next decade, far below the economy average. Many of these areas are relatively labour intensive and have more limited opportunities to improve productivity — at least within shorter term (say institutional) constraints. In such sectors, greater demand for services will therefore directly correspond with strong employment growth.

That said, enduring broad based productivity gains are possible going forward and, indeed, will be pivotal in raising overall living standards. Technological advancements, say from the NBN (discussed in Chapter 6), are expected to play a large part in driving productivity growth, especially in the delivery of human services.

3.5 Some key indicators

Some key indicators of the how the NSW economy will look in 2020 include:

- The NSW economy is projected to grow by more than 30% over the next decade.
- The number of NSW workers is expected to increase from around 3.5 million in 2010 to about 3.9 million in 2020.
- The State’s population will increase from around 7.1 million in 2010 to approximately 8 million in 2020.
- The State will also be older, with the average age of the population increasing from 39 in 2009 to 41 in 2020.
- The larger population will require more housing, and around 390,000 new dwellings are projected to be built in NSW over the next decade.
- NSW will also be more technically advanced, with high-speed broadband available throughout the State. Smart technologies will change the way services such as health, education, transport, electricity and water are used and delivered.
Importantly, achieving the projected growth in the NSW economy and population should not be taken for granted. Much will depend on putting in place appropriate policy settings, such as:

■ Ensuring adequate urban and economic infrastructure, particularly to meet NSW’s future population requirements.

■ Undertaking appropriate investments in skills development with a focus on ensuring workers are equipped to meet the challenges of a modern economy.

■ Developing responsive and flexible regulatory frameworks that can adapt to new circumstances, including those associated with the four mega-trends.

These issues are discussed further in Chapter 10.
Part II  Aspects of the mega-trends

Over the next decade and over the longer term, a number of mega-trends will profoundly influence the shape and performance of the NSW economy. Climate change policies, linkages with rapidly emerging economies in Asia, developments in information technologies and demographic changes will each give rise to various structural adjustments within NSW. This part of the report discusses the nature and characteristics of these transformational trends, how they are likely to impact on NSW (and Australia) and what industries are likely be most heavily affected.

How each of these trends will ultimately unfold cannot be established with certainty. In this regard, the natures of key uncertainties for each mega-trend are also explored through modelling of alternative scenarios. By describing a different way in which the uncertain aspects of the future could play out, these scenarios help frame the magnitude of sensitivities around the central case projections.
Climate change — both the physical impacts and the policy responses to mitigate them — will therefore provide a major long-term challenge for NSW. This chapter highlights key impacts, and in particular how climate change policies may affect various sectors of the economy over the decade to 2020.

4.1 Physical aspects of climate change

Climate change may affect the NSW economy through a range of effects including:

- reduced and more variable water supplies for agriculture (and maybe mining) both in the Murray-Darling Basin and along the coast;
- more frequent extreme weather-related events including heatwaves, hail storms, floods or surges of sea water;
- rising sea levels; and
- a rising snow line.

Such changes will have very important consequences for economic assets — notably land, water rights and buildings — and the usage and costs of water usage. They will affect patterns of land use and production and profitability in the agricultural and related sectors, particularly in regional NSW. They may also affect the availability of water for some mines.

Over the next decade, the major impacts on business from climate change itself may be felt in two areas in particular, namely:

- agricultural production; and
- services associated with extreme weather events, such as emergency services and insurance.

In each case, the effects of climate change appear to have been present over the past decade at least. For example, industry sources have indicated that reinsurance rates for weather related events began rising in the 1990s.

In the case of agriculture, the extent to which environmental changes will impact on NSW industry depends on the ability for the sector to adapt, including making adjustments in anticipation of tighter entitlement caps and reduced allocations on water extractions for irrigated communities within the Murray-Darling Basin.

These adverse consequences are likely to be mitigated to some extent by increasing demand from Asia for Australian agricultural products.
Other impacts, such as rising sea levels, are occurring over long time frames and are therefore outside the 10-year focus of this study.

4.2 Policy response to climate change

Climate change mitigation initiatives at the Commonwealth level currently centre on two key policies aimed at supporting the uptake of alternative energies.

- The Carbon Pollution Reduction Scheme (CPRS), incorporating a national emissions trading scheme (ETS), was designed as the cornerstone of the Australian Government’s climate change policy response and will impose a price on carbon. The Australian Government has announced that the scheme is to be introduced in 2013.

- The Renewable Energy Target (RET) is the main policy response that so far has been implemented nationally. The RET is designed to encourage the deployment of higher cost (and otherwise uneconomic) renewable energy generation by providing effective subsidies from high-emission generators and wholesale market purchasers. From January 2011, the existing RET scheme will be separated into two parts — the Small-scale Renewable Energy Scheme (SRES) and the Large-scale Renewable Energy Target (LRET).

A variety of other more targeted climate change policies to complement the CPRS has been, or will be, introduced at both federal and state levels. Complementary measures include: state feed-in tariff schemes for small-scale solar photovoltaic (PV) generators; a $500 million Renewable Energy Fund; a $500 million National Clean Coal Fund; the Green Car Innovation fund; solar and clean energy research programs (such as the $1.5 billion Solar Flagships demonstration program); and the NSW Energy Savings Scheme and Clean Business NSW policy.

Given time, the CPRS by itself should provide the incentive for a low emissions economy to develop in an economically efficient manner. The rationales for the RET and many of the complementary measures revolve around the notion that the price signals from the CPRS will be quite muted and that additional temporary measures are needed to bring forward the desired investments in a timely fashion. As a result, some of the most significant effects on industry over the next decade are likely to flow from the application of the RET and the various complementary measures and support for research and development activities.

4.2.1 Alternative energy development

CPRS and RET

Over the coming decade, the RET will provide the strongest encouragement for the development of alternative, low-emission technologies for electricity generation (see Chart 4.1). To date, new renewables generation across Australia has been concentrated in the relatively proven technologies of wind and solar PV generation. The latter has been given additional impetus through state and federal rebates and the introduction of feed-in tariff schemes.
There are numerous potential sites for wind farms in NSW (the NSW Department of Environment, Climate Change and Water has identified a number of ‘renewable energy precincts’), and the RET provides a strong incentive for these options to be thoroughly investigated. A relevant example includes the proposed Silverton wind farm project near Broken Hill which has a planned capacity of over 1000MW.

However, greater opportunities exist in Victoria and South Australia to contribute wind-generated electricity to the National Electricity Market (NEM) and this will inevitably lead to a change in the balance of relative state contributions to NEM generation in favour of these two states.

Wind power, however, is not suitable for base load generation. At present, natural gas is the only alternative to coal for base load generation that has been shown to be commercially viable (at least at the levels generally envisaged for the price on carbon emissions).

Coal seam gas (CSG) appears to present a commercially viable opportunity for NSW, as already demonstrated in a number of local projects in Queensland. NSW current lags Queensland in the development of its CSG resources, but the technology is very prospective. Indeed, CSG from, for example, the Gunnedah Basin could well come on-stream at a commercially viable scale well before 2020. Santos has invested $476 million to buy CSG resources in the Gunnedah Basin.

At the same time, the coming decade will be important for assessing how well NSW is placed to exploit various renewables technologies that could provide base load generation into the
The NSW economy in 2020

future. For example, geothermal or large-scale solar thermal technologies will not be developed sufficiently to contribute to the policy effort by 2020 but NSW industry is well placed to play a part in the research and development effort over this period.

Although still in the early stages of development, the most prospective low emissions option for base load generation is carbon capture and storage (CCS). In fact, one of the reasons why modelling of the economic impact of climate change policies designed to achieve significant reductions in emissions by 2050 find that the costs should be manageable is the assumption that CCS is deployed on a commercial scale from the mid-2020s.¹

The development of CCS and CSG technologies and opportunities has particularly significant implications for the future of employment and growth in the NSW coal-mining region of the Hunter Valley.

**Complementary measures and research**

In terms of low emission electricity generation, a substantial amount of research activity is currently being undertaken in NSW. This includes research programs at the CSIRO, the Centre for Energy and Environmental Markets at the University of NSW, the Institute for Sustainable Futures at the University of Technology, Sydney and the Newcastle Institute for Energy and Resources at the University of Newcastle with a particular focus on basic research.

The RET also encourages participation in emissions reduction at the household level through eligibility under the scheme of solar and heat pump hot water units (although the latter is currently under review) and small-scale solar PV generators. These will make a significant contribution to achieving the RET target, and provide some growth and employment opportunities in NSW through manufacture and installation. It will also encourage additional industry innovation in these areas. This is evidenced, for example, through new product lines pursued by Rheem and Dux — the two largest water heater manufacturers, which are located in NSW. In addition to the RET, complementary policies such as rebates and feed-in tariff schemes, operated chiefly at state level, provide additional stimulus to these industries.

A more detailed analysis of the specific industry opportunities arising from climate change policies, including in renewable energy, is being separately undertaken by Ernst & Young.

### 4.3 Impacts of a carbon price

Modelling was undertaken based on a CPRS-25, in combination with the RET and an international trading scheme, leading to a carbon price of around A$50 per tonne of CO₂-e at 2020. The free allocation of permits for emissions intensive trade exposed (EITEs) industries, provided for under proposed transitional arrangements in the CPRS, was assumed not to exist given international participation in emissions reductions.

The NSW sectors most likely to be impacted, relative to a no-mitigation scenario are:

- thermal coal and coking producers;
- aluminium;
- electricity; and
- petroleum products.

For NSW, the industry impacts of the CPRS and RET to 2020 and beyond will be felt primarily by the electricity generation sector and coal industry, as well as by sectors that are intensive users of energy, such as metal processing. NSW has exposure to a number of sectors that will be heavily impacted by a carbon price, such as steel production.

Structural adjustments in NSW’s electricity generation over the next decade will be limited with the existing suite of coal-fired base load generation still likely to dominate the electricity market until 2020, being gradually displaced by lower-emission gas-fired as well as wind generation (Chart 4.2).

**Chart 4.2: Composition of energy generation in NSW under CPRS-25**

Source: Access Economics

**Industry impacts**

While mitigation policies are seen as imposing manageable aggregate costs on Australia, there is wide variation in the impact across sectors. The key drivers of sectoral impacts are:

- the relative emission intensity of goods and services across the economy;
- the degree of trade exposure;
- the emission intensity of Australian production compared with overseas producers;
- potential mitigation options; and
- the relative price elasticity of demand.

The coal industry, especially coking coal, will be protected to a large extent by strong demand in export markets. Metal manufacturers may not have such protection.
For emission intensive trade exposed sectors, impacts will be determined largely by the global emission price, changes in global demand for the relevant product, changes in the exchange rate and the relative emission-intensity of global producers. For other sectors, relative emission-intensity across the domestic economy, general macroeconomic impacts and technology options will be critical.

Many other traded low-emission sectors could benefit from the (relatively) lower exchange rate that would result from the CPRS. In the absence of the CPRS (and associated global emission reduction commitments), Australia’s terms of trade would likely be higher, primarily due to unmoderated global demand for energy resources. These potential benefitting sectors include: wood products, textiles, clothing and footwear, chemical manufacturing, non-energy mining like gold, dairy and grains. Australia is likely to lose competitiveness where its production is more emission-intensive than its competitors.

4.4 Key uncertainties

In addition to the uncertainties surrounding new technologies, NSW industries and the economy at large are subject to uncertainties relating to climate change via:

- the prevailing price on emissions; and
- the treatment and protection of emissions intensive trade exposed (EITE) industries under the CPRS.

The carbon price

The most pervasive impact of climate change policies on NSW industry will be driven by the carbon price, which is highly dependent on the final details of the CPRS and the levels of international policy action and trading.

Assuming that international trading in permits begins before 2020, the carbon price in Australia will reflect the world price, with those producers required to purchase permits being able to do so in a global market.

The world price for carbon emissions will depend on the nature of the commitments made by major emitting economies, and especially on:

- how tight and how firmly applied are the commitments made by developed economies including the United States; and
- whether China has a scheme in place by 2020 that is considered suitable for its permits to be accepted in an international market.

The impact of an increase in the carbon price from $50 to $80 per tonne of CO₂-e at 2020 has been examined. The broad macroeconomic impacts on the NSW economy are shown in Table 4.1 and the sectoral impacts are presented in Chart 4.3.

An increase in the carbon price to $80 per tonne of CO₂-e is projected to reduce economic output by 2.0% or approximately $10.4 billion at 2020 compared with the central case. In relative terms, this impact is marginally lower for NSW than for the national economy (-2.3% in GDP at 2020), reflecting the lower emissions intensity of NSW’s industry structure.
Under a higher carbon price scenario there are broad-based structural implications for the NSW economy. Almost all sectors of the economy experience a decline in output relative to the baseline, including service based activities like finance, health and retail activities.

The greatest impacts are seen in more emissions intensive sectors such as electricity generation, mining and metal manufacturing. For instance, thermal coal production is projected to decline by over 15% relative to the central case driven by reduced export demand and lower domestic electricity generation requirements.

A notable aspect of the higher carbon price concerns the relatively small impact on iron and steel production in NSW, compared with a more significant contraction in aluminium production. This essentially reflects differences in the relative emission intensity of both activities.

Aluminium production worldwide is concentrated in areas where cheap energy is available, including countries such as Canada, Brazil and New Zealand where these industries heavily rely on hydroelectricity. A higher carbon price will significantly drive production away from areas where aluminium production is based on fossil fuels, like in NSW, to countries which can utilise low emission production techniques.

Conversely, for iron and steel production, this emission intensity differential operates in the other direction and may actually favour producers in NSW and Australia. For instance, many iron and steel mills in China have low efficiency by global standards, being smaller in scale and based on outdated furnace technologies. Accordingly, they will be affected to a greater degree under a higher carbon price compared with more efficient producers, say in NSW.

Transitioning to a carbon constrained economy is expected to open up new opportunities in greener industry activities such as renewable energy generation and energy efficient construction services. However, much will depend on establishing certainty on major climate change policy initiatives like the CPRS in order to facilitate longer term business investment and entrepreneurship.

The higher carbon price under this scenario would clearly present significant challenges for government and industry. The structural adjustment pressures are potentially severe and managing an overall reduction in employment, particularly where heavy industry is concentrated (for example, the Hunter) will be crucial.

<table>
<thead>
<tr>
<th>Table 4.1: Higher carbon price scenario — impacts at 2020</th>
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<tbody>
<tr>
<td>NSW</td>
</tr>
<tr>
<td>---</td>
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<tr>
<td>GSP/GDP</td>
</tr>
<tr>
<td>Household consumption</td>
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<tr>
<td>Government consumption</td>
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<tr>
<td>Exports</td>
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<tr>
<td>Imports</td>
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<tr>
<td>Investment</td>
</tr>
<tr>
<td>Employment (‘000 FTE)</td>
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<tr>
<td>Real wages</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: Impacts are based on an increase in the carbon price from $50 to $80 per tonne of CO₂-e at 2020.
Chart 4.3: Impact of $80/tCO$_2$-e carbon price on gross value added at 2020

Source: Access Economics
Note: Chart depicts the change in GVA by sector at 2020 relative to the base case involving a carbon price of A$50 t/CO$_2$-e.
Treatment of emissions intensive trade exposed sectors (EITEs)

While not specifically modelled, the extent of ‘free’ allocations of permits to EITEs, as well as the extent of mitigation in export and import-competing markets, will determine the degree of impact on these sectors. Some firms potentially face losing investment and resources due to their reduced competitiveness under a CPRS. For NSW, the most vulnerable firms are in metals manufacturing.

Regardless of the extent of initial support for EITEs, this support would be withdrawn over time, so firms would still need to adapt to a carbon price over the longer term.

Implications for NSW — climate change

- The physical impacts of climate change will pose particular challenges for water and land use. Water availability in the Murray-Darling Basin will reduce and become more variable. This will place greater impetus on agricultural producers improving their water efficiency and drive a shift to higher-value agriculture.

- Near term economic activity in response to climate change will be mostly driven by various complementary policy instruments. This will generate increased activity and innovations in renewable energy generation and energy efficient construction services.

- Gas fired generation, potentially fuelled by coal seam gas, will be crucial to meet baseload electricity requirements to 2020. Beyond this timeframe, longer term investments in baseload generation will be needed. The most prospective baseload technologies are likely to include carbon capture and storage (CCS), geothermal and large-scale solar generation.

- Metal manufacturing in NSW will be particularly vulnerable from climate change. However, there is considerable uncertainty regarding the precise treatment of this and other emissions-intensive industrial activities under a domestic emissions trading scheme, particularly over the next decade. Because of the strong possibility of differential climate change policy being adopted internationally, much will depend on the level and timing of support given to emissions intensive trade exposed sectors.
Emerging economies have contributed more to global economic growth than advanced economies in recent years and are likely to continue to do so. Importantly, the two largest emerging economies, China and India, have substantial and increasing appetites for many of the goods and services that NSW exports. Emerging economies also provide a wide range of relatively cheap manufactured imports to NSW and investments in NSW businesses, albeit from a low base. In some areas, the NSW economy and emerging economies are direct competitors. Consequently, the shape of the NSW economy in 2020 will be influenced in a number of ways by its links to emerging economies.

The economies of China and India held up well through the global financial crisis and subsequent economic downturn. This is partly due to the limited direct links to global financial markets and their governments’ strong stimulus spending on infrastructure. It also serves to emphasise the potential for continued rapid development as these countries progressively lift per capita GDP levels towards those seen in the developed world. Importantly for the NSW economy, strong growth and further development in China and India look set to continue in the decade ahead.

The prominence of infrastructure, construction and, in the case of China, in the growth of emerging economies translates into their assuming a large and growing share of the world’s raw materials. This means future demand for commodities will stay strong and commodity prices remain well above their historical averages (although they may fall some way from their current highs). Also, the rise of the middle class in emerging economies will affect consumption patterns; higher incomes allow consumption of higher value-added products and services.

Chart 5.1: GDP growth for China and India
Therefore, emerging economies are a valuable market for trade with NSW, not only in the form of resource and agricultural exports but also services such as education, finance and tourism.

The links are not all one way; NSW benefits from importing competitively priced manufactured goods, especially from China. Also, China and India are sources of investment, to develop NSW resources. High levels of domestic saving in emerging economies will provide a large pool of funds for investing in projects around the world, including potentially in NSW, over the next decade.

At the same time, development of emerging economies will enable them to compete in some sectors with more advanced economies, including Australia.

Consequently, some domestic industries will flourish and may be able to take advantage of new opportunities that arise, but others inevitably will decline, permanently transforming the structure of the NSW economy.

### 5.1 Patterns of growth in China and India

The composition of Chinese and Indian growth over the next decade will be important in determining their influence on the NSW economy.

In China, the strong economic performance of recent years has been driven by exports and investment-oriented growth. High levels of construction and investment have been supported by growing export volumes of manufactures, while consumption has accounted for a smaller component of economic growth.

Those trends suggest that the Chinese economy may be quite unbalanced. In particular, China has very high saving and investment rates (at around 45% of income) — a result which is likely due to:

- an underdeveloped financial system;
- limited social security; and
- lags in spending catching up to higher income levels.

In addition, the subsidisation of electricity and food prices in China may also be encouraging an overconsumption of resources. China currently accounts for 20-40% of the world’s consumption of many energy and industrial commodities, a pattern which will change as the economy develops over time.

Importantly, China is already embracing new technologies. Across many areas, labour-intensive production is being replaced with new processes, allowing the country to skip stages of development by importing and adapting technology from abroad. China has also been committing resources to its own research and development industry.

Services and institutional development in China are still relatively immature. Legal and regulatory systems are generally not well-defined, making it difficult for foreign companies to operate effectively in the domestic market. While the financial sector has been subject to significant reforms over the past 10-15 years, it is still highly regulated.
Looking ahead over the next decade, it is expected that the focus of the Chinese economy will remain on construction and infrastructure. Despite the large spending in these areas over the past decade, the gap to improve standards toward levels seen in more advanced countries remains large. The manufacturing sector is likely to continue to make advances in high technology production, while a greater emphasis on the environment and conservation may see funding for emissions reduction or less energy-intensive construction. The development of the domestic services sector across areas including education, finance and business may increase international competition for foreign companies, particularly in the Asian region.

The Indian economy is currently far less advanced than China’s overall, with a lower level of income per capita. India enjoys a number of important economic successes in industries such as information technology, software, call centres and back office functions for the banking and financial services sectors. These benefits are particularly notable in centres such as Mumbai, Bangalore, Hyderabad and Delhi.

Despite relatively high education levels and the widespread use of the English language, India ranks relatively poorly on the World Bank’s *Ease of Doing Business* rankings. In 2009, India was ranked 133 out of 181 countries, suggesting that the regulatory environment is not conducive to business operation (in contrast, China was ranked 89 in 2009).

Looking forward, the Indian economy may struggle to contain a current account deficit of more than 2% of GDP which has the potential to periodically hamper growth. The service sector accounts for a relatively large proportion of economic growth in India. The contribution of services to GDP was more than 60% between 2000 and 2006 (ADB 2006). However, it is not clear if the export of services will provide a reliable driver of growth over the long term.

Despite those difficulties, past reform successes from the early 1990s and a focus on improving development and infrastructure will help to lay a platform for robust growth over the next decade.

For NSW, economic growth in China and India over the next decade present a number of opportunities, including for the export of commodities (particularly coal), services related to infrastructure (such as engineering, architecture, building and business services) and education. Future income growth may also generate opportunities for the NSW tourism sector. The further development of the Indian services sector may also represent competition for NSW firms.

### 5.2 Trade and investment linkages

Developed economies currently account for the bulk of NSW’s trade and investment flows. However, Australia’s location in the Asia Pacific region provides opportunities for NSW to tap into the faster growth of regional emerging economies — principally China and India.

In fact, the pace of industrialisation in high growth emerging economies is producing a marked increase in their relative importance in the global economy. Growth rates in China have been particularly high. Indeed, the Australian economy’s resilience in the face of the recent global financial market and economic downturn was helped by its trade ties with the robust Chinese economy.
NSW has key linkages with rapidly growing China and India. In 2008-09, China was the State’s largest trading partner, with bilateral merchandise trade amounting to $20.5 billion, while corresponding trade with India was $2.1 billion (ABS 5368.0).

NSW’s major merchandise exports to emerging economies are coal, oil, copper, zinc, wool, yarn, fabric and aluminium, while imports comprise electrical machinery, machinery, woven apparel, toys and sports equipment.

Coal is an especially important export for NSW. At the April 2010 price reset, coal prices increased on the back of strong demand from China and India. Coking coal contract prices are up strongly on last year, with some producers achieving prices of up to $200 per tonne. Thermal coal, used in electricity production, also experienced rises of the order of 40% in recent annual contract negotiations. Importantly, China became a net importer of thermal coal for the first time in 2009, while India doubled its volume of imports in the last financial year. In 2010, India also committed to $500 million investment in Illawarra coal mines for direct export to India.

Infrastructure investments will assist NSW in making the most of the increased resource prices. Recent improvements to the capacity and efficiency of the coal export supply network will increase the economic benefit for NSW through easing supply constraints. For example, rail and port facilities such as the Kooragang Island coal terminal off Newcastle will boost export capacity over time.

This capacity expansion is likely to provide a considerable boost to the NSW economy, lifting the contribution of coal exports to growth over time. The upgrade of port facilities will increase coal export capacity in NSW from around 117 Mt pa in 2010 to 211 Mt pa in 2020, a rise of more than 80%. Holding the coal price constant at its 2010 level, and given the lift in export volume capacity to 211 Mt pa, the annual value of coal export capacity from Newcastle
The NSW economy in 2020 is projected to rise from around A$12 billion in 2010 to A$22 billion in 2020. This represents an increase in the share of coal exports from approximately 3.1% to 4.3% of Gross State Product over 10 years.

Trade connections to emerging economies are by no means limited to the resources sector. Austrade data show that in 2010, 23% of Australian exporting small and medium enterprises (SMEs) trade with China, indicating diversity in trade ties and products.

NSW accounts for just over 40% of Australia’s services exports in areas such as education, finance, tourism and legal and professional services. In particular, among Australian states, NSW is:

- a significant provider of education services for international students;
- the dominant exporter of financial and business services; and
- attracts the most international tourists.

With Australia’s relatively stable and regulated financial system, a high world ranking for political stability, financial institution transparency and intellectual property protection, Sydney’s strong financial sector ensures NSW is able to provide an economic environment conducive to expansion in financial services exports to emerging economies. These high value added sectors will continue to experience increased demand from emerging Asian economies while their own sectors mature.

While this demand is expected to grow over the next decade, such an outcome is not a foregone conclusion. Visa applications have been soft in recent times, partly affected by increased competition from the United States in higher education provision. The stronger Australian dollar, which raises living expenses for international students, has also dampened demand.

5.3 How these global forces affect NSW

There are two sides to the story of trade linkages with emerging economies. On the one hand, industrialisation will support demand for NSW’s goods and services and encourage the State’s economic growth. Indeed, exports of goods from NSW to China and India have risen sharply over the last two decades (see Chart 5.3). However, competitive forces from emerging economies on the global market could challenge NSW’s future position and comparative advantage. Development of these economies could improve their ability to compete with NSW businesses in areas such as information and business services. With these challenges will come new opportunities, and these will affect the structure of the NSW economy in 2020.

Overall, however, the continued strong growth in emerging economies should provide clear net benefits to the NSW economy over the coming decade.

5.3.1 A boost to demand

Strong demand for NSW’s minerals resources provides jobs, income and royalties to the State economy. As China and India develop, they will in time diversify production to activities that are less reliant on resources than is currently the case. However, as outlined above, for the next decade at least, infrastructure and manufacturing will remain fundamental to growth with sustained high demand until income levels are markedly higher.
Infrastructure shortfalls have prevented NSW from taking full advantage of the increased demand for the State’s mineral resources and continue to do so. The expansion of capacity at the coal loading facilities in Newcastle, and the planned further extensions, will help to realise more of the potential earnings. They should also serve as a potent reminder of the need to ensure that adequate infrastructure is put in place in a timely manner to take full advantage of any future opportunities that may arise in the resources sector, or in any other part of the NSW economy.

**Terms of trade**

This demand for resources will also have the effect of lifting Australia’s terms of trade. As shown in Figure 5.1, the terms of trade are expected to ease from its current heights in the coming decade as supply constraints ease and production is better able to meet demand. However, they are expected to remain at an elevated level compared to those seen prior to 2005, sustained by emerging economy demand.
Potential consequences of the terms of trade remaining high are increased imports and volume of trade, and movement of capital and investment towards resource industries and away from others.

The boost to national income from the terms of trade will also support the Australian dollar. In the baseline scenario, the Australian dollar is assumed to settle at a little under US$0.80 as the supplement to income from resources offsets other areas of weakness in Australia’s current accounts, as shown in Figure 5.2.

While the high terms of trade and exchange rate are often criticised for being dampeners on the economy, through crowding out of investment and expansion of some sectors at the expense of others, there have been upsides as well. The RBA has pointed out that the terms of trade effect has in fact boosted income to the whole economy and not just the resource sectors. Additionally, around 45% of Australian exporters are also importers, and hence the higher exchange rate would have reduced supply costs by increasing purchasing power.
The overall impact of the growth in emerging markets has been a net positive for the NSW economy — for example, through increased demand and higher prices for the State’s mineral resources — but, it has helped some other jurisdictions more.

5.3.2 Rising middle class incomes

China and India have reached a stage of development where their middle classes are growing rapidly. This change of itself will affect their relationship with the NSW economy. As per capita income increases, tastes and preferences for goods and services change. Typically, this change boosts the level of consumption, but also involves generally moving from low-value added products to higher-value added products. For NSW, the industries likely to benefit from the growth of the middle class in emerging markets include higher value-added agricultural products and services.

The Asian Development Bank (2005) predicts that China’s middle class — households with assets of between US$18,000 and US$36,000 in 2005 dollars — will grow to almost 500 million by 2020. McKinsey (2007) estimates that over the next two decades, India’s middle class will grow rapidly — from 5% to 40% of the population — and help to create the world’s fifth-largest consumer market.

Higher value-added agricultural products include those that may consume more water or energy in their production, such as beef and dairy and some horticultural products. Note that due to climate change, it is important to try and ensure water rights for these types of exports if the opportunities that arise are to be taken advantage of.

Amongst the various services sectors likely to be affected by rising incomes, a few stand out, namely education, tourism, construction and financial and business services. These are outlined below.

Education

China and India are investing a lot of resources in developing their education systems. However, it seems unlikely that they will be able to meet future demand, especially for university education, because of the difficulty of training large numbers of suitably qualified teachers. A bigger issue is how the NSW and Australian university sectors cope with the anticipated increase in demand for places from China and India without compromising on the quality of the education experience.

Strong demand for education services from international students (see Chart 5.4), particularly China and India, has boosted the NSW economy in recent years and generated spin-off demand for other sectors of the economy, including the retail trade, and restaurant sectors of the economy. In 2010, over 160,000 international students were enrolled in NSW educational institutions.

The higher education sector in NSW experienced strong growth over the last eight years, recording 61,147 international students in 2010. However, the highest growth was seen in the Vocational Education and Training (VET) sector which surpassed the higher education sector by number of enrolments in 2008.
The NSW economy in 2020

Chart 5.4: International student enrolments in NSW

[Graph showing enrolments in NSW over time for higher education, VET, ELICOS, schools, and other categories.]

Source: Australian Education International
Note: Data presented are enrolments of international students and not student number counts.

In terms of exports, international students travelling to NSW for education purposes in 2009 contributed $6.76 billion to the State economy (see Chart 5.5). In that year, NSW received around 38% of the national export value (approximately $17.99 billion) from international students.

Chart 5.5: Exports of education services

[Graph showing exports of education services from 1999 to 2009 for NSW and Australia.]

Source: ABS Cat No. 5368055004 International Trade in Services
The composition of international student enrolments in NSW and Australia for the top 10 nationalities is shown in Table 5.1. China and India have the highest number of enrolled students, with around 49,000 and 17,000 respectively.

Table 5.1: International student enrolments by nationality, 2010

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<tr>
<th></th>
<th>NSW</th>
<th>Australia</th>
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<tbody>
<tr>
<td>China</td>
<td>49,273</td>
<td>123,257</td>
</tr>
<tr>
<td>India</td>
<td>17,041</td>
<td>76,294</td>
</tr>
<tr>
<td>South Korea</td>
<td>11,464</td>
<td>24,783</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3,194</td>
<td>20,167</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>6,105</td>
<td>18,798</td>
</tr>
<tr>
<td>Thailand</td>
<td>9,955</td>
<td>16,302</td>
</tr>
<tr>
<td>Nepal</td>
<td>10,651</td>
<td>16,225</td>
</tr>
<tr>
<td>Indonesia</td>
<td>6,035</td>
<td>13,331</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2,908</td>
<td>9,527</td>
</tr>
<tr>
<td>Brazil</td>
<td>4,604</td>
<td>9,207</td>
</tr>
<tr>
<td>Other nationalities</td>
<td>43,293</td>
<td>123,125</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>164,523</strong></td>
<td><strong>451,016</strong></td>
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</tbody>
</table>

Source: Australian Education International, student enrolment data 2010

NSW has a strong base from which to expand its export of education services, especially to emerging Asia. While China and India are both investing aggressively in their educational institutions, the extent of growth of their middle classes means that their efforts to increase the supply of education services will struggle to match demand. The export of education services could expand for upper secondary schooling, universities and vocational training.

The demand for education services from emerging economies over the next decade is expected to strengthen as these countries move to ‘up-skilling’ their workforce in anticipation of transitioning to higher value add economies. China’s construction boom will require a substantial number of engineers and architects, while India’s move into high value computer equipment and software manufacturing will increase the demand for IT (and MBA) qualified workers. Underlying this is the continued demand for English literacy — English remains the language of international business and demand will continue as China and India industrialise.

However, government immigration policies will have a significant impact on the export of education going forward. The recent changes to student visa regulations and the narrowing of the skilled migrant occupation list have had serious repercussions for commencements in English language courses, particularly in the key Chinese and Indian markets. This will have further implications for other higher education providers as around 65% of English language students on student visas continue their study in the vocational or university sectors.

The vocational training sector also needs to address quality issues, to be able to capitalise on the opportunities. Parts of the sector have gained a reputation as merely providing convenient back-door ways to gaining Australian citizenship, rather than as providers of quality education and improved employment prospects.
Tourism

There has been a downward trend in tourism numbers in the past decade. This partly reflects a relatively high base in the late 1990s and around the Sydney Olympics and, more recently, the strength of the exchange rate.

However, it is also due to changing preferences of particular types of tourists. To tap into the expected increase in tourists from China and India, operators need to devise packages and attractions that will appeal to these groups.

Construction services

There appears to be lots of potential for construction and building services professionals and firms to expand in Asia. The infrastructure requirements of these economies are huge. Australia has world renowned expertise in building, design, architecture and engineering helped by the strong domestic base where the necessary skills and techniques can be developed. For example, the Government of India’s Planning Commission estimates annual infrastructure requirement is around US$150 billion (Chart 5.6).

![Chart 5.6: India’s planned investment requirements, 2011](chart)

Source: Asian Development Bank 2009

Financial and professional services

Australian firms doing business in Asia are able to capitalise on the skills of the local workforce. A lot of work is being done in Asia, especially to help facilitate overseas companies doing business in Asia. There will be increased demand for these services as per capita incomes increase, but also increased competition (see Section 5.3.3).
5.3.3 Competitive forces

The growth of an educated middle class in emerging economies will provide competition to the NSW economy. Rapid industrialisation, combined with a large labour force, makes the emerging economies powerhouses for manufacturing, particularly for goods with low value added. However, in higher value-added industries and some niche markets in the professional arena too, emerging economies may directly compete with NSW firms.

Manufacturing

An area of growing competition for NSW is from the emerging economies investing heavily in business innovation and in new systems of management and production, to capitalise on their abundant supplies of cheap labour. The number of companies from Brazil, India, China or Russia on the Financial Times 500 list has more than quadrupled from 2006 to 2008, from 15 to 62 (The Economist 2010).

Emerging-country companies are no longer relying on traditional Western models of business, but are investing in new business models that reinvent systems of production and distribution, recruitment and retention. Their models cater for the need to direct production not only towards their booming domestic markets, but to appeal to all levels of the income pyramid that includes the rising middle class from the metropolises in China and India, to the billions of workers and farmers living in rural areas.

These business models are leading to the production of more advanced products that are both of a higher quality and cheaper. Some of the most important innovations have not been revolutionary breakthroughs in new products, but rethinking existing products aimed at the middle or bottom of the income pyramid.

Although Australian companies might not be competing directly on the production level, emerging companies are attracting a larger amount of foreign investment. Foreign investors are increasingly willing to move money around the world in search of highest returns. Western multinationals are investing heavily in emerging markets as they regard them as the hotbed of economic growth and brainpower. In addition, they are more inclined to do their research and developing in emerging markets, as opposed to conducting their research at home and production overseas.

To retain a competitive edge, NSW needs to focus on higher value added manufacturing as opportunities will continue to exist for innovative and high quality products despite the higher Australian dollar and increased competition. Niche market products and more advanced and creative manufacturing techniques continue to set products apart from the mass-produced output in which emerging economies have a comparative advantage.

Services

In the next decade, emerging economy development could begin to provide greater competition for NSW goods and services. Advancement of their economies and further shifts into higher value manufacturing and services will raise competitive challenges for the domestic industry, particularly in areas where a sizeable skilled labour force could exceed our own.
In particular, as outlined above, India already has a strong position in export markets for many service industries including software, back offices for financial firms, call centres and other activities that lend themselves to be outsourced remotely. This will provide a solid base for Indian companies to expand, both at home and internationally. It may mean that more niches of activity currently conducted in NSW are outsourced to India, especially where proximity to the customer does not matter.

Sydney is also likely to face competition as a regional financial centre. It seems likely that Chinese and Indian firms will continue to dominate providing services to their local markets for financial services. In this sphere, knowledge of local laws, customs and systems will be important.

For cross border services, however, Australia is likely to maintain its comparative advantage in reputation, transparency and the quality of the regulatory system. Sydney is well placed to continue to be a major regional financial centre for the coming decade at least and could expand a range of services exports in areas such as funds management or advisory services — that is, to be an off-shoring destination for higher value activities.

Despite such competitive threats, the net outcome for NSW is expected to be positive as competition will encourage domestic resources to be move to more profitable sectors of the State’s economy.

5.4 Uncertainties and risks

While the mining boom has been largely beneficial for NSW, it also has the potential to expose the economy to volatility in the commodity markets. The central case for the Chinese and Indian economies over the next decade is for strong growth.

In the near term, uncertainty surrounds China’s growth path due to concerns that the pace of growth is unsustainable and that parts of the Chinese economy may be overheating. To the extent that China’s resource imports have increased due to government stimulus or stockpiling when prices were relatively low in 2009, there are risks as the effects of stimulus ease. This could result in a substantial fall in commodity prices, against which the NSW economy is vulnerable given its degree of reliance on resources as a source of export income.

While the near term risks may not materialise, managing the pressures unleashed by the longer term transition to a developed, open economy will continue to pose a threat to China’s economy through to 2020 and beyond. In particular:

- the disparity between incomes and living standards between the booming coastal regions and the inland is causing unrest that periodically boils over;
- the imbalance between high savings and excess investment on one hand and low consumption on the other is causing strains; and
- the lack of a freely floating exchange rate creates imbalances globally as well as making domestic demand management more difficult.

These longer term pressures may cause a correction in growth at some stage in the next decade. Potential slowing of growth, and more importantly, the possibility of volatile or disrupted growth, could have significant impacts on China’s trading partners. These in turn could significantly reduce the profits of, especially, resources sector companies leading to cuts
in domestic production and jobs in both NSW and other states. However, over the short-term this scenario is considered unlikely and Chinese growth is expected to remain strong with government policies firmly focused on continued investment in construction and equipment.

Domestic demand in India also remains strong despite a dip in the economy in 2009 as a result of the global financial crisis. India's outlook is for continued strong economic growth over both the short and longer term with the three ingredients of population, (workforce) participation and productivity all expected to increase robustly over the next decade.

Nevertheless while NSW can reap the benefits of strong ties to emerging economies, caution should nevertheless be exercised against becoming overly reliant on these economies as a source of stimulus.

5.5 Sensitivities

The impact to the NSW economy from changes in export commodity prices has been specifically examined. One modelling scenario explored what would happen if commodity prices increase by 30% compared to the central case. Under this scenario, the rise in commodity prices occurs over a number of years and is fully implemented in the simulations by 2015, with further adjustments taking place throughout the economy in the latter years leading up to 2020.

A lift in commodity prices 30% above that in the baseline scenario is projected to have a significant impact on the NSW economy. This is evidenced in recent economic performance. Between 2005 and 2008, higher commodity prices generated a higher terms of trade and higher exchange rate in Australia, resulting in 'two-speed' economy effects. These effects were relevant both geographically (with stronger economic growth recorded in mining States such as Western Australia and Queensland), and compositionally (with mining and construction contributing a larger share of total output at the expense of other activities like manufacturing).

Looking forward, the structural implications for the NSW economy from higher commodity prices are shown in Chart 5.7 below, while the broader macroeconomic effects are presented in Table 5.2.

NSW mining sectors such as coal, alumina and other non-ferrous metals clearly benefit from a sharp lift in commodity prices. Higher commodity prices improve the profitability of mining activities and encourage an increase in output and investment. These sectors are projected to see a pronounced increase in the value of output of around 10-15% at 2020 compared with baseline projections. Output in related industries such as construction and electricity distribution are also expected to increase under such a scenario.

Conversely, the associated shift in the exchange rate (in which the Australian dollar appreciates by around 4.6%) impacts negatively on other trade exposed sectors such as manufacturing and agriculture. These sectors broadly experience a fall in the value of output of around 1-4% at 2020.

As shown, higher commodity prices accentuate the two-speed economy conditions, causing the effects to be felt more acutely. Importantly, while that would likely mean growth in NSW would be slower than in more resource-intensive states — which will continue to attract more
mining related investment and labour resources — growth in NSW would still be higher in an absolute sense and the overall effect would therefore be positive. Indeed, under such resource market conditions, GSP is projected to be 0.5% higher or around $2.3 billion compared with the central case.

There are, as indicated in the scenario modelling, a number of benefits flowing from increased commodity export revenues. A higher terms of trade, as implied with higher commodity prices, allows more imports to be purchased for a given amount of exports. This increase in real purchasing power would provide important broad-based benefits for many sectors of the NSW economy, including retailers.

Such activity also has key wealth implications. Buoyant economic conditions are generally reflected in higher valuations for a range of asset classes, including equities and real estate. This adds to overall household wealth and further supports demand. Moreover, associated increases in government tax receipts also benefit NSW households — say by helping fund tax cuts or additional government initiatives.

While a sharper ‘two-speed’ economy effect resulting from higher resource prices would likely have an overall positive impact, it will also give rise to some key policy challenges. Perhaps foremost will be to effectively manage the structural adjustments away from lower value trade-exposed activities (such as certain types of manufacturing and agriculture) towards more competitive higher value areas. In many respects, such transition is already well underway irrespective of the precise level and duration of any prevailing commodity price increase. That said, higher prices may well accelerate this process, potentially leading to more acute transitional pressures emerging.

Higher commodity prices will also place an increased onus on ensuring NSW’s mining export infrastructure chains are expanded in a timely and efficient manner. Indeed, forgone opportunities from infrastructure bottlenecks will be larger, the higher commodity prices rise. In this regard, the sufficiency of capacity investments will be pivotal in maximising the export and revenue opportunities from extraordinarily high (by historical standards) commodity prices while they persist.
Chart 5.7: Impact of 30% rise in commodity prices

Source: Access Economics

Note: Chart depicts the change in GVA by sector at 2020 from a 30% increase in commodity prices relative to the base case.
The NSW economy in 2020

Table 5.2: Higher commodity price scenario — impacts at 2020

<table>
<thead>
<tr>
<th></th>
<th>NSW</th>
<th>% change</th>
<th>Australia</th>
<th>% change</th>
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<tr>
<td></td>
<td>$billion</td>
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<tr>
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<td>-</td>
<td>0.9</td>
<td>-</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Source: Access Economics

Implications for NSW — emerging economies

The rapid expansion and development of emerging economies, especially China and India, will have a significant bearing on the NSW economy in the decade to 2020. There are many potential benefits, but also some significant challenges, such that:

- The net impact on the NSW economy is expected to be positive, due to the increased demand for locally produced goods and services.

- The impact will not be distributed evenly, resulting in a ‘two-speed’ national economy. Other resource-intensive states will attract more capital and labour resources; and demand for commodities will tend to push up the exchange rate, causing difficulties for some trade-exposed sectors.

- Ensuring adequate export infrastructure will be essential to maximise opportunities from emerging markets as they arise. A critical area will be in further developing coal export capacity at Newcastle.

- Economic development in emerging economies, including growing middle class populations in China and India, will also present opportunities for service exports in areas such as building and construction, environmental services and education.
The NSW economy in 2020

6 The information economy

The development and implementation of advanced information and communication technologies (ICTs) over recent decades has transformed societies and economies around the globe, enabling people to more rapidly exchange information.

Improved access to information through the use of ICTs enhances decision-making, reduces search costs, improves competition, increases choice and lifts productivity. Further, ICTs help to reduce supply costs (e.g. where physical stores can be replaced by online shops) and can also facilitate more opportunities for social interaction and exchange of information for leisure and entertainment.

The development of intelligent technologies that are ready to be deployed in a wide range of industries and applications as well as the rollout of high speed broadband is set to underpin an even more profound transformation in the economy over the coming decade than that witnessed with the earlier wave of ICT investments.

6.1 Key innovations in the ICT sector

The ICT sector continues to experience rapid development and release many new products and services around the globe. While there is uncertainty regarding the potential applications of many IT-related innovations, more is known about the scope and direction of specific service advancements.

Productivity-enhancing intelligent systems are being introduced in virtually every part of the economy and entertainment and news services are being delivered through radically evolving communications platforms. ‘Smart systems’ for transport, electricity and water are likely to be deployed (in varying degrees) in the next decade, driving efficiency gains and better services. The health and education sectors may see substantial changes to delivery models if industry acceptance can be attained.

Recent innovations in the sector also include advances in mobile communications services. The rapid increase in use of mobile telecommunications, including mobile data, unlocks a range of productivity gains through increased connectivity and the ability for workers to be contactable while on the move.

Information services will undergo more radical change as new technologies are brought online supported, in part, by the rollout of high-speed broadband. Information technology advancements and innovations will likely lower costs for business, change business models (including greater access to international markets), and alter the customer interface in a number of areas.

A wide range of additional ICT developments are expected to gain leverage from the NBN, with the network serving as a facilitator of these services. Potential examples include increased uptake of VoIP phone services (and an associated decline in use of traditional landlines) and video conferencing and calling services.

The largest adjustments in the ICT sector over the next decade are likely to be changes in how other businesses use ICT rather than changes in the ICT sector itself. This includes applications
but also ways of doing business, with scope for tele-working and cross-firm collaboration over the internet, and, potentially, new product offerings in some areas.

Australian businesses have been relatively slow so far in the adoption of some technologically innovative applications and services. Uptake of e-commerce and the delivery of services electronically for retail businesses in Australia have lagged many other developed nations.

While broadband penetration in Australia is more advanced, with Australia about average in broadband penetration rates among OECD economies, current download speeds are somewhat below average. This is reflected in a lower ITIF Broadband Ranking than for some OECD countries with lower penetration rates (Chart 6.1).

**Chart 6.1: Broadband penetration in the OECD, 2008**

The National Broadband Network

The NBN is expected to be a catalyst for further ICT development and productivity in the broader economy, providing speeds of 100Mbps over fibre to the premises to 93% of the Australian population and 12MBps to all others. The faster speeds and greater coverage provided through the NBN will be critical for the emergence of a wide range of applications, product offerings and entirely new business models.

The latest and perhaps most far-reaching phase in the transformation of the ICT sector is underway with the rollout of high-speed broadband in most developed and many developing economies.

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2 Assuming the Federal Government adopts the recommendations of the 2010 McKinsey/KPMG implementation study.
Broadband appears to have been the element of ICT with the single biggest impact on the economy in the last 20 years (Chart 6.2). In a broad study of the growth effects of ICT for the World Bank, Qiang (2009) found that each more ‘advanced’ stage of ICT had a larger impact than those previously, and the growth effects of broadband outstripped those of other ICT technologies. This study found that a 10 percentage point increase in broadband penetration in high-income economies such as Australia resulted in an increase in economic growth of 1.2 percentage points. The report also notes that these benefits become even larger once a critical mass penetration rate is reached.

Chart 6.2: Growth effects of ICT

Source: Qiang 2009
Note: Economic growth effects are shown per 10 percentage point increase in telecommunication penetration.

Broadband networks play a critical function in the transfer of data and information and have already become an important facilitator of the knowledge economy. Basic broadband services have been particularly important for data-intensive service industries such as the finance and business services sectors, although the increased speeds available under the NBN and resulting applications may increase diversification of the main beneficiaries of broadband.

The scope for broadband to act as an enabler of structural change and productivity growth in the economy potentially expands as adoption of the technology increases and it affects an increasing number of sectors and activities. Greater bandwidth and speed effectively increases the range of activities that can be undertaken online.

The NBN provides the potential to extend other technological developments through the economy and society. It may provide a catalyst for significant change in sectors where the potential, to a large extent, was already there. The NBN (and other ICT developments) will allow for increased access to markets and supplies and will likely change the business model for many industries as it will affect how businesses operate and for new applications and content. Emerging broadband applications across the education and health sectors highlight the potential for the technology to transform service delivery, facilitating effective ‘face-to-face’ contact through use of technology where such face-to-face contact is impractical. As
such the NBN will provide a direct stimulus to the economy through increased investment in the ICT sector.

The NBN will facilitate a wide range of services that are not feasible using current internet speeds, or that would be available at a considerably greater service quality. Some of these are detailed below.

**Tele-health**

Tele-health is a potentially transformative application of the NBN, which is only viable with ubiquitous high-speed broadband. If widely adopted, tele-health has the potential to lead to substantial cost savings in health and aged care.

There are four main components of tele-health.³

- **Real time (or synchronous) tele-health** involves ‘live’ consultations in a wide range of specialties ranging from dermatology and cardiology to psychiatry. Consultations may occur between medical professionals and patients, or among medical professionals only (for example, a GP and a specialist).

- **Store and Forward (or asynchronous) tele-health** is the transmission of medical data — such as echocardiograms (ECGs), photographs of skin lesions, blood glucose levels, and x-rays — for remote diagnosis.

- **‘Tele-homecare’ (or remote monitoring)** is the transmission of medical data for disease and injury management and prevention. Examples include monitoring of patients undergoing dialysis, remote foetal monitoring, or support and care to elderly people with chronic conditions living at home.

- **Tele-education** is the transmission of medical information, either for the training of health professionals or to assist members of the public to self-manage their health (including tele-triage).

The benefits of offering such services through tele-health include time savings in providing results of tests faster through store and forward services, and substantial savings from avoided trips to major health care centres. These benefits are particularly large in more remote areas, where the time savings from trips avoided can be several days.

Some services, particularly store and forward, have limited availability under existing ICT software and internet speeds. However, the developments in tele-health applications and the rollout of the NBN will create greater scope for remote care. An important gain in this area is the improved quality of service and reduced latency (i.e. fewer delays and slowdowns) that the increased bandwidth of the NBN enables, which means services are more reliable.

**Tele-work**

Innovative tele-work applications and increased internet speeds provided through the NBN will allow for more efficient access to remote servers and enable employees to work from home with greater ease. The improved reliability of internet speeds in a fibre network and ability to

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³ Definitions of tele-health are quite varied. This list comes from the California Telemedicine and e-Health Centre, a US Federal Telehealth Resource Centre.
undertake remote monitoring through services such as quality video conferencing are also likely to increase employer acceptance of tele-working, increasingly viewed as a practical and mutually beneficial arrangement rather than something to be endured by the business.

This creates higher productivity (or increases leisure time) by reducing travel time and costs for workers, and also provides greater locational flexibility for businesses, as there is less importance for them to be co-located with employees. Tele-work also provides recruitment flexibility, as geographical location ceases to be an impediment to hiring the most talented individuals. Hiring the most talented individuals, and not losing staff due to relocation, affords increased productivity and reduced search costs to replace staff.

If widespread tele-work were to be adopted, this has scope to significantly reduce infrastructure pressure, particularly in transport systems. There may also be some decentralisation of business headquarters, with less need to be conveniently located near customers.

Creative industries

Creative industries are able to utilise the increased bandwidth to collaborate across firms and, indeed, across the globe. Historically, computer generated imagery services and editing services were undertaken in the same studio as where the film was shot, however the ability to send very large files in a reasonable time may change this. For Australian editors and CGI experts the NBN may see them able to work on films that have been otherwise produced elsewhere. Among other things, for NSW, this presents a potentially large benefit through the Fox Studios based in Sydney.

Improvements to speed and bandwidth are also likely to see changes to the distribution chain for video-based creative works, including film, television and video games. These can be remotely distributed through the internet, with no need for physical packaging or transport. This includes distribution from film companies to cinemas for screening using fully digitised copies. Consumer demand for internet-based delivery of such media is likely to drive adoption of these new distribution methods.

Cloud computing

Cloud computing is a service which is currently available through the internet, but would likely be more widely used under ubiquitous high speed broadband. These applications allow the user to store information, software and shared resources in huge data centres on remote servers which are accessible via the internet.

This practice reduces capital expenditure on physical infrastructure, with firms instead renting server space and software from a third-party provider and cost sharing with other firms. It is particularly beneficial to small businesses which can access software that they could not justify purchasing for their firm alone. Cloud computing also reduces service disruptions, such as those caused by servers crashing, although it is dependent on reliable internet access.

Cloud computing fundamentally changes the way in which computing and storage services are provided. While these have existed in the past at lower speeds, higher speeds and bandwidth improve the reliability of cloud computing, making speeds for accessing stored information
comparable with access from local physical servers. These services appear set to take off this decade, providing significant productivity gains for business.

**Grid computing**

Grid computing applies the resources of many computers in a network to a single problem at the same time. This significantly increases processing power by disaggregating computing tasks over a grid of computers, thereby increasing speeds of data interpretation. While this is feasible at lower speeds, the power of grid computing is enhanced by greater speeds and bandwidth provided through the NBN.

**6.1.3 Advanced smart electricity grids**

Advanced smart grid electricity solutions harvest data on electricity consumption in real time and create increased efficiencies across the electricity industry. While there are potential improvements to be achieved throughout the system, perhaps the most significant involve:

- providing real-time information on generation and load throughout the network which can enable distributors to significantly reduce transmission losses; and
- helping to manage demand in peak periods which not only can improve reliability but also reduce the capacity requirements for the network.

In particular, developments in smart electricity grids have created real-time services which allow electricity users to monitor their consumption of electricity on an ongoing basis, allowing them to better adjust consumption based on price signals. Remote device control (e.g. controlling use of electricity through heating and cooling systems) is also more readily possible in the future with ubiquitous connectivity and high bandwidth.

Under its $100 million *Smart Grid, Smart City* program, the Australian Government has recently announced that Newcastle will be the site of Australia’s first commercial-scale smart grid demonstration project. Among other things, this initiative will explore synergies between smart grid technologies and the NBN.

Other pilot programs are also being undertaken. For example, a trial of smart electricity grids in Newington and Silverwater in Sydney is presently testing a number of tools and strategies around developing a state-wide smart grid network. It is estimated that this ‘Smart Village’ has the potential to create some $355,000 worth of customer energy saving (Smart Village fact sheet 2009).

The benefits are expected to be particularly large during peak periods, where pricing encourages consumers to be more alert to cutting energy use. Numerous trials have been conducted in Australia and overseas to investigate the potential benefits under different models and circumstances. For example, IBM reports that a US smart grid project led to a 15% decline in peak load, while in Canada, a smart meter led to energy bill savings between 6% and 12%, and pricing structures that encouraged using less power during peak periods saw 25% of usage shifted away from peak periods (IBM 2009).

While much of the focus of smart grids has centred on the use in homes, the benefits within transmission and especially distribution networks are likely to be much greater:
The real-time monitoring and, thereby, adjustment of flows and pressures throughout the network can result in substantial reductions in transmission losses. While the scale of the improvements will not be fully understood until smart grids are properly integrated into the system, the expectation is that transmission losses could be reduced by at least 5%, with most of the improvement occurring in distribution systems. That is, for the same amount of electricity consumed, at least 5% less electricity needs to be generated:

- Not only does this represent a significant lift in productivity, it would make a significant contribution to efforts to reduce greenhouse gas emissions.

In addition, the intelligent system would improve reliability by providing greater scope to isolate the point at which the network failure commences using real-time information, allowing for a shorter time to repair. Energy Australia (2010) also reports an expectation that some faults could be repaired remotely through the smart grid.

6.1.4 Intelligent transport systems

Intelligent traffic systems will improve the operation of the transport system by:

- improving the coordination of lights throughout the network;
- providing information and maybe price signals to motorists so that they adjust their travel patterns; and
- assisting freight operators to tailor their travel patterns to coordinate with different players along supply chains.

Agencies such as the Road Traffic Authority (RTA) and Sydney Ports Corporation are investing in aspects of such system, and encouraging others to do likewise. To be most effective, the technology needs to be matched with appropriate regulatory regimes that may involve significant reform.

These systems assist traffic planners in providing real-time information to motorists about delays, and in improving efficiency of toll collection points. More advanced traffic management applications include direct machine-to-machine services, including automated use of traffic flow data to dictate traffic light sequencing and improved to-the-minute information about public transport running times.

In time, the advances could even include some control over the operation of vehicles. Indeed, IBM has recently lodged a patent application for a system that manages the engine in response to a traffic signal, meaning effectively that the car can be forced to stop at a red light. These applications improve road safety, with substantial potential gains to the NSW Government from safety improvements, and associated reductions in congestion that result from fewer accidents blocking roads.

There is also scope for transport fleet operators to remotely monitor their vehicles, with customer service gains and greater certainty about employee productivity. Transport systems could also incorporate broadband combined with sensor technology to track cargo shipments, informing customs prior to arrival of the contents of cargo. However, transport industry benefits may be partially offset by losses in the form of reduced business travel due to videoconferencing and similar technologies.
The adoption of innovative productivity-enhancing applications in the transport industry is estimated to increase this decade, as reducing transport inefficiencies and emissions becomes a key priority for Governments.

6.1.5 Water systems

The gains to water usage are twofold.
- gains from a smart water network, similar to the smart electricity grid; and
- the introduction of ‘just-in-time’ irrigation systems.

A smart water network enables households to better monitor their use of water between billing periods, as well as (where available), the relative use of dam water and recycled water. Households will be able to manage their total use of water and the composition of the water used to minimise the cost and reduce usage.

Sydney Water is involved in the Smart Village project at Silverwater and Newington. It is estimated that this project has the potential to create customer water savings of $54,000 per year across the smart village as they cut use in response to real-time information, and this will reduce consumption by 28,500kL (Smart Village Fact Sheet 2009). Applied state-wide, these benefits are potentially very large and could ease pressure on the water supply.

Water supply for farming in regional areas of Australia has long been problematic. The use of real-time data of the watering requirements of the land for farmers, as well as up-to-date information on rain forecasts, can substantially reduce the incidence of use of ‘just-in-case’ irrigation. A sensor network can be used to determine when the soil requires additional water, and this can be connected to gates that open or close the irrigation system as required. This gives scope for more widespread water trading to those with need. In the case of the Murray-Darling Basin, this is expected to result in an additional 1,000 to 2,000 gigalitres per annum of surface water being re-allocated to environmental flows by 2020 (Siemens 2010).

6.1.6 Mobile communications

The importance of the mobile telephone has grown over the past two decades as use and useability of the technology has improved, and as substantial declines in cost has made mobile telecommunications readily affordable for most. The use of mobile telecommunications has significantly affected businesses and the way people live.

More recently, advancements in the capabilities of mobile telecommunications have seen the development of mobile data and internet services. A wide range of content services and applications have become available, and there are increasing synergies gained from multi-function handset technologies that also function as, for example, music players or cameras.

These mobile data applications have an increasingly wide range of applications, and this range is expected to continue to increase over the coming decade. As well as basic email and internet services while on the move, mobile data is likely to be applied in a range of machine-to-machine contexts. Mobile data have already spread to some non-phone devices, including some e-book readers for mobile download of books and newspapers.
Access Economics has developed forecasts of the adoption and use of data-enabled mobile devices to 2014 in Australia. The forecasts suggest that data adoption rates will increase by 282% over the next five years (Chart 6.3). The forecast growth in subscription rates would mean that total adoption rates by 2013-14 will be just under 70%. However, because of the many potential mobile data applications, this does not mean that this proportion of the population will have a mobile data service. Rather, it simply means that there will be 0.7 services in operation for every person. It is likely that some individuals will have several devices, each with their own data subscription.

![Chart 6.3: Forecast data subscriptions per capita](image)

Source: Access Economics

### 6.2 The future of the ICT sector in NSW

The information economy will have both a direct and indirect effect on the composition of the NSW economy in 2020. The ICT sector forms a larger part of the NSW economy than it does nationally. As a result, new developments and innovation in the sector have a proportionately higher impact on the NSW economy.

ICT services in NSW will face a number of challenges over the coming decade:

- The presence of Australian headquarters for a number of multinational corporations in Sydney accounts for part of NSW’s relatively high share of the nation’s ICT sector. For some of these multinational corporations, the main form of economic activity conducted in Sydney is the marketing and distribution of products generated overseas, services which are likely to be increasingly automated and conducted online. However, some do have large research and development operations based in NSW and provide employment opportunities and a focus the development of a robust ICT industry more broadly.

- Increasing interstate competition, from Victoria and Queensland in particular, is directed at attracting more ICT industry to their states. Similarly ICT, particularly high-speed broadband, provides scope for small businesses to operate entirely online, with no physical location, as proximity to suppliers and customers is no longer a business constraint.
While Australians have a reputation as early adopters of new technologies, this has not always been the case for significant parts of the economy. For example, the use of electronic commerce in retailing is low relative to some other developed economies, while the tourism industry in particular has been noted as under-utilising existing technology, highlighted in the Jackson Report (2009).

By its nature, the market proximity of ICT services is not crucial and service providers compete in a global marketplace. The development of software and applications for mainstream services is dominated by a few multinational corporations, and this trend is likely to continue. Some of these corporations such as Google and IBM conduct significant research and development in NSW, boosting the NSW economy and creating jobs. Small firms have also been successful in developing products for niche parts of the market based on the skills and ideas of a few individuals, and this trend is likely to continue.

The greatest potential for ICT businesses in NSW may be in providing services to other businesses — in both government and the private sector — including operating their IT systems or developing bespoke software for particular needs. Similarly, consumers will demand greater support as their options for communications, entertainment and education expand.

Furthermore, the advances in intelligent systems throughout the economy, not only in areas commonly cited such as electricity, transport or water, will require support from a variety of ICT companies.

Advancements in the digital economy will have a significant effect on many small and medium-sized enterprises. ICT developments will support closer linkages between these businesses and their customers, whether located in NSW, other parts of Australia or overseas. They will also drive productivity gains. Moreover, ICT developments will also act as a platform for developments in other sectors of the NSW economy.

Uncertainty exists over how well placed NSW industry itself is placed to take advantage of the increased demand for ICT products (partly resulting from the introduction of the NBN):

- The fact that there will be a growing domestic market for these services should provide a solid basis for an expanded sector. This along with the technological developments should help the global competitiveness of NSW ICT companies.
- On the other hand, NSW is not alone in pursuing this agenda and the technological developments bring with them a greater openness of markets and reduced entry barriers for interstate and overseas firms to provide ICT services into the NSW economy.

However, new innovations in the ICT sector and rollout of the NBN may not have a significant impact on the ICT sector’s share of the economy. To a large extent, ICT is an input into other goods and services and the development of ICT may involve improvements in productivity of ICT services (which, of itself, would see the sector decline as a share of the economy) as well as increased demand for the services. As a result, the ICT sector as a share of the NSW economy may remain at a similar level over the coming decade to that in 2010.

Instead, the largest adjustments in the ICT sector over the next decade are likely to involve shifts in the composition of the sector, largely driven by changes in how other businesses use...
ICT. For example, all aspects of the media sector are already being transformed as consumers are able to access news and entertainment through new channels.

Faster and more reliable internet speeds through the NBN as well as a consumer base that is increasingly willing to use new services means that NSW businesses in ICT and related areas are operating in a global marketplace, providing both significant opportunities as well as strong competition from numerous sources. The fact that more ICT services will be consumed within NSW means that, overall, the sector should prosper but the composition of growth will be important.

6.3 Productivity effects of ICTs

The impact of ICTs on the economy is driven by the productivity gains enabled in other sectors of the economy rather than the direct impact from the technology itself. Several studies estimate the contribution of ICTs to productivity growth. Linkages between productivity growth and usage of ICTs are complex. The main difficulty in estimating ICT effects is that the increased usage of ICT often occurs at the same time as other factors are increasing or in tandem with policy changes, such as broad microeconomic reform (e.g. National Competition Policy).

Australia

The Productivity Commission (2004) suggested that the take up of ICTs accounted for a share of total productivity gains. It found that the increased use of ICTs added around 0.2-0.3 percentage points to the acceleration of annual growth in output and capital deepening over the latter part of the 1990s. Another Productivity Commission (2003) study states that in the 1990s, ICT capital contributed 0.5 percentage points to productivity growth.

The Productivity Commission also found that there is evidence that increased ICT use made a contribution to output and labour productivity growth, adding 0.1-0.2 percentage points to the acceleration in Australia’s annual multifactor productivity growth. In contrast, the National Office of the Information Economy (2003) undertook a series of firm level case studies and found that ICTs contributed up to 1.26 percentage points of growth in labour productivity.

International

Chen et al (2010) examined productivity growth globally between 1970 and 2009. They calculated that ICT capital contributed 0.35 percentage points to advanced economies’ average GDP growth of 2.0% in 2005-08.

Looking specifically at future technologies, the evidence is more limited. Katz et al (2009), utilise a regression-based analysis to develop estimates of the impact of Germany’s broadband policy, to introduce broadband at speeds of 50Mbps to 75% of households by 2014, with FTTH to be rolled out to 50% of households by 2020. This study found that the rollout of high speed broadband in Germany would result in an additional €170.9 billion of GDP (an increase of 0.6% in annual growth) over the period 2010-2020. The German case is based on a base-level of technology in which 92% of households already have access to speeds of at least 1Mbps, with less than 2% accessing speeds of less than 384Kbps. However, it is unclear whether this study incorporates any improvements to the existing state of technology in estimates of the impact.
Estimates of the impact of ICTs are likely to fall well short of the full benefits to economic welfare because national accounting constructs do not include potentially significant items such as the increase in welfare from increased choice and greater competition. Additionally, many of the benefits through the use of ICTs involve qualitative improvements, even though they may not involve a quantifiable productivity improvement — for example, online learning and collaboration beyond the classroom may improve the quality of education received by school students, but the impact on output per teacher and classroom is relatively little.

6.3.1 Productivity impacts to 2020

Although other ICT developments will be occurring over the coming decade (notably in wireless technologies), the NBN is expected to dominate the ICT sector, with impacts directly from its rollout as well as flow-on effects in terms of the additional technologies enabled.

NSW is more densely populated relative to Australia as a whole, so the 100Mbps rollout is likely to cover NSW at a greater rate than the national average, with a lower proportion of the population relying on 12Mbps only.

This relatively high population density has improved the economic case for past private sector construction of broadband, meaning that the base level of technology in NSW is higher than elsewhere in Australia (although there are areas where infrastructure remains below par due to lack of competitive imperative). This reduces the likely additional productivity gains from the NBN as more broadband technology is already available.

A ranking of the relative impacts of the NBN on productivity is provided in Table 6.1.

These rankings are based on the unique potential applications, methods of doing business and product offerings that are enabled for each sector. Additionally, some geographic factors are at play. For example, while Mining and Agriculture, Forestry and Fishing may have notable automation and data analysis (e.g. from satellite imaging) gains, such gains will be tempered by the fact that these industries are more remotely located and therefore a larger proportion of businesses will only receive the 12Mbps service. However, because any estimate of the productivity impacts of a future technology are highly uncertain, sectors have been placed into productivity groupings rather than individual rankings.
Table 6.1: Productivity rankings by economic sector

<table>
<thead>
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<th>Sector</th>
<th>Productivity benefit rank</th>
<th>Timing of adoption</th>
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<tr>
<td>Transport, postal and warehousing</td>
<td>Very high</td>
<td>Early-Mid</td>
</tr>
<tr>
<td>Electricity, gas, water and waste services</td>
<td>Very high</td>
<td>Mid</td>
</tr>
<tr>
<td>Rental, hiring and real estate services</td>
<td>Very high</td>
<td>Early</td>
</tr>
<tr>
<td>Health care and social assistance</td>
<td>Very high</td>
<td>Mid</td>
</tr>
<tr>
<td>Education and training</td>
<td>High</td>
<td>Early-Mid</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>High</td>
<td>Mid-Late</td>
</tr>
<tr>
<td>Financial and insurance services</td>
<td>High</td>
<td>Early</td>
</tr>
<tr>
<td>Retail trade</td>
<td>High</td>
<td>Mid</td>
</tr>
<tr>
<td>Information media and telecommunications</td>
<td>High</td>
<td>Early</td>
</tr>
<tr>
<td>Professional, scientific and technical services</td>
<td>Medium</td>
<td>Early</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>Medium</td>
<td>Mid</td>
</tr>
<tr>
<td>Mining</td>
<td>Medium</td>
<td>Mid</td>
</tr>
<tr>
<td>Administrative and support services</td>
<td>Medium</td>
<td>Mid</td>
</tr>
<tr>
<td>Public administration and safety</td>
<td>Medium</td>
<td>Early</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>Low</td>
<td>Early and Late</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Low</td>
<td>Mid</td>
</tr>
</tbody>
</table>

Source: Access Economics (based on literature and industry consultations)
Note: These rankings assume an inside-out rollout strategy. If the rollout strategy is outside-in or a hybrid model the timings will differ.

Some of the significant divergence in rankings is due to the impact of previous ICT developments. For example, the Financial and Insurance Services sector has historically been a large beneficiary of ICT innovations, however higher speeds are likely to have a more muted effect on the sector. This is partly due to the fact that head-office locations in major city centres mean the incremental speed gains under the NBN will be smaller than for other sectors. In addition, there is little in the way of new applications and product offerings available to this sector through speed, machine to machine applications, or high-quality video, above and beyond what may be expected for white collar industries more broadly.

Conversely, the Accommodation and Food Services sector is viewed as a particular beneficiary. This sector will be able to utilise new applications — such as high-quality video for marketing and fully automated booking services — that will replace individuals. The NBN will provide greater consistency in quality of service, which is important for tourist sites where current internet services are less reliable. There may also be a further, catch-up benefit, as the NBN provides impetus for the addition and/or upgrading of services that are already available under existing technology but that have not yet been adopted.

Economic impacts

The above productivity groupings are combined with past estimates of the whole-of-economy impacts of high-speed and ‘traditional’ broadband to allocate productivity shocks to each economic sector. Each group is attributed a potential productivity shock, which is the maximum proportional increase in labour productivity that may be attained. These figures are then augmented using a range of factors which may constrain the ability of each sector to attain the potential maximum impact.
The current state of technology — industries based in areas where ADSL2+ or similarly advanced services will not experience the same rate of improvement in services as those where current services are at basic broadband standards, reducing their potential to gain from the NBN.

Expected pattern of the NBN rollout — the NBN has an eight year build timeframe, and the scope to benefit from the NBN will differ for regions based on when the network is built in their area. The earlier the build, the larger the potential benefits. It is unclear what the rollout pattern looks like at this stage, however an ‘inside out’ build which starts at major population centres before pushing out to more remote areas is likely.

Adoption rates — the length of time between when the NBN becomes available and when businesses adopt the NBN influences the magnitude of the impacts. A longer delay to adoption reduces the proportion of the potential benefit that is attained.

The adjusted productivity impacts of the NBN are detailed in Appendix C (see Table C.3). These have been used to formally model the impact of the NBN on industry output (see Table 6.2). This analysis differs from the approach used to examine the impact of the other mega-trends. Rather than test the sensitivity of central case projections for respective mega-trend elements, it provides a sense of the overall dimension of the productivity impact of the NBN and related technologies which is embedded in the central case. In doing so, it essentially shows the impact of the NBN and associated developments compared with a scenario in which the NBN is not developed, noting that certain technological and network improvements will still occur in the absence of the NBN.

### Table 6.2: Impacts of the NBN on industry output at 2020 (% change)

<table>
<thead>
<tr>
<th>Industry</th>
<th>NSW</th>
<th>Rest of Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary agriculture</td>
<td>0.12</td>
<td>0.17</td>
</tr>
<tr>
<td>Forestry and fishing</td>
<td>0.28</td>
<td>0.27</td>
</tr>
<tr>
<td>Coal</td>
<td>0.31</td>
<td>0.34</td>
</tr>
<tr>
<td>Oil</td>
<td>0.39</td>
<td>0.42</td>
</tr>
<tr>
<td>Gas</td>
<td>0.41</td>
<td>0.48</td>
</tr>
<tr>
<td>Other minerals</td>
<td>0.29</td>
<td>0.25</td>
</tr>
<tr>
<td>Processed food</td>
<td>0.20</td>
<td>0.23</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.31</td>
<td>0.33</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.53</td>
<td>0.53</td>
</tr>
<tr>
<td>Water</td>
<td>0.54</td>
<td>0.54</td>
</tr>
<tr>
<td>Construction</td>
<td>0.54</td>
<td>0.49</td>
</tr>
<tr>
<td>Trade</td>
<td>0.45</td>
<td>0.44</td>
</tr>
<tr>
<td>Transport</td>
<td>0.55</td>
<td>0.54</td>
</tr>
<tr>
<td>Communications</td>
<td>0.45</td>
<td>0.46</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>0.47</td>
<td>0.49</td>
</tr>
<tr>
<td>Other business services</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>Recreation and other services</td>
<td>0.41</td>
<td>0.38</td>
</tr>
<tr>
<td>Government services</td>
<td>0.51</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Source: Access Economics
The overall GSP impact of the NBN in NSW for 2020 is $1.8 billion (in 2010 dollars). This is the benefit for one year only, and represents the gap between the economic outcomes in NSW where the NBN has been rolled out and a counterfactual where the NBN is not built, but private sector investment in ICT has continued.

There are likely to be high benefits in the years between 2010 and 2020, as the NBN comes online and the gap between the NBN and the counterfactual level of broadband speeds is at its peak. By 2020, the available download speeds in the ‘no NBN’ scenario are likely to be catching up somewhat to the NBN scenario. The impacts for each sector are broadly higher for sectors that are already ICT-intensive, with some particularly large gains for sectors where the NBN enables significant other technologies, such as Electricity, Water, and Government services (incorporating health care). The gains are also large for sectors that have historically been key beneficiaries of ICT advancements, even where there are no new major applications expected. These gains are instead driven by the ability to utilise existing internet-based applications faster.

The lower benefits are largely in labour-intensive industries such as Agriculture and Forestry and Fishing. These sectors have a lower potential range of applications for the technology and therefore a lower maximum potential benefit. These sectors, along with the various Mining categories, also have lower benefits as they are typically in more remote areas that may only receive wireless or satellite services at 12Mbps under the NBN.

Impacts for the rest of Australia are broadly similar to those for NSW, with notable differences only for gas (lower in NSW), construction (higher), primary agriculture (lower) and mining of other minerals (higher). Differences between NSW and the rest of Australia are likely to be driven by the difference in current technology (with some areas of NSW likely to have higher existing internet speeds compared to Australia as a whole), and the rollout pattern of the NBN (with NSW likely to receive a larger than proportional share of 100Mbps service, providing a boost to the achievable gains for sectors on the margins of the fibre rollout).

### 6.4 Key uncertainties

Past ICT innovations have been associated with a sluggish initial uptake, followed by a rapid upsurge in uptake as applications of the technology become available and a ‘critical mass’ is reached, where there is scope for networking benefits. Some of this is also driven by price declines, with new ICT products typically too expensive for all but the heaviest of users to justify immediate adoption.

However because the NBN represents, to some extent, an upgrade of internet access infrastructure rather than a new service *per se*, it is possible that uptake of the NBN may exceed what previous ICT experience would suggest. This, in turn, would accelerate the development and uptake of new flow-on ICT products — potentially creating the opportunity for the benefits of the information economy to exceed those projected.

Pricing remains a key uncertainty of the NBN. The McKinsey/KPMG Implementation Study (2010) provided some indicative wholesale pricing (starting at around $30 per month for basic services) but retail pricing across the whole network will not be known for some time. This wholesale pricing was recommended on the basis that pricing should be geared towards encouraging uptake rather than profit-making. If such pricing were adopted, the uptake of the NBN and associated ICT products would be faster than historical ICT experience suggests.
However, there is a risk that pricing may not be as low as the Implementation Study indicates, and this would lower the take-up and reduce potential gains.

The extent to which NSW stands to benefit from the NBN and ICT flow-on technologies depends in part on the particular rollout of the network. With plans to rollout 100Mbps to the 93rd percentile of the population of Australia, broadly by population density, but no clear rollout plan yet publicly available, it is unclear what coverage for NSW will be.

Given the relative population density of NSW and Australia as a whole, the uncertainty appears on the upside, with NSW likely to receive a rollout of 100Mbps to more than 93% of the State population. The higher speeds and quality to a larger share of the population will stimulate uptake relative to other states, particularly in the areas closer to the 93rd percentile, where the upgrade to 100Mbps represents a significant gain on existing services.

There are still uncertainties on the precise rollout strategy that will be adopted for the NBN. An ‘inside out’ strategy, where the network is built first in the most densely populated areas before expanding out to more remote areas, has been estimated (see Access Economics analysis for Telstra in 2009) as the rollout pattern with the highest benefits. This is because the costs are relatively low early while the benefits are more ‘front loaded’ and accrue to a large number of potential users in a more immediate fashion. If an alternative rollout pattern is adopted (for example, ‘outside in’), this may lower the benefits as the number of premises connected to the network in the early years is lower while substantial infrastructure development costs are borne up front.

Indeed, future ICT gains remain unclear as the NBN itself remains subject to political uncertainty. The Federal Opposition has pledged to cancel the rollout if it wins government, meaning that the economic impacts expected to flow from the NBN will only be realised as far as private investment replaces the network. Under such a scenario, the benefits to industries that are based in major cities, particularly Sydney, will be realised, although on a potentially different timeline. Those industries predominantly in more remote areas, where there is little profit to be gained by private investment from building infrastructure, are less likely to receive upgrades to NBN standard.

The ability of the NSW economy to realise gains from the NBN depends on the responsiveness of those sectors that stand to gain the most. The fact that many of those industries with large potential benefits have historically been relatively reluctant to adopt ICT technology means there is a risk the maximum potential benefits will not be harnessed.

In particular, Health and Community Services and Accommodation, Cafes and Restaurants have been slower adopters of ICT technology. In particular, the health care sector has been identified as one of the industries with the largest benefits but where acceptance of past ICT upgrades has not been high. The fact that the NBN is a government infrastructure project may see a greater adoption rate, at least among public sector services, however there remains a need for practitioners to actively use the technology in order to fully ‘unlock’ the productivity benefits. If these industries with large potential gains can be encouraged to adopt the NBN, through government policy or other mechanisms, there is a potentially large upside opportunity to be exploited.

Accommodation, Cafes and Restaurants, meanwhile, may have experienced relatively low uptake in the past due to variable speeds and quality of service, especially in regional tourism.
areas where ADSL and faster services are not available. The NBN will remedy these issues by providing a consistent quality of service, thereby improving the value of using internet-based marketing to potential domestic consumers. However it remains unclear as to whether these quality aspects will improve adoption and use of ICTs, or whether there are other, perhaps cultural, factors behind current low usage.

NSW also has potential upside from the NBN compared to other states due to its strong research and corporate base in ICT and the relatively high importance of ICT-intensive desk-based roles. ICT-intensive types of employment are likely to have higher attainable productivity gains from the NBN, with scope for potentially large benefits over and above what has been estimated here through the development of new applications and processes. This will be especially dependent on the advent of new applications.

Importantly, expectations of the future productivity impact of ICTs are based only on what is currently known about future developments — that is, the NBN rollout and known applications. There are likely to be additional applications that emerge after the rollout has taken place, as businesses become more accustomed to using high-speed broadband and develop a better understanding of its potential.

The overall implication of these uncertainties is that there is a substantial upside potential for the NBN. While some challenges may constrain the benefits, the potential for benefits that exceed expectation if demand is higher than expected, as well as from as-yet unknown applications of NBN technology mean that the overall benefits to NSW from the information economy may be substantially higher than has been estimated here.

### Implications for NSW — information economy

- There is a wide range of new ICT services to come online over the next decade. Key among these is the NBN.
- NSW, as a state with a strong research base in ICT and innovation, and head offices for large corporations, is in a strong position to harness the benefits of ICT adoption. The relatively high importance of ICT-intensive desk-based roles in NSW means the gains may be larger.
- The potential gains from ICT are primarily in their use, through new applications and ways of doing business, rather than the ICT sector itself. The ICT sector is important to the NSW economy as a facilitator of broad productivity improvements.
- Many of the potential gains flow to government services, including government-owned water and electricity through smart networks (including smart irrigation); smart transport systems that can reduce congestion on roads with potential flow-on benefits in reduced infrastructure needs; and potentially large gains from the use of tele-health to provide remote care, reducing pressure on the public hospital system.
- There is likely to be some first-mover advantage in local industry driving productivity gains through the use of ICT rather than industry being forced to respond to the productivity gains of other regions as they upgrade. It is therefore important that the adoption of NBN services by industry be encouraged as soon as services are available.
7 Demographic change

The demographic profile at both the national and state levels is changing — the population is growing and ageing. This demographic shift will show up in a changing demand for services, particularly in aged care, the financial sector, and residential construction and infrastructure.

Changing dependency ratios will also give rise to significant fiscal challenges for government.

The demographic profile explored in this chapter is based on Access Economics’ baseline projections for NSW population growth. Both Access Economics’ and the NSW Department of Planning’s population estimates are consistent in forecasting strong population growth in NSW over the next decade. Importantly, the major implications of robust population growth are similar under both forecasts, including for strong underlying demand for housing.

The Access Economics baseline demographic profile of NSW in 2010 and the projected profile in 2020 are shown in Chart 7.1. This baseline data incorporates the latest available historical data from the ABS.

The latest Commonwealth Government population forecasts for Australia — drawn from Treasury’s 2010 Intergenerational Report (IGR) — project an average annual rate of growth of 1.2% over the next 40 years, slightly lower than the 1.4% increase over the previous 40 years. Population growth and ageing are projected to continue, with growth in the population over 65 accelerating at a rate greater than the increase in children and the working age population.

The forecasts also suggest that working-age ratios are expected to fall simultaneously with the rise in aged and child dependency ratios. The number of working aged people in relation to those 65 and over declined by around a third from 1970 to 2010, with projections for further
declines in the upcoming decades. This will further exacerbate the pressures to finance the required infrastructure and investment to support the ageing population.

Under Access Economics baseline assumptions, NSW’s population is set to grow from 7.1 million in 2009 to almost 8.2 million in 2020.

Migration is a significant factor in population growth and ageing because of its potential to moderate the effects of the ageing population. In general, the age structure of migrants is younger than the general population, and mostly of working age. The proportion of children is similar to that of the domestic population, while there are significantly fewer migrants in the over 65 age group.

As such, the inflow of migration both boosts the working age population and reduces the overall proportion of those over 65. They contribute positively to the State’s population, (workforce) participation and productivity and should assist in fuelling economic growth. Forecasting the flow of net migration is a key to determining the impacts on housing, aged care and other services.

### 7.1 Effects of an ageing population

#### 7.1.1 Health and aged care services

The IGR explained that pressures on the health system would escalate as a result of the ageing of the population. The larger proportion of older people would place pressures on the hospital, residential aged care and community services systems which will need to respond accordingly.

More so than in previous generations, both a greater number and greater proportion of retirees are looking to remain at home rather than moving to retirement villages or aged care facilities. The growing popularity of a ‘tree’ or ‘sea’ change in retirement has created regions of high demand from this demographic, as well as for associated infrastructure and services of particular importance to this group, such as a focus on health care availability. This provides
opportunities for NSW to develop skills and facilities in these locations and leverage aged care specialisations into an advantage.

Older people generally have higher health costs due to increased levels of chronic disease and the greater number of life-threatening illnesses. In 2004-05, persons aged 75 years and older accounted for over one-fifth (21%) of total health expenditure (AIHW 2010), but only around 6% of the population (ABS 2010).

As such, substantial pressure would be placed on government health expenditure with the Commonwealth Treasury estimating that hospital expenditure will increase from $594 per capita in 2012-13 to $803 in 2022-23 in real terms. Treasury also noted that health costs would escalate as a result of funding of advanced technologies and rising demand for higher quality health services.

In light of the rising costs of an ageing population detailed in the IGR, the Commonwealth and State Governments have recently moved to reform the health system. This has culminated in an agreement between the Commonwealth and States and Territories (except Western Australia) that the Federal Government will be the majority funder of public hospital services. Hospitals will be run through Local Hospital Networks and operated by the states.

Aged care, in particular, will be placed under significant pressure. Spending on aged care is projected to grow from 0.8% of GDP in 2009-10 to 1.8% of GDP in 2049-50 (Treasury 2010). Aged care services include government funding for residential aged care (commonly known as nursing home care) and community care services (including the Home and Community Care Program and the Community Aged Care Package program). Treasury projects that increased government spending would be primarily caused by residential aged care, more than doubling to 2049-50 as a share of GDP.

Both health and aged care stand to benefit from investment in provision of these services via technology. Opportunities exist which allow for consolidation of the sector and greater expansion of the private sector’s role. While private sector models of retirement villages exist, the lower profit incentives of nursing homes and community care have seen these dominated by not-for-profit and government organisations. The use of ICT could deliver efficiency gains which may provide incentives for private sector investment in the nursing homes sector of aged care services and facilities provision.

7.1.2 Consumption patterns

Generally, economic data show spending patterns over the life cycle follow an inverted-U shape, with expenditure at its lowest at the beginning and end of a life cycle and highest when people are in the workforce.

In addition, the composition of expenditure also changes. Differences in proportional household spending across various stages in the life cycle can be attributed to a range of factors including housing costs, the number within a household, and the income and expenditure of those within a household. Spending patterns are closely associated with life cycle stages, as spending preferences change as younger adults leave home, couples have children, buy a house, and retire from work.
Table 7.1: Average weekly expenditure by broad expenditure group, 2003-04

<table>
<thead>
<tr>
<th>Goods and services</th>
<th>Young couples&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Couples with young children&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Couples with older children&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Older couples&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total expenditure</td>
<td>$1169</td>
<td>$1071</td>
<td>$1,537</td>
<td>$614.65</td>
</tr>
<tr>
<td>Expenditure on goods and services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>22.2%</td>
<td>19.8%</td>
<td>10.8%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Fuel and power</td>
<td>1.7%</td>
<td>2.5%</td>
<td>2.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Food and non-alcoholic beverages</td>
<td>13.9%</td>
<td>16.4%</td>
<td>18.4%</td>
<td>20.8%</td>
</tr>
<tr>
<td>Alcoholic beverages</td>
<td>2.7%</td>
<td>1.9%</td>
<td>3.1%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Tobacco</td>
<td>0.9%</td>
<td>1.0%</td>
<td>1.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Clothing and footwear</td>
<td>3.6%</td>
<td>4.8%</td>
<td>6.1%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Housing furnishings and equipment</td>
<td>7.1%</td>
<td>5.9%</td>
<td>5.5%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Household services and operation</td>
<td>4.2%</td>
<td>8.4%</td>
<td>5.6%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Medical and health</td>
<td>3.3%</td>
<td>5.0%</td>
<td>4.4%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Transport</td>
<td>16.3%</td>
<td>15.5%</td>
<td>19.0%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Recreation</td>
<td>13.4%</td>
<td>10.0%</td>
<td>12.6%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Miscellaneous goods &amp; services</td>
<td>2.0%</td>
<td>1.9%</td>
<td>2.3%</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

Source: ABS 2006

Note: <sup>a</sup> Young couples refers to couples where one partner is below the age of 35. <sup>b</sup> Couples with young children refers to couples with their eldest child being below 5 years old. <sup>c</sup> Couples with older children refers to couples with dependent and non-dependent children. <sup>d</sup> Refers to couples where one partner is above the age of 65.

As shown in Table 7.1, proportional spending on housing generally declines over the lifecycle as younger couples spend heavily on mortgage and rental costs as well as spend to acquire household furnishings and equipment.

Older couples spend proportionately more on food and non-alcoholic beverages, recreation, medical care and health expenses, and domestic fuel and power than other selected life cycle groups. Generally low income households have relatively high proportional spending on basic and non-discretionary items; however older couples have relatively high discretionary spending on recreation. Thus, there are opportunities for sectors such as tourism and racing, which are typically favoured by older generations, to expand and provide more targeted services.

### 7.1.3 Financial services and wealth management

The management of retirement incomes will escalate in importance, particularly as the first of the baby boomers were able to access the pension in 2010. This generation saw superannuation become widely available to most workers in the 1980s and have benefited from recent reforms and contribution schemes which have allowed them to supplement this retirement income stream.

As burgeoning costs of aged care will place increased pressure on government budgets, the capacity of the older population to fund their own care in the future will become of greater importance.
The economy’s ability to adjust to demographic change will depend on the degree of flexibility of financial markets. An older population places different demands on financial instruments, with increased demand for those that assist in the management of retirement incomes. Examples of these include reverse mortgages, annuities and long-term indexed bonds.

Due to upward trends in NSW house prices, many retirees will find themselves asset rich but income poor after leaving the workforce. Those in older generations who were not covered by compulsory superannuation are more likely to find themselves in this situation. Financial products such as reverse mortgages allow for borrowing against the equity of a dwelling without needing to sell it. This can provide a steady stream of income without displacing retirees and has additional benefits of reducing the burden on public finances.

Younger generations will also consume more financial services. There is now greater awareness of the need to build retirement savings without relying solely on the government, with an associated demand for wealth management at earlier stages in life. There has been a trend towards acknowledging the burden of retirement also falls on the individual, especially to support a higher quality of life in later years.

7.2 Effects of a larger population

7.2.1 Infrastructure

Urban transport infrastructure in NSW will require significant upgrades over the next decade to adjust to the pressures of strong population growth. Maintenance and extension of the existing road and rail network will be required, as well as additional infrastructure added, to support increased passenger and freight loads over time. Sydney’s Metropolitan Strategy some of these issues.

More broadly, the Metropolitan Strategy that is currently being reviewed provides a framework for managing population growth while meeting objectives related to economic, social and environmental needs. It aims to encourage a better connection between where people live, work, shop, access key services and go to school.

It is planned that around 30% of the growth will be in Greenfield sites, primarily in the south-west and north-west, with the remaining 70% in existing areas. This implies a need for significant urban renewal and increased density of the current residential areas. The aim is to concentrate much of the development in ‘centres’ of varying scale and foci, and along existing transport links.

The existing Metropolitan Strategy established many of these principles and they are progressively being reflected in policy action. The rate of population growth envisaged over the next decade suggests that the implementation of the Strategy will have to assume a greater urgency than it has over recent years.

7.2.2 Construction

With a trend towards smaller average household sizes, there will be strong demand for residential construction to 2020, as demographic pressures further exacerbate the existing undersupply of housing. NSW Planning projects that around 390,000 new dwellings may be
required in NSW to accommodate a much higher population. (The IGR projections imply an even larger number of new dwellings will be required.)

Access Economics expects the level of real dwelling investment in NSW to be more than $12 billion larger in 2019-20 compared with 2009-10. That growth will see dwelling investment rise as a share of the NSW economy from 4.8% in 2009-10 to 7.3% in 2019-20.

In addition, consistent with the objectives of the Metropolitan Strategy, considerable construction in commercial developments — notably shopping centres and offices — will be demanded. Much of this construction will occur in existing ‘centres’, both in the CBD and North Sydney as well as other centres throughout the metropolitan region. Office vacancy rates are expected to again be declining in the near future, as construction activity and employment recover from the downturn. With skilled migration planned to boost the working age population as the baby boomers transition into retirement, there should be solid demand for offices in the upcoming years.

### 7.3 Alternative scenarios

Access Economics modelling suggests moderate growth and ageing of the population in the next decade, although lower or higher population forecasts, such as those in IGR 2007, or those in IGR 2010, could eventuate.

Table 7.2 shows Access Economics baseline population projections for NSW and Australia, along with sensitivities around the baseline. These sensitivities include:

- A high case — where population growth was modelled in line with the assumptions detailed in the IGR 2010.
- A low case — where population growth was modelled in line with the assumptions detailed in the IGR 2007.

<table>
<thead>
<tr>
<th>Table 7.2: Baseline and sensitivity forecasts of NSW population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2010</strong></td>
</tr>
<tr>
<td>Population</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
</tr>
<tr>
<td>New South Wales</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td><strong>Low scenario</strong></td>
</tr>
<tr>
<td>New South Wales</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td><strong>High scenario</strong></td>
</tr>
<tr>
<td>New South Wales</td>
</tr>
<tr>
<td>Australia</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: The table shows that population in the high case sensitivity is initially smaller than in the base case. That result is due to differences in the short-term migration assumptions between the two cases. Stronger annual population growth in the high case sensitivity leads to a larger overall population in 2020 relative to the baseline.
Compared to current projections, IGR 2007 suggests that annual population growth will slow to around 0.4% approximately 40 years hence, while IGR 2010 suggests the slower growth will be 0.9%. Population projections for 2047 were 28.5 million, whereas new projections for 2050 are 35.9 million.

Ultimately, the exact number is uncertain and there are upside and downside risks to population growth. It is acknowledged that the population will grow in the coming decades, but it is the magnitude that is uncertain. This is significant, as planning for infrastructure and aged care pivots on these figures.

Regardless, there will still be increased requirements for health and aged care, through a greater population as well as an ageing population. Dwellings and related infrastructure will be required to accommodate the growing population. However, the location of these dwellings and the associated infrastructure required to service them may vary depending on the age structure of the population.

If lower migration eventuates, this could place pressure on labour force participation and exacerbate the aged and child dependency ratios. This would put further burden on governments who may not have budgeted for the lower taxation income from this workforce combined with the greater proportion of funding of dependents, which must be obtained from other sources.

Different population scenarios will have varying magnitude of effects on sectors of the economy. However, both population ageing and growth are inevitable for NSW towards 2020 and will need to be accounted for.

### 7.4 Sensitivities

The economic impact of these alternative higher and lower population projection scenarios has been examined (see Table 7.3 and Table 7.4).

Higher population growth than under the baseline scenario would have a large positive impact on the NSW economy. Overall, such growth would generate increased broad-based demand for goods and services and help support employment and business investment. There would also be a key ‘supply side’ impetus provided through a greater number of workers which would increase potential output in NSW. In conjunction, these two influences contribute to a projected increase in GSP of 0.6% or about $3.3 billion at 2020 compared with the central case.

The sectoral implications of a higher population scenario are shown in Chart 7.3. Greater demand for goods and services more broadly means that the benefits of a larger population are spread across much of the economy, with almost all sectors of the NSW economy benefiting. Particular opportunities are likely to emerge for the NSW construction sector with greater demand for new dwellings and associated infrastructure. There will also be greater demand for health care, education and public administration services generated from increased population growth, which will see comparatively higher output in those sectors. Those sectors which are heavily reliant on exports rather than domestic demand, such as mining, are far less impacted by a larger population.

A key issue of higher population growth, driven largely through increased overseas migration, is that it can offset some of the impacts of population ageing. For instance, importing labour...
from abroad can potentially play a large role in addressing skills shortages in key industries such as health and aged care.

Higher population growth is not without challenges. For instance, a larger NSW population places additional pressure on existing urban infrastructure. This could manifest in congestion on roads and public transport infrastructure, higher house prices and rents, and increased utility prices. Greater policy attention and levels of investment will be important to address these potential pressures.

### Table 7.3: Higher population growth scenario — impacts at 2020

<table>
<thead>
<tr>
<th></th>
<th>NSW</th>
<th>% change</th>
<th>Australia</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSP/GDP</td>
<td>3.3</td>
<td>0.6</td>
<td>9.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Household consumption</td>
<td>2.0</td>
<td>0.7</td>
<td>5.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Government consumption</td>
<td>0.6</td>
<td>0.8</td>
<td>1.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Exports</td>
<td>-0.1</td>
<td>-0.1</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Imports</td>
<td>1.2</td>
<td>0.8</td>
<td>3.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Investment</td>
<td>0.8</td>
<td>1.4</td>
<td>2.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Employment ('000 FTE)</td>
<td>36.0</td>
<td>0.9</td>
<td>106.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Real wages</td>
<td>-</td>
<td>-0.3</td>
<td>-</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: Population growth under this scenario is modelled in line with the assumptions detailed in the IGR 2010.

### Table 7.4: Lower population growth scenario — impacts at 2020

<table>
<thead>
<tr>
<th></th>
<th>NSW</th>
<th>% change</th>
<th>Australia</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSP/GDP</td>
<td>-4.4</td>
<td>-0.9</td>
<td>-14.6</td>
<td>-0.9</td>
</tr>
<tr>
<td>Household consumption</td>
<td>-2.0</td>
<td>-0.7</td>
<td>-6.5</td>
<td>-0.7</td>
</tr>
<tr>
<td>Government consumption</td>
<td>-0.6</td>
<td>-0.9</td>
<td>-2.4</td>
<td>-0.9</td>
</tr>
<tr>
<td>Exports</td>
<td>-0.5</td>
<td>-1.3</td>
<td>-4.0</td>
<td>-1.1</td>
</tr>
<tr>
<td>Imports</td>
<td>-0.6</td>
<td>-0.4</td>
<td>-2.1</td>
<td>-0.4</td>
</tr>
<tr>
<td>Investment</td>
<td>-0.3</td>
<td>-0.5</td>
<td>-1.4</td>
<td>-0.6</td>
</tr>
<tr>
<td>Employment</td>
<td>-42.3</td>
<td>-1.1</td>
<td>-137.3</td>
<td>-1.1</td>
</tr>
<tr>
<td>Real wages</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: Population growth under this scenario is modelled in line with the assumptions detailed in the IGR 2007.

In contrast to the high population scenario, lower population growth relative to baseline assumptions leads to reduced economic growth and employment. Under this scenario (see Table 7.4), GSP is projected to be 0.9% lower or about $4.4 billion compared with the central case.

Many of the effects of lower population growth are the direct opposite of the higher population growth scenario outlined above. Most notably, lower population will create less
demand in the NSW economy and provide less capacity to expand the labour supply, resulting in a smaller economy overall.

Compositionally, the effects of weaker population growth would be felt across the NSW economy as demand for most goods and services would be reduced. Sectors which are influenced by demography rather than the broader economic cycle, such as health and education, would be most affected by the lower population growth.

Some pressures noted in the high population scenario would also be reduced. For example, lower population growth would place less demand on infrastructure and require a less significant urban infrastructure investment program compared with the baseline.
Chart 7.3: Effect of higher population

Source: Access Economics
Note: Chart depicts the change in GVA by sector at 2020 from higher population based on IGR 2010 projections relative to the base case.
Implications for NSW — demographic change

- In 2020, NSW will have a larger and older population. This will require additional investments in housing and associated infrastructure, as well as a range of human services like aged care. Ageing effects will be gradual, and much of the impact will be felt beyond 2020.

- The demographic shift to 2020 will result in a change in demand for goods and services. An older population will likely demand more leisure, aged care, health, and financial and wealth management services. Product and financial markets will need to be responsive and adapt to these changes as they occur over time.

- The wealthier population and demands for more individual services, along with potential reforms to health and aged care, could provide greater opportunities for the private sector in the provision of health services. Greater ICT integration in the health sector may also generate efficiency improvements in the delivery of health services.

- An increase in demand for transport and other public infrastructure will require extension and upgrade of existing networks. Infrastructure will also need to operate more efficiently to meet the requirements of a larger population.

- Opportunities exist to provide services for aged persons within specific regions of NSW to support a larger population of retirees. Regions which provide well-targeted health care, tourism and recreation services may succeed in attracting stronger population growth over the next decade.
Part III Challenges and opportunities for NSW

This part of the report builds on the preceding discussion of the four mega-trends. It explores the specific economic challenges for NSW emanating from these trends over the next decade or so. There is a focus on the nature of the structural adjustment challenge, including where they are likely to be most acute and the implications for government.

The impact of the four mega-trends will be pervasive and far reaching and will give rise to considerable economic opportunities for NSW. This part provides a range of foresighting perspectives on future prospects for NSW industries from both an industry development and global context, including those areas of the economy which will have the greatest bearing on NSW’s ongoing prosperity. The role of government is also examined in this context such as those areas where government can play an effective facilitatory role to promote development and broader economic flexibility.
8 Future prospects: shaping a modern and dynamic economy

Over the next decade and further, the four mega-trends identified will present a range of important challenges for NSW. They will also open up substantial opportunities across various areas of the economy. This chapter provides some insight into what the NSW economy could look like in 2020, based on these trends and economic modelling undertaken. In particular, the discussion identifies existing strengths which can be leveraged to create new markets and areas in which government can play a pivotal facilitatory role.

Economic development in NSW has been underpinned by a quarter of a century of reforms supporting a flexible, internationally oriented economy. This has not only helped the NSW economy withstand an array of global and domestic shocks over the last 10 years but has also been a key element in responding to the opportunities generated by rapid growth in major Asian countries.

Importantly, such policy frameworks will continue to be vital in harnessing new (and unexpected) opportunities over the next decade. However, there will also be major advantages from a more direct role for government in facilitating activity and development in emerging growth areas of the economy and in helping manage the changes arising from the mega-trends.

New challenges and opportunities

The discussion below illustrates some of the key challenges and opportunities in specific sectors that, if embraced, could put NSW at the leading edge in both new domestic and international markets. The discussion is not intended to be comprehensive but rather provides a sense of the possibilities that could arise. This will provide background for the subsequent discussion on challenges (Chapter 9) and suggested priority areas for government attention (Chapter 10).

The challenges and opportunities highlighted in this section are:

- deployment of smart technologies (intelligent systems for transport, energy, water, education, health and so on);
- provision of quality health and aged care;
- climate change mitigation and adaptation;
- population growth (especially housing demands and transport);
- Asian growth (developing new markets and facing increased competition); and
- regional NSW.

Many of the above issues are interrelated. In particular, advanced information technologies will be applied across a wide range of industries such as health, water and transportation. In addition, increasing demand from Asia will provide opportunities for agricultural exports which will assist further development of regional Australia and provide impetus for better use of water including through smart water systems.
8.1 Intelligent systems

Central to almost every aspect of change facing NSW over the coming decade is the development of new information technologies, leading to a new world of wholesale change that will provide myriad opportunities across all sectors of the economy. It is therefore critical that such technologies are implemented and used to the fullest extent possible.

Smart technologies and approaches can be achieved through:
- application of IT based ‘intelligence’ on a system wide basis — such as in smart electricity grids and integrated transport systems; and
- connectivity to workplaces, homes, hospitals and other services — in the form of availability, access, useability and affordability that can reduce costs and improve effectiveness (including personalisation) in distribution of services.

Intelligent systems can be employed to build new skills and facilitate cross-disciplinary approaches, and to provide incentives and certainty for additional research activity and investment, which themselves become export opportunities for NSW.

Possibilities for use of intelligent systems in NSW over the coming decade are almost endless. Among the most prospective are transport, electricity, water, education and health. Even if NSW were to harness only part of the potential that ICT can provide, it will lead to solid advances in the State economy.

A few examples of potential to be unlocked in the coming decade are provided in the following sections. In each case, the full potential of the opportunity would require the deployment of infrastructure, the adoption of new applications and ways of doing business, and complementary policy and regulatory changes.

8.1.1 Intelligent, multi-modal transport systems

An intelligent transport network, at its peak of development, would encompass and integrate every aspect of the system: pedestrians, cyclists, motorists, trains, trams, buses and ferries and the networks along which they travel.

Such a network could incorporate:
- park-and-ride and park-and-drive solutions, messaging and coordination systems;
- safety related distance sensing technologies for all vehicles;
- integrated fare management;
- transport interoperability;
- provision of advanced, interactive traveller information;
- traffic signalling timing;
- ramp metering; and
- integrated, interactive route planning and advice.

In addition, the use of GPS technologies could open opportunities for monitoring traffic flows, developing user incentives to encourage optimum use of the road transport network by time-
of-day, assess private tolling operators’ revenue needs and permit the development of more effective traffic modelling, simulation and prediction is critical to system success.

This could reduce transit times, reduce congestion, enable more efficient infrastructure planning, and lessen greenhouse gas emissions. It may also cause some socio-economic consequences that would need to be addressed. However, even if the full potential of such a smart transport network were not able to be achieved because of implementation difficulties, considerable improvements can be achieved through the implementation of key elements of the agenda.

In NSW, the government implements various transport policies through the RTA, transit authorities and in partnership with the private sector:

- The RTA has been active in some aspects of smart transport including those related to freight logistics, addressing issues such as driver fatigue and speed, as well as better use of arterial roads through system-wide monitoring and coordination of lights.
- Private investors have an established position providing electronic connections into vehicles in order to toll certain private and public concessions.
- The NSW Government has very recently announced that it will implement a UK-style ‘oyster’ smart card system for public transport users.

There is opportunity to design and develop a strategy with government, GBE and private sector organisations to implement a City of Sydney wide intelligent transport system:

- The City of Sydney provides an ideal test bed for an intelligent, city wide, multi-modal transport system.
- Such a strategy will create additional investment opportunities that are likely to attract new technologies, enterprises and commercial companies to NSW.

8.1.2 Smart grids, smart meters

Smart grids combine advanced communication, sensing and metering infrastructure with existing energy networks. This enables a combination of applications that can deliver a more efficient, robust and consumer-friendly electricity network. Smart grid infrastructure uses sensors, meters, digital devices and analytic tools to automate, monitor and control the two-way flow of energy from power plant to plug.

Smart grids have the potential to transform the way we use energy in our homes and businesses. A smart grid can identify and resolve faults on the electricity grid, automatically self-heal, manage voltage and identify infrastructure that requires maintenance. Smart grids can also help consumers manage their individual electricity consumption and enable the use of energy efficient ‘smart appliances’ that can be programmed to run on off-peak power.4

The opportunity is to fast track the rollout of smart grids in NSW and to trial smart meter usefulness and human and social factors ahead of design and implementation of a state-wide smart meter/smart home solution.

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Such an effort should be seen in the context of programs to develop smart grids throughout Australia. For example, the Australian Energy Regulator has been reviewing how best to ensure that the regulatory system does not hinder, and ideally supports, its introduction.

In addition, the Australian Government recently announced that Newcastle will be the site of Australia’s first commercial-scale smart grid under its $100 million *Smart Grid, Smart City* demonstration project. In partnership with the energy sector, this initiative will support the installation of smart grid technologies and explore synergies with the NBN.

There are opportunities for technology and social research to be undertaken to progress this initiative. The challenge is now to extend this progress to achieve the full potential of smart grids. In this regard, avenues to involve NSW enterprises and technologies in this and other trials should be further explored.

### 8.1.3 Smart school and university campus

The opportunity is to develop an intelligent campus for a selected trial of NSW education institutions and, in so doing, further strengthen NSW’s position as a leading provider of education to both domestic and overseas students. Collaborative approaches to the delivery of education across a selected group of institutions, including multiple language offerings, could be considered.

The smart campus model could be extended to an online collaboration of the research and teaching capability in NSW to support the skills and knowledge required to address other industry development opportunities.

There are also technologies, enterprises and commercial companies that would be attracted to NSW if there was this focus for investment and market opportunities.

An intelligent campus involves remote and distance education techniques using computers and hand held devices. The applications are not new but delivery blockages appear to involve funding and technology that integrates student records and entitlements to certain courses, and the absence of a unique student identifier as an enabler of initiatives such as those involving distance education, as well as access to certain lecturers and tutors. Other potential barriers lie in use of copyright material for restricted purposes, which again is an issue of enabling entitled and secure access which is already solved technically.

Smart campus can deliver more teaching online and can deliver multimedia to multiple devices — make use of existing lecture spaces, but personalised around tutorials and experiential based learning.

The smart campus concept includes a federated campus model where specialisation can be resident at one university but available to students at other campuses through online, delivery. This is not dissimilar to the way libraries are organising themselves collaboratively and electronically.
8.2 Health and aged care

The ageing and regional populations of NSW, increasing incidence of lifestyle diseases, increasing availability of costly treatments using costly technologies, and shortages in qualified medical personnel and available beds will provide considerable challenges and opportunities for government policy in the coming decade. Additionally, a recent Productivity Commission report (Performance of Public and Private Hospitals 2009) showed that both public and private hospitals sampled were operating at 20% below productive capacity.

ICT will provide many opportunities to address the challenges faced by policy makers to ensure high quality health services are received by all residents, irrespective of age, mobility, location or income. A perennial challenge of health and aged care policy in NSW (and Australia) has been to shift the proportion of services provided within the community thereby reducing the pressure on expensive hospital and aged care facilities.

8.2.1 ICT-based solutions

Key ICT-based solutions to health challenges are likely to be focussed around:

- creating electronic health records for patients;
- the many dimensions of telemedicine (see Chapter 6); and
- building on these developments, in-home monitoring for, especially, the aged and to support outpatient care.

The rollout of the NBN, together with the introduction of numerous applications, will form an integral part of these solutions. This outlook is also premised on the fact that there are technologies, enterprises and commercial companies that already operate in NSW and which can be participants in a coordinated approach which would involve identifying existing expertise and building on that.

Government with the private sector could trial smart homes and smart communities focused on the objective of enabling better care and access to health services.

Online systems such as remote medicine are currently in use on a piecemeal basis, very much driven by available funding, even in the instances where the business case proves the economics of the project. Applications can be any sort of screening, diagnostics and information dissemination and are highly relevant to Australia because of the distances to often medically underserviced rural and remote regions.

Electronic health systems are in trial in WA and Victoria which link up patient, GP and specialists in a patient centric referral system and are demonstrating improved patient management.

A national electronic health record has been mooted for some time and is a priority in the recent Federal government budget. The cost and medical outcome benefits are well researched and costed. There are technical barriers to a national rollout and concerns not to make the costly mistakes made in the UK.

In all of these areas, there is significant research effort in universities, CSIRO and the private sector which needs to be harnessed collectively as part of the system solutions.
8.2.2 Other dimensions of an ageing society

Along with changes in the delivery of services that may be enabled by the rollout of advanced information technologies, the ageing of the population also will have an impact on the other aspects of the NSW economy including:

- the balance between the private sector provision of health and aged care facilities and services. Currently, the balance between roles played by the public and private sectors varies considerably for different parts of the system despite there being a strong case for mixed delivery at all points. For example, presently the (for-profit) private sector plays a significant role in the provision of retirement villages but little role in nursing homes. As the dual pressures to contain costs and provide services better tailored to individual needs build, there will be a need for a broader role for private business:
  - support for the development for a broader role for private business in the provision of health and aged care services may be best support by strategies that extend beyond government departments involved in overseeing core aspects of these services; and

- as outlined in Chapter 7, as people age, their consumption patterns change. For example, an increase in demand for tourism services — and different types of tourism services — can be anticipated.

8.3 Climate change

Addressing the long term structural challenges presented by climate change will require action across a range of policy fronts. In addition to an overarching national response on climate change — principally through the CPRS — there is a key role for more state-focussed policies aimed at promoting effective adaptation responses and supporting the timely development of new low emission sources of energy.

Just under 90% of installed electricity generation capacity in NSW in 2007-08 was met from black coal. However, use of alternative technologies while still small — around 7% of total capacity — is increasing (especially through increased household use of solar hot water systems and small-scale PV generators). Key electricity consumers are shown in Chart 8.1.

Chart 8.1: NSW electricity consumption by sector

![Chart 8.1: NSW electricity consumption by sector](source:image)
8.3.1 Electricity generation

Achieving substantial cuts in the emissions intensity of (coal-fired) baseload power generation mix will be crucial to meet emissions reduction commitments. Apart from wind generation, most of the activity on renewable energy for electricity is likely to be of relatively small scale and not useful for baseload generation.

In contrast, natural gas appears to offer the potential for new low emission baseload generation capacity. As gas-fired generation becomes more competitive under when a carbon price is introduced, it will likely play a greater role in delivering energy across the national electricity market.

Opportunities from coal seam gas

There are encouraging coal seam gas resources which if commercialised to sufficient scale offer the potential to support electricity generation and local manufacturing in the Hunter, and contribute to exports of LNG. Because of these broader development implications, well-targeted policy action to support and indeed accelerate the development of a viable coal seam gas sector in NSW may be warranted.

There are many potential avenues for such support, including through addressing key resource development hurdles. In this regard, major gas developments are typically complicated by high capital costs, long development timelines, and complex approvals processes — often across a number of jurisdictions. Further development challenges can also be presented through environment and land access issues and the adequacy of support infrastructure in remote areas.

A possible role for carbon capture and storage (CCS)

Other baseload power options should also be examined, particularly in relation to diversifying the mix of generation technologies. Much of the analysis conducted in Australia and internationally indicates that CCS is currently the most prospective way to achieve emissions abatement for coal-based electricity at a large scale. However, while many of the individual technologies for CCS are technically proven, the process is still being developed in an integrated sense. Considerable commercial uncertainties remain especially concerning costs of large-scale operations, timing and the coordination between the various elements of CCS facilities. Notably, such uncertainties are likely to remain for some years.

There are important development hurdles for the commercialisation of CCS technologies which are highly location specific. This is especially the case for carbon storage in which there are typically unique geological and spatial factors. As a result, proving up storage resources is likely to involve larger development hurdles and longer lead times than commercialising carbon capture and transport components. This places an increased emphasis on making meaningful research and development contributions on storage resources in NSW.

8.3.2 Adjusting to compete in a low carbon environment

In addition to reducing emissions in electricity generation, there is a multitude of opportunities to apply new and existing knowledge to current manufacturing and construction processes to address a low carbon economy and constrained use of resources. The challenge is to make
significant changes to the way the industrial system operates in order to make it sustainable and competitive.

There are centres of excellence in manufacturing in NSW able to undertake the redesign and rethinking process. For example, the Warren Centre at Sydney University is an industry-linked institute which brings together leaders in selected fields of engineering technology to collaborate and ‘develop new insights and knowledge in a specific segment of technology [and] accelerate a specific technology’s use by Australian industry.’

The potential of these efforts has been outlined in a UK context by Professor Steve Evans of Cranfield University as follows:

*Significant changes to the way we think about the industrial system are needed in order to make it sustainable. We have to look creatively at rethinking the full cycle of designing, making and serving, at rapid innovation in the products of the current system as well as the development of new models for satisfying human needs and desires through different systems of production and consumption. We need step changes in performance of the system as a whole. Some experts argue that it is possible to change our industrial system so that we:*

- add the same value with 25% of the materials and energy previously required (‘Factor4’)
- make use of the 90% of discarded extracted materials
- use benign materials that can be reused again and again (so-called ‘cradle-to-cradle’)
- refurbish and reuse sophisticated long-lasting components again and again
- develop a system of global manufacture of a universal set of extra high value components, which could be assembled in a decentralised network with diverse, locally produced components and sub-systems
- build industrial systems that mimic and nurture the environment

*Without advocating a particular target or technique, the common features of such thinking are that they deliver a step change in performance, that they do not rely on technology that is not yet available, and that they derive from changes to the whole industrial system. Just as such changes to the industrial system require cooperation across all the parts of the system, the practice, study and teaching of ‘sustainable industrial systems’ requires cooperation between disciplines at an unprecedented level.*

NSW industries can take advantage of developments both here and elsewhere — innovation does not all have to be home-grown to provide new opportunities; indeed, we need to take advantage of leading edge developments everywhere and apply them here to be competitive.

The Economist (2010) reported ‘developing countries are becoming hot beds of business innovation ... they are coming up with new products and services that are dramatically cheaper than their western equivalents: $3000 cars, $300 computers and $30 mobile phones that

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5 Lead author: Professor Steve Evans (Cranfield University), Towards a sustainable industrial system with recommendations for education, research, industry and policy, International Manufacturing Professors’ Symposium in Cambridge UK in July 2008 and the subsequent UK Manufacturing Professors’ Forum.
provide nationwide service for just 2 cents per minute. They are reinventing systems of production and distribution, and they are experimenting with entirely new business models’.

Examples of such opportunities are illustrated through the following case study, taken from the work of Professor Evans.

**Case study 1: The Brandix Group (Sri Lanka)**

The Brandix Group, which exports clothes to international retailer Marks & Spencer (M&S), has redesigned a 30-year-old factory to meet ‘green’ factory standards. This facility was awarded the Platinum Certificate in the LEED rating system of the US Green Building Council.

*What trigger is the company responding to?*

M&S found that their customers expected them to address their environmental impact as part of ‘business as usual’ operations. A response needed to include suppliers.

*What was the response?*

Brandix implemented an integrated program of change, using best practice management and production through existing technologies,

Tarred roads have been replaced with paving blocks to greatly reduce heat build up around the factory, which in turn prevents heat flow into the factory and helps save on air conditioning.

The building management system is an intelligent control center that controls carbon dioxide and humidity levels in the modern air conditioning system ensuring an optimum working environment.

The windows use special glass material that allows sunlight into the plant’s workspace without the accompanying heat. LEDs provide light to the sewing machines at needle point, supplementing the natural light, reducing total electricity consumption by 10%.

The factory’s steam boilers and steam distribution systems have been redesigned and a brand new super-efficient air conditioning system installed, reduced total energy consumption by 46%.

The plant’s roof has been redesigned to harvest rainwater, collecting about 115 cubic meters per day, which is recycled for all use except drinking water. Subsequently, a tertiary filtration system and a disinfection process allow the used water to be recycled again for toilet flushing and gardening. The overall result is a reduction of 58% in total water consumption.

An electrically-powered car is used for delivery of samples between plants and for short haul of stock within the factory, sourcing its energy from the plant’s windmill.

The factory recycles and reuses 100% of the solid waste produced. Even canteen waste is composted to contribute to biogas generation. This biogas is then used to power the gas burners in the kitchens.

**Bottom line benefits**

Brandix achieved a reduction of carbon emissions of 80%, an energy saving of 46%, a reduction of water consumption by 58% and zero solid waste to landfill. The changes lead to qualitative benefits such as improved employment conditions as well as considerable benefit in both top and bottom line performance, through effective cost and waste management and higher productivity.
The NSW economy in 2020

8.4 Housing and the built environment

The expected strong growth in the NSW population over the next decade will present considerable economic opportunities. This includes a new source of labour, which will become increasingly important as the baby boomer generation starts retiring in greater numbers and as rapid growth in the resources sector and allied industries draws labour from other sectors.

The larger population will also create challenges for policy makers through increased demand for urban infrastructure and housing. Delivering on the objectives of the Metropolitan Strategy will be critical in ensuring adequate new centres, better integration of housing with employment, shopping and schooling facilities, and improved transport linkages.

It is imperative that a Metropolitan Strategy, including centres policies, is able to cope with a range of rates of increase in population given the inherent uncertainties and the lead-times involved.6

It is important to note that, while infrastructure renewal and replacement is necessary, particularly in housing and transport, some of the existing investment can be better utilised and its economic life extended through the application of smart technologies. There are additional benefits to this approach, including the potential to:

■ achieve better environmental outcomes, for example through reduced congestion;
■ address problem areas which are global in nature and thus build export opportunities in services and products;
■ create a ‘test bed’ approach for action learning and development of leading edge capabilities; and
■ provide a market led strategy for industry and sectors that could result in new home grown viable ICT enterprises.

8.4.1 Delivering the Metropolitan Strategy

A key challenge for accommodating increased populations within the Sydney metropolitan region, in addition to ensuring the provision of sufficient housing options, will arise from the need for additional services such as transport, health and education as well as ample retail and commercial facilities to service an expanded community.

Transport congestion in particular poses a difficulty for the NSW Government, especially given the constraints imposed by the city’s geography. Two means of counteracting such demands are available through providing Government support for increased opportunities for:

■ tele-working; and
■ employment in Major and Specialised Centres throughout the metropolitan region as outlined in the Government’s draft Centres Policy.

In the case of tele-working, the NSW Government can lead by example and also promote the benefits of tele-working to enterprises where this option is feasible for employees.

6 Note that the population projections contained in the NSW Department of Planning’s latest documentation are lower than those contained in the Commonwealth’s Intergenerational Report.
In developing strategic centres, government has the opportunity to ensure greater local employment and retail opportunities and choices for residents.

8.4.2 Construction

Robust population growth will generate strong demand for new dwellings in NSW, which will lead to a marked expansion of the construction sector over the next decade. From this, substantial opportunities are likely to emerge in design and construction innovations and niche markets. These opportunities include addressing environmental challenges associated with climate change, such as optimal energy efficiency and water conservation through the adoption of new technologies in both residential homes and commercial buildings.

Infusing greater levels of information technology and sustainable design could provide a solid base in which to develop a viable building services export market, particularly into emerging Asian economies.

8.5 Exporting to Asia

Rising incomes and burgeoning middle classes in China and India will provide both threats and opportunities for the NSW economy. Opportunities arise through new and increasing demand for a range of products and services which NSW is well placed to provide, such as education, legal and financial services, tourism and agricultural products. However, the same forces that provide these opportunities will lead to increasing competitive threats as emerging market economies develop greater skills and become increasingly able to attract foreign investment.

The coming decade will see an increasing transfer of technology and skills to developing markets. By being at the forefront of this transfer (rather than resisting it), NSW firms can further improve their links to the global economy by building strong relationships in existing markets, developing opportunities to provide support services and simultaneously opening the way for new markets, for example in high value-added manufacturing and agricultural products.

8.6 Regional NSW — the Murray-Darling Basin

Over the coming decade, many agricultural regions across NSW such as the Murray-Darling Basin (where three quarters of Australia’s irrigated crops and pastures are grown) will need to prepare for higher temperatures, more frequent periods of exceptionally low rainfall and greater volatility in the availability of water on a year-to-year basis.

A key implication is that there is likely to be less water available for irrigation and more variable water supply. This will place a greater emphasis on putting in place sustainable water management practices, including through the use of smart water systems, and water-efficient infrastructure investments. It will also encourage a shift to higher value agriculture.

Against these environmental challenges, rising incomes and burgeoning middle classes in China and India are likely to increase demand for agricultural products, providing substantial opportunities for NSW farmers to position themselves as safe and reliable food producers.
8.6.1 Flexibility in the face of variability in water supply: the case for rice

It is tempting to advance the notion that radical changes in the composition of agricultural production will be needed in the face of more expensive and variable water supply which is forecast to persist as global temperatures trend higher. However, close examination of the options will be needed and result in different conclusions.

Rice may be a case in point. In particular, rice uses a lot of water and it has been argued that it does not represent best use of limited water resources. However, such a view discounts some potentially strong arguments in favour of continued rice production in the Murray-Darling Basin, notably that:

- domestic rice yields are multiples of those recorded in many parts of Asia; and
- in years of zero water allocations, rice fields can be easily converted for alternative uses and then replanted when allocations resume making them highly suitable to variability in water supply.

That is, rice production may continue to form a profitable part of some regional communities’ livelihoods within the Murray-Darling Basin and do so in a manner that can be sympathetic to the broader environmental objectives. Flexibility in the response to water will be needed throughout the Murray-Darling Basin.

8.6.2 Water trading

Water trading systems are already in place in NSW, and in recent years the Federal Government and NSW Government have used the purchase of entitlements to restore environmental flows in the Murray-Darling Basin.

In the decade ahead, restoration of the Murray-Darling flows will create opportunities for reverse trading; that is, potential excess environmental flows can be sold to agriculture (and other) industries, maximising the use of water resources appropriate to the prevailing conditions in any year.

8.7 Where might ‘sunrise’ industries emerge?

The future is inherently uncertain. It is impossible to fully anticipate each emerging opportunity over the next 10 years, just as there have been frequent surprises over past decades. New markets and ideas will take off that are not only unexpected but could not have been foreseen.

A major implication of this uncertainty is that it places a premium on fostering a flexible, innovative and vibrant culture across the economy — one which supports an enterprise class and in which firms and individuals can respond quickly to changed circumstances, generate new ideas and drive productivity and economic growth.

However, while it is impossible to predict each element of the next decade, it still remains prudent for businesses and government to strategically position on the basis of the most identifiable risks and prospects. Indeed, much of the above discussion (as well as the sectoral discussion in Appendix A) has focused on a potential range of opportunities for NSW over the next decade and further.
With this in mind, there are a number of sectors and areas in which the medium term prospects for NSW look most encouraging. These potential ‘sunrise’ sectors should be considered as speculative and accordingly viewed with some caution.

**Green industries**

- Building and construction services have scope to expand into more advanced design, incorporating leading-edge solutions to environmental challenges, including integration of new information technologies. In part, climate change policies will encourage development of new mitigation or adaptation opportunities, for instance through new building materials and construction techniques. There may be scope to export construction services and innovations into emerging Asian markets.

- The development and manufacture of renewable energy technologies could expand in response to demand for lower carbon-intensive electricity generation. Particular opportunities may emerge in the development of carbon capture and storage technologies.

- Markets in ecotourism and related accommodation may emerge in response to demands for more niche tourism experiences, building on NSW’s reputation as a safe and clean destination for travellers.

**Niche services**

- The export of health services could develop with a focus on growing markets in Asia, in a similar fashion to the education sector.

- Tourism packages tailored for older travellers, including from overseas, could be a high growth area for the NSW tourism sector. Tourism services tailored to the needs of growing markets from China and India may require new business models, just as operators in the past adapted their businesses to cater to tourists from Japan and Korea.

- Building on expanding business service exports to Asia (such as legal, accounting and management consulting), new opportunities might arise to develop services in and around climate change policies and commitments. These might include carbon accounting and compliance services.

**Higher-value manufacturing and agriculture**

- Strong international competition will encourage the continued transition to higher value and more complex manufacturing activities which embody new knowledge and technological change. Areas where such activities might expand include green building materials and forms of renewable energy.

- There might become greater scope to produce higher value-added processed and semi-processed food, targeting a more time-constrained domestic market, and likely growing protein demands of emerging international markets. This could build on NSW’s strong reputation as a reliable and safe food producer.

- Knowledge gained through the shift into more productive agriculture could also give rise to new service exports, for example in efficient irrigation methods and arid-zone agriculture.
Financial services

- NSW already has a good base as a robust and well-regulated regional financial services hub which would be used to leverage into new markets, particularly in the Asia-Pacific region. Key areas of potential development include Islamic finance, carbon trading and global middle-office functions.

Smart networks and e-services

- Intelligent technologies offer a large potential to develop new ways of meeting demands for health, education, transport and utility services. There may be considerable opportunities to lead the development of such applications. These might include:
  - rail and port infrastructure systems;
  - Intelligent Transport Systems for urban transport networks;
  - smart electricity metering and demand side management; and
  - remote controlled forms of agriculture, including irrigation, pasture control and monitoring.

- New opportunities in the development of tele-health and tele-education services and applications could emerge, in particular leveraging off the rollout of the NBN.

Many of these sunrise opportunities represent particular prospects within what may be larger priority areas for the NSW Government and business. These broader agendas are reviewed in Chapter 10.
9 Emerging challenges

The mega-trends examined in Part II will lead to considerable structural changes in NSW. These adjustments will present a range of challenges for both industry and government, not only to mitigate the worst impacts of these forces and smooth the transitional process but to capitalise on the many and varied opportunities likely to emerge.

This chapter discusses where the most pressing challenges are likely to be. Notably, the main challenges do not align strictly or exclusively to the four mega-trends examined. Rather, there are a multitude of commonalities and crossover issues — with a general theme of shaping a modern and flexible economy. These challenges are therefore presented in a more direct context which, among other things, cover issues of infrastructure, urban development and workforce skills.

Regulatory and policy frameworks

Developing well-crafted regulation that is effective in meeting various policy objectives, while doing so at the least possible cost to the economy is inherently difficult. And the regulations have been introduced in the first place for good reasons.

Nevertheless, business believes that regulatory requirements have increased over the past decade in NSW and Australia as a whole. Investment decisions have been affected by inflexible regulations. Accordingly, there is a need to reinvigorate microeconomic reform agendas:

- At the national level, COAG has established processes for the review and possible harmonisation or simplification of regulations in a range of areas. However, given the complexity of the reforms, progress has been limited in some areas and not all regulatory streamlining enhancements will be implemented until 2012.

- Indeed, for many issues, it is easier to address problems at the level of individual governments — in particular, because the need for relevant action varies across jurisdictions. At a minimum, any new regulations need to be designed to minimise costs and ideally supplant existing regulations. While most states, including NSW, have regulatory gatekeeping arrangements in place and policies aimed at reducing the overall regulatory burden, a commitment to further reform is needed.

One area of particular need for NSW at present will be to ensure that planning policies and regulations are able to ameliorate pressures associated with expected population growth. The principles articulated in the Metropolitan Strategy (and which look likely to be preserved as the strategy is reviewed) are sensible and provide a solid policy framework going forward. The main challenges will be ones of implementation.

The steps made over the past few years to reform planning in NSW — ranging from small DAs granted by local councils to large projects of ‘state significance’ — should help. But these reforms are yet to settle down properly and more is needed if the various pressures are to be met in an orderly manner.

Moreover, the challenges that lie ahead will involve delicate decisions related to redevelopment of established precincts and brown-field sites where property rights may be
affected and local communities will have to be brought along. These are difficult issues, but ones which threaten the objective of creating an attractive investment climate for existing and new business if they are not addressed.

**Meeting infrastructure requirements**

NSW’s long-term economic performance is highly dependent on efficient infrastructure provision and utilisation. Strategic infrastructure facilities in the energy, transport, communications and water sectors contribute to almost all economic activities and play a vitally important role in productivity and export competitiveness. A responsive, forward-looking infrastructure sector is also crucial for meeting NSW’s future economic challenges such as climate change and demographic change (both a larger and older population), as well as more immediate concerns regarding capacity constraints.

In recognition of these issues, a pivotal challenge over the next decade will involve developing the State’s productive capacity and modernising key infrastructure assets. This will likely require well-targeted, cost-effective and timely investments in areas where infrastructure shortfalls are most pressing. Some key areas include:

- **Urban transport networks** — Central to much of the Metropolitan Strategy is the delivery of an efficient urban transport system. To an extent, this will be helped if planning decisions facilitate the objective of a better balance between where people live, work and shop. It is also being help by improvements in the design of and technology used in the rail system as well as the reforms to private buses.

  However, many of large challenges lie ahead. For example, key arterial roads are already congested and easy solutions to their relief are not evident. Whether through road upgrades or the introduction of new rail systems, congestion on roads such as Victoria, Parramatta and Canterbury Roads will continue to add to the costs of working and doing business in Sydney.

- **Electricity networks** — A key medium-term challenge for the NSW energy sector will be to meet increasing demand while responding to measures that seek to reduce carbon emissions including the introduction of an emissions trading system and renewable energy targets. These will have implications for price, demand and the mix of generation technologies and future infrastructure provision. At this stage some generation investment within the national electricity market (NEM), including within NSW, appear to be effectively on hold pending firmer policy commitments (and timing) on an emissions trading scheme.

- **Freight networks** — The sudden (and largely unanticipated) surge in resource demand from around 2005 has seen bottlenecks arise with port handling and loading capacity in the Newcastle coal ports (as well as others in central Queensland). While significant investments in port handling and loading capacity are occurring, further investment in logistics and coal loading capacity will be required to avoid acute supply chain constraints re-emerging and to take advantage of expected strong demand for coal over the next decade.

  Similarly, the handling of containers through Port Botany has been subject to review in recent times to address congestion landside. Changes are being introduced, and further ones contemplated for both road and rail. This will involve some investment in physical infrastructure, but the biggest changes will be delivered through improvements in the ‘software’ of the whole of the supply chain. Again, various stakeholders will have interests to consider but it is important that the reforms are delivered.
Workforce skills development

In the recent past, skill shortages have occurred in a range of NSW industries such as health care, building and construction and manufacturing. In the wake of the global financial crisis, skills shortages in some industries may again emerge. Australia avoided a recession and unemployment peaked at lower than expected levels. Underlying consumer and business demand has also improved. Combined, these factors will likely lead to skills shortages in some areas over the next decade, particularly in the mining and construction industries.

The ageing population will also cause concern for some sectors in terms of how they will obtain sufficient staff once baby boomers start to retire in greater numbers. The community services, aged care and health industries face the additional consequence of increased demand for their services due to an ageing population. Workforce skills development in these industries will be especially critical for NSW over the coming years.

Over the next decade, changes to the way businesses operate due to technology will affect the demand for skilled labour. For example, greater prevalence of online booking systems for retailers and the NSW tourism sector mean skills and training are required in e-communications and web management skills. In addition, a range of government policies will influence how industries perform and how training occurs. In the information technology sector, for example, the National Broadband Network (NBN) rollout is likely to result in shortages of skilled telecommunications workers.

Another trend to emerge over the coming decade will be the increasing demand for green occupations and associated skills in NSW, including skills in measuring and reducing carbon pollution, skills to reduce waste (particularly in the manufacturing process), and skills to install energy saving devices.

Regional NSW

Regional NSW is going to face its own set of challenges over the coming decade, driven by the impact of the mega-trends on the current industry structure. Agriculture and mining are very important to regional NSW, and both are heavily reliant on water and climatic conditions, and international trade (in particular, livestock and mining). As a result of the specific characteristics of industry in regional NSW, this area is highly exposed to an ageing population, climate change and the terms of trade.

Demographic change will have substantial implications for agriculture in regional NSW as this sector is particularly exposed to an ageing workforce. Agriculture has experienced a steady ageing of its workforce over time as young labour migrated towards more productive areas of the economy. This problem will be further exacerbated as mining attracts not just capital, but labour, away from farming and livestock in regional areas.

Regional communities in NSW will have a larger share of the burden of climate change than metropolitan areas via both policy responses and adaptation. The shift to a more carbon neutral economy will see a heavy regulatory — and financial — responsibility placed on high emission industries such as manufacturing and electricity generation, which are traditionally located outside metropolitan areas. While there will be opportunities for regional communities to develop around renewable resources, high-emission industries will decline in both size and number.
Further exposure will arise as a result of the impact of climate change — namely, water security. Regional NSW has recently emerged from a substantial drought period which saw considerable losses of livestock and crops. This took its toll on regional communities, with many areas of regional NSW experiencing declining populations.

**Fiscal pressures for government**

The emerging challenges over the next decade will have sizeable implications for both the Federal and NSW Governments’ budget balance.

The Productivity Commission (2005) projected that State expenditure requirements will increase by approximately 0.8% of GDP over the coming decades, with a significant proportion of the expected increase attributable to the increase in — and ageing of — Australia’s population. Given the current reliance of Australian States on the tax transfer system, government spending will be constrained by the ability to raise taxes. According to the Henry Review (2009), ‘financing the projected increases in Australian and State government spending would be equivalent to the entire revenue raised by the GST.’

The ageing population will substantially increase spending pressure in the areas of health, age-related pensions and aged care. Government spending on health is expected to rise both as a result of the increased number of older people and an increase in demand for health services more generally.

A further burden on the government budget balance will arise as the dependency ratio increases in coming years. The ageing population and lower participation rates will combine to slow growth in real GDP per capita to 1.5% per annum (assuming that productivity trends do not improve), and this will have implications for the capacity of government to fund services (IGR 2010).

Climate change adaptation and mitigation will place additional pressure on government balance sheets. Carbon emission mitigation via the CPRS is not expected to significantly decrease the Government’s revenue base — the CPRS is projected to reduce the average annual growth rate of Australia’s GNP per capita by only 0.1 of a percentage point (IGR 2010). However, during the transition period, a substantial amount of government support will be provided to exposed industries and households, placing pressure on government spending. Additional government funding will be used to support the development of low emissions technology and for the development of infrastructure needed for a low pollution economy.

**Ensuring effective delivery of health services**

The ageing population and increasing complex and chronic disease are likely to underpin growing demand for NSW health services into the future. The ageing population will have a substantial impact on the health services industry, from both a supply and demand point of view. On the supply side, an ageing workforce is presenting challenges for employers, such as retaining industry knowledge and skills. On the demand side, the increasing pressure on end-of-life care due to a population that lives longer, associated innovations in treatment and rising consumer expectations will require a greater number of skilled health care workers.

The increasing prevalence of chronic disease, including the rising prevalence of diabetes, heart disease asthma and obesity, are also increasing the demands on NSW health services. The
growing emphasis on risk factor identification and management, including screening tests, all require additional allocation of resources. Multidisciplinary teams will play a greater role in providing services to clients in community settings and will be required to deal with increasingly complex needs of consumers. All of these factors will affect the delivery of health services in NSW, and must be managed to ensure that demand can be met in an efficient manner.

Government policy and regulation, especially in relation to reform of the health system as recently agreed between the Federal and State and Territory Governments, will also impact on the delivery of health services. This reform is aimed at increasing the efficient and effective delivery of health services, and the consequences of this initiative for NSW will be realised over the next decade and beyond.

**Greater manufacturing and service competition**

The sectors on which the emerging economies of China and India will have the greatest impact are manufacturing and services. The competition they provide to the manufacturing industry will come as no surprise given the volumes of mass-produced, low value added products which are increasingly imported to local shelves. In particular their comparative advantage is in their sizeable labour force — and combined with rapid industrialisation they are becoming powerhouses for manufacturing.

This is not to say that competition is only on the low value added front. The emerging economies are increasingly moving into markets for products which require a greater quantity of skill and innovation and the developed world is responding by pouring capital into the economies to fuel this growth. This is also creating competition for foreign investment into the NSW economy as investors seek high returns and are willing to bear the higher risk. Multinational organisations are also increasingly conducting research and development activities in emerging economies to create better linkages with eventual production.

The adoption of new business models which cater for all the growing levels of the income period is proving to be dynamic, particularly as it addresses the volume of demand for high quality technology at low cost. Boosts in innovation have led to advancement in product design and the organising of distribution channels to reach the billions of consumers who are just entering the global market.

On the services front, there has been a trend of off-shoring services to emerging economies, most notably to India. This has been encouraged by the information economy through which greater connectivity is allowing for business to be conducted in a range of locations rather than requiring everyone under one roof. While there has been a proliferation of lower skilled services, such as call centres, being sent offshore, increasingly higher skilled services such as IT assistance are also being directed to information hubs overseas.

**The nature of structural change**

As discussed earlier in this report (see Chapter 2), there have been sweeping changes in the composition of both the Australian and NSW economies over the last thirty years or so. A key feature is that the share of manufacturing and agriculture in economic activity has declined while there has been an increase in the services sector over the same period.
An important point is that these relative declines are not unique. Indeed, most advanced economies have experienced similar shifts in the structure of economic activity away from manufacturing and agriculture to services (OECD 2006).

Some key factors driving these changes have been:

- changing consumer preferences with rising national incomes;
- increased globalisation and trade — often involving growing international fragmentation of production and competition from lower-wage developing economies; and
- strong productivity gains within manufacturing activities.

Economies are inherently dynamic and over one decade to the next will evolve to varying degrees in response to a range of social, technological and international factors. In this regard, it can often be unhelpful to view structural changes away from certain activities (such as manufacturing) in a negative context. Rather, it reflects a common pattern of economic advancement and rising living standards — one that involves leveraging off NSW’s (and Australia’s) abundant resource-base and focusing on more efficient and productive activities.

Policy settings also play a large role in the structure and composition of the economy. In this regard, significant structural and trade liberalisation reforms pursued at both a Commonwealth and State level have helped transform NSW into an open, flexible and dynamic economy.

Importantly, this is set to continue over the next decade. Not only will considerable structural adjustment be required as a result of climate change policies but ongoing reforms to further promote competitive markets — say in water, transport and community services — will also have a large bearing on the shape of the economy.
Conclusions: Priority areas for the NSW economy to 2020

Over the next decade, the mega-trends will present substantial challenges and opportunities for the NSW economy. Effective action by both government and industry will be needed to focus priorities and thereby take full advantage of these opportunities.

A number of priority areas, which draw on the analysis presented in the earlier sections, are summarised in this chapter. They cover areas where NSW is particularly well placed to take advantage of the opportunities likely to arise in the medium term, where government can take a leading role in encouraging new technology applications, and where new approaches offer the potential to reinvigorate vulnerable sectors.

The difficulties of achieving meaningful and practical changes in many of these areas should not be underestimated. Some areas, like those related to the provision of certain human services, have proved difficult to reform and would need to be examined in the context of broader policy agendas. Many of the most pressing challenges also cross-over various government agencies and areas of responsibility.

10.1 Some overarching themes for framing future priorities

Some key overarching themes are particularly useful in considering strategies and initiatives to deal with the medium term challenges and opportunities facing NSW. In part, these major themes can help frame potential policy responses and focus priority areas, especially where crossover impacts, prospects and commonalities arising from the mega-trends and other influences are most pronounced.

10.1.1 Regional impacts

The forces likely to affect the NSW economy over the coming decade, including the four mega-trends, will result in differential regional impacts. Crucially, many of the associated structural adjustments which will be necessary over the next decade and beyond are likely to involve more acute pressures in regional areas — often as result of declining populations, an ageing workforce and limited alternative employment opportunities. For example:

- As discussed in Chapter 9, regional communities will face much of the burden from climate change mitigation and adaptation, partly through a reduction in water availability. This will impact on agricultural production which is an important source of income in rural areas. An important recognition is that a strong and stable agricultural sector is the foundation of many rural communities.

- In contrast, the robust demand for commodities from China and India will support mining activities in NSW. In turn, this will continue to underpin growth and sustenance in many rural and regional communities.

Clearly these two influences will have varying impacts across regional NSW. Some areas are likely to prosper over the medium term as a result of their particular economic base (especially, if focused on mining related activities), while others will face substantial challenges and lower than average growth.
These potential differentiated impacts are shown in Figure 10.1, which maps changes in output at a Local Government Area (LGA) across NSW. This analysis explores the first round effects of different rates of growth by industry sector on a state-wide basis (as summarised in Chart 3.4) assuming that the regional pattern of each industry is unchanged. Thus, for example, if one area has more mining activity than the state average, it will tend to record relatively strong growth given the forecast strength of mining over the next decade.

At face value, Figure 10.1 indicates that the divergence in growth across different LGAs in NSW is not expected to be pronounced, with most LGAs being within ±10% of the State average, which is for around 30% growth over the decade.

However, it is important to recognise that this map shows potential ‘first round’ impacts only. The induced second round effects, in which capital and labour have greater scope to adjust and relocate, are likely to be amplified — both on the positive and the negative. For example, a more buoyant region is likely to attract additional labour and population which, in turn, will have flow on effects in areas such as construction or retail trade.

**Figure 10.1: Percentage change in output across NSW regions**

In terms of regional NSW, the largest prospective growth areas are those with a distinct mining focus (such as Broken Hill and Cobar), larger regional cities, or along the coast. Many regional LGAs have more than 10,000 residents and, to service this population base, have considerable diversity within their local economies. For example, larger country and coastal towns often serve as regional services centres for surrounding areas — including for the provision of...
business services, health and aged care — and will benefit from higher growth in these activities.

Some smaller LGAs (such as Urana) do not have a main regional centre and tend to be dominated by agriculture and/or forestry. Because these areas have less overall balance in their local economies and limited exposure to mining related activities, they experience lower relative growth in the decade ahead.

The wider Sydney region fares well, with almost all areas recording average or above average growth to 2020. A large influence is that these larger population centres will have a greater proportional services focus which will boost their overall growth potential. South western Sydney shows lower relative growth primarily due to a higher proportion of manufacturing in its economic base.

Any initiatives aimed at revitalising local economies and communities, especially in regional NSW (see below), should be framed in the context of these potential impacts and the likely magnitude of the structural adjustment challenges.

10.1.2 Priorities may be linked and interdependent

Like many of the challenges discussed in Chapter 9, there are strong interconnections for most of the priority areas for the decade ahead. For example, harnessing opportunities for greater agricultural exports into emerging Asia could provide a critical boost for regional sustainability and drive deeper improvements in productive efficiency, say from smart metering and water management principles.

Further, smart network technologies could be applied in a range of areas such as traffic control and electricity and water management. The successful development of such technologies could play a pivotal role in meeting challenges across both urban and regional areas. Similarly, as emphasised below, advances in communications technologies provide the potential for significant improvements in terms of both efficiency and effectiveness throughout the health system.

Recognising where these cross-over opportunities are most prospective, and where direct government action or coordination can overcome relevant development or implementation hurdles, will be crucial in devising effective policy action going forward.

Skills development will be crucial across many sectors

Particular skills shortages emerged over the last decade following strong economic growth nationally and in NSW. Looking forward, such challenges are likely to persist, especially given expected retirements from the baby boomer generation and the movement of labour to higher-growth areas, such as the more resource-intensive states.

Many of the challenges and opportunities discussed in this report are substantial and will require a highly skilled and adaptive workforce. High levels of human capital will help underpin sustainable economic growth in the face of new (and possibly unforeseen) challenges and opportunities. A key factor is this requirement spans a variety of sectors of the economy. As such, it places an increased emphasis on policy initiatives that support broad-ranging skills development and encourage workforce participation.
In the context of these three central ideas, the discussion below outlines suggested priority areas where government can effectively:

- play a direct leadership role through well-targeted policy interventions and regulatory regimes; and
- provide a more supporting industry development function by establishing clear strategies and goals for those sectors of the economy identified as priorities.

It should be noted that these do not represent specific policy proposals. Detailed examination and analysis of concrete policy actions would be required in each area, and each would warrant a dedicated policy development program.

### 10.2 A direct leadership role for government

The suggested priorities below set out areas where direct action by government can be effective in positioning NSW for the challenges ahead and building on its major advantages and strengths.

A core requirement will be to ensure that government’s direct activities in these and related areas are both efficient and effective. In particular, that there is strong coordination between government agencies and support within the centre of government.

**Connectivity: a central role for government**

Over the next decade, there are many areas where the application of information technologies will profoundly change the way in which economic and social activities are undertaken. Within NSW and the broader national economy, the rollout of the NBN offers considerable potential to accelerate the development of innovative applications centred on greater ‘connectivity’.

The breadth of the changes means that there will be options for government support through numerous channels and activities. The risk is that such support will become fragmented and applied inconsistently over time. A whole-of-government approach provides the best scope for realising the potential benefits both within government and the economy overall. A secondary but, nevertheless, very important priority could involve supporting small and medium size business embrace the advance information technologies.
The NSW economy in 2020

Priority area 1: Supporting greater connectivity

■ Intelligent technologies — Intelligent technologies are set to significantly improve the efficiency and functioning of four areas of the economy where government plays a central role — namely in health, education, transport and utility services. In each of these areas, there will be a need for initiatives targeted at the adoption and use of new technologies and complementary policy or regulatory reforms. Effective coordination at the centre of government, applied consistently over the decade, will be needed. Because of this deep involvement, government could effectively facilitate or support a range of adoption initiatives — especially in terms of the direct delivery of government services. This would also provide a focal point for industry in areas where advanced technologies will be important.

■ Supporting small business — There will be particular challenges for many small and medium sized enterprises that will be presented with both:
  ▪ global reach in terms of customers; and
  ▪ increased competition from around the world.

Government programs to enable SMEs to take advantage of broadband and other advances in information technologies could make a valuable contribution to the realisation of opportunities across the economy.

Health and aged care: the need for long-term reform

The broader health and aged care sector is a significant part of the economy, and one with the potential for sizeable improvements in terms of effectiveness and efficiency, and thus is a high-priority policy area for government. Among the many important trends facing the sector which will present various challenges over the next decade and beyond are:

■ an older population will place greater cost pressures of the delivery of health services; and

■ greater community affluence will increase demands for more tailored services.

Both of these impacts will increase the requirements for improving the effectiveness and efficiency of the overall health system. A particularly critical issue facing the sector will be to ensure the efficacy of regulatory frameworks.
Priority area 2: Health and aged care reform

- The information economy will provide an important catalyst for delivering change and driving efficiencies in the sector. In particular, various e-health initiatives will provide the ability to deliver more tailored services in the community reducing the reliance on health facilities. Some workforce issues/challenges may stifle the application of certain e-health innovations and these could usefully be addressed as part of a broader reform program.

- The private sector plays an important role in the sector, particularly in the provision of retirement villages and hospitals. Going forward, and given various social factors, a mix of both public and private providers will continue to be optimal. However, there is likely to be a large potential to increase the role of the private sector in the delivery of health and aged care services. Importantly, greater use of information technologies will play an important role in enhancing productivity in service delivery regardless of ownership. The development of private businesses in parts of the industry could be supported by strategies developed by agencies beyond the traditional health related departments.

Climate change: positioning NSW for the future

Minimising the costs of adapting to climate change will be dependent on support through a variety of initiatives, including those aimed at promoting relevant technological development and deployment.

In particular, areas where considerable economic gains for NSW are possible are likely to involve those related to addressing localised problems or challenges in which the opportunities for harnessing international research and innovation will be most limited. This also reflects the reality that research and other relevant resources are limited and need to be directed to the most prospective areas.

In addition to specific action areas, initiatives aimed at improving the flexibility of the economy will also be important. In this regard, broad-based reforms aimed at boosting future productivity and economic growth will be critical for enhancing the range of potential climate change adaptation opportunities.
Priority area 3: Addressing the climate change challenge

- Natural gas development in NSW looks to have the potential to support electricity generation and local manufacturing in the Hunter over the next decade. It could also contribute to exports of LNG, dependent on the emergence of a viable east coast LNG facility.
  - On the other hand, apart from wind generation, most of the activity on renewable energy for electricity is likely to be of relatively small scale and not useful for base-load generation.

- The long-term fate of the NSW coal industry will be influenced by where carbon capture and storage becomes commercial. This will not be known for some years and research and development in storage resources within NSW is needed. Such activity could leverage off NSW’s strong research base in resource and energy related areas.

- Opportunities will also come through the development of emissions abatement technology; sustainable design and construction; renewable energy; and energy management technologies and consulting services.

- Water scarcity issues could become more pronounced over time, affecting agricultural production in regional NSW including in the Murray-Darling Basin. To minimise the potential impact of reduced water supplies it will be important that productivity improvements in irrigation areas are pursued. This could involve efficiency-enhancing investments in water delivery infrastructure, which also aim to improve environmental flows, as well as fostering new businesses in water management.

Reinvigorating regional NSW

The extended period of unfavourable seasonal conditions, accompanied by an often strong Australian dollar, has placed many regional NSW communities under pressure, especially those within the Murray-Darling Basin. Even if seasonal conditions are not as severe as seen on average over the past decade, a more coordinated and proactive approach to revitalising regional communities and economies is warranted. In doing so, the growing markets in Asia should benefit producers of high-value products such as meat, diary, and particular parts of horticulture and crops.

Australian Government funding is available to support these communities. However, progress to date has been uneven with, for example, parts of northern Victoria achieving greater success in upgrading infrastructure and refocusing production than many other sub-regions in the basin.

Parts of regional NSW which are less dependent on agricultural production are likely to face different development pressures over the coming decade. For instance, strong population growth in mining centres and coastal areas of NSW will increase demands on infrastructure and construction services, as well as the provision of health and social services.
Priority area 4: Regional NSW

- Increasing demand from emerging Asia and environmental pressures in the Murray-Darling Basin should encourage high-value agriculture. Combined with Commonwealth support, the NSW Government and regional communities might develop their own version of strategies similar to the ‘food bowl’ in northern Victoria.

- The growth and vibrancy of many rural and regional communities — especially in mining related centres and along the coast — will be highly dependent on the provision of infrastructure and social services which can respond effectively to changed settlement patterns and population ageing.

Workforce skills development

In the years ahead, the combined impact of the mega-trends and other forces will change workforce requirements in the NSW economy. Importantly, these will cut across a range of industries and sectors. NSW has a large, diverse and skilled workforce with sophisticated skills in critical areas, including in financial management, engineering and construction, resource development, design and scientific research. It will be important to strengthen this skills base over the next decade to take advantage of the opportunities that will arise.

Priority area 5: Skilled workforce

- **Productivity** — Productivity enhancements will come about through increased participation in the education sector (including life-long learning); and partnerships between industry, the education sector and Government.
  - Our workforce will need to have systems to enable cross-disciplinary collaboration between highly skilled individuals working in disparate fields.

- The NSW economy will be faced with a number of challenges in the future including those arising from the combined influence of the four mega trends. Government and business have a key role in helping to build the State’s knowledge capabilities to meet these challenges through education and ongoing skills development.

- Education providers and employers will need to work closely together to develop and deliver education and skills training which accommodates a workforce that is vibrant and constantly adapting to new drivers and technologies.

10.3 Supporting industry development

The priorities below identify areas where government can potentially play a more supporting industry development role to maximise the economic opportunities likely to emerge over and beyond the next decade.

A main benefit of such support will be to help build greater confidence from industry and investors to fund new enterprises, product development and related R&D in these and other potential ‘sunrise’ areas.
The NSW economy in 2020

Exporting to Asia: playing in burgeoning markets

The rapidly emerging economies of China and India represent a pivotal shift in global economic power to Asia. The transformation in these economies will have a profoundly positive impact on the NSW economy, producing a range of export and foreign investment opportunities. However, it will also intensify competition for trade-exposed sectors, including those involved in higher-value manufactures and services.

A key implication of this development is that there will be a re-balancing of various sectors and the need/ability for local players to be responsive to changing demands.

Priority area 6: Export opportunities to dynamic Asian markets

- There are several key areas where export opportunities to emerging Asia look most prospective:
  - **Tourism** — There appear strong opportunities from developing the Chinese and Indian markets to offset declining visitor trends in other international markets.
  - **Financial sector** — Sydney can build on its reputation as a vibrant, well-regulated centre for financial service excellence in the Asia Pacific region. Growth prospects will present themselves in new financial and risk management products.
  - **Professional, scientific and technical services** — There is a strong base in NSW across a range of activities including accounting, management consulting, engineering and architecture. Demand for these types of services is likely to expand as Asian economies go further along the path of economic development.
  - **Education** — The NSW education sector is already a significant provider of education service exports. Increasing middle classes in Asia will provide the potential to greatly expand these services, especially in the university sector. Further opportunities exist for vocational training but will be greatly dependent on making progressive improvements in quality and reputation.
  - **Health services** — A more speculative opportunity exists to increase exports of health services into Asian markets, particularly for higher-end and medical training services. Much will depend on a national policy in the area and new initiatives are likely to be driven by private providers.

A key aspect of each of these areas is that there will be increased competition from the emerging markets themselves but that demand generated by these economies is likely to be stronger. That said, it will be important that respective NSW sectors are highly responsive and market-focused in order to capitalise on new opportunities as they arise.

In an overall sense, further economic gains from greater trade integration with emerging Asian markets can be leveraged from Sydney’s position as a global city.

Building and construction: using NSW’s strong base

NSW has a strong base in construction on which to leverage considerable economic opportunities in the decade ahead. There are already leading edge construction companies based in NSW that are successfully engaged in export markets. Further, the industrial base in NSW will expand driven by the need to significantly increase dwelling investment to accommodate a larger population.
Priority area 7: A dynamic building and construction sector

The expected strong demand for dwellings in NSW should see the sector expand markedly over the next decade. This provides opportunities in design and construction services, including in regard to:

- addressing environmental challenges associated with climate change and water scarcity; and
- the adoption of new technologies in the home such as information technologies, modular building practices and energy efficient materials.

The strength of the sector could also provide a base for developing construction and building service exports to emerging Asia.

Creative industries: building on local talent

Creative functions are set to play a more important role in the economy going forward. In part, this is driven by higher levels of innovation and design content in broader economic activities such as business services and manufacturing. There will be key opportunities for NSW to build on the strength of its creative talent and industry base. Importantly, creative industries can play a larger role in supporting higher value manufacturing and service activities and promoting broader industry competitiveness.

Priority area 8: Promoting creative industries

There are several reasons that underpin the importance of a strong and vibrant creative industries base in NSW:

- NSW already has considerable pool of creative talent;
- there is the potential to leverage off further developments in the information economy;
- creative activities are highly mobile and competition from abroad will be strong;
- it can provide broader spillover benefits to the community in terms of supporting our identity and local culture; and
- design and innovation-related services are important inputs for other sectors.

The opportunity is to leverage the capabilities of this sector to take advantage of demographic trends — driving increases in leisure time — and ICT trends in emerging platforms.

Enhanced competitiveness of other sectors can be brought about by creative businesses through such things as design in products, processes and services.
Appendix A: Compositional change in the NSW economy to 2020

This appendix covers the sectoral components covered in the modelling in greater detail. The 55 sector breakdown has been grouped into 24 broader classifications (with some related sectors being combined).

In addition, four composite industries — creative industries, tourism, ICT and education and scientific research — are discussed. These industries cut across standard industry structures but, within each composite, include many shared activities.

The structure of this appendix is as follows. Firstly, the activities covered under each sector are discussed. Expected changes in value added shares between 2010 and 2020 under the baseline scenario are then set out. Following this, key industry drivers over the next decade are explored, with particular focus on which of the mega-trends is likely to be most critical. Finally, a range of challenges, uncertainties and potential development opportunities are identified for each sector.

Technical note

This appendix provides greater sectoral detail of the NSW economy than presented elsewhere in the report. Some sectoral results under this finer decomposition may differ slightly with industry projections presented elsewhere in the report. This arises largely from the way different sectors are considered and aggregated in the general equilibrium (GE) modelling framework compared with measures used in generating economy wide forecasts. (More detail on how these different modelling approaches are integrated is provided in Appendix C.)

This issue is especially prevalent in those industries which have greater service intensity. In particular, differences in how some non-core service activities are treated will affect forward projections of industry output. Under the GE framework, for instance, many supporting service activities for the manufacturing industry such as some forms of information technology, accounting and design services are not attributed to manufacturing but to other service areas. Accordingly, some sectors, most notably manufacturing, appear to be under represented in this sectoral decomposition. It should be noted that such inconsistencies are not significant in the context of this study — they affect neither the direction nor the order of magnitude of industry output changes over the decade.
Overview of the sectoral composition

Chart A.1: Baseline NSW industry structure

The NSW economy in 2020
Chart A.2: Baseline NSW composite sectors

Table A.1: Baseline NSW industry composition

<table>
<thead>
<tr>
<th>Sector</th>
<th>Share of value added</th>
<th>Value added ($million)</th>
<th>Growth 2010-20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
<td>2010</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Agriculture and forestry</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops</td>
<td>1.6%</td>
<td>1.6%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Livestock</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.4%</td>
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<tr>
<td>Other agriculture</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Forestry</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Mining</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal coal</td>
<td>2.2%</td>
<td>2.3%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Coking coal</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Natural gas</td>
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<td>0.0%</td>
<td>0.2%</td>
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<tr>
<td>Crude oil</td>
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<td>0.1%</td>
<td>0.1%</td>
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<tr>
<td>Other mining</td>
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<td>0.2%</td>
<td>0.2%</td>
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<tr>
<td><strong>Manufacturing</strong></td>
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<td></td>
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<tr>
<td>Aluminium</td>
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<td>Iron and steel</td>
<td>1.9%</td>
<td>1.5%</td>
<td>1.4%</td>
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<tr>
<td>Other non-ferrous metals</td>
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<td>0.5%</td>
<td>0.8%</td>
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<td>Non metallic minerals</td>
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<td>0.4%</td>
<td>0.4%</td>
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<td>Petroleum</td>
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<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Chemicals, rubber and plastics</td>
<td>1.9%</td>
<td>1.4%</td>
<td>1.1%</td>
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<tr>
<td>Motor vehicle parts</td>
<td>1.0%</td>
<td>1.1%</td>
<td>0.8%</td>
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<tr>
<td>Electrical equipment</td>
<td>0.8%</td>
<td>0.9%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>1.4%</td>
<td>1.1%</td>
<td>0.9%</td>
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<tr>
<td>Processed food</td>
<td>2.4%</td>
<td>2.0%</td>
<td>2.0%</td>
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<tr>
<td>Lumber and wood products</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Pulp, paper and printing</td>
<td>0.8%</td>
<td>0.5%</td>
<td>0.4%</td>
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</table>
## The NSW economy in 2020

<table>
<thead>
<tr>
<th>Share of value added</th>
<th>Value added ($million)</th>
<th>Growth 2010-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 2010 2020</td>
<td>2010 2020</td>
<td></td>
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<tr>
<td><strong>Electricity, gas and water</strong></td>
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<td>Water</td>
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<td>Electricity distribution</td>
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<td>Gas distribution</td>
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<tr>
<td>Construction - Non residential</td>
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<td>Construction - Engineering</td>
<td>1.1% 1.2% 1.3%</td>
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<td><strong>Trade, accommodation and business services</strong></td>
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<td>Wholesale trade</td>
<td>6.1% 5.4% 5.1%</td>
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<td>Retail trade</td>
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<td>Insurance services</td>
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<td>Professional Scientific and Technical</td>
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<td>Administration and Support</td>
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<tr>
<td><strong>Government services</strong></td>
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<tr>
<td>Public administration and Safety</td>
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<tr>
<td>Education and Training</td>
<td>5.0% 4.6% 4.2%</td>
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<tr>
<td>Health care and social assistance</td>
<td>5.7% 6.9% 7.5%</td>
<td>22834 32339</td>
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<tr>
<td><strong>ICT and other</strong></td>
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<tr>
<td>Arts and Recreation</td>
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<td>Other communications</td>
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<td><strong>Total</strong></td>
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<td><strong>Composite sectors</strong></td>
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<tr>
<td>Tourism</td>
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<td>12724 16014</td>
</tr>
<tr>
<td>ICT</td>
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<td>18759 25082</td>
</tr>
<tr>
<td>Education and scientific research</td>
<td>5.1% 4.7% 4.2%</td>
<td>18165 21344</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>- - -</td>
<td>64708 82882</td>
</tr>
</tbody>
</table>
Administrative and support services

Coverage

This sector covers businesses mainly engaged in performing routine support activities for day-to-day operations of other business or organisations including administrative support services such as office administration, human resources, taking orders, providing credit reporting and arranging travel tours. Other support services include cleaning services, pest control, gardening and packaging products.

The NSW sector, as a proportion of the value added to the state economy, is larger than the national average. In terms of value added, administrative and support services accounted for around 3.15% of the NSW economy in 2010. This share is expected to increase slightly by 2020 to 3.18% and will remain a comparatively larger share of the state economy than the national economy. Over the next decade, the administrative and support services sector is expected to grow by 32.4% in NSW, lower than the 52.1% in Australia.

Key drivers

The information economy will shape the administrative and support services industry in the forecast period. As a share of value added, the industry is expected to increase slightly, indicating the greater efficiencies which can be achieved through ICT. There is potential for increased use of information technologies to streamline the sector, the scope of which will be aided by the NBN.

Demand for the services provided by the sector is correlated with the Gross State Product and will increase as the services sector of NSW grows. This will be driven by international linkages, potentially with emerging economies. Greater development of the financial and insurance sectors, for instance, will require improved coordination of operations, particularly across time zones. This will create demand for administrative and support services.
The NSW economy in 2020

Challenges and uncertainties

- The possibility of off-shoring of administrative and support services threatens the sector. With improvements in ICT linkages, it becomes a real possibility that not all services will be required in-house. For instance, some technical support and reception services are currently outsourced to generic companies who provide assistance for a range of organisations simultaneously.

- Competition from low labour costs in emerging economies such as India will see off-shoring of IT departments and reception facilities.

- The advent of cloud computing will allow more small to medium enterprises to reduce network support costs, reducing the need for an IT department.

Development opportunities

- The information economy will allow for the sector to provide greater value-added services, or achieve a larger range of tasks with more efficient management. The additional tasks which administrative and support services provide could make them more valuable within an organisation, which may outweigh the benefits of outsourcing.
Agriculture, forestry and fishing

Coverage

This sector incorporates primary agricultural activities. In the context of the quantitative modelling, this includes four activities — crops, livestock, forestry and other agriculture.

As a proportion of value added to the state economy, the NSW sector is smaller than the national average. In terms of value added, agriculture accounted for around 2.4% of the NSW economy in 2010. Cropping is the major contributor to this, making up approximately two thirds of this category. By 2020 the share of total NSW value added from agriculture will drop slightly to 2.1%, however, the composition of this remains largely unchanged within the sector.

Crops made up 1.6% of value added in NSW in 2010, and is expected to decline to 1.4% in 2020. Similarly, the shares of livestock and other agriculture are expected to decrease slightly from approximately 0.44% to 0.39% and 0.31% to 0.28% respectively. Over the next decade, the sector is expected to grow by 16.2% in NSW, lower than the 21.3% in Australia. As a share of the economy, the component crops, livestock, forestry and other agriculture are each forecast to grow by 16.2% in NSW, compared to 21.7%, 26%, 14.6% and 17.5% respectively in Australia.

Key drivers

Over the next 10 years, agriculture, forestry and fishing will continue to face environmental constraints which will be significant in affecting production. Of the four mega-trends, climate change will have the greatest impact on the sector, as increasing variability will affect production decisions, the degree to which supplementary inputs (such as irrigation) need to be relied on, and the viability of particular land uses in certain areas. For crops, this will affect the relative shares of dryland and irrigated agriculture in certain regions of NSW. Feed supplements may be increasingly required for livestock finishing due to limited pasture availability.
Emerging Asian economies are expected to provide export growth opportunities. In general, as median incomes rise in these economies, so will the demand for higher protein diets. This is expected to create overseas demand for exports of cattle and sheep. While the live export market is dominated by the northern states of Australia, there is scope for NSW to help meet the demand of the processed meat markets in these emerging economies.

More intensive competition from overseas producers will also affect NSW agricultural production as consumers may increasingly shift to cheaper imported products. China is increasingly exporting fruit, vegetables and seafood to Australia, though there have been potential food security issues which may limit the extent and nature of import penetration. The ability to supply safe, clean and high quality produce is likely to develop further as a key competitive advantage for both NSW and Australian agribusiness.

Domestic demographic change will also affect demand for output from the sector. Growth in the population will require greater food supplies. This will place greater demand on current production and encourage greater intensity of land use, though this may be constrained by environmental factors as well as urban sprawl. For instance, the market gardens in Sydney have been on the threatened as Sydney’s residential areas spread to the south and north west.

**Challenges and uncertainties**

- Periods of restrictions on water and increased competition for constrained water resources will affect production decisions in both cropping and livestock.
- Food security is being increasingly challenged by resource constraints (e.g. water, energy, land, agricultural inputs) and environmental risks such as climate change.
- The prospect of an elevated currency, predominantly driven by high commodity prices, will affect export competitiveness and increase competition from imports. On the other hand, a decline in commodity prices would benefit the sector through a currency depreciation which would benefit producers of traded products such as agricultural goods.
- An emissions trading scheme or some form of carbon pricing will benefit the agricultural sector if proposed plans to allow members to purchase offsets from agriculture are supported. Emissions-intensive forms of agriculture like beef production will be considerably affected by a carbon price if captured under a scheme.

**Development opportunities**

- The information economy provides opportunity for improvements in logistics and marketing opportunities through new information technologies. It will also allow farmers to remotely control aspects of their operation like irrigation and pasture control, and facilitate more sophisticated data collection.
- A move to higher value-added and niche agricultural products is possible in response to changing tastes and preferences from rapidly expanding Asia-Pacific markets. In particular, NSW’s strengths as a reliable, safe and productive food producer can be leveraged to meet growing demand and changing diets in Asia.
Construction

Coverage

Construction covers the construction of buildings and other structures, additions, alterations, installations, reconstruction, maintenance and repairs of buildings and other structures. In the quantitative modelling, construction includes residential, non-residential and engineering construction.

Overall, construction consists of 7.5% of the NSW economy in terms of value added in 2010, and this is projected to increase to 8.8% by 2020. The majority of construction is attributed to residential construction, while non-residential accounts for almost one quarter and engineering about 15%. Although construction as a share of the NSW economy is currently similar to its share compared to the Australian economy, construction is forecast to grow considerably faster within the state compared to the national economy by 2020.

Over the next 10 years, the sector is expected to grow by 54.5% compared to 47.9% in Australia. As a share of the economy, the residential construction component is expected to grow strongly by 60.9% in NSW, though lower than the 67.4% in Australia. On the other hand, non-residential and engineering construction are forecast to grow by 39.5% and 52.6% in NSW, outstripping rates of 14.4% and 14.6% respectively in Australia.

Key drivers

The NSW infrastructure and construction sectors are likely to expand strongly over the next decade with much of the growth driven by the need to meet requirements for a growing population.

Population growth will be a key driver for residential construction, along with interest rates, employment and income growth. Demographic change will see the population grow in the key household-forming age group of 18-39 years. Utilities in general will also increase as a result of population growth.
The rapid growth of China and India has also seen an increase in commodity prices and demand for resources. The increased industrialisation and urbanisation of these countries has driven up the level of investment in infrastructure and engineering construction to cater for these needs.

Though not necessarily changing the volume of construction, climate change will impact the construction industry with a greater focus on sustainability with more efficient technologies such as water and energy saving appliances. Building codes are already incorporating energy efficient requirements in order to reduce the carbon footprint of households and businesses.

**Challenges and uncertainties**

- An ageing population may exacerbate skills shortages within the construction industry as construction businesses struggle to find workers with the appropriate skills and qualifications.
- Meeting the challenges of population pressures will require responsive adjustments of regulation and the planning framework especially with regards to both the release of land and re-development of brownfield sites.

**Development opportunities**

- The expected strong demand for dwellings will see the infrastructure and construction sector expand markedly over the next decade.
- There is an opportunity to develop leading edge solutions to the environmental challenges while integrating new information technologies throughout building design.
- The continued growth of China and India will push infrastructure growth including rail and port infrastructure within Australia.
- These economies might also provide new opportunities to export services in infrastructure design and construction.
Electricity, gas, water and waste services

Coverage

The electricity, gas, water and waste services division comprises of businesses engaged in the provision of electricity, gas, water drainage and sewage services. It also includes the collection, treatment and disposal of waste materials, and waste recovery activities. Electricity services include electricity generation, transmission and distribution, while gas services include gas distribution.

In the quantitative modelling, this sector is broken down into water, electricity generation, electricity distribution and gas distribution.

In terms of value added, the electricity, gas, water and waste sector accounted for around 2.5% of the NSW economy in 2010, and is slightly smaller than its national comparative proportion. On a state level, electricity generation was the largest contribution accounting for almost half of the sector, followed by water (0.7%), electricity distribution (0.65%) and gas distribution (0.07%). By 2020, the share of total NSW value added from this sector will rise slightly to 2.6% and will result in a slight composition shift from electricity generation to gas distribution.

Over the next decade, the sector is expected to grow by 32.4%, above the 25.7% anticipated in Australia. As a share of the economy, the gas distribution component is expected to grow very strongly by 204.4% in NSW, far above the 23.8% in Australia. The water, electricity generation and electricity distribution components are also forecast to grow by 33.7%, 24.6% and 25.3% in NSW, above rates of 26.2%, 25.4% and 26.1% respectively in Australia.

Chart A.6: Electricity, gas, water and waste services share of value of added

Key drivers

Demand for these utilities is relatively price inelastic, with baseload requirements remaining constant irrespective of the state of the economy — washing, cooking, food storage and waste disposal are required by households even when discretionary spending is cut. However,
climate change is a particular driver of this sector which will affect demand, particularly through energy and water saving devices, and recycling.

While the CPRS did not meet its original 2010 commencement date, its ultimate implementation is still probable, at least in some form. Policies to reduce greenhouse gas emissions particularly affect the supply side of the utilities sector, though incentives for households also exist.

For instance, solar credits and rebates encourage households to use solar energy for hot water systems and feed-in tariffs encourage the supply of excess generated energy to the grid. As sustainable technologies and electricity generation from renewable sources become more mainstream, they will provide competition to the traditional electricity and gas providers.

Demographics will also play a role in shaping the demand for utilities in the coming decade. In NSW, the growing population will be housed in a combination of 30% greenfield release areas, and 70% in existing areas. This means that the services will need to be extended to cater for new areas, as well as for increasing density of existing areas.

Electricity generation requirements will need to match the demands of this population, particularly during peak periods, while additional landfill sites may need to be identified to address the issue of waste. There may be a need for more permanent water restrictions to ensure that the existing dams can support larger populations, or the dam capacities themselves may need to be increased.

**Challenges and uncertainties**

- The introduction of the CPRS would increase the cost structure of existing energy generation technologies and will make alternative renewable energy forms relatively more affordable.

- Implications of a higher carbon price on emissions intensive trade exposed industries who are major consumers of electricity and other resources.

- The extent of population growth and where people will live and work, and the required expansion to the existing system. Potential resource constraints (water for instance) will affect provision of the sectors services.

- NSW Government incentives for the renewable energy sector which will provide competition to the existing infrastructure. Implications of direct government involvement in the electricity industry, energy-efficient programs and the feed-in tariff. Pricing policies in the face of growing demand and the implications of this for alternative renewable energy use.

**Development opportunities**

- The integration of renewable and existing energy sources to meet energy needs in a less carbon-intensive way.

- The information economy will encourage greater development of water and energy saving technologies, and remote control of utilities to collect information and ensure sufficient energy to meet baseline and peak demand periods.

- Improved recycling technologies to more efficiently reuse waste products and reduce the reliance on new resources.
The NSW economy in 2020

Financial and insurance services

Coverage

This sector incorporates both the financial and insurance sectors under the broad category of business services. The sector represents a larger share of value added to the NSW economy than its national equivalent, with most of these services centred in Sydney.

Financial services have comprised approximately 71% of the sector in the last decade and look to represent a similar proportion to 2020. Financial services contribute 11.5% of value added to the NSW economy, and this is expected to grow slightly to 11.6% in the forecast period. On the other hand, insurance services make up 4.6% of value added, with the proportion expected to remain roughly the same or decline marginally over the next decade.

The sector is expected to grow by 32% in NSW in the decade ahead, lower than the 41.1% in Australia. As a share of the economy, the component financial services and insurance services are forecast to grow by 32.8% and 30.1%, again below the 40.6% and 42.3% in Australia.

Key drivers

Sydney is well-placed to continue as a major financial centre for Australia and the region. Its position is based on a strong skill base and a sizeable local market as well as a range of factors that mean that it is a convenient place to conduct global financial business. These factors include the use of English, the ready availability of other language skills, the time zone, advanced communications and the attractiveness of Sydney as a place to live. In addition, Australia’s reputation as a safe place to do business with a robust regulatory regime has been boosted by its ability to navigate through the global financial crisis.

The financial sector has weathered the global financial crisis in reasonable shape although challenges remain in important parts of the sector. Looking ahead, the sector will be one of the most directly affected by both the expansion of new information services and the ageing of the population. Australia’s financial sector’s ability to cope with the global financial crisis —
and NSW as the state with the largest financial sector — provides some potential for the sector to further develop its reputation as a regional financial sector over the coming decade.

The NSW finance and insurance sector is likely to be affected by a number of the trends examined in this report over the next decade. The sector has already been a leading adopter of ICT services and this is expected to continue. The superannuation implications of an ageing population will generate further growth opportunities in funds management, while the proposed introduction of some form of carbon pricing may generate new growth potential relating to the market for carbon permits.

Most of the new opportunities related to the trading of emissions permits are likely to relate to advisory and compliance matters rather than the trading of the permits and related financial instruments themselves, an activity that would be readily bolted onto existing trading operations.

The emergence of China and India also offers opportunities and challenges for finance and insurance services as more of the world’s financial business will be conducted in Australia’s time zone, with institutions based in Australia well-placed to provide services in the region.

As countries like UAE, China and India develop they will strengthen their skill base and their financial and legal institutions, allowing them to meet a greater share of the market themselves. It may take many years before China and India are able to build reputations and systems sufficiently to act as major financial centres for business beyond their borders, but they will become increasingly able to service their domestic markets. Also, India is set to continue to build its capability in a broad set of back office functions.

Chinese and Indian financial services groups are active in the Australian market, with many opening in Sydney. There are opportunities for co-operation between Sydney and these regional financial centres as they develop.

Challenges and uncertainties

■ Existing trends towards a deeper use of technology leading to more services being delivered remotely and the further integration of markets globally, will continue and may intensify. This will provide a challenge for Sydney to maintain its place as a major regional financial centre, though it also presents opportunities for development.

■ Increased global networks will further open up the economy to external shocks unless risks are well secured. China, like all economies, is not immune to economic fluctuations and over-dependence on its pattern of growth will be detrimental if the economy falters due to its long term debt and possibly unsustainable growth.

■ Federal Government impediments such as tax uncertainty for foreign investors and other recommendations of the Johnson Report into Australia as a Financial Centre are being adopted slowly following the 2010 Budget.
Development opportunities

- Australia’s ability to navigate the global economic crisis has enhanced its reputation as a robust and well-regulated financial centre for the region. This will provide an opportunity to further develop markets at home and globally.

- There are key opportunities for Sydney to leverage and build its existing strengths as a regional financial centre — particularly in terms of ongoing innovation in financial services and by continuing to redefine itself as a high value, high skill market. While more financial services will operate offshore in regions with lower labour costs, Sydney will be able to maintain a strong position regionally. Emerging sub-sectors that may grow during the decade include Islamic finance, carbon trading and global middle-office functions.
Food, Beverage and Tobacco

Coverage

This sector includes the manufacturing and sale of food products, beverages and tobacco. In the quantitative modelling, food, beverage and tobacco is referred to as processed food.

As a proportion of value added to the state economy, the NSW sector is smaller than the national average. In terms of value added, food, beverage and tobacco accounted for around 1.96% of the NSW economy in 2010. However, by 2020, the share of total NSW value added from food, beverage and tobacco will rise slightly to 2.04%. Over the decade ahead, the sector is expected to grow by 35.9% in NSW, higher than the 11.6% in Australia.

Chart A.8: Food, beverage and tobacco share of value of added

Key drivers

As food and beverages are essential commodities, and tobacco is an addictive substance, their demand is relatively price inelastic, although some substitution in consumption may exist. Demographic factors are likely to have the greatest impact on shaping this sector.

The growing population will place demand on the sector, with supermarkets and restaurants and cafes facing increasing patronage, particularly in residential and office hubs. The supply of food, beverages and tobacco will need to meet this growing demand. An area for potential expansion is in processed food manufacturing, as increasingly time-constrained people seek a fast and nutritious meal which is partly prepared. Though this niche market declined slightly as a result of the downturn, with people substituting prepared meals for cheaper ingredients cooked at home, it is likely that this trend will reverse as employment increases and incomes rise.

The increase in the population and associated urban sprawl may limit food production and see this and processing move offshore. The high Australian dollar is supporting imports including food products which are competing with the NSW sector.
Government policy will also shape demand for components of this sector. The 25% increase in the cigarette tax announced in the 2010 Federal Budget is expected to reduce demand for cigarettes.

Challenges and uncertainties

- Review of current alcohol taxation may lead to the introduction of a volumetric alcohol tax being applied on the sector, as recommended by the Henry Review. This may cause a substitution between types of alcoholic beverages or consumption of alternative substances.

- International competition for processed food will increase as food production and processing techniques improve, particularly in emerging economies. The high Australian dollar will make it cheaper to import processed food rather than producing it domestically.

Development opportunities

- Increasing value-added and quality of processed food will increase its market share, particularly for time-constrained people seeking a fast and nutritious meal. This market will tap into emerging economies through higher protein foods prepared in ways to which they are not traditionally accustomed.
Health care and social assistance

Coverage

This sector covers activities involved in providing services in human health care where medical practitioners are integral to the production or service delivery. For the modelling, this sector is not disaggregated any further.

In terms of value added, health care and social assistance accounted for around 7% of the NSW economy in 2010, increasing to 7.5% in 2020. Health care and social assistance, as a proportion of the State economy is similar to that across Australia. Over the next decade, the sector is expected to grow by 41.6% in NSW, lower than the 54.5% in Australia.

Chart A.9: Health care and social assistance share of value added

Key drivers

It is expected that demographic change and an ageing population will place significant pressures on the NSW health system, particularly hospital care, residential aged care and community care. Older people tend to have higher health costs due to the increased levels of chronic disease and the greater number of life-threatening illnesses. In addition, the baby boomer generation experiences higher expectations of health and therefore demand more advanced health technologies. The health sector is expected to grow in response to the ageing of the population over the next 10 years.

Improvements in ICT are also expected to have important implications for the health sector in NSW. Technological advancements may help to improve health services in rural and regional areas of the State through remote diagnostics and treatment. It may also allow more home-based care for persons with mild disabilities; residential aged care will remain labour intensive, but would experience efficiency gains as a result of improved technology. E-health agendas are currently focused on electronic health record systems, but over the decade the effort will
The NSW economy in 2020

broaden into numerous other areas of ‘tele-health’ involving the provision of health and aged care services over a distance.

Challenges and uncertainties

■ Structural and financial reforms under the COAG National Health and Hospitals Network Agreement are intended to provide a more secure funding base for health and hospitals into the future. While States and Territories will continue to be responsible for the management of public hospitals, the Commonwealth Government will take on a greater role in funding cost growth. Funding shares will be fixed between the two tiers of government. An injection of additional funding will provide more services in the short term.

■ Uncertainties still remain as to the provision of services by the private health industry. Given that services will become more tailored to address individual demands, there is significant scope for expansion. However, industry costs and tight margins experienced in the residential and community care sector may restrict private sector involvement, while retirement villages provide more scope for private sector involvement.

Development opportunities

■ Finally, there is a potential for the NSW health sector to expand its exports of services to growing markets in Asia. While the growth of this activity will be heavily influenced by policy and regulatory objectives, parallels with the success in exporting education services can be made.

■ The aged care sector will account for a larger proportion of the sector overall, and the private sector will have greater opportunities and incentives to provide more aged care facilities and services. New technologies will allow more efficient and effective health services to be delivered, including with greater reliance on services provided directly into the community and less reliance on in-patient hospitals.
Manufacturing

Coverage

The manufacturing sector has seen a relative decline in both NSW and Australia generally, particularly due to lower trade barriers and increased international competition.

Over the next decade, the manufacturing output is expected to grow by 18.7% in NSW, lower than the 26.4% growth in Australia.

Chart A.10: Manufacturing share of value added

Source: Access Economics
Note: These changes in value added share differ slightly from broader industry results in Chapter 3, predominantly because of differences in the decomposition of certain non-core activities. The direction and level of output change from 2010 to 2020 are consistent.

Key drivers

Over the decade, despite the decline in manufacturing’s share of total product, the sector is set to record modest positive growth rates. That is, the sector will still grow in absolute terms.

Advances in the information economy will present the greatest potential for the industry going forward. Innovation and development of more efficient production techniques will lower average costs in the industry and change the nature of manufacturing.

Opportunities for some sub-sectors of manufacturing will develop over the next decade. Indeed the future of manufacturing may be increasingly determined by higher value niche activities which can take advantage of emerging markets and new technologies. In particular, areas such as sustainable building, renewable energy and medical technology are likely to present opportunities into the future.

Important linkages exist with the NSW manufacturing sector and other industries, and the sector's growth is highly dependent on proximity to the market as well as local resources and expertise. For instance, metal manufacturing such as steel fabrication and aluminium smelting has been based on the availability of energy using coal and minerals from elsewhere in
Australia. Demand for iron and steel has also been underpinned by engineering and residential construction throughout Australia.

Emerging economies again provide both competition and demand for manufacturing. Manufacturing exports from China are growing at a rapid pace and threaten the viability of the domestic manufacturing sector. That trend will be exacerbated by a higher terms of trade over the longer term (decreasing the relative price of imported manufactured goods).

Free trade agreements may also intensify competition from abroad, although this is only expected to account for a minor part of the decline in the share of manufacturing. An agreement with the Association of South-East Asian Nations (ASEAN) was signed in 2008, while agreements with Korea and China are currently being negotiated.

On the other hand, as incomes increase in Asia, the demand for value-added agricultural products will rise, with opportunities presented for food processing industry. Similarly, the demand for high value added products will increase, particularly if areas of strong innovation.

Challenges and uncertainties

- Low skill, trade exposed industries will be substantially compromised by international competition and an influx of cheaper imports. The strong Australian dollar will continue to challenge exporters while imports become relatively cheaper. Strong growth in China and India will underpin a relatively high terms of trade and exchange rate going forward.

- Climate change policies will present challenges for emissions-intensive producers, particularly under carbon pricing schemes which will add significant operating costs to manufacturing.

Development opportunities

- Climate change policies will present opportunities for those engaged in adaptation or mitigation activities, such as developing renewable energy technologies or sustainable building materials.

- Changing market conditions will place a greater emphasis on NSW manufacturers focusing on high value-added activities that embody greater quantities of new knowledge and technological change.

- Increased use of ICT provides opportunities for small niche producers to thrive, reflecting greater innovation, design and service intensity in production. These would be supported by a strong research and skills base, and will include areas of medical technology, and customised products for consumers.
The mining sector in NSW is smaller than the average across Australia; however its contribution to value added will increase over the next decade. In 2010, it contributed 3.1% of value added to the NSW economy, compared to approximately 7.7% of value added in Australia.

In NSW the majority of this comes from thermal coal production, whereas at the national level the ‘other minerals’ category dominates. Thermal coal comprises 79% of the mining category in NSW, representing a 2.3% share of value added in 2010, with expected growth to 2.8% by 2020. Natural gas currently comprises only 0.04% of value added to the state, but is expected to be significant if the carbon pollution reduction scheme is implemented in the next decade. This would cause its share to increase to 0.23% of value added over the time period.

In terms of modelling, mining consists of thermal coal, coking coal, crude oil, natural gas and other mining.

Over the next decade, the sector is expected to grow by 67.1% in NSW, above the 50.8% in Australia. As a share of the economy, the component growth is mainly fuelled by growth in natural gas. The other components, thermal coal, coking coal, crude oil and other mining are expected to grow by 60.2%, 63%, 63% and 41.7% in NSW respectively. This compares to growth rates of 61.9%, 58.4%, 33.2% and 49.4% in Australia.

Key drivers

Emerging economies will be most pertinent in affecting the mining sector in NSW to 2020. Economic development and rapid industrialisation will fuel the demand for mineral imports — which for NSW is most notably coal.

Coal production and exports are set to expand significantly over the coming decade to meet growing demand from emerging Asia.
Coal export capacity will lift from an estimated 117 million tonnes per annum (Mt pa) in 2010 to 211 Mt pa in 2020 with the recent opening of a new coal loader at Newcastle and a possible fourth loader planned. This has the potential to allow extra exports accounting for around 4.3% of NSW’s economic output.

Over recent years, considerable investment has been undertaken in coal-seam gas in NSW. This investment will have consequences for electricity generation in the Hunter, manufacturing that uses gas as an input, the need for pipelines to be constructed to expand the gas network in NSW and, possibly, liquefied natural gas (LNG) exports.

Other key mining sectors include gold, copper and other base metals. Again, demand from Asia is providing a strong impetus for exploration and production at existing mines to be expanded.

On the climate change front, while China is expected to invest heavily in low emissions energy over the coming decades, its energy needs for the next decade at least will require (coking and thermal) coal.

Domestic policy will also affect mining production in NSW. The proposed introduction of the CPRS domestically would see a shift away from coal in domestic electricity generation. Over the next decade, natural gas and wind power are best placed to replace coal-fired generation.

If feasible, sizeable funds are set to be applied to bring carbon capture and storage technologies to commercial scales. This will require considerable activity in NSW over the next decade to identify and prove-up sites within NSW for storage of CO₂ emissions.

**Challenges and uncertainties**

- Fluctuating commodity prices and the new quarterly system of price negotiation for coal contracts increases the price risk to the industry, though greater returns will result if high demand conditions continue. The sustainability of China’s demand remains in question.

- The high Australian dollar will dampen the export gains of the NSW mining industry, though it will make imports of capital cheaper.

- The proposed introduction of the resource super profits tax (RSPT) on mining, and the rate that it is eventually set at will have implications for the profitability and output of the NSW mining industry, with the possibility that investment will decline in the medium term.

**Development opportunities**

- Natural gas development in NSW, including the Gunnedah Basin, has the potential to support electricity generation, manufacturing in the Hunter region and the export of LNG. Coal seam gas may emerge as a new export for NSW by 2020.

- The viability of carbon capture and storage technologies (commercially and at scale) will not be known until close to 2020. During this period, there will be considerable developmental activity in NSW in carbon capture and storage, especially in identifying and proving up sites for storage.
Non-metallic minerals

Coverage

This sector covers non-metallic mineral mining and quarrying including construction material mining such as gravel and sand. In the quantitative modelling, this sector is not disaggregated any further.

As a proportion of value added to the state economy, the NSW sector is smaller when compared to the national proportion. In terms of value non-metallic minerals accounted for 0.36% of the NSW economy in 2010. It is estimated that by 2020, the share of total NSW value added from non-metallic minerals will rise slightly to 0.4%. On the other hand, the size of the sector on a national level will remain stagnant over the same period. Over the next decade, the sector is expected to grow by 48.6% in NSW, above the 38.7% in Australia.

![Chart A.12: Non-metallic minerals share of value of added](#)

Source: Access Economics

Key drivers

This sector is largely driven by demand for building and construction materials. According to the Institute of Quarrying Australia, approximately 90% of the output from quarries in Australia (of materials such as sand, gravel, crushed rock and clay) is used in the building and construction industries.

Emerging economies, particularly China, have led the demand for Australia’s non-metallic minerals. The increased industrialisation of China as well as India has driven up the level of construction and therefore the mining of construction materials. This demand is expected to continue in the medium term, coinciding with the boom in China’s construction industry.

In addition, population growth will increase the demand for construction materials on the domestic side. Given that NSW alone is planning to build 640,000 new homes to cater for
Sydney’s forecast population growth by 2031, the demand for non-metallic minerals is expected to remain strong.\(^7\)

**Challenges and uncertainties**

- Over the longer term, the key risk would be the sustainability of China’s demand for non-metallic mineral products, particularly as it is closely linked with China’s construction industry. Inflated prices already exist within the commercial and residential property sector and there is a risk that the government will move to correct this through higher interest rates, although this is unlikely in the short term.

- On the domestic front, higher interest rates, the end to the First Home Owners scheme and stemming of government stimulus will dampen the outlook of the construction industry.

**Development opportunities**

- Opportunities exist in exporting Australia’s technical expertise. For example, Australia has pioneered advanced waste management practices and the integration of quarrying with downstream construction material manufacturing.

- The expected strong domestic demand for dwellings as well as growth in China and India will increase the demand for non-metallic materials over the next decade.

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\(^7\) NSW Government (2005), Metropolitan Strategy for Sydney to 2031, *City of Cities: A Plan for Sydney’s Future*
Petroleum, coal, chemical and polymers

Coverage

This sector covers petroleum, coal, chemical and polymers manufacturing. Petroleum product manufacturing includes automotive fuel, aviation fuel and LPG manufacturing. The petroleum, coal, chemical and polymers sector is split into 2 categories — petroleum, and chemicals, rubber and plastics.

As a proportion of value added to the state economy, the NSW sector is roughly the same size as the national average. In terms of value added, petroleum, coal, chemical and polymers accounted for around 1.65% of the NSW economy in 2010. The chemicals, rubber and plastics category forms the majority of this contribution, making up almost 90% of this share. By 2020 the share of total NSW value added from petroleum, coal, chemical and polymers will drop significantly to 1.23%, however the composition of the sector will remain almost unchanged.

Chemicals, rubber and plastics made up 1.45% of the value added to the NSW in 2010, and this is expected to fall 1.08% in 2020. Similarly the share of petroleum is expected to decrease from 0.20% in 2010 to 0.15% by 2020.

Over the next decade, the sector is expected to decline by 3% in NSW, unlike the 14.6% growth in Australia. As a share of the economy, the component petroleum and chemicals, rubber and plastics sectors are both expected to decline by 3% in NSW respectively. This compares to growth rates of 16.3% and 14.3% in Australia.

![Chart A.13: Petroleum, coal, chemical and polymers share of value of added](chart.png)

Source: Access Economics

Key drivers

Of the involved sectors, petroleum will be the key force behind the momentum in this industry. Demand for petroleum inputs will remain strong despite world oil prices as it remains a critical input into production. In particular, the demand for petroleum products —
especially from vehicle and aircraft fuel — will continue to be strong in the upcoming decade as the thirst for this resource will increase with the growth in the NSW population.

As yet, there are no alternatives to fuel which are efficient and affordable enough to be used on a broad scale. Renewable energy and electricity have been used to fuel passenger transport, though its limited application to date has not reduced the strength of demand or the price of fuel.

Chemicals, rubber and plastics have also become commonplace in production and output. Demand for these products would move in line with GSP as increased demand for goods in general will see greater use of rubber and plastics in their production. In particular, this demand for output will be spurred onwards by the strong demand from emerging economies.

**Challenges and uncertainties**

- Increasing viability of alternative energy sources would provide competition for the petroleum sector.
- Concerns about climate change provide impetus for reduction in pollution through use of petroleum and in the development of chemical and polymer products. This will spur demand for greener technologies which will impact on output from this sector.
- Production of chemicals, rubber and plastics from emerging economies is likely to increase over the coming decade as they continue to industrialise, competing with domestic industry with lower priced output.

**Development opportunities**

- Recycling opportunities reduce the need for creation of new rubber and plastic products, though there is scope for diversification and investment in these technologies and in niche production of recycled goods for the green consumer market.
Primary and fabricated metals

Coverage

Primary and fabricated metals includes iron and steel forging, aluminium and other metal product manufacturing. In the quantitative modelling, this category is broken down into three categories — iron and steel, aluminium, and other non-ferrous metals.

As a proportion of value added to the state economy, the NSW sector is smaller than the comparative national proportion. In terms of value added, primary and fabricated metals accounted for 2.24% of the NSW economy in 2010. Iron and steel was the largest component to this, making up around 65% of the primary and fabricated metals sector. By 2020 the share of total NSW value added from primary and fabricated metals will rise to 2.43%, however, the composition of this remains largely unchanged within the sector.

Separately, iron and steel make up 1.47% of the value added to the NSW economy in 2010, and this is expected to decrease slightly to 1.43% by 2020. Aluminium is set to also decrease its share from 0.23% to 0.20% over the next 10 years although other non-ferrous metals will see its share increase from 0.53% to 0.80%.

Over the decade ahead, the sector is expected to grow by 41.8% in NSW, lower than the 59.3% growth in Australia. As a share of the economy, the component iron and steel, aluminium and other non-ferrous metals sectors are expected to grow by 12.2%, 27.3% and 94.7% in NSW respectively. This compares to growth rates of 69.1%, 60.3% and 55.2% in Australia.

Chart A.14: Primary and fabricated metals share of value of added

Key drivers

The primary and fabricated metals sector would be correlated with building construction. Demand for buildings will expand over the next decade with much of the growth driven by the need to meet requirements for a growing population.
The rapid growth of China and India has also seen an increase in commodity prices and demand for resources. The increased industrialisation and urbanisation of these countries has driven up the level of investment in infrastructure and engineering construction to cater for these needs.

**Challenges and uncertainties**

- The introduction of the CPRS will increase the price of iron ore and steel (as large emitters); however, strong demand from China for these commodities is expected to continue.
- An ageing population may exacerbate skills shortages within the industry.

**Development opportunities**

- The expected strong demand for dwellings will see the infrastructure and construction sector expand markedly over the next decade.
- The continued growth of China and India will push infrastructure growth including rail and port infrastructure within Australia.
The NSW economy in 2020

Professional, scientific and technical services

Coverage

The professional services sector includes scientific research, architecture, engineering, computer engineering, law, accountancy, advertising, market research, management and other consultancy, veterinary science and professional photography. Within this category, labour is the integral input to the service delivery as opposed to equipment and materials. In most cases, activities generally require a high level of expertise and training. In the quantitative modelling, this sector is not disaggregated any further.

Professional, scientific and technical services accounted for around 8.35% of the NSW economy in 2010 in terms of value added, and is projected to increase to 8.70% of the NSW economy by 2020. The professional, scientific and technical services sector is larger as a proportion of the NSW economy than as a proportion of the Australian economy. Over the decade ahead, the sector is expected to grow by 36.5% in NSW, lower than the 53.3% growth in Australia.

Chart A.15: Professional, scientific and technical services share of value added

Key drivers

The emerging markets in Asia present significant challenges and opportunities. On one hand, their demand for services will increase and Australia-based professional services firms can establish themselves within these economies and facilitate global companies seeking to access these markets. For example, demand for legal, accounting and management consulting services will expand as institutions in these countries develop and incomes increase, while demand for engineering and related services will be driven by the needs for improved infrastructure. With a well-educated service sector, there are real growth opportunities in providing high level of skills to support businesses in the Asia Pacific region. The extent to which demand for such services is expected to increase over the next decade will
counterbalance any negative consequences that may be felt by NSW firms due to a higher Australian dollar.

Economic development in Asia is also likely to lead to greater foreign investment in Australia, either through mergers, acquisitions or greenfield projects. Such investment will generate demand for the legal, accounting and other professional services in NSW.

On the other hand, China and India are also becoming more highly educated and are already moving into the professional services space. Emerging economies are investing heavily in education and as such, foreign investors are increasingly willing to conduct their research and development in these markets as opposed to carrying out research at home and producing overseas.

Climate change and relevant government policies will also see heightened demand for a wide range of professional services. For example, businesses and governments would engage legal and consultancy services in order to implement climate change policies in relation to regulation, compliance and corporate strategies.

An ageing population will support an expansion in advisory services (including financial, accounting and health care advice, and the coordination of such advice) as individuals seek services tailored to their distinctive needs. For example, it could increase the demand for services such as child care, retirement planning services, and financial planning services.

Finally, the ‘information economy’ will transform both how professional services firms are managed and relationships with customers, both domestically and globally.

**Challenges and uncertainties**

- Should Australia rely more on the exporting of its professional services, it would increase its vulnerability to external shocks such as political events, or economic crises.
- As emerging economies focus more on developing their professional services sectors, competition may increase within this space.

**Development opportunities**

- Given the prospective growth in emerging Asia, this sector has the potential to develop into one of the most important exporters for NSW over the coming decade. Firms providing legal, accounting and management consulting services will be particularly well-placed to benefit.
- Climate change policies will be accompanied by new regulatory requirements. In addition to these requirements driving demand for new carbon accounting and compliance services, those policies will also provide incentives for corporate strategies to adjust, resulting in new demands for professional services firms.
- The export of such services from NSW will also continue to expand at a solid pace, in part leveraged off Australia’s reputation as a stable country from which to conduct business in the region and Sydney’s position as a global city.
Public administration and safety

Coverage

The public administration and safety sector includes activities within the Federal, State and Local governments and the judiciary. It also covers activities involving upholding public safety and security services such as the police, investigative services, fire service, correctional services and border control. In the quantitative modelling, this sector is not disaggregated further.

As a proportion of value added to the state economy, the NSW sector is larger than the comparative national proportion. In terms of value added, public administration and safety accounted for 5.4% of the NSW economy in 2010. By 2020, the share of total NSW value added from public administration and safety will fall to 5% although it will still remain larger than the national average. Over the decade ahead, the sector is expected to grow by 19.7% in NSW, lower than the 27.5% growth in Australia.

![Chart A.16: Public administration and safety share of value of added](chart.png)

Source: Access Economics

Key drivers

The public administration and safety services sector has traditionally grown in line with the state of the general economy and is largely determined by Government policies rather than external market factors. The main components of the public administration and safety workforce are concentrated on state government administration and public order and safety services.

Demographic change is likely to have the most significant impact on the public administration and safety workforce. With a workforce skewed towards mature age workers, with 44% of the workforce aged 45 years and over, an ageing workforce may lead to workforce shortages unless there is a supply of new workers entering the workforce.

The introduction of some government policies may increase the production of the sector. For example, the introduction of policies to tackle climate change may require a growth in the government workforce to handle the administration of an emissions trading scheme.
Challenges and uncertainties

■ As a sector, public administration and safety is less uncertain than other sectors given that it is largely dependent on Government policy and funding rather than external market forces.

■ A significant challenge for the future will be replacing ageing workers given that public administrative and safety services has, on average, an older workforce than other industries.

Development opportunities

■ The development and administration of new government policies may create opportunities for growth such as the potential for an ETS.
Rental, hiring and real estate services

Coverage

Rental, hiring and real estate services comprises mainly of businesses that rent, hire or otherwise allow the use of their own assets by others including motor vehicle and transport equipment rental and hiring.

The rental, hiring and services sector accounts for around 3.6% of the NSW economy in terms of value added and is larger than its comparative national proportion. By 2020, the size of the sector compared to the NSW economy is expected to change very little. On the other hand, the proportion of the sector on a national level is set to fall from accounting for 3.33% of the national economy to 3.23%. Over the study period, the sector is expected to grow by 31.5% in NSW, lower than the 36.3% growth in Australia.

Chart A.17: Rental, hiring and real estate services share of value of added

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<th></th>
<th>Australia</th>
<th>NSW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>6.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>2010</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2020</td>
<td>2.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

Source: Access Economics

Key drivers

Housing pressures of a growing population will be the key driver for rental and real estate services in NSW to 2020. While the current housing supply shortage is pushing up the price of dwellings and forcing first home buyers out of the market, if construction picks up as economic conditions improve, the cost pressures could ease. Credit constraints are easing and there look to be signs of recovery in the construction sector.

Real estate services will be required to manage the housing and office stock for a growing population, with increased density in existing areas and development of new hubs. Sydney’s Metropolitan Strategy involves a vision for a ‘city of cities’ with jobs, housing and services centred on at least five major centres.

Rental and hiring services may see some gains with further development of information technologies. The NBN will assist in improved online services which will make rental and hiring more efficient.
Challenges and uncertainties

- The pace of housing and office construction will be key to having the stock of real estate which can be bought, sold and rented. This will be influenced by interest rates and credit constraints as well as business sentiment in the medium term.

Development opportunities

- Expansion of rental and hiring services with improved information and online options through developments in the information economy.
Retail trade

Coverage

The retail trade sector contributed 5.2% of value added to the NSW economy in 2010, and similarly 5.5% to Australian value added. The sector’s share is expected to decline slightly in NSW over the next decade, though its share will firm in Australia as a whole. Over the next decade, the sector is expected to grow by 21.8% in NSW, lower than the 42.5% growth in Australia.

Chart A.18: Retail trade share of value added

![Chart showing retail trade share of value added for Australia and NSW from 2001 to 2020.]

Key drivers

The retail environment in the next decade will be shaped by changes to the market structure, with new players entering the market and current participants changing their focus. Overseas supermarkets, such as Aldi and Costco will compete domestically, while existing operators look to expand their product range (for instance Woolworths entering the hardware market) as shopping centres expand and offer additional services.

Demographic change and the information economy will be the most significant of the megatrends affecting the retail trade industry in NSW over the coming decade. The composition of the NSW retail services sector will be influenced by a changing pattern of demand reflecting:

- the ageing of the population;
- preferences for products that meet consumers’ values such as environmental sustainability and ethics; and
- the increased prevalence of online shopping for goods and services.

Demographic factors, including a growing and ageing population, are likely to contribute to the composition of retail activity. Retail goods and services targeted at the older generations will face increased demand over the coming decade as more of the baby boomers enter their retirement years.
The growing population is also likely to have more diverse tastes and preferences, with a trend towards environmentally sustainable goods and ethics in production — for instance organic beef and free range eggs.

To date, Australians have not embraced online shopping (or electronic commerce more generally) to the extent seen in some other countries such as the United Kingdom. The rollout of the National Broadband Network and the accompanying expansion in applications and services, may see this change and place pressure on traditional parts of retailing to maintain their market share.

Areas that would seem to be most exposed include department stores, book stores and travel agents. To the extent that such retail activity migrates to the internet, there may be a flow-on impact on domestic suppliers of the relevant goods and services.

**Challenges and uncertainties**

- A more competitive and diverse retail environment, including an increased presence of overseas retailers could arise, affecting profitability and output of the NSW sector.
- The return to more ‘normal’ levels of interest rates will limit discretionary spending on retail trade as families rebuild their savings. More conservative spending patterns adopted in the downturn will remain even as employment increases, with consumers substituting cheaper products for brand names and hence reducing overall spending.

**Development opportunities**

- The rollout of the National Broadband Network will see a larger share of retailing traditionally provided by department stores conducted online though a more modest increase in supermarket (grocery) retailing conducted online is expected.
- There will be greater opportunities for direct producer-customer interface in many areas traditionally served by smaller retailers. There will also be greater opportunity for NSW retailers to sell products interstate and overseas, while also facing greater competition from retailers located outside of NSW.
  - Today this includes items such as books, consumer electronic goods or travel services. In the future this will expand to include many more consumer goods (for example, clothing and groceries) and services for both households and businesses.
Transport and machinery equipment

Coverage

Transport and machinery equipment covers motor vehicle and motor vehicle parts manufacturing as well as shipbuilding, boatbuilding and railway building and repair services. This sector is split across two categories — motor vehicle parts and electrical equipment.

As a proportion of value added to the state economy, the NSW sector is larger than the comparative national proportion. Transport and machinery and equipment accounted for around 2% of the NSW economy in 2010 in terms of value added. Motor vehicle parts accounted for just over 55% of the transport and machinery sector. By 2020, the share of total NSW value added from transport and machinery equipment will drop significantly to only 1.5% of the NSW economy. However, the composition of this sector will remain largely unchanged.

Separately, motor vehicle parts account for 1.12% of the NSW economy in 2010, and this is expected to fall to 0.83% by 2020. Electrical equipment is also expected to fall from 0.9% to around 0.7% in 2020. Over the decade ahead, the sector is expected decline by 2.9% in NSW, though 16.2% growth is expected in Australia. As a share of the economy, the component motor vehicle parts and electrical equipment sectors are both expected to decline by 2.9% in NSW. This compares to growth rates of 17.1% and 14.2% in Australia respectively.

Chart A.19: Transport machinery and equipment share of value of added

Source: Access Economics

Key drivers

The demand for transport and machinery equipment will be closely correlated with the demand for transport services and hence the size of the state population and state of the economy. Meeting the demands of a more densely populated metropolitan area in NSW and the development of ‘major centres’ as outlined in the Sydney Metropolitan Strategy will require further investment in transport infrastructure and hence for the machinery and equipment associated with this development.
The NSW economy in 2020

Challenges and uncertainties

■ Burgeoning production capabilities of emerging economies will affect the state’s transport and machinery equipment manufacturing sector. The high Australian dollar will continue to contribute to making imports cheaper than domestic production, favouring these overseas industries.

Development opportunities

■ Developments at the port of Newcastle will continue to fuel demand for transport and machinery equipment, in coal transportation to the ports as well as in coal loading facilities on to boats. There is significant potential for expansion to reduce the queues of boats waiting offshore, and while demand for this export remains strong, so will associated demand for new machinery and maintenance of existing infrastructure.
Transport, postal and warehousing

Coverage

This sector covers activities including the transportation of passengers and freight by road, rail, water or air. Other transportation activities include postal services, pipeline transport and sightseeing transport. This sector is split into three categories — air transport, water transport, and land transport.

The transport, postal and warehousing sector accounts for 5.9% of the NSW economy in terms of value added in 2010. Land transport is the largest contributor to this sector, accounting for over half of the sector. By 2020, it is expected that the share of transport, postal and warehousing sector will fall to 5.6% of the NSW economy. The NSW sector remains smaller than the national average.

Separately, land transport accounts for 3.35% of the NSW economy in 2010 and this is expected to fall to 3.2% by 2020. The categories of air transport and water transport are also expected to fall by 2020, from 2.14% to 2.09% and from 0.43% to 0.35% respectively. Over the next decade, the sector is expected to grow by 24.7% in NSW, lower than the 44.9% growth in Australia. As a share of the economy, the component air, water and land transport sectors are expected to grow by 27.7%, 6.1% and 25.3% in NSW respectively. These growth rates are all lower than the respective 41.4%, 49.8% and 45.7% expected in Australia.

Key drivers

The demand for transport services for passengers and freight are aligned with the state of the economy. Demographic factors will drive passenger demand for commuting and travel and freight demand is aligned with the strength of business and business confidence.

As the population of NSW increases between now and 2020, there will be a greater traffic of people commuting daily. The Sydney Metropolitan Strategy aims to reduce the strain on
public transport and roads through the creation of ‘major centres’ to provide hubs for work and residences in an attempt to minimise the distances travelled.

Challenges and uncertainties

■ Upgrading the existing haphazard system of transport in NSW is a significant challenge as coordination in planning is required to overcome the poor linkages between modes of transport.

■ Three significant government initiatives aim to improve coordination across the transport network: the release in February 2010 of a fully-funded Metropolitan Transport Plan; the establishment of NSW Transport, a new super-agency that will be responsible for delivering a total-integrated transport solution; and the incorporation of a long-term (25 year) transport strategy into the updated Metropolitan Plan, which is scheduled to be released in the second half of 2010.

Development opportunities

■ Management of existing transport infrastructure will be improved by congestion charges and technology. Further developments may include adopting Intelligent Transport Systems, using technology to provide information on traffic flows for use in remote management. An example of this is the variable message signs (VMS) used to notify road users of traffic incidents or delays and alternative routes.

■ Developments in ICT will reduce the turnaround time for freight, particularly in the coordination and logistics stages. An improved service for monitoring of freight in transit will be of assistance particularly for large organisations and valuable shipments.
Wholesale trade

Coverage

Wholesale trade in a broad sense covers resale of new or used goods to businesses or government users. The wholesale trade sector contributed 5.4% of value added to the NSW economy in 2010, and similarly 5.6% of Australian value added. The sector is expected to decline in NSW over the next decade to 5.1%, even though its share will rise across Australia to 5.7%. Over the next decade, the sector is expected to grow by 22.6% in NSW, lower than the 42.3% growth in Australia.

Chart A.21: Wholesale trade share of value of added

Source: Access Economics

Key drivers

Wholesale trade is driven by the strength of the NSW economy, business confidence and trade linkages. With emerging economies capable of mass producing manufactures, this makes up a significant share of NSW’s wholesale trade.

ICT has previously played an integral role in improving the productivity of wholesale trade in the 1990s with the introduction of bar-coding and scanning technology. It is expected that continued developments in technology will boost the productivity of wholesale trade such as the introduction of radio frequency identification technology that allows advanced tracking of goods in delivery. In addition, other opportunities exist through the use of internet and e-commerce, allowing wholesalers and customers to gather product information and market their products.

Challenges and uncertainties

- International competition from emerging economies, particularly in the manufacturing sector, may flood the markets for wholesale trade leaving less of a foothold for NSW.
Development opportunities

- Emerging markets provide a strong source of wholesale trade through demand for inputs and sale of outputs.
- Advanced distribution technologies may create efficiency gains within the sector although it may lead to lower employment over the short term.
Wood, pulp and paper

Coverage

This sector covers wood product manufacturing, pulp and paper manufacturing and printing services. This sector is split into two categories — lumber and wood products, pulp, paper and printing.

The wood, pulp and paper sector as a share of the NSW economy is very similar to the national share. In NSW, the sector accounts for around 0.6% of the economy in terms of value added. By 2020, it is expected that the share will drop slightly to around 0.5% of the economy. The national share is also expected to fall in similar amounts. Over the next decade, the sector is expected to grow by 8.6% in NSW, which is less than the forecast 12.2% growth in Australia. As a share of the economy, the component lumber and wood products, and pulp, paper and printing sectors are both expected to grow by 8.6% in NSW respectively. This is below the respective 10.3% and 12.9% expected in Australia.

Key drivers

Demand for wood products have been on the decline due to the increasing cost of wood as an input where cheaper synthetic substitutes are available. There is also a move towards use of lower quality wood which is covered or treated, rather than using the more expensive hardwoods which are now in shorter supply.

Sustainability factors and the carbon released in logging are also reducing demand for wood products, as recognition of their sequestering abilities become better known. Recycling reduces demand for new paper products and to some degree printing services, as people think twice before printing in recognition of limited resources.
The continued development of ICT and the internet will mean that globally, consumers are shifting from paper-based communication to digital alternatives, resulting in drops in demand for paper. In addition, digital communication technologies have allowed consumers to access news online, again decreasing demand for newspapers and newsprints while the emergence of e-readers and e-books allows books to be read electronically.

**Challenges and uncertainties**

- Recycling will affect the share of new and wood paper products which will decrease demand for the industry’s output.
- The introduction of the CPRS will further reduce demand for wood products if there are adequate gains to be made.
- The growing significance of digital communication and continued developments in ICT will reduce the need for newspapers and paper.

**Development opportunities**

- Inclusion of recycling processes into the manufacturing chain will provide growth directions for the sector.
- Although the US and the EU consume the most paper per capita, global consumption growth will be primarily located in China and India, providing significant opportunities for Australian pulp and paper businesses.
Composite industry — Tourism

Coverage

Under the modelling framework, the tourism composite industry comprises air transport, water transport, land transport, retail trade, accommodation, education and training, processed food, motor vehicle parts, other manufacturing and residential construction. Retail trade and accommodation account for the largest shares of this mix.

Over the next decade, tourism is expected to decline in its share of value added in NSW from 3.3% in 2010 to 3.2%, which is less than the decline expected in Australia. In terms of value added, the accommodation sector accounted for around 2.6% of the NSW economy in 2010. By 2020 the share of total NSW value added from accommodation will drop slightly to 2.3%, with the national proportion also falling to 2.4%. As a share of the economy, the accommodation and education and training sectors are expected to grow by 18.4% and 18% in NSW respectively. These are both below the respective 36.3% and 21.3% expected in Australia.

Key drivers

The drivers for tourism in NSW are mainly in emerging economies and demographics. NSW is currently the most favoured international tourist destination in Australia, though its position will be affected by interstate competition.

The growing middle classes in emerging economies provide key demand for tourism, which NSW is ideally positioned to absorb. As discretionary spending increases, so too does demand for services such as tourism, which is one of NSW’s major exports. Additionally, demand for higher education services in NSW will have flow on implications for tourism as students often travel while in Australia.
As the baby boomers retire, a market will open up for tourism targeted at this age cohort. Retirees are more likely than the other sectors of the population to support the tourism industry year-round, which will give the sector a boost. Services which cater to the demands of this generation and the experiences they seek will face growth in the coming decade.

Tourism also stands to gain from the information economy. The NBN can provide opportunities for higher quality services through information on attractions, accommodation and activities which will assist tourists in assessing the relative merits of a destination and planning beforehand. Potential gains exist in use of high-quality video for marketing and in addressing the universal quality of services for tourist sites where current internet services are less reliable. Not only will this improve the ease of coordination for consumers, it will reduce labour costs for the tourism service providers in addressing individual concerns.

**Challenges and uncertainties**

- The tourism industry is particularly vulnerable to the high exchange rate, particularly where international visitors are involved. The strength of the Australian dollar makes other alternatives relatively cheaper by comparison and will increase international competition for the sector.

- The relative favourability of Sydney as a tourist destination is not certain over the coming decade, particularly with the growing strength of Melbourne as a migrant destination.

**Development opportunities**

- Ecotourism and related accommodation preferences provide scope for value added niche markets to develop. Reduction of carbon footprints and use of renewable energy sources will also benefit the bottom line of businesses.

- Tailoring tourism packages for the ageing population, in terms of services and facilities provided, to meet the growing demand.
Composite industry — Information and communications technologies

Coverage

In the modelling of the information and communications technologies composite industry, information media and telecommunications and other communications account for the greatest shares. Wholesale trade and manufacturing sectors are also included under this category.

As a proportion of value added to the state economy, the NSW ICT sector is larger than its national equivalent. ICT accounted for around 4.8% of the NSW economy in 2010 in terms of value added, and is projected to increase to 4.9% of the NSW economy by 2020. As a share of the Australian economy, ICT currently represents 3.9% of the Australian economy in terms of value added, and is expected to decrease slightly to 3.8% by 2020.

Key drivers

The main driver that will alter the state of the ICT sector will be the development of the information economy. Given that ICT has a larger share of the NSW economy than across the country, the information economy, such as the rollout of the National Broadband Network will provide a significant boost to the ICT sector, allowing faster speeds and greater coverage around the state. It will be a catalyst for significant change in how businesses operate and for new applications and content.

Information services will undergo radical change as new technologies are brought online supported, in part, by the rollout of the National Broadband Network. However, these changes may not have a significant impact on the ICT sector’s share of the economy. The largest adjustments in the ICT sector over the next decade are likely to involve shifts in the composition of the sector, largely driven by changes in how other businesses use ICT.
example, all aspects of the media sector are already being transformed as consumers access news and entertainment through new channels.

Advancements in the digital economy will have a significant effect on many small and medium-sized enterprises (SMEs). ICT developments will support closer linkages between these businesses and their customers, whether located in NSW, other parts of Australia or overseas. They will also drive productivity gains. For instance, the emergence of cloud computing over the next decade will enable these businesses to reduce their information technology costs (covering computation, storage and network support costs) and improve offsite accessibility.

However, the emerging economies of China and India will present significant challenges for the ICT industry as they move from production of less complex goods into higher-value manufacturing and services. As these economies become more highly educated and labour remains cheap, businesses are more willing to outsource their information technology and even research and development to these countries.

**Challenges and uncertainties**

ICT services in NSW will face a number of challenges over the coming decade.

- The presence of Australian headquarters for a number of multinational corporations in Sydney accounts for part of NSW’s relatively high share of the nation’s ICT sector. For some of these multinational corporations, the main form of economic activity conducted in Sydney is the marketing and distribution of products generated overseas.

- Increasing interstate competition, from Victoria and Queensland in particular, to attract more ICT industry to their states.

- While Australians have a reputation for being early adopters of new technologies, this has not always been the case for significant parts of the economy. For example, the use of electronic commerce in retailing is low relative to some other developed economies.

By nature, location is not important for where many ICT services are produced. Faster and more reliable speeds, as well as a consumer base that is increasingly willing to use new services, means that NSW businesses in ICT and related areas are operating in a global marketplace. This provides both significant opportunities as well as strong competition from numerous sources. The fact that more ICT services will be consumed within NSW means that, overall, the sector should prosper but the composition of growth will be important.

**Development opportunities**

- The National Broadband Network will act as a catalyst to strengthen the domestic ICT industry and will provide further opportunities for business and government in this sector. The greatest potential for ICT businesses in NSW may be in providing services to other businesses, including operating their IT systems or developing software for particular needs.

- Intelligent technologies offer the potential to develop transformative ways of tackling major areas of economic and social need including in the areas of health, education, transport and utilities.
Composite industry — Creative industries

Coverage

In the modelling, creative industries are predominantly comprised of information media and telecommunications, professional, scientific and technical services. Additionally, the ‘creative’ aspects of arts and recreation, and parts of the pulp, paper and printing, other communications, education and training and other manufacturing sectors are included.

The creative industries sector has a role in the NSW economy both as a sector in its own right as well as supporting other industries’ competitiveness. This ‘horizontal’ spillover impact is consistent with greater use of design and creativity as an integral part of product and/or service development, production and provision by other industries.

Over the decade ahead, creative industries is expected to grow as a share of value add in NSW from 3.9% in 2010 to 4.0% in 2020. At the national level, creative industries comprise 3.3% of value added and this is expected to increase to 3.4% by 2020.

Chart A.25: Creative industries share of value added

Key drivers

While overall growth in creative industries in NSW is expected to be relatively modest over the next decade, it is likely there will be substantial change in the composition of the industry — with continued strong growth in those sub-sectors best able to take advantage of advances in ICT.

The type of products and services demanded from the sector will evolve over the next decade, with particular influences flowing from the mega-trends. For instance, certain sub-sectors, such as architecture and industrial design, which will face increasing demand for environmentally sustainable and innovation-intensive services.

Demand for creative industries services will also be driven by demographic factors, with different age groups having different demands from the sector. The ageing population may
well generate increased demand for the theatrical and visual arts as patrons, as people find more time in retirement to appreciate these events. On the other hand, younger people may have a greater demand for creative media and communications, for instance in portable music and gaming.

Information technologies will assist the supply side of the creative industries, in providing a medium which can reach a wider audience at low marginal cost. These technologies also allow for more advanced production and design techniques, for instance in 3D movies and computed-aided design (CAD).

Challenges and uncertainties
- The greater ‘digitalisation’ of creative industries will increase the global competition for NSW creative industries, as consumers will be easily able to access services from interstate and overseas. There will also be increased threat of plagiarism or copyright violations as media becomes more readily available.
- It may become more difficult to capture returns from intellectual property and, as a result, new business models may evolve.
  - For example, newspapers have already begun to modify their business models — and sources of content — and this change is set to accelerate as high-speed broadband becomes widely available.

Development opportunities
- A myriad of new content for delivery over the NBN and other communications networks will be developed in coming years. It will be easier for NSW businesses to sell products into a global market but, equally, it will be easier for NSW consumers to source content from elsewhere.
- Development in ICT may lead to a larger digital content in creative services and change the way in which these are delivered. There are key opportunities for NSW to build on the strength of its creative talent in film, digital media and design as the demand for digital content grows.
- A wealthier population will tend to spend a larger proportion of their incomes on entertainment, with significant differences in markets for different age groups.
- The ageing population will present an expanding market for creative industries targeted at this age group. Significant growth opportunities exist to for senior-friendly services across all creative industries.
- Burgeoning markets in Asia may also provide potential for NSW industry, including in such areas as design and advertising.
- Despite the increasing global mobility of ICT investment, there may be opportunities for NSW to leverage its existing concentration of ICT businesses to attract R&D and other high value-add activities.
The NSW economy in 2020

Composite industry — Education and scientific research

Coverage

The education and scientific research industry is represented in the modelling by a weighted sum of the education and training sector and the professional and scientific and technical services sector. Over the decade ahead, the composite industry is expected to decline as a share of value added in NSW from 4.7% to 4.2%; as a share of national value added education and scientific research is expected to decline from 4.8% to 4.1% in 2020.

Chart A.26: Education and scientific research share of value added

Key drivers

The education and scientific research sector will be boosted by demand from demographic factors, emerging economies and advances in the information economy.

The demand for education services generally declines with age — school aged children are required to attend school, with numbers decreasing in vocational and tertiary education, with declines associated with the rising level of education. With the age pyramid of NSW becoming increasingly top heavy as the population ages, there will be a relative reduction in demand for education and training.

Emerging economies are also expanding sources of demand for the services of the education sector. International student demand for education will be a significant source in the coming decade. In particular, there is anecdotal evidence that international students are increasingly favouring professional services related degrees, which bodes well for the future export of these services.

Scientific research is driven by the level of education in an economy. With higher levels of education, there will be a greater number of research qualified individuals who will contribute knowledge to the economy. The information economy will increase the stock of knowledge available on which this research can rely. The accessibility of resources and the technology available to assist in analysis will be drivers of the scientific research capacity of NSW.
However, to some degree the level of scientific research is determined by the state of the economy and the GSP, as this will determine the level of investment. In tighter economic conditions, there is likely to be more emphasis on the profit-making divisions of an organisation rather than on research and development which is an investment in future gains.

**Challenges and uncertainties**

- The ageing population will create skill shortages in the education and scientific research industries. As with the other Australian states, NSW requires a larger stock of teachers as many face retirement in the next decade. Government policy on visas and skilled migration aim to address this issue.

- Emerging economies will begin to compete in these sectors as their workforce becomes increasingly skilled. The areas in which they would diversify may potentially compete with services in NSW.

**Development opportunities**

- Education and scientific research both stand to gain from improvements in the information economy. The accessibility of information will improve education and training by providing a greater stock of knowledge which is readily available. Scientific research will gain from the knowledge linkages and analytical capabilities of information systems.

- With the ongoing debate regarding climate change and its potential impacts, as well as the efficacy of particular management strategies, there is a knowledge gap which could be filled by this sector until global consensus on action is reached.

The ageing and growing population will provide increased opportunities for the education sector as workers seek to up-skill and upgrade their qualifications to remain in the workforce.
Appendix B: Consultations

Consultations were held with the following parties.

**Direct consultations**

AGL  
Arts NSW  
CSIRO  
Department of Primary Industries  
Google  
IBM  
NSW Innovation Council  
Retirement Villages Group within Macquarie Capital Group  
Santos  
Screen NSW  
Telstra  
UNSW

**Government round table (26 February 2010)**

Arts NSW  
Department of Education and Training  
Department of Environment and Climate Change and Water  
Department of Planning  
Department of Premier and Cabinet  
Department of Transport  
Industry & Investment NSW  
NSW Treasury

**Industry round table (25 March 2010)**

AIIA  
Alstom Limited  
Auscott  
Australian Information Industry Association  
Biofuels Association of Australia  
GE Energy  
GE Healthcare  
Henry Davis York  
Macquarie Generation  
NSW Farmers’ Association  
NSW Innovation Council  
NSW Manufacturing Council  
NSW Minerals Council  
Office of the Chief Scientist  
ResMed  
SRDT  
Sydney Business Chamber  
The Project Factory  
Thomson Reuters

**NSW Business Forum (29 April 2010)**

Access Economics also participated in the NSW Business Forum, and prepared material for discussion. The Forum involved over 150 business leaders as well as NSW Government Ministers and senior government officials. The purpose of the Forum was to gain input into the Business Sector Growth Plan through the identification of opportunities and challenges likely to affect key sectors over the next 10 years and ways in which government could support these sectors going forward.
Appendix C: Technical aspects of the modelling

Modelling framework

The broad modelling approach to the study is outlined below.

Scenarios

The following approach was taken to empirically examine the various mega-trends scenarios. The effects of climate change policies, demographic change and emerging economies will be explicitly modelled in a general equilibrium framework. The information economy impacts were examined in a more qualitative sense.

A modelling framework (see Table C.1) and brief description of how the scenarios were fashioned is set out below.
### Table C.1: Mega-trend scenarios — modelling framework

<table>
<thead>
<tr>
<th>Theme</th>
<th>Climate change</th>
<th>Demography</th>
<th>Emerging economies</th>
<th>Information economy</th>
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<tbody>
<tr>
<td><strong>Central case</strong></td>
<td>Incorporates current government climate change policy and international developments</td>
<td>Incorporates latest Treasury projections</td>
<td>Incorporates strong growth in China and India with commensurate implications for commodity prices and Australia’s terms of trade</td>
<td>Based on NBN rollout and complementary innovations and applications</td>
</tr>
<tr>
<td></td>
<td>CPRS 25 with RETs and international trading scheme, carbon price ~A$50 per tonne of CO₂-e at 2020, no specific support for EITEs</td>
<td>Access Economics population projections for NSW and Australia</td>
<td>Robust economic growth in China (8% pa) and India (6-8% pa), with commodity prices trending down from around 2011-12 but still high by historical standards</td>
<td>Assumes NBN is rolled out well before 2020 and that there is further significant change regarding the use of various technologies (eg intelligent systems) and services/applications</td>
</tr>
<tr>
<td><strong>Scenario(s)</strong></td>
<td>Similar emissions abatement commitments and policy parameters with higher carbon price ~A$80 per tonne of CO₂-e at 2020 — ie from more restricted international trading of permits</td>
<td>Higher population growth — ie based on Treasury’s 2010 IGR projections for NSW</td>
<td>Materially lower commodity prices (approximately 30%), with growth rates for China and India unchanged from central case</td>
<td>Differentiated productivity impacts by sector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower population growth, consistent with previous Treasury projections (IGR 2007) — ie from higher net migration from NSW</td>
<td></td>
<td>Consequences of NSW businesses and households embracing technologies more quickly, leading to productivity enhancing usage of the NBN</td>
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</table>
Emerging economy (commodity price) scenarios

These scenarios examined the impacts of a commodity price increase or decrease by 30% compared to the central case. This price change is effected over a number of years and is fully implemented in the simulations by 2015 (see Table C.2). This allows the economy to adjust in the post 2015 period leading into 2020.

Table C.2: Commodity price path (%)

<table>
<thead>
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<th>2010</th>
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<td>Price</td>
<td>0</td>
<td>-/+ 6</td>
<td>-/+ 12</td>
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</table>

The price impacts are assumed to be driven from demand side influences that put upward/downward pressure on export prices. Normally a price increase (decrease) would see a corresponding decrease (increase) in exports. However, for these scenarios the intention is to capture the effects of a change in commodity prices while the quantity demanded remains constant — that is, a pure price effect is being modelled where NSW (and Australian) resource producers maintain their supply into world markets but at a different prevailing price. To implement this, export quantities are fixed at a constant level equivalent to those in the central case.

Climate change (carbon price) scenario

The central case assumes a CPRS-25 scenario in which carbon prices reach $50 per tonne of CO$_2$-e at 2020. Under the alternative carbon price scenario, the impacts of the carbon price reaching $80/tCO$_2$-e by 2020 are examined. It is this end point rather than the actual price path to the year 2020 that is the focus of inquiry. This higher ($80/tCO$_2$-e) carbon price by 2020 is achieved in the modelling by allowing prices to increase to this level in steady increments of $3 per tonne of CO$_2$-e per year.

The scenario assumes international trading in carbon permits and, accordingly, the price is applied uniformly across all eight international regions in the model. This also applies to Australian state regions.

Demographic scenarios

The two demographic scenarios examined the impacts of a higher and lower population projection around the central case. The high scenario is modelled on the 2010 Intergenerational Report (IGR). The 2010 IGR itself includes three projections — a high, central and low case — with the one adopted for this exercise being the IGR 2010 high projection. The scenario adopts the 2010 IGR assumptions from 2011 onwards and allows population to grow accordingly.

The low population scenario is based on the 2007 IGR central case in which population growth was projected to be considerably lower. In modelling this projection, there was a structural ‘step change’ issue given population growth between 2007-2010 exceeded the projections such that actual population at 2010 was higher than the 2007 IGR estimate for that year. To address this, the 2007 IGR growth assumptions from 2011 onwards are applied using 2010 as a starting year.
Because this set of scenarios has utilised a variety of different projections, population growth follows different paths to 2020. However, it is the final year projections that matter for the analysis rather than the actual growth paths.

Working population is assumed to be those aged between 15 and 64 in all scenarios and the central case.

**Information economy**

Productivity shocks for the information economy (NBN) scenario are given in Table C.3. These are based on maximum potential productivity impacts, which reflect ‘outer envelope’ sectoral productivity gains if 100Mbps fibre technology is rolled out to 100% of the NSW population and adoption of the NBN reaches 100% immediately.

These maximum potential impacts are then adjusted to reflect ‘real world’ conditions, in which the network takes some time to build, fibre only reaches 93% of households Australia-wide, and initial demand is relatively slow in the early years. Overall adoption is taken to follow a Lorentz curve pattern, in line with expectations of the NBN Implementation Study and past experience of uptake of previous ICT innovation.

The network build pattern assumes the network is built from the inside out, favouring more heavily populated areas and industries located there. This tends to benefit sectors such as real estate, finance and insurance and professional services. Fibre is assumed to be rolled out to the most densely populated areas of Australia to reach 93% coverage, with the remainder covered at 12Mbps by wireless and satellite. This limits the potential productivity impacts for sectors that are more remotely located, particularly agriculture and mining.

**Table C.3: Productivity impacts from the NBN (%)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport, postal and warehousing</td>
<td>0.003</td>
<td>0.009</td>
<td>0.022</td>
<td>0.048</td>
<td>0.096</td>
<td>0.161</td>
<td>0.244</td>
<td>0.335</td>
</tr>
<tr>
<td>Electricity, gas, water and waste services</td>
<td>0.003</td>
<td>0.008</td>
<td>0.020</td>
<td>0.045</td>
<td>0.092</td>
<td>0.159</td>
<td>0.242</td>
<td>0.333</td>
</tr>
<tr>
<td>Rental, hiring and real estate services</td>
<td>0.003</td>
<td>0.009</td>
<td>0.022</td>
<td>0.048</td>
<td>0.097</td>
<td>0.166</td>
<td>0.251</td>
<td>0.340</td>
</tr>
<tr>
<td>Health care and social assistance</td>
<td>0.003</td>
<td>0.009</td>
<td>0.022</td>
<td>0.048</td>
<td>0.098</td>
<td>0.166</td>
<td>0.250</td>
<td>0.340</td>
</tr>
<tr>
<td>Education and training</td>
<td>0.002</td>
<td>0.005</td>
<td>0.013</td>
<td>0.029</td>
<td>0.060</td>
<td>0.103</td>
<td>0.158</td>
<td>0.218</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>0.002</td>
<td>0.005</td>
<td>0.013</td>
<td>0.028</td>
<td>0.058</td>
<td>0.100</td>
<td>0.156</td>
<td>0.218</td>
</tr>
<tr>
<td>Financial and insurance services</td>
<td>0.003</td>
<td>0.008</td>
<td>0.018</td>
<td>0.037</td>
<td>0.072</td>
<td>0.118</td>
<td>0.171</td>
<td>0.223</td>
</tr>
<tr>
<td>Retail trade</td>
<td>0.002</td>
<td>0.005</td>
<td>0.013</td>
<td>0.029</td>
<td>0.059</td>
<td>0.103</td>
<td>0.159</td>
<td>0.220</td>
</tr>
<tr>
<td>Information media and telecommunications</td>
<td>0.003</td>
<td>0.007</td>
<td>0.017</td>
<td>0.037</td>
<td>0.072</td>
<td>0.118</td>
<td>0.172</td>
<td>0.224</td>
</tr>
<tr>
<td>Professional, scientific and technical services</td>
<td>0.001</td>
<td>0.004</td>
<td>0.009</td>
<td>0.020</td>
<td>0.038</td>
<td>0.063</td>
<td>0.091</td>
<td>0.119</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>0.001</td>
<td>0.003</td>
<td>0.008</td>
<td>0.018</td>
<td>0.035</td>
<td>0.059</td>
<td>0.088</td>
<td>0.119</td>
</tr>
<tr>
<td>Mining</td>
<td>0.000</td>
<td>0.001</td>
<td>0.002</td>
<td>0.005</td>
<td>0.012</td>
<td>0.025</td>
<td>0.051</td>
<td>0.106</td>
</tr>
<tr>
<td>Administrative and support services</td>
<td>0.001</td>
<td>0.003</td>
<td>0.008</td>
<td>0.017</td>
<td>0.035</td>
<td>0.058</td>
<td>0.088</td>
<td>0.118</td>
</tr>
<tr>
<td>Public administration and safety</td>
<td>0.001</td>
<td>0.003</td>
<td>0.008</td>
<td>0.017</td>
<td>0.033</td>
<td>0.056</td>
<td>0.084</td>
<td>0.117</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.003</td>
<td>0.007</td>
<td>0.015</td>
<td>0.032</td>
<td>0.069</td>
</tr>
</tbody>
</table>
The NSW economy in 2020

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>0.001</td>
<td>0.002</td>
<td>0.005</td>
<td>0.012</td>
<td>0.024</td>
<td>0.040</td>
<td>0.062</td>
<td>0.085</td>
</tr>
<tr>
<td>Construction</td>
<td>0.001</td>
<td>0.002</td>
<td>0.005</td>
<td>0.011</td>
<td>0.022</td>
<td>0.038</td>
<td>0.059</td>
<td>0.084</td>
</tr>
<tr>
<td>Arts and recreation services</td>
<td>0.001</td>
<td>0.003</td>
<td>0.006</td>
<td>0.013</td>
<td>0.026</td>
<td>0.043</td>
<td>0.064</td>
<td>0.085</td>
</tr>
<tr>
<td>Other services</td>
<td>0.001</td>
<td>0.002</td>
<td>0.005</td>
<td>0.012</td>
<td>0.024</td>
<td>0.040</td>
<td>0.062</td>
<td>0.084</td>
</tr>
</tbody>
</table>

Source: Access Economics

Note: The sectoral productivity impacts of the NBN for 2019 and 2020 are assumed to be the same as for 2018 when construction of the NBN is scheduled to be completed.

Composite industry methodology and data sources

As part of the analysis the following ‘composite’ industries are being examined:

- tourism;
- information and communications technologies;
- creative industries; and
- education and scientific research.

These industries cross-over standard industry structures and are effectively constructed for the analysis by combining specific shares of existing industries using a range of data sources (the shares of each of these sub-industries sums to 1).

Each sub-industry used in the composites is assigned a ‘parent’ industry according to their ANZSIC classification. The growth over time in each composite industry is then undertaken using a weighting based on compositional share combined with the forecast growth rate of the parent industry. The key industries comprising each composite industry and the main data sources are discussed below.

For each composite industry employment data was obtained for the latest year available and this was then adjusted according to historical growth rates to estimate a 2010 employment figure. The data sources for each composite industry are shown in Table C.4.

### Table C.4: Composite industry employment data sources

<table>
<thead>
<tr>
<th>Industry</th>
<th>Source</th>
<th>Base year</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT</td>
<td>DEEWR (based on ABS Labour Force data)</td>
<td>2010</td>
</tr>
<tr>
<td>Tourism</td>
<td>ABS Tourism Satellite Accounts</td>
<td>2008-09</td>
</tr>
<tr>
<td>Creative Industries</td>
<td>CRC for Creative Industries and Innovation</td>
<td>2006</td>
</tr>
<tr>
<td>Education</td>
<td>ABS Labour Force data</td>
<td>2009</td>
</tr>
</tbody>
</table>

Tourism

The tourism composite is constructed using detailed information available from the tourism satellite accounts. These show that the total value added in the tourism industry amounted to $40.6 billion in 2006-07. The sector comprises of two broad types of industries — tourism characteristic industries and tourism connected industries. The former includes those industries which can be directly linked to tourism related activities — accommodation, travel agency operations etc. The latter consists of those industries that are not necessarily tourism
related in a primary sense but contribute to the sector nonetheless — food manufacturing, libraries, casinos etc (see Table C.5).

**Table C.5: Composition of tourism sector**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Share of tourism sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tourism characteristic industries</strong></td>
<td></td>
</tr>
<tr>
<td>Travel agency and tour operator services</td>
<td>3.6%</td>
</tr>
<tr>
<td>Taxi transport</td>
<td>0.8%</td>
</tr>
<tr>
<td>Air and water transport</td>
<td>10.4%</td>
</tr>
<tr>
<td>Motor vehicle hiring</td>
<td>1.8%</td>
</tr>
<tr>
<td>Accommodation</td>
<td>12.3%</td>
</tr>
<tr>
<td>Cafes, restaurants and takeaway food outlets</td>
<td>8.3%</td>
</tr>
<tr>
<td><strong>Total tourism characteristic industries</strong></td>
<td>37.2%</td>
</tr>
<tr>
<td><strong>Tourism connected industries</strong></td>
<td></td>
</tr>
<tr>
<td>Clubs, pubs, taverns and bars</td>
<td>2.6%</td>
</tr>
<tr>
<td>Other road transport</td>
<td>2.3%</td>
</tr>
<tr>
<td>Rail transport</td>
<td>1.4%</td>
</tr>
<tr>
<td>Food manufacturing</td>
<td>2.3%</td>
</tr>
<tr>
<td>Beverage manufacturing</td>
<td>1.7%</td>
</tr>
<tr>
<td>Transport equipment manufacturing</td>
<td>0.4%</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>2.2%</td>
</tr>
<tr>
<td>Automotive fuel retailing</td>
<td>0.7%</td>
</tr>
<tr>
<td>Other retail trade</td>
<td>9.8%</td>
</tr>
<tr>
<td>Casinos and other gambling services</td>
<td>0.5%</td>
</tr>
<tr>
<td>Libraries, museums and arts</td>
<td>1.1%</td>
</tr>
<tr>
<td>Other entertainment services</td>
<td>1.2%</td>
</tr>
<tr>
<td>Education</td>
<td>6.0%</td>
</tr>
<tr>
<td>Ownership of dwellings</td>
<td>6.0%</td>
</tr>
<tr>
<td><strong>Total tourism connected industries</strong></td>
<td>38.0%</td>
</tr>
<tr>
<td><strong>All other industries</strong></td>
<td>7.7%</td>
</tr>
<tr>
<td><strong>Net taxes on tourism products</strong></td>
<td>17.0%</td>
</tr>
</tbody>
</table>

Source: ABS Tourism satellite accounts

The GE model contains a different set of sectors to those in the tourism satellite account. When the two data sets are aligned the breakdown becomes as shown in Table C.6.
Table C.6: Composition of tourism sector within GE framework

<table>
<thead>
<tr>
<th>GE industry</th>
<th>Share of tourism sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air transport</td>
<td>6.9%</td>
</tr>
<tr>
<td>Water transport</td>
<td>6.9%</td>
</tr>
<tr>
<td>Land transport</td>
<td>8.4%</td>
</tr>
<tr>
<td>Retail trade</td>
<td>36.9%</td>
</tr>
<tr>
<td>Accommodation</td>
<td>16.3%</td>
</tr>
<tr>
<td>Education and Training</td>
<td>7.9%</td>
</tr>
<tr>
<td>Processed food</td>
<td>5.4%</td>
</tr>
<tr>
<td>Motor vehicle parts</td>
<td>0.5%</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>2.9%</td>
</tr>
<tr>
<td>Const - Residential</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

Note: Due to the imperfect alignment of industries between the satellite account and the GE sectoral breakdown slight discrepancies may exist between the two data sets. Composition of the sector is assumed to remain constant over the period of the analysis.

ICT

The approach taken with ICT is largely the same as the tourism sector outlined above. The basis for the estimates is the ABS satellite accounts which are then aligned with the GE sectoral disaggregation (see Table C.7).

Table C.7: Composition of ICT sector

<table>
<thead>
<tr>
<th>Industry</th>
<th>Share of ICT sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing</strong></td>
<td></td>
</tr>
<tr>
<td>Computer and electronic office equipment manufacturing</td>
<td>0.4%</td>
</tr>
<tr>
<td>Communication equipment manufacturing</td>
<td>1.2%</td>
</tr>
<tr>
<td>Other electronic equipment manufacturing</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total manufacturing</td>
<td>3.3%</td>
</tr>
<tr>
<td><strong>Wholesale trade</strong></td>
<td></td>
</tr>
<tr>
<td>Computer and computer peripheral wholesaling</td>
<td>8.7%</td>
</tr>
<tr>
<td>Telecommunication goods wholesaling</td>
<td>2.6%</td>
</tr>
<tr>
<td>Other electrical and electronic goods wholesaling</td>
<td>9.9%</td>
</tr>
<tr>
<td>Total wholesale trade</td>
<td>20.9%</td>
</tr>
<tr>
<td><strong>Information media and telecommunications</strong></td>
<td></td>
</tr>
<tr>
<td>Software publishing</td>
<td>1.1%</td>
</tr>
<tr>
<td>Telecommunication services</td>
<td></td>
</tr>
<tr>
<td>Internet service providers and web search portals</td>
<td>1.7%</td>
</tr>
<tr>
<td>Data processing and web hosting services</td>
<td></td>
</tr>
<tr>
<td>Electronic information storage services</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
The NSW economy in 2020

### Industry Share of ICT Sector

<table>
<thead>
<tr>
<th>Industry</th>
<th>Share of ICT sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total information media and telecommunications</td>
<td>43.3%</td>
</tr>
<tr>
<td><strong>Computer system design and related services</strong></td>
<td></td>
</tr>
<tr>
<td>Electronic (except domestic appliance) and precision equipment repair and maintenance</td>
<td>31.5%</td>
</tr>
<tr>
<td><strong>Electronic (except domestic appliance) and precision equipment repair and maintenance</strong></td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Note: Information on some subsectors is not available for publication in this dataset.
Source: ABS ICT satellite accounts

Table C.8 shows this in terms of the GE model framework.

### Table C.8: Composition of ICT sector within GE framework

<table>
<thead>
<tr>
<th>GE industry</th>
<th>Share of ICT sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Media and Telecoms</td>
<td>43.3%</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>20.9%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3.3%</td>
</tr>
<tr>
<td>Other communications</td>
<td>32.5%</td>
</tr>
</tbody>
</table>

Note: Composition of the sector is assumed to remain constant over the period of the analysis.

### Creative industries

The creative industries composite uses the same methodology as above but employs data provided by Industry & Investment NSW. The composition of the industry is based around employment by its sub sectors (see Table C.9).

### Table C.9: Composition of creative industries sector

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Share of total sector employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspaper Printing or Publishing</td>
<td>10170</td>
<td>8.6%</td>
</tr>
<tr>
<td>Other Periodical Publishing</td>
<td>6308</td>
<td>5.4%</td>
</tr>
<tr>
<td>Book and Other Publishing</td>
<td>2498</td>
<td>2.1%</td>
</tr>
<tr>
<td>Recorded Media Manufacturing and Publishing</td>
<td>1669</td>
<td>1.4%</td>
</tr>
<tr>
<td>Jewellery and Silverware Manufacturing</td>
<td>1304</td>
<td>1.1%</td>
</tr>
<tr>
<td>Architectural Services</td>
<td>9665</td>
<td>8.2%</td>
</tr>
<tr>
<td>Computer Consultancy Services</td>
<td>40909</td>
<td>34.7%</td>
</tr>
<tr>
<td>Advertising Services</td>
<td>11316</td>
<td>9.6%</td>
</tr>
<tr>
<td>Commercial Art and Display Services</td>
<td>5346</td>
<td>4.5%</td>
</tr>
<tr>
<td>Film and Video Production</td>
<td>4013</td>
<td>3.4%</td>
</tr>
<tr>
<td>Radio Services</td>
<td>1840</td>
<td>1.6%</td>
</tr>
<tr>
<td>Television Services</td>
<td>7745</td>
<td>6.6%</td>
</tr>
<tr>
<td>Libraries</td>
<td>1841</td>
<td>1.6%</td>
</tr>
<tr>
<td>Museums</td>
<td>1743</td>
<td>1.5%</td>
</tr>
<tr>
<td>Music and Theatre Productions</td>
<td>3478</td>
<td>3.0%</td>
</tr>
<tr>
<td>Creative Arts</td>
<td>3346</td>
<td>2.8%</td>
</tr>
</tbody>
</table>
The NSW economy in 2020

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Share of total sector employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound Recording Studios</td>
<td>252</td>
<td>0.2%</td>
</tr>
<tr>
<td>Performing Arts Venues</td>
<td>929</td>
<td>0.8%</td>
</tr>
<tr>
<td>Services to the Arts, nec</td>
<td>863</td>
<td>0.7%</td>
</tr>
<tr>
<td>Photographic Studios</td>
<td>2555</td>
<td>2.2%</td>
</tr>
<tr>
<td>NSW total</td>
<td>117790</td>
<td></td>
</tr>
</tbody>
</table>

Source: As supplied by Industry & Investment NSW

This corresponds to the GE breakdown as per Table C.10.

Table C.10: Composition of creative industries sector within GE framework

<table>
<thead>
<tr>
<th>GE industry</th>
<th>Share of creative industries sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulp, paper and printing</td>
<td>18.8%</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>3.0%</td>
</tr>
<tr>
<td>Professional Scientific and Technical</td>
<td>24.8%</td>
</tr>
<tr>
<td>Information Media and Telecoms</td>
<td>40.6%</td>
</tr>
<tr>
<td>Arts and Recreation</td>
<td>16.4%</td>
</tr>
<tr>
<td>Other communications</td>
<td>9.8%</td>
</tr>
<tr>
<td>Education and Training</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Note: Composition of the sector is assumed to remain constant over the period of the analysis.

Education and research

This composite sector consists of two main sub-sectors:

- Education and training, and
- Professional, scientific and technical services.

The movement of the overall composite sector is estimated using a share weighted sum of the movement in these underlying components. The precise weighting is based on a combination of NSW Government statistics and ABS employment data.
References


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AIHW 2010, Health System Expenditure on disease and injury in Australia, 2004-05, April.


Qiang 2009, Information and Communications for Development 2009: Extending Reach and Increasing Impact, World Bank


