

Deloitte Access Economics

Prospects and challenges
for the Hunter region
A strategic economic study

Regional Development Australia
Hunter

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Acronyms

ABS	Australian Bureau of Statistics
CBD	Central Business District
CGE	Computable general equilibrium
CSG	Coal seam gas
FTE	Full-time equivalent
GRP/GSP/GDP	Gross regional/state/domestic product
GE	General equilibrium
HVCCC	Hunter Valley Coal Chain Coordinator
HVRF	Hunter Valley Research Foundation
ICT	Information and communication technologies
LGA	Local Government Area
LNG	Liquefied natural gas
Mbps	Megabits per second
NBN	National Broadband Network
NPV	Net present value
OECD	Organisation for Economic Co-operation and Development
PCEH	Personally Controlled Electronic Health Record
SME	Small to medium enterprise

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Executive summary

The Hunter is Australia's largest regional area, encompassing 11 Local Government Areas and the nation's seventh largest city, Newcastle. In many ways, the Hunter can be considered as a microcosm of the national economy, with significant exposure to resources, agriculture, energy production, defence and service industry bases, and a large urban centre based on a coastal fringe. As such, the prospects and challenges for the region are very much tied in with those confronting the nation as a whole.

This study has examined the longer term influences which are likely to shape the Hunter economy over the next two decades, both across the lower and upper parts of the region. The study contains a number of possible actions and priorities, relevant to both government and business, for enhancing the region's economic potential going forward and to drive a more dynamic and sustainable region.

The contours and character of the Hunter economy

The Hunter currently comprises around 8% of economic activity in New South Wales, with regional output of approximately \$36.9 billion in 2012 — making it Australia's largest regional economy.

The Hunter economy has quite distinct industry bases. With strong foundations in mining and agriculture it has also undergone substantial structural changes over the past two decades, including considerable expansion in broad service sectors.

A central long term economic projection of the Hunter economy was undertaken as part of this study. Table i below shows the composition of the region's key industries now and as it is projected to change over the next 20 years.

In an overall sense, the Hunter economy is projected to grow by nearly 75% with output of around \$64.8 billion in 2036. Average annual growth for the region over the next two decades is around 2.4%. Economic performance is projected to be similar across the upper and lower Hunter regions and is higher than the rest of New South Wales where annual economic growth is expected to be around 2.1% over the same period. Importantly, the economic advancement of the Hunter over this period will involve a steady rise of incomes and living standards.

Table i: Projected industrial composition of the Hunter, 2012-2036

Industry	2012 (%)	2036 (%)	Δ (%)	Average annual growth (%)
Mining	22.3	24.2	▲ 1.9	2.8
Manufacturing	11.7	11.2	▼ -0.5	2.2
Health Care and Social Assistance	7.7	8.4	▲ 0.7	1.9
Financial and Insurance Services	6.5	6.3	▼ -0.2	2.7
Construction	6.0	6.1	▲ 0.1	2.5
Education and training	5.6	6.1	▲ 0.5	1.9
Retail Trade	5.0	4.9	▼ -0.1	2.4
Transport, Postal and Warehousing	5.1	4.8	▼ -0.3	2.3
Public Administration and Safety	5.4	4.7	▼ -0.7	1.9
Professional, Scientific and Technical Services	4.8	4.6	▼ -0.2	2.6
All other industries	19.9	18.7	▼ -1.2	1.8
Total value added	100	100		2.4

Source: Deloitte Access Economics

Structural advancements

While the Hunter economy will be considerably larger (under central case assumptions) over the longer term, it will also involve new activities, both within new and existing sectors. Indeed, as some industries and businesses expand, others will restructure, shrink or perhaps disappear. This is an inherent aspect of the dynamics of modern economies, and one integral to sustained improvements in community living standards.

Some key structural features of the Hunter economy over the next two decades include:

- With 40% of the State's coal resources located in the Hunter, the mining industry accounts for almost a quarter of the Hunter economy. It is also a major direct employer, with the industry presently employing around 17,700 FTE workers, representing about 7.2% of the regional workforce.

The Hunter's mining sector is expected to expand over the next 20 years or so, underpinned by additional coal production and the emerging CSG sector. The mining sector is projected to contribute around 24.2% of total regional output in 2036, representing an increase of almost 2% from 2012.

- The influence of the mining sector also extends to other allied industries, such as those which form part of the Hunter coal supply network. Together, the construction, transport and wholesale trade industries currently constitute around 15% of the economy and employ around 37,400 FTE workers. These industries are expected to remain forceful in the long term, with projections suggesting they will retain their current share of the Hunter economy in 2036.

- Consistent with Australia's ongoing structural shift away from heavy industries and manufacturing, the contribution of the Hunter manufacturing sector is projected to decline, albeit moderately, over the next two decades. Projections indicate that manufacturing will comprise about 11.2% of the regional economy by 2036.
- Further, along with a broader and longstanding trend towards services nationally, the service intensity of the Hunter is also projected to increase (services currently represent about 70% of the overall regional economy). The health sector is the region's largest service sector and largest employer, representing about 7.7% of the regional economy and employing about 31,000 FTE workers. The health industry is projected to expand to around 8.4% of the Hunter economy in 2036.
- Another key regional service sector is education and training. The majority of these services are located in the lower Hunter (eg the University of Newcastle), with the sector comprising about 5.6% of economic activity and employing 16,400 FTE workers. The education sector is projected to expand to around 6.1% of the regional economy over the next two decades.

Major influences facing the region

Looking ahead, the Hunter will continue to modernise and be shaped by a range of global and domestic factors, both separately and in combination. As illustrated in the central economic projection for the region, these will change the composition of economic activities undertaken across the Hunter and how Newcastle functions as a regional capital and satellite to Sydney.

The major influences, along with some key threats and opportunities for the region, are discussed below. These influences will be pervasive and far reaching. However, while they are expected to present considerable economic benefits for the Hunter as a whole, successfully securing new opportunities and alleviating any adverse consequences going forward is not assured. Much will depend on the ability of industries and governments to be adaptive, nimble and innovative.

Integration with Asia

The ongoing integration of Australia with large industrialising economies in Asia, notably China and India, will have a profound impact on the region. The Hunter contains Australia's largest coal export supply network which is a major resource supplier to customers in Japan, South Korea, China and other Asian countries.

Over recent years, the region has benefited from strong global demand for resources which has underpinned substantial expansion in mining production and supply network capacity. Indeed, during the last five years or so there has been marked improvement in the operation and coordination of the coal supply chain with the most pressing bottlenecks at the Port of Newcastle being alleviated.

Near term prospects are heavily linked to the pace and scope of economic development in the Asia Pacific region, particularly China's demand for commodities. However, long term growth in rapidly industrialising markets will ultimately support volume demand and prices, and it is expected that the region's coal sector will perform strongly over the long term.

Beyond mineral resources, broader integration with Asia will also have considerable implications for the region. By 2020, the Asian region will be economically larger than Europe and North America combined. The region's middle class is also expected to increase to around three billion people, comprising around 60% of the world's total middle class.

In particular, proximity to such markets and the demand for higher value products and services will present enormous commercial opportunities for agricultural producers and tourism and education providers in the region. The Hunter has proven premium farming, wine and equine industries and existing strengths as a high-quality tourism destination. Newcastle University also has substantial potential to reinforce its position as a leading regional Australian tertiary education provider.

Key threat: Moderating Asian commodity demand

Given its nationally-significant base of coal mining and support activities, the Hunter is especially vulnerable to a softening of commodity demand from Asian economies and a decrease in Australia's terms of trade (principally from lower mineral and energy prices).

A reduction in commodity prices would considerably reduce profitability across the mining industry. It would also involve decreased economic activity in the large cluster of industries which support mining and resource operations, as well as lower household income and consumption.

Scenario analysis, under which commodity prices decline by approximately 30%, shows economic output in the Hunter could fall by around \$4.0 billion in present value terms over the period to 2036. Notably, the economic impacts are likely to be more acute in the upper Hunter where mining activity is more heavily concentrated.

A key facet to these adjustments is that, in a diversified economy, a moderation in commodity prices and resource related earnings also involves some economic 'upside'. In particular, the region's farming, tourism and education sectors stand to benefit as a lower currency improves their international cost competitiveness.

However, much will depend on ensuring these sectors are well positioned to capitalise on new opportunities.

- This may involve better integrating tourism service offerings across the region, possibly involving the development of new aviation links, permanent cruise shipping and other complementary services.
- It could also involve sharpening the focus of the University of Newcastle towards attracting a greater share of overseas students.

A major aspect of addressing the risks presented by lower commodity prices will involve how effectively the region can utilise its natural advantages in agriculture, tourism and education services — especially with a view to harnessing the opportunities presented by a rapidly growing Asian middle class.

Changing settlement patterns

It is expected that the Hunter will continue to experience robust population growth over the next two decades. Currently, around 615,000 of people live in the Hunter and this is projected to increase to around 762,000 by 2036.

It should be noted that the scale of potential population increases is relatively uncertain. Much will depend on the balance of population shifts with the Sydney Metro area, with a relatively small movement of people between Sydney and the Hunter involving a far greater proportional increase for the region. As such, population growth in the Hunter will largely reflect decisions across the Sydney metro area, especially transport and planning, and their respective influences on the relative attractiveness of the Hunter.

Over time growth will also be driven by advancements in the digital economy allowing people to reside along the coast for its lifestyle advantages while pursuing traditional 'city-based' careers. Further, expected increases will be affected by new employment opportunities emerging in the region. For instance, expansion of energy resources and agricultural production across the region will increase demand for skilled workers and tradespeople.

Such growth stands as a major economic opportunity for the region, enabling a greater range of commercial enterprises and generating additional areas of employment. More generally it will also help bring about greater dynamism in the region — new residents invariably bring ideas and allow more sources of entertainment and culture to flourish.

Catering for a larger population base and greater number of workers involves obvious pressures for local planning and infrastructure and will need to be carefully managed. An important challenge involves the adequacy of road and rail linkages with Sydney and the upper Hunter.

A further key policy and planning issue will involve where additional residents to the region will be located. Given current settlement patterns and likely changes in the region's industrial structure, most of the increases in the population base are likely to occur along the coast with some increases in Maitland.

Key opportunity: A bigger Hunter

A larger population and employment base has significant and broad-ranging economic implications for the Hunter. In an overall sense, it helps diversify the economy, provide more market opportunities for local businesses and drive greater dynamism.

These impacts were illustrated in scenario analysis in which there is robust population growth in the Hunter over the next two decades. Under this scenario, the region's population grows by an additional 37,000 residents and 20,000 workers over central growth expectations (in which the Hunter population increases from around 615,000 to 762,000 people by 2030).

For the region, this higher population growth generates additional (broad-based) economic activity of around \$21.4 billion in present value terms over the next two decades. The uplift in economic output is greater in the lower Hunter where, consistent with longstanding settlement patterns, much of the population growth is likely to be accommodated.

A range of growth challenges

The strength of population growth, both in the Hunter and more broadly, is very much an issue for New South Wales. This fundamentally relates to the level of active policy influence on where people live and work, and how this is incorporated into state and local government planning agendas. For instance, growth in the Hunter will be heavily influenced by decisions made under the Sydney metropolitan strategy.

For the Hunter, there are considerable opportunities to facilitate more robust population growth underpinned by best practice and responsive planning and infrastructure investment frameworks. Indeed, regions which put in place integrated and well-functioning planning structures will tend to attract a greater share of population growth over the long term — and the ability to secure the benefits of a stronger and more diverse economic base.

Achieving strong population growth will involve substantial policy challenges for the Hunter, with key pressures including the provision of adequate housing, infrastructure and transport systems. It is vital that integrated planning that takes a long term view and enhances the natural lifestyle attractions of the region is established as a priority.

Transitioning to a less carbon intensive economy

The Hunter economy has a relatively high emissions profile. Along with its substantial coal mining operations, it has a comparative strength in other energy intensive activities such as electricity generation and metals processing.

As such, the transition to a carbon-constrained economic environment including policies which seek to price carbon and promote energy-efficient technologies will have considerable implications for the region's heavy industry base over the longer term.

There are uncertainties on how a national carbon price will unfold over the next few years, in terms of its structure, the nature of international linkages, or indeed its very existence. However, much of this is near to medium term policy 'flux' and the longer term direction is still very much weighed in terms of concerted global action to reduce emissions.

Heavy industries are inherently large scale, capital intensive and long lived. Accordingly, more incremental adjustments are less likely to occur. For the Hunter, there exist key vulnerabilities in terms of the closure or downscaling of parts of the region's industrial base and a reduction in regional employment. Such structural change was seen in the closure of the BHP steelworks Newcastle in 1999.

This points to the advantages of economic diversification in the region and the pursuit of comparative advantages outside of energy intensive industries, especially where there are relevant and transferable skills sets available in the region. Much of this will occur more ‘organically’, but there are also areas where policy action can play a useful role. For example, the establishment of the Australian Solar Institute and Clean Energy Innovation Centre in Newcastle has the potential to leverage the Hunter’s advantages in energy production and related activities.

Key threat: An industrial downsize

The Hunter has a large energy-intensive and heavy industry base, centred on proximity to its port and rail infrastructure and the coal fields. Consistent with ongoing changes to the structure of the economy, there remains a key risk to the region from a reduction in this industrial capacity over the medium to long term, whether directly through climate change policy or other forms of economic adjustment.

These potential impacts were examined in scenario analysis which incorporated the risks of a near term structural ‘shock’ to the region’s industrial base. This could involve the closing down or relocation of part of the region’s heavy industry base, such as an existing electricity generator or aluminium plant.

The economic impacts from this form of downsize are rather abrupt, with large short term declines in employment and income. Importantly, however, regional economic activity is able to rebound as resources are effectively absorbed by other sectors of the economy. Over the longer term, output and employment in the Hunter are shown to recover largely within a 10-15 year period.

The adjustment process illustrated in the analysis somewhat mirrors the experience of recent structural change in the Hunter and highlights the region’s economic diversity and resilience. In particular, it points to the challenges associated with utilising existing skills and transferrable workforce capabilities in the region.

This may involve a number of aspects, including:

- Expanding research capabilities in the areas of renewable energy.
- Ongoing development of industry clusters in and around Newcastle Airport, particularly related to defence services.
- Promoting further high-value advanced manufacturing capabilities.

The Hunter is especially vulnerable to the closure or downscaling of parts of the region’s industrial base. Ensuring such risks are effectively managed and any dislocation impacts are minimised will require concerted effort to enable existing workforce skills to be retained in the region and absorbed in other areas of the economy.

Digital economy advancements

As seen over the past few years, there has been notable acceleration in the impact of the digital economy on businesses and individuals. In particular, the adoption and deployment of advanced information technologies (eg through social media applications) have driven rapid changes in certain industries such as retail and media.

This more recent pace of change is not expected to diminish and will effectively ‘broaden out’ across more sectors.

Many of these advancements will be facilitated by new wireless network capabilities and the National Broadband Network, as well as the advent of more automated business systems.

The provision of health and education services stand as major areas of transformative change. While new digital based service delivery options in these sectors have taken some time to take hold (e.g. e-health records), they have the potential to induce large changes once they occur. These will influence how these services are accessed, allowing people to locate away from large metro centres.

Advancement in the digital economy also reduced barriers to entry in many markets. This raises a number of competitive pressures but may enhance the appeal of the Hunter as a potential location for businesses. Metropolitan areas have generally benefited from better access to larger markets, and have attracted a greater share of skilled labour. However, the advent of digital technologies can allow businesses greater access to markets without a (or with less) physical presence, and provide employees with the flexibility to live and work in different locations. This can enable businesses to take advantage of the lower commercial rent and other business costs in the Hunter, while remaining in proximity to Sydney.

For the Hunter economy more generally, increased adoption of digital technologies has the potential to stimulate economic growth in the region and diversify activity. Currently, the Hunter has a heavy concentration in mining and agriculture. By attracting a greater variety of service businesses to the area, digital technologies can provide an opportunity to widen the base of the local economy and promote more balanced development.

Strategic challenges and responses

There will be significant pressures and challenges for the Hunter region in the years ahead. For the region's economic base, this will give rise to a number of risks as well as new opportunities. Importantly, the pace of economic change is expected to be large going forward. This has a number of dimensions, as discussed earlier in terms of the major influences on the region.

- Changes associated with the demand for commodities from Asia and developments in the digital economy may cause business conditions to change quite rapidly.
- In contrast, population growth and climate change related factors are slower moving and are likely to impart a more gradual influence on the shape and performance of the Hunter, especially over the medium to long term.

As a starting point, the Hunter has a solid base to flexibly absorb and respond to emerging economic circumstances. For instance, it has a relatively diverse economic base, a considerable pool of skilled workers and offers important lifestyle benefits and natural attractions.

Structural foundations

The Hunter economy has diversified and modernised over the last 15 years or so through structural adjustment and greater service orientation. However, this should not disguise that the heart of the Hunter economy is still very much focused on energy resources and related heavy industry.

In fact, mining (and electricity generation) will continue to be important (and expand) for some years, although the path beyond a decade or so becomes more uncertain. In this regard, while this industry foundation has provided substantial growth and strong employment opportunities over the last decade, these regional comparative advantages also involve some economic vulnerability. Indeed, weaker demand for resources from Asian customers would lead to lower mining production and resources-based investment in the region. And, at a national level, this would entail some devaluation of the currency and a decline in Australian real incomes.

The region's heavy industry base, especially in the lower Hunter, could also come under longer term adjustment pressure, through a transition to lower emission activities and broader global competitiveness issues.

These risks are not to underplay the region's strengths. There are both inherent and unforeseen risks for any economy, irrespective of the activities undertaken. What it does point to is the region's ability to weather an economic shock or downturn where there is a core concentration of highly related industries.

The balance of risks

In considering the overall economic opportunities and risks for the Hunter over the next two decades, it should be noted they are unlikely to be balanced evenly. The economic upside for the region is likely to manifest in stronger and more balanced growth and consolidation. In effect, growth is driven by greater development prospects for the region's strategic industries.

In contrast, the downside risks are likely to be more abrupt — potentially involving the closure or substantial downscaling of parts of the region's industrial base and a large reduction in regional employment.

Responding to the challenges

The region's capacity to manage such pressures will be heavily dependent on how effective existing skill sets across the region can be leveraged and resources reallocated in response to changing economic circumstances. This might involve greater transfer of employment in high value manufacturing and defence services where workers in some heavy industries have readily transferable skills.

Maximising the Hunter's economic prospects over the long term will require building on its natural and acquired advantages and enhancing its industry diversification. This has a number of major elements:

- It will involve continued development of existing economic strengths in resources, energy generation and heavy industries, as well as growth in related supporting services.
- It will also involve exploring new areas of likely future comparative advantage such as in defence, selected high value manufacturing and premium agriculture, where existing capabilities and skill sets can be harnessed and built upon.

- Services, which are a large and expanding part of the regional economy, will generate a range of new opportunities. In particular, there will be greater prospects in areas such as high value tourism and education, and new initiatives to reinvigorate these areas could drive significant benefits.
- There will be substantial requirements to put in place a range of supporting infrastructure investments. These will need to have a focus on enabling greater regional mobility, managing the relocation of more people to the region and revitalising urban centres.

Key opportunity: Enhanced accessibility

There are many economic advantages for the region in attracting stronger population growth over the next two decades. Indeed, concerted efforts to improve access to and within the Hunter have the potential to boost productivity and support a substantially larger residential and worker community.

This can occur in various ways and could feasibly entail a combination of road and rail infrastructure across the upper and lower Hunter, between Maitland and Newcastle, and to the Sydney metropolitan area, and increased use of telecommuting.

Scenario analysis highlighted the potentially large economic benefits associated with improving access to the Hunter and addressing regional transport pressures. Economic output in the Hunter over the next 20 years was projected to increase by around \$23.5 billion in present value terms.

This illustrates that improving broader accessibility across the Hunter has the potential to ‘unlock’ many of the economic gains of having more people live and work in the region.

Planning and infrastructure investment frameworks have a big role to play. It is crucial that the region harness its existing advantages in terms of space, proximity to Sydney and fewer physical constraints than other metro areas in New South Wales to retain and attract businesses and people. Areas where planning has tended to be fragmented and lacking cohesion need to be addressed as a priority, including exploring the potential for consolidation of local governments in the Hunter.

A responsive, forward-looking infrastructure and planning framework sector is vital for meeting future economic challenges and promoting regional connectivity and economic inclusion. A unified ‘voice’ for the Hunter supporting its dealings with Commonwealth and State governments would help drive greater coordination and advance the interests of the region.

Priority areas for regional development

A range of potential options, in the context of RDA Hunter’s strategic priorities, are summarised below. These include areas where regional authorities, including local governments, can play a more active role in industry development.

Table ii: Summary of regional development priority areas

Key strategic issues	Drivers & opportunities	Regional development priorities & challenges
<i>Growth and diversity of the regional economy</i>		
<ul style="list-style-type: none"> • Integration with Asia • Ongoing development of the services economy • Emerging regional industries 	<ul style="list-style-type: none"> • Strong investment and demand driven by industrialising Asian economies <ul style="list-style-type: none"> ○ Encompasses resources, premium agriculture and tourism and education services • Services will continue to expand as part of regional development, including in health, education and retail • New opportunities in coal seam gas and higher value manufacturing (including defence related) appear highly prospective 	<ul style="list-style-type: none"> • Explore new areas of likely future comparative advantage such as in defence, selected high value manufacturing and premium agriculture, where existing capabilities and skill sets can be harnessed • Promote regional mobility and vibrant urban centres • Ensure linkages with industry, research agencies and the CSIRO are deepened and have a focus on regional strengths and issues • Develop a concept for a defence 'super base' in the region, especially in the context of the new Defence White Paper • Ensure a supportive and low cost environment for small businesses
<i>Improvements to the region's infrastructure</i>		
<ul style="list-style-type: none"> • Promoting regional connectivity and economic inclusion • A responsive, forward-looking infrastructure sector is vital for meeting future economic challenges such as climate change and population ageing, and more immediate capacity constraints 	<ul style="list-style-type: none"> • More focus on intra-regional road links would help drive further efficiencies • Integrating areas of the lower Hunter with Newcastle, and links to the upper Hunter are crucial for broader development in the region • Newcastle can play a big role in relieving the stresses on Sydney arising from urban growth 	<ul style="list-style-type: none"> • Free up bottlenecks and transport corridors, including around the ports and Newcastle • Ensure adequacy of rail capacity connecting mines in the upper Hunter with port facilities in Newcastle • Enhance road links (eg the New England Highway) which allow workers to commute from outside the region • Address transport bottlenecks between Sydney and Newcastle

Key strategic issues**Drivers & opportunities****Regional development priorities & challenges*****Comprehensive and cohesive planning for the future***

- The population of the Hunter is expected to increase significantly over the next 20 or so years
- Over the next two decades, considerable investment will be required to increase the capacity of the coal export supply network
- Water security is an important strategic issue for the region
- A larger population base will enable a greater range of commercial opportunities and generate additional areas of employment
- Increased population in the region and the potential for decreased water yield and higher variability associated with climate change, especially beyond the next two decades, will present particular challenges
- Explore the potential for improving integrated regional planning and service delivery through consolidation of local governments in the Hunter
- Catering for a bigger Hunter will put pressure on local planning and transport — including the adequacy of road and rail linkages with Sydney and the upper Hunter, and the provision of new dwellings
- Access arrangements and overall management of the rail network have worked well in recent times, but these need to remain effective at ensuring investments meet future needs and that new coal field prospects can be developed
- It is likely that multiple approaches to addressing regional water security will be needed going forward — reflecting that no one option is likely to offer the best solution and the difficulties in securing large scale investments

Skills and workforce development

- Sectoral changes, including ongoing development of the region's coal resources, an expanded services sector, and consolidation of the region's heavy industry and manufacturing base, will place new demands on the region's workforce
- Much of the compositional changes will be gradual, allowing workers and businesses to adjust according to emerging market opportunities
- Many of the workers needed to support expansion of the Hunter's resource and industrial base will come from within the region
- A large base of retirees will increase the demands and opportunities for service providers (eg in health, retail and lifestyle industries)
- Expansion of strategic industries will require additional workers to move to the region
- The ability to attract new, especially younger, people will be affected by developments in and around Newcastle, and the quality of infrastructure links and services
- Ensuring the availability of relevant training options is responsive to requirements will be a priority

Key strategic issues	Drivers & opportunities	Regional development priorities & challenges
<i>Knowledge skills, creativity and innovation</i>		
<ul style="list-style-type: none"> • Changes to the region’s economic structure will place additional onus on increased knowledge-based skills and innovation • The region’s capacity to innovate will be greatly determined by the skills and knowledge of its workforce • Developing Newcastle as a vibrant metropolitan centre is important to fostering meaningful new industry clusters 	<ul style="list-style-type: none"> • Newcastle is Australia’s second largest non-capital city and, located close to Sydney, has substantial capacity to more deeply integrate into corporate Australia • Dedicated innovation and research centres (eg Hunter Medical Research Centre, Newcastle Institute for Energy and Resources) play a crucial role within the regional economy 	<ul style="list-style-type: none"> • Develop parts of Newcastle to help open up greater economic ‘pull’ factors, including opportunities to revitalise the Newcastle CBD and more centrally locate new business or education services where possible • Existing institutional structures in research and industry collaboration have the potential to be further consolidated and built on • Linkages between the University, CSIRO, the John Hunter Hospital and relevant industries can be deepened and re-focused
<i>The region’s natural and built environment</i>		
<ul style="list-style-type: none"> • Existing and new residents are attracted to the region’s substantial lifestyle advantages 	<ul style="list-style-type: none"> • From a preservation and amenity perspective, building on the region’s pristine and world-class environmental features is fundamental 	<ul style="list-style-type: none"> • There are potential gains from better promoting tourism and events in the region • Some relatively low cost initiatives could enhance the amenity and tourism value of the region’s coastline <ul style="list-style-type: none"> ○ This includes the development of an integrated network of environmental and walking tracks — perhaps linked over the longer term to the extensive Sydney coastal walking routes

1 Introduction

Regional Development Australia Hunter (RDA Hunter) engaged Deloitte Access Economics to undertake a study on the performance and growth potential of the Hunter region taking a longer term perspective. The study examined the major economic drivers and trends which are likely to influence the Hunter economy over the period to 2036, and their impacts on industry, businesses and the community.

The study was undertaken using a ‘foresighting’ approach. This essentially involves longer term scenario analysis within a consistent and comprehensive empirical framework of the Hunter region. A primary aim of the study was to explore different possible futures and the attendant risks and opportunities facing sectors and the regional economy as a whole. In doing so, the study draws out the linkages between the Hunter region and the broader New South Wales and Australian economies, recognising the region’s position as a strategic economic centre.

Four major influences were examined:

- The consequences of various climate change abatement and adaptation policies, especially those associated with energy production, resources, transport, and the natural and built environments.
- Demographic trends and settlement patterns including those associated with structural changes to the region’s economic profile.
- Goods and services demand and competition from industrialising economies in Australia’s region, notably China and India.
- The impacts of advancement in information technologies that will change how business is conducted and individuals learn, work and play.

A key focus of the study was to examine the risks and opportunities for the Hunter economy presented by these factors. This included identifying challenges for existing industries, where new markets might emerge and relevant uncertainties. In short, the study explored which industries will be best placed to take advantage of the prospects presented by a new economic environment.

The study has aimed to help provide a solid basis for RDA Hunter’s policy and strategic development processes, recognising its existing priorities as well as current government objectives — including the recently announced Federal Government commitment for a long term infrastructure blueprint for the Hunter region. RDA Hunter’s current strategic priorities are outlined in Box 1.

The study contains a series of recommendations for future actions and priorities, relevant to both government and business, for enhancing the region’s economic potential going forward and to drive a more dynamic and sustainable region.

Box 1: RDA Hunter's strategic priorities

Regional Development Australia Hunter (RDA Hunter) is the peak regional development consultative organisation for the Hunter region. It is governed by a board of community members and forms part of a national network of 55 RDA regions across Australia.

RDA Hunter has identified six priority areas which form part of its development support and activities:

- comprehensive and cohesive planning for the future
- improvements to the region's infrastructure
- growth and diversity of the regional economy
- skills and workforce development
- knowledge skills, creativity and innovation
- the region's natural and built environment.

Analytical approach

The modelling of the Hunter economy, including in response to various global and domestic influences, has been undertaken using the Deloitte Access Economics Computable General Equilibrium (CGE) model. An outline of the modelling framework is provided in Appendix B.

This empirical approach has many advantages. It allows the whole-of-economy impacts of various economic 'shocks' (in this case, the various domestic and international influences) to be explored across multiple transmission channels. The scale and pattern of relevant effects to industries, and the Hunter economy as a whole can then be distilled. This empirical approach was adopted in recent analysis of the New South Wales economy conducted for the New South Wales Innovation Council.

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. The analysis has therefore involved consultations with key sectors of the Hunter economy, RDA Hunter and other stakeholders.

Report structure

This report is divided into two parts:

- **Part I: The current and future shape of the Hunter economy** — This part of the report explores the composition of the Hunter economy, including its major industries, patterns of settlement and relevant economic linkages. Building on this analysis, how the region is likely to change in response to major domestic and global influences is examined.
- **Part II: Future prospects and challenges for the Hunter** — Following on from the preceding analysis, this part looks at the main development challenges and opportunities for the Hunter which are likely to unfold over the next two decades. It sets out a range of possible strategic priorities and responses that could be pursued to maximise the region's economic prospects, recognising where the attention of RDA Hunter is likely to be most effective.

Part I: The current and future shape of the Hunter economy

This part of the report sets out the current shape of the Hunter economy and how it may evolve over the next few decades in response to key domestic and global forces. These influences include the influence of rapidly industrialising economies in Asia, demographic change, developments in information technologies and climate change policies.

A central case projection to 2036 — which essentially depicts the combined influence of these main influences — is discussed, alongside the implications for strategic sectors of the Hunter economy.

2 The Hunter economy in 2012

In many ways, the Hunter can be considered as a microcosm of the national economy, with significant exposure to resources, agriculture, energy production, defence and service industry bases, and a large urban centre based on a coastal fringe. Consistent with contemporary economic trends, service industries in the Hunter have grown in prominence, such as through high value mining support and health and tertiary education services. While the overall picture of the region paints an image of diversity, there are clear patterns of specialisation within the Hunter.

The lower Hunter, which covers the five LGAs of Cessnock, Lake Macquarie, Maitland, Newcastle and Port Stephens, has developed from a largely mining and manufacturing heartland. Over the past two decades, economic activity has become more service intensive, although primary and secondary industries are still pivotal to economic performance. The upper Hunter is more heavily concentrated in primary activities through substantial coal mining and agricultural operations, particularly in the Muswellbrook, Singleton and upper Hunter LGAs. Areas such as Gloucester, Dungog and Greater Lakes are major centres for thoroughbred breeding, viticulture and tourism.

Overall in 2012, the Hunter contributed around 8% of gross state product (GSP) with output in the region totalling approximately \$36.9 billion — making the Hunter the largest regional economy in Australia. Key indicators for Hunter economy are outlined in Table 2.1.

Table 2.1: Key figures for the Hunter economy, 2012

Economic indicators	Lower Hunter	Upper Hunter	Hunter	NSW	Australia
Gross output (\$b)	27.0	9.9	36.9	458.5	1401.2
Services output share (%)	72.5	28.4	60.7	81.5	74.5
Resident population	515,000	100,000	615,000	7,261,000	22,725,000
Dependency ratio (%)	55	63	56	51	47
Employment (FTE)	161,500	34,500	196,000	2,319,000	8,020,000
Unemployment rate (%)	4.9	7.1	5.5	5.2	5.4
Skilled workers share (%)	30.4	22.2	27.3	46.7	47.5
Median weekly income (\$)	985	1,090	1,000	1,015	1,015

Source: ABS, Deloitte Access Economics

2.2 Population and demographics

The Hunter is the most populous area in regional Australia, with a residential population of around 615,000, significantly more than the Australian Capital Territory and Tasmania. The lower Hunter (which includes the city of Newcastle) is the most heavily populated part of the region, with 515,000 residents. Over the last decade, population growth in the lower Hunter has been higher than the New South Wales, average of 1% per annum — underpinned by substantial growth in mining investment, coastal lifestyle benefits and proximity to Sydney.

The upper Hunter by comparison has a more rural composition characterised by low population densities. Population growth in the upper Hunter has been driven by coal mining activity. For instance, in areas where mining activity is most prevalent, such as Singleton and Muswellbrook, average annual population growth rates have been close to 1.5%. In Dungog, where there is limited mining, population growth rates have been approximately 0.5%.

Unlike other mining intensive regions in Australia where development has been enabled by substantial interstate migration (eg through contract workers), population growth in the upper Hunter has involved widespread relocation of lower Hunter residents. This highlights one of the enduring consequences of the BHP Steelworks closure in 1999 that involved manufacturing employees in Newcastle entering other industries. This trend also points to the self-sufficiency of the Hunter region which has thus far met its labour requirements through regional restructures rather than drawing on resources from other parts of the State. More broadly, the high level of intraregional migration emphasises the innate attractiveness of living in the Hunter and the strong sense of regional affinity, especially when structural pressures have been confronted.

Population ageing

Australia's population is ageing. This process, which is a function of both the baby boom and the steady increase in life expectancy, is set to continue apace over the next few decades. Earlier this month, the ABS released the highest life expectancy estimates ever recorded in Australia. Under current projections, a male born today could expect to live 80 years, while a female could expect to live over 84 years.

Importantly, population ageing in the Hunter appears to be occurring at a faster rate than the rest of Australia. This can be attributed to several localised factors, including:

- an increase in intrastate and interstate migration for people aged over 60 during the past 25 years
- the persistent loss of younger residents, for instance to pursue employment or education opportunities elsewhere
- low inward migration rates for key working age groups such as students and young professionals.

The net result for the Hunter is a relatively high dependency ratio, currently around 56%, which is greater than for New South Wales (51%) and across Australia (47%). It should be

noted that the challenge of attracting and retaining young people is not exclusive to the Hunter and is an issue faced by many other regional economies.

Table 2.2 provides a current demographic profile of the Hunter, New South Wales and Australia.

Table 2.2: Population estimates, 2012

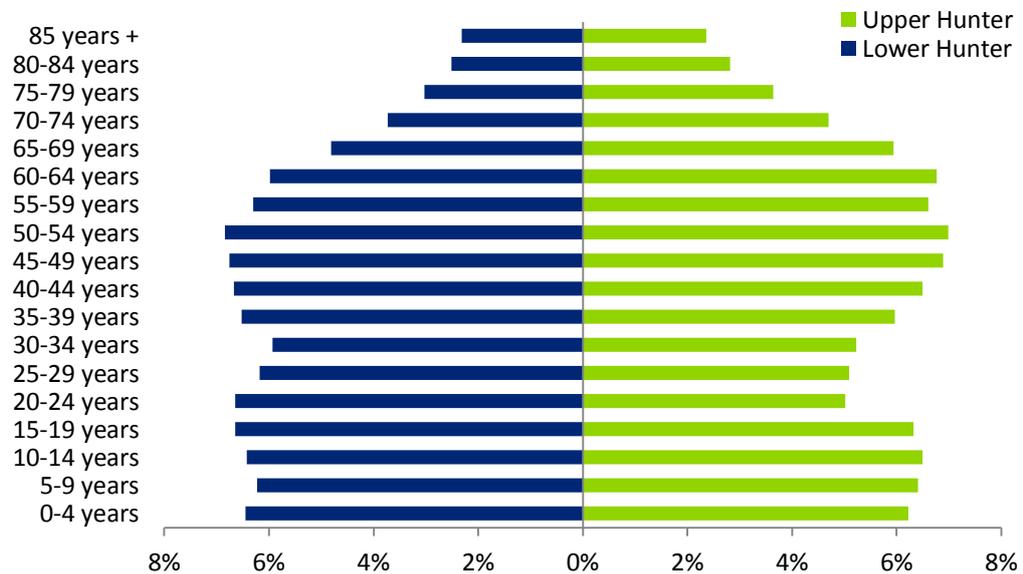
	Lower Hunter	Upper Hunter	Hunter	NSW	Australia
Population	515,000	100,000	615,000	7,261,000	22,725,000
Working age population	332,000	61,000	383,000	4,814,500	15,225,000
Dependency ratio (%)	55	63	56	51	47
Extreme age ratio* (%)	7	8	7	6	6

Note: *Extreme age ratio is the number of residents aged over 80 years as a percentage of working age residents
Source: ABS Census, NSW Department of Planning

Population ageing is more pronounced in the upper Hunter where the dependency ratio has increased from 60% to 63% since 2001. This is in contrast to the lower Hunter where the dependency ratio has remained stable at around 55% over the same period. Chart 2.1 illustrates that the age profile of the lower and Hunter regions are largely similar for residents below the age of 40. However, there is a heavier concentration of older residents in the upper region.

This presents unique challenges for the upper Hunter where the combination of a smaller base and ageing population may hinder the ability of businesses to access suitable labour in the future. This can be a particular impediment for the farming sector where more acute age pressures exist. The ability of the upper Hunter to secure ongoing high-value mining opportunities (for example in coal and coal seam gas) is firmly linked to having a critical mass of skilled workers and supporting industries. This has a direct bearing on development costs and can be key factors in the decision to proceed with a project given other opportunities are typically available to proponents.

Chart 2.1: Age profile of the Hunter, 2012



Source: ABS Census, NSW Department of Planning

Ethnic mix in the region

The Hunter's regional identity has been shaped over centuries and is the culmination of factors such as geography, colonial settlement, economic development trends as well as the locational preferences of new migrants. For instance, the expansion of the mining sector and related industries has led to employment growth in occupations in which many ethnic groups are typically underrepresented. There also appears to be a strong metropolitan inclination demonstrated by new migrants. In 2011, it is estimated that 82% of overseas born residents elected to live in Australia's cities.

In light of these elements, it is unsurprising that like many parts of regional Australia, the Hunter too is characterised by a lower level of ethnic diversity. ABS Census data from 2011 indicates that 88% of residents in the Hunter were born outside Australia, compared to 70% across the rest of the country. Though what is surprising is the fact that unlike its regional counterparts, the level of social diversity has been declining, from 15% of overseas-born residents in 2001, to 13% in 2006 and 12% in 2011. Further to this, where residents are born overseas, there has been a strong Anglo-Saxon presence, with 83% of residents born in places such as the United States, United Kingdom and New Zealand.

In an area where settlement patterns are largely determined as a matter of birth rather than choice, there are substantial opportunities to improve economic competitiveness, build social capital and increase regional dynamism. This can be achieved targeting key population threads, including:

- established migrants from metropolitan bases (like Sydney)
- skilled migrants from outside of Australia
- international students, either looking to study in Australia or seeking to gain permanent residency.

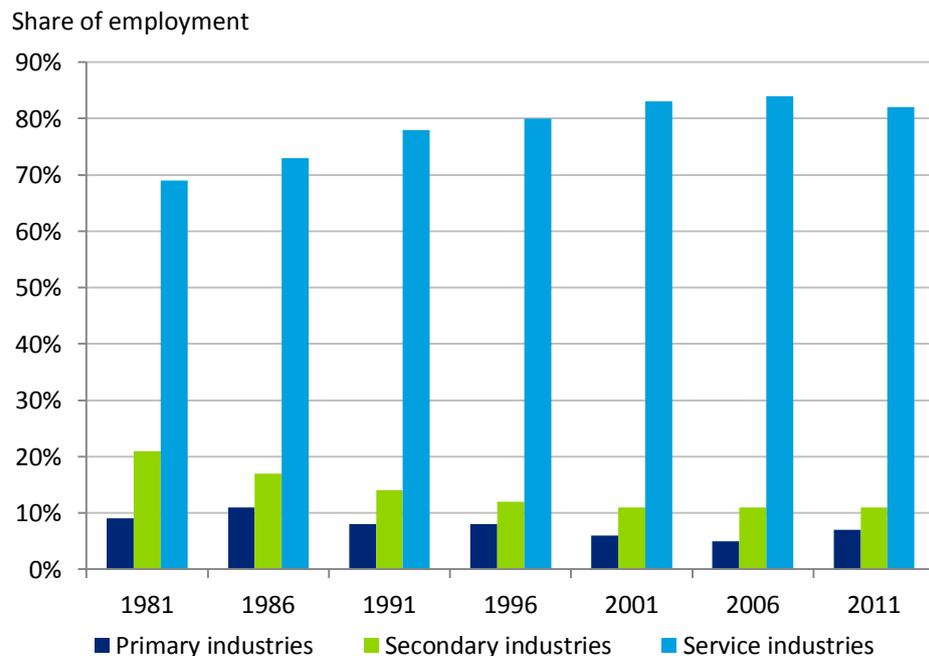
Indeed the benefits of social globalisation are clearly visible in cities such as Sydney and Melbourne and have played a major role in fostering a culture of international engagement, receptiveness to new ideas and a general ‘outward’ focus. Most recently this has been achieved through tremendous growth in the number of Asian migrants. Residents from China, India and the Philippines alone constitute a third of permanent migrants in the country.

Following the path of urban areas, developing a deeper dialogue with Asia has the potential to uncover gains beyond the export of primary goods and tap into its large skilled and highly educated population. There are signs that the Hunter’s tertiary education sector has already gained from greater internationalisation. The share of Asian undergraduate students in the Hunter has more than doubled from 6% in 2001 to 13% in 2011. This has played an important part in promoting the cultural vibrancy in the Newcastle and Lake Macquarie areas — also boosting education related friends and family tourism in other parts of the Hunter.

2.3 Workforce and employment

Perhaps of most consequence to the shape of the modern Hunter economy has been a gradual restructure away from its heavy industrial base, especially during the 1980s and 1990s. These structural changes involved severe cuts to manufacturing jobs, such as the closure of the BHP Steelworks plant, accompanied by a strong shift in employment towards service sectors. Chart 2.2 profiles the changes to the region’s employment composition over the last two decades, including a growing services orientation.

Chart 2.2: Historical employment patterns



Source: ABS

Currently, the Hunter labour force comprises around 245,000 full-time equivalent (FTE) workers. Health and social assistance is the largest employer industry, accounting for 31,000 FTE jobs, followed by manufacturing with 24,900 FTE jobs (see Table 2.3). While contributing around 22% of economic output, the mining industry directly employs 7.2% of the regional workforce (approximately 17,700 FTE workers), reflecting the substantial capital intensity of mining operations. The influence of the mining industry is therefore better gauged by examining its impact on related sectors. For instance, mining development and capital investment is currently exerting a large impact on the construction industry, which now employs just above 8% of the regional labour force.

Table 2.3: Hunter employment by industry, 2012

Industry	Employment (FTE)	Employment (% share)
Agriculture, Forestry and Fishing	4,500	1.8
Mining	17,700	7.2
Manufacturing	24,900	10.2
Electricity, Gas, Water and Waste Services	4,700	1.9
Construction	20,100	8.2
Wholesale Trade	6,450	2.6
Retail Trade	25,150	10.3
Accommodation and Food Services	16,200	6.6
Transport, Postal and Warehousing	10,850	4.4
Information Media and Telecommunications	2,250	0.9
Financial and Insurance Services	6,850	2.8
Rental, Hiring and Real Estate Services	4,200	1.7
Professional, Scientific and Technical Services	15,750	6.4
Administrative and Support Services	6,800	2.8
Public Administration and Safety	16,600	6.8
Education and Training	16,350	6.7
Health Care and Social Assistance	31,000	12.7
Arts and Recreation Services	2,650	1.1
Other Services	12,000	4.9
Total	245,000	100.0

Source: Deloitte Access Economics

After robust employment over the last decade, recent job cuts in the mining sector have seen unemployment creep up to 5.5%, just above the New South Wales, average of 5.2% (see Table 2.4). In the past, the Hunter has managed industrial restructure relatively effectively. This had involved, for instance, wide-scale reskilling and transfer of manufacturing workers to the growing mining, construction and wholesale trade industries. The restructure away from heavy industries was also helped by the formation of a cooperative, HunterNet, in 1992. Since its inception, the cooperative has worked to create new market opportunities for manufacturing, engineering and consulting companies by encouraging innovation and collaboration between members.

However, any future structural change may be made more challenging by the ageing of the region's population and because many of the emerging employment opportunities are being generated in higher skill service industries where skills may not be so easily transferable.

These issues are being felt more acutely in the upper Hunter. Here, an older, predominantly male and low skilled workforce is also accompanied by a higher level of long term unemployment. It is estimated that approximately 30% of unemployed people in the upper Hunter have been out of work for more than 52 weeks. This compares to 22% in the lower Hunter and 20% at the State level. Moreover, about one in five workers in the upper Hunter hold high skill positions, compared to one in two at the state and national level.

In general terms, the links between lower skill levels, long periods of unemployment and social disadvantage become more significant as economies modernise — those who suffer entrenched joblessness have been found to be more likely to drop out of the labour force and rely on social welfare. Long term unemployment often sends strong (negative) signals to prospective employers, in itself reducing the attractiveness of individuals.

Table 2.4: Workforce summary, 2012

	Lower Hunter	Upper Hunter	Hunter	NSW	Australia
Employment (FTE)	161,500	34,500	196,000	2,319,000	8,020,000
Unemployment rate (%)	4.9	7.1	5.5	5.2	5.4
Share of long term unemployment (%)	22	30	25	20	21
Participation rate (%)	60.9	60.5	60.8	63.6	65.2
Share of skilled workers (%)	30.4	22.2	27.3	46.7	47.5
Median weekly income (\$)	985	1,090	1,000	1,015	1,015

Source: ABS, Deloitte, Access Economics

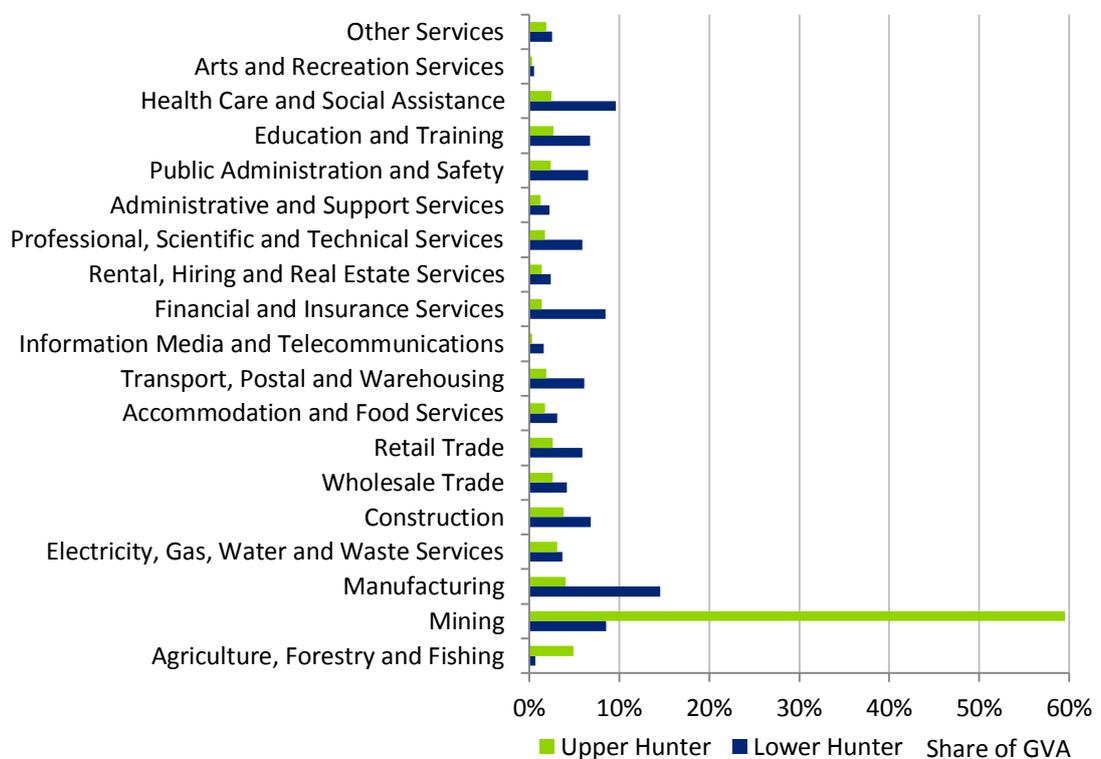
Already in the upper Hunter pockets of disadvantage are evident — often masked by 'average' employment indicators which conceal the struggles of the lower quartile. For instance, on first glance, it appears that residents in the upper Hunter are relatively affluent with higher median incomes. However, these higher average incomes are essentially driven by well-paid mining workers and there are large differences in other industries.

Areas such as Cessnock and Great Lakes have significantly lower income levels and have recorded unemployment rates consistently above 9% since 2001. These areas typically have less direct exposure to the mining industry and have seen a substantial loss of lower skilled manufacturing and agricultural jobs over the last 15 years or so. Without improvements in training and employment outcomes, income and social disparities between mining and non-mining workers may become more accentuated.

2.4 Industrial composition

Reflecting the distribution of the region's resource endowments and comparative advantages, the diversification of the Hunter economy has almost exclusively been centred in the lower Hunter (Chart 2.3). This has seen a marked rise in service sectors such as tertiary education and health care over the past two decades. In total, service based industries comprise about 70% of the lower Hunter economy, which is comparable to the national average of 75%. The upper Hunter has a much more narrow industry focus with mining and agriculture contributing around 65% of economic output.

Chart 2.3: Lower and upper Hunter industrial structure, 2012



Source: Deloitte Access Economics

Even with the increasing diversification of the lower Hunter, the Hunter's overall economic performance is still underpinned by its mining industry, which represents approximately 22% of the regional economy. Within the mining sector, coal production has been the driving force behind much of the activity. Currently, around 75% of the State's coal production occurs in the upper Hunter, almost all of which is transported to domestic and international customers through the Port of Newcastle in the lower Hunter. In 2011, 14% of Australia's total exports were sent through the Port of Newcastle.

The continued expansion of the region's mining industry has strengthened and driven growth in mining-related clusters around the Hunter, including metals processing, freight transport and construction.

This is clearly seen in the Hunter's industrial composition, in which the manufacturing, construction and transport industries together represent 20% of the economy. Segments of service industries are also aligned with mining operations, with a number of large businesses developing regional commercial capabilities closer to the mine gate, especially in the areas of administration, finance and professional services.

The industry structure of the Hunter region is shown in Table 2.5.

Table 2.5: Hunter value added by industry, 2012

Industry	Value added (\$b)	Value added (% share)
Agriculture, Forestry and Fishing	0.5	1.8
Mining	6.7	22.3
Manufacturing	3.5	11.7
Electricity, Gas, Water and Waste Services	1.1	3.5
Construction	1.8	6.0
Wholesale Trade	1.1	3.7
Retail Trade	1.5	5.0
Accommodation and Food Services	0.8	2.7
Transport, Postal and Warehousing	1.5	5.1
Information Media and Telecommunications	0.4	1.2
Financial and Insurance Services	2.0	6.5
Rental, Hiring and Real Estate Services	0.6	2.1
Professional, Scientific and Technical Services	1.4	4.8
Administrative and Support Services	0.6	2.0
Public Administration and Safety	1.6	5.4
Education and Training	1.7	5.6
Health Care and Social Assistance	2.3	7.7
Arts and Recreation Services	0.1	0.5
Other Services	0.7	2.4
Total	30.0	100.0

Source: Deloitte Access Economics

3 Longer term factors and implications

This chapter examines the main trends that appear most crucial in shaping the Hunter economy over the next two decades. This is a significant length of time and unforeseen events and influences are also likely to emerge. In this regard, the key uncertainties and underlying pre-conditions relevant to each trend are also explored, augmented by specific analysis at a Hunter level.

A key focus of this section is to examine the risks and opportunities presented by these factors for the Hunter economy. The four key longer term factors being examined are:

- demand and competition from developing economies like China and emerging Asia-Pacific countries, and linkages to the Hunter
- demographic trends influencing the Hunter economy, both at a regional compared to the national level
- impact of information technologies which are set to transform how businesses operate and individuals conduct their everyday lives
- consequences of climate change abatement and adaptation policies, especially those associated with the Hunter's emission intensive operations.

3.1 New patterns in the global economy

Demographic shifts and economic growth convergence are bringing about large structural shifts in the global economy. China has grown particularly rapidly over the past decade, accounting for around one-quarter of the world's GDP growth over the period, but other developing economies across Asia, Eastern Europe and Latin America have also increased substantially.

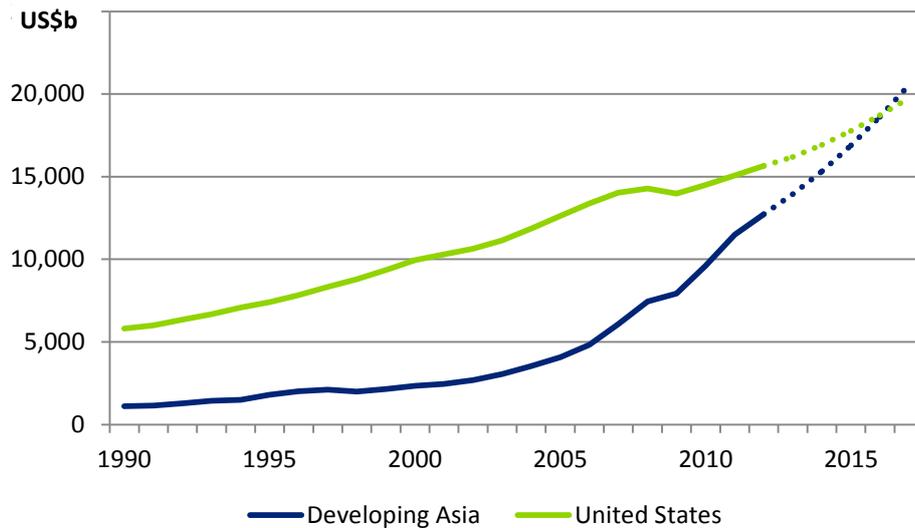
Into the future, ongoing demographic changes will also shift the pattern of global growth. Like Australia, most advanced countries have already started to experience acute population ageing, but a number of developing countries in Asia and Eastern Europe will also experience significant ageing from around 2020. Developing countries will continue to grow strongly as the relative size of their working-age population increases in coming years, although growth patterns are likely to shift into the future as China's population starts to age.

The rise of the Asian economies

The industrialisation of Asia which is well underway is likely to be one of the defining events of the 21st century. China and India, which together represent almost 40% of the world's population, have largely underpinned the rapid growth in the region over the past decade, with China recently overtaking Japan this year to be the world's second largest economy.

Growth in China is likely to continue to outpace other major countries over the coming decade, with other major economies also expected to grow strongly. As shown in Chart 3.1, GDP of developing Asian economies represented just 20% of US GDP in 1990, rising to be 76% of US GDP in 2011, with the IMF predicating that the regions' output will surpass that of the US by 2017.

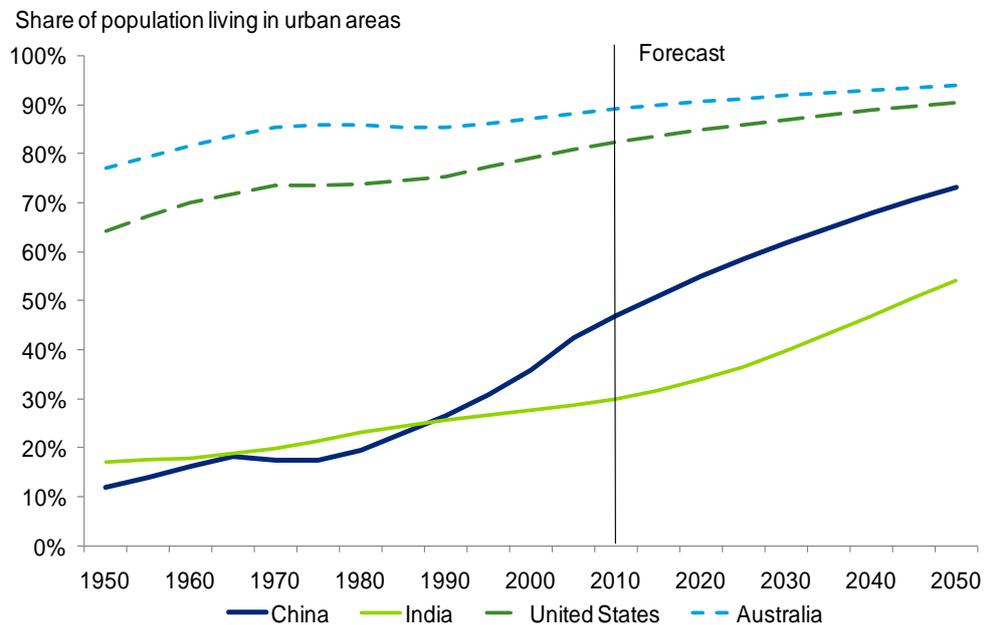
Chart 3.1: Economic output of developing Asian economies and the United States



Source: IMF

By around 2020, however, the OECD predicts that growth in the Indian and Indonesian economies could outpace that of China. This reflects a number of factors, including a natural slowing as China becomes more developed and demographic challenges associated with its one child policy.

Nonetheless, large gaps in living standards will remain, which will continue to underpin strong economic growth China and other developing regions for several decades to come. Indeed, despite the rapid growth in China over the past decade, its urbanisation rate has only increased to 50% and remains well below that of developed economies (see Chart 3.2).

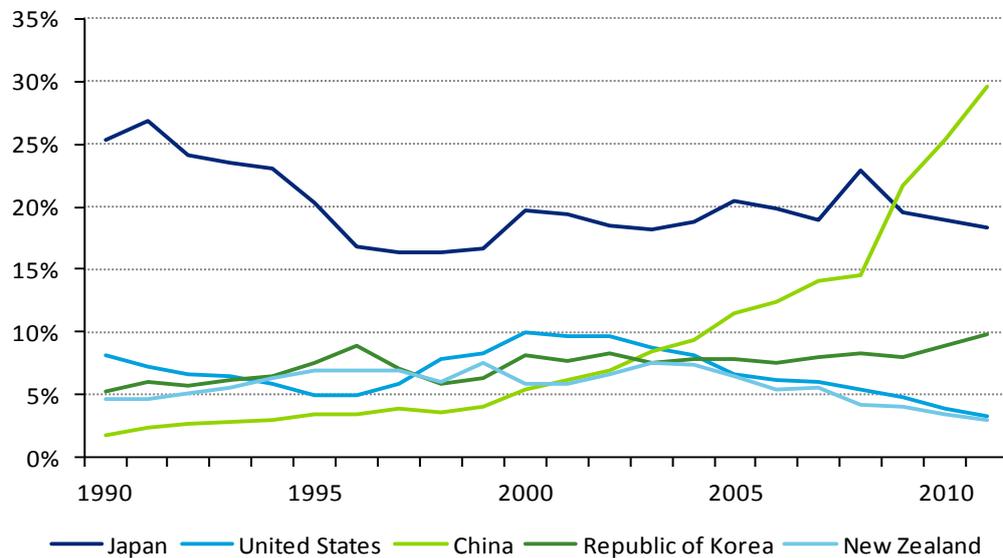
Chart 3.2: Urbanisation trajectories for key economies

As incomes in Asia rise, the nature of growth in the region is likely to shift. In recent decades, growth in China in particular has been largely export led, which has allowed the country to grow quickly and invest large sums into the development of infrastructure which is driving the demand for commodities. However, as the urbanisation rate increases and the Chinese middle class rises, economic growth will be increasingly driven by domestic consumption. Like consumption patterns in other developed economies, this will lead to more demand for higher quality food, particularly protein rich food like milk and dairy, as well as service orientated consumption. For China's trading partners, including Australia, this means demand from China is likely to start to impact more on non-resource sectors into the future, like high-quality agricultural goods, services and tourism.

Australia is well positioned to benefit

Developments in Asia have already had profound implications for Australia's economy. The direct impact on the economy has been largely felt through higher prices for resource and agricultural commodities. Australia has been well placed to benefit from rising Asian commodity demand due to its proximity to the region, large natural resource base and stable investment environment.

The benefits flowing to Australia from growth in Asia, and China in particular, can be seen in the shifts in Australia's major trading partners. Over the past 20 years, Australia's trade has been confined to a small number of markets, with trade with top five partners accounting for around 50% of total trade. Major trading partners include the United States, United Kingdom, New Zealand, China, Japan and Republic of Korea. Over the last decade, China has risen from the fifth largest trading nation to be Australia's largest trade partner by a considerable margin.

Chart 3.3: Australia's major export destinations, percentage of total value

Source: UN Comtrade

Into the future, the continued rise in Asia is likely to have a more widespread impact on the economy. While the initial stages of the mining boom are showing signs of slowing as construction projects are completed and new capacity comes online, the increase in income per capita in developing and emerging Asian countries will drive demand for a greater variety of Australian agricultural and other goods, as well services like tourism and education. This is already providing a timely boost to sectors that have been undergoing limited or no growth due to terms of trade pressures and a decline in traditional markets.

Already, the number of visitor nights in Australia from Chinese tourists has increased by close to 70% in the past four years and expenditure has grown to \$3.6 billion per year, which is Australia's largest source market. By 2020, Tourism Australia projects that expenditure by Chinese visitors has the potential to reach \$7 billion-\$9 billion each year in Australia, more than doubling their current economic contribution.

The Australian Government has recently acknowledged the importance of Asia in its 'Australia in the Asian Century' White Paper. The paper discusses the impact of the rise in Asia not only on the Australian economy, but also on society and the strategic environment (see Box 2). It also sets out the opportunities and challenges for Australia as Asia enters its next phase of development. A challenge for Australia is to become more engaged in the region, and build on the links already established. Importantly, the paper acknowledges that other large Asian economies outside of China, such as Indonesia and India, will also be very important.

Box 2: Asian Century White Paper 2012, Australia in the Asian Century

Australia in the Asian Century contemplates a significant shift in the global marketplace associated with the rise of Asia. These developments have profound implications for Australia. Already Asia's ascent has changed the social and economic fabric of Australia, the period to come however is expected to have a larger transformative impact.

As Asian economies continue to develop, the changing tastes and preferences of its burgeoning middle class is set to shift towards higher value services demand. For the Hunter, this means that along with gains for traditionally dominant sectors such as mining and agriculture, there will also be greater opportunities for service industries such as education and tourism. Key findings from the White Paper for these sectors are outlined below.

Education

Education is currently Australia's largest service export and is an industry likely to grow further over time. Australia's existing universities are likely to see increasing numbers of international applicants as Asian incomes rise and demand for higher education increases correspondingly. Established Australian universities have excellent international brands, particularly in developing Asian countries. Growth in the reputation and branding of Australian universities will most effectively be driven by industry groups or the Federal government. Therefore, the ability of a higher education institutions to integrate with initiatives like the Federal Government's existing international education brand, *Future Unlimited*, will be key to tapping into the growing number of international students from Asia.

Education is also an industry with significant spillovers. At present, over a third of skilled migrants in Australia were international students in the past. This suggests that higher education institutions should also be considered strategic sources of skilled migrants coming from Asia. Even when international students return home, the connections they forge in Australia provide opportunities for business and cultural exchange in the long-run.

Tourism

International tourism is expected to grow significantly, with the growth in inbound arrivals from Asian countries expected to outpace growth in all other markets in both percentage and absolute terms.

To fully harness this opportunity, Australia will need to ensure a competitive and robust airline market remains in place. The ability for Asian consumers to conveniently and affordably access reliable air services into and out of Australia will be critical to tapping this market. Furthermore, Australia will need to increase investment in tourist infrastructure such as hotel rooms.

The tourism industry itself will need to develop culturally relevant products to cater to the demands of Asian consumers. This will need to be developed in coordination with advertising and branding campaigns that will have to be conducted at the national level. Furthermore, being a fundamentally service based industry, tourism will need to cater to the language and cultural sensitivities of Asian tourists in order to better service these markets. This will require investments in cultural exchange or international networking institutions.

Tourism also has natural spillovers in the form of demand for retail and transport services that are likely to be driven by increasing tourist numbers.

However, the increased reliance on emerging Asian economies also means that Australia is becoming increasingly sensitive to the inevitable fluctuations in growth throughout the Asian region. Any slowdown in that region would have significant consequences for demand for resources, as well as business and consumer confidence.

In conjunction, the deeper integration of global capital markets also means that international economic shocks, such as a sudden slowdown in economic growth in China, are transmitted across global borders with greater speed.

How these global forces impact the Hunter economy

The most profound impact of the rise in Asia on Australia to date, and on the Hunter region, has been driven by an increase in global demand for resource commodities. World commodity prices have increased by 105% over the past decade, despite recent declines. Like other resource rich regions in Western Australia and Queensland, the Hunter has experienced substantial economic gains and is set to benefit further as its capacity to export coal expands. The region's coal seam gas industry, which is still in its infancy, also has the potential to tap into the Asian market over the longer term.

However, the increase in demand for resources from Asian economies has been so large and so rapid that is also having some disruptive effects on non-mining activity in the region. Existing transport infrastructure — including the road network, key rail lines and port facilities — has at times struggled to cope with the influx of freight movements. This was most visible over the past five years in the large queues of coal vessels at the Port of Newcastle.

In order to support ongoing growth, substantial infrastructure investment in the region is likely to be required. Expansion of port facilities has already been approved, and by 2032 the export capacity will be roughly double. New investment in the region's road and rail networks will also be needed to align with additional port capacity and ensure that passenger transport services are sufficient. The associated construction activity, and the ongoing operations of the port and freight movements, will generate a large number of jobs in the region over the next couple of decades.

Along with the economic benefits to the region, there are a number of challenges. There will need to be an increase in the provision of housing to cater for the workers moving to the region. Already house prices have increased substantially in the region and careful planning will be needed to ensure that adequate land is released to keep pace with the rising demand. The provision of government services like healthcare and education will also need to expand to match the increase in demand.

There are also environmental implications with increased mining activity, and more generally with associated population growth. The Hunter is a varied ecosystem which includes fragile coastal environments that need to be carefully protected.

More recently, and into the future, rising incomes in Asia will drive demand for services, including tourism and education, and higher quality agricultural commodities. The Hunter economy is well positioned to benefit from these emerging trends. Tourism is a well-established part of the region's economy, given its close proximity to Sydney and diverse attractions, and Newcastle University already has a relatively high proportion of international students. The agricultural sector also has a number of export opportunities, particularly for premium products like wine, as well as dairy and meat. The challenge for these industries will be to adapt to the preferences of the Asian market, and respond effectively to growing demand.

The importance of emerging Asian economies to the region is already well evident. An important challenge for the region will be to foster these cultural and business linkages to the Asian region to continue capitalising on the rise of Asia in coming decades.

3.2 Demographic change

Australia's demographic profile is in the process of undergoing tremendous change: the population is growing overall, coupled with pronounced ageing. These fundamental shifts will have major economic implications. They will ultimately start reducing the per capita growth capacity of the economy and increase fiscal pressures for governments to meet new healthcare and infrastructure requirements. They will also change the demand for goods and services driven by new consumer preferences.

The Hunter is particularly exposed to these demographic trends. In addition to Australia-wide trends, driven by natural increases and net overseas migration, the Hunter too is subject to a high rate of net internal migration. There are several factors underlying the migration from other parts of Australia to the Hunter, including congestion and the high cost of living in Sydney. Retirees who want to move away from major cities, particularly Sydney, are also a significant driver of population growth. Commonly termed 'sea-changers', this trend is particularly important because it magnifies the ageing of the population in the region.

A larger population

Since 2001 Australia's population has increased by around 3.1 million (or over 380,000 people per year). This has been the highest level of growth in Australia's history with population growth rates since 2001 averaging around 1.6% a year. The distribution of the population is largely confined to urban areas. Around 70% of the nation's population lives in the five mega metropolitan cities in and around Sydney, Melbourne, Brisbane, Perth and Adelaide. Following on from the population drift towards cities evident since beginning of the last century, this percentage has remained remarkably constant for the last three decades.

In contrast, it is commonly thought that rural and regional Australia is in decline and suffering from perennial outward migration. This is not the case for the entire regional Australia. Many parts of the country are attracting inward migration seen primarily through a 'coastal drift' trend. The Hunter's proximity to Australia's premier gateway city in Sydney combined with its picturesque landscape and relative affordability has traditionally attracted niche population groups, namely established workers looking for a lifestyle change and retirees.

Overall, it is estimated that the Hunter population will grow from 622,000 in 2012 to about 762,000 by 2036. Population levels for the Hunter have been projected by integrating count data from the 2011 ABS Census and forward growth rates from the New South Wales Department of Planning (see Table 3.1).

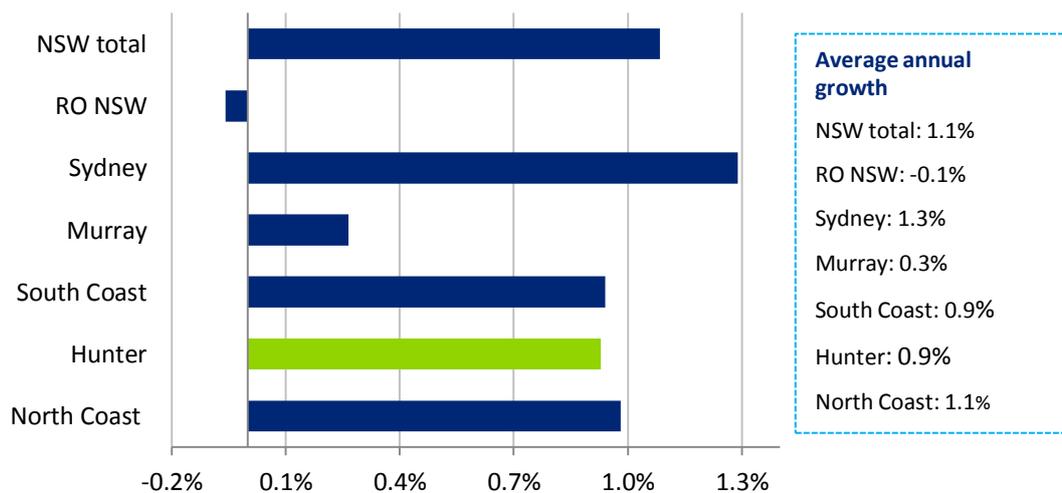
Table 3.1: Population estimates, 2036

	Lower Hunter	Upper Hunter	Hunter	NSW
Population	639,000	123,000	762,000	8,774,900
Working age population	366,000	65,500	431,500	5,396,100
Dependency ratio (%)	74.6	87.8	76.6	62.6
Extreme age ratio* (%)	15.3	18.4	15.8	10.7

Note: *Extreme age ratio is the number of residents aged over 80 years as a percentage of working age residents

Source: ABS Census, NSW Department of Planning

This translates to an average annual growth rate of around 0.9% and annual increase of 5,850 new residents each year. This is similar to the population growth rates expected for the North and South Coast (see Chart 3.4).

Chart 3.4: NSW projected population growth by region, 2012-2036

Source: NSW Department of Planning

Mirroring the distinct economic facets of the lower and upper region, population growth across the Hunter is not evenly balanced. Wider national and international trends have illustrated that the expansion of service industries have favoured those regions with bigger service sectors, skilled workers and more diversified economic structures. These economies are also the ones that have historically experienced consistently high rates of population growth. This is demonstrated in the lower Hunter where population growth has been supported by the growing number of employment opportunities in government services, health and education. This has also led to some stark differences in the demographic profile among regions (discussed below). By 2036, the population of the lower Hunter is projected to reach around 640,000 people, growing from 520,000 in 2012.

Population growth rates are comparatively more variable in the upper Hunter. The cyclical nature of the dominant mining and agriculture sectors heavily influence the size and demographic composition of smaller LGAs.

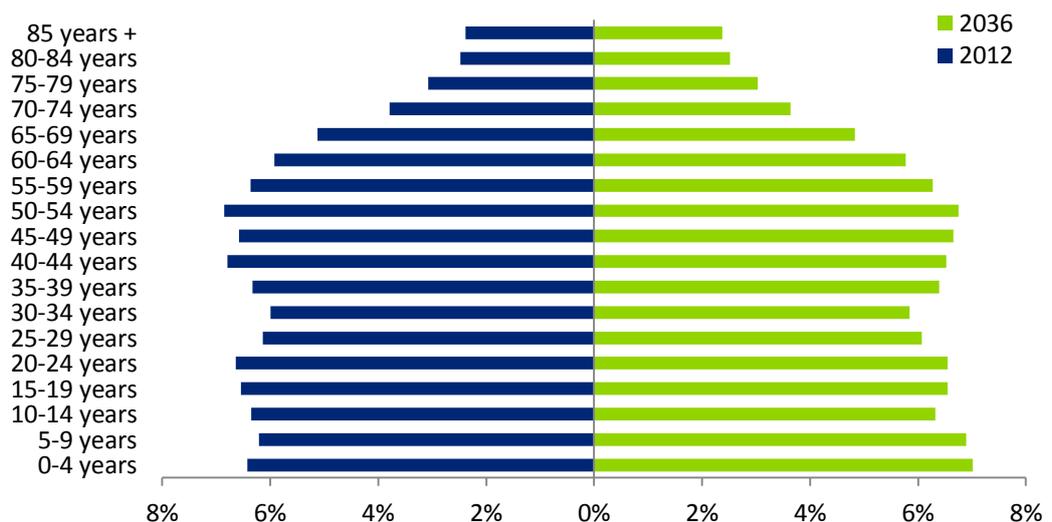
Most recently, coal expansion and resource development in the upper Hunter has raised the population growth rate of neighbouring communities. As these industries continue to develop into the future it is likely that skills shortages in the region will also draw in new residents. Over the long term as coal mines reach capacity and resource projects become fully operational, it is likely that the substitution of capital for labour will reduce the need for local resident participation — amplifying the already apparent ageing challenges. The population of the lower Hunter is expected to increase by 21,000 to reach about 123,000 people in 2036.

An ageing population

People over the age of 65 are the fastest growing age group in Australia, and this is set to continue for the next couple of decades. There has been a clear tendency over recent decades of retirees migrating away from major cities towards regional areas along the east coast and south-west coast of Australia.

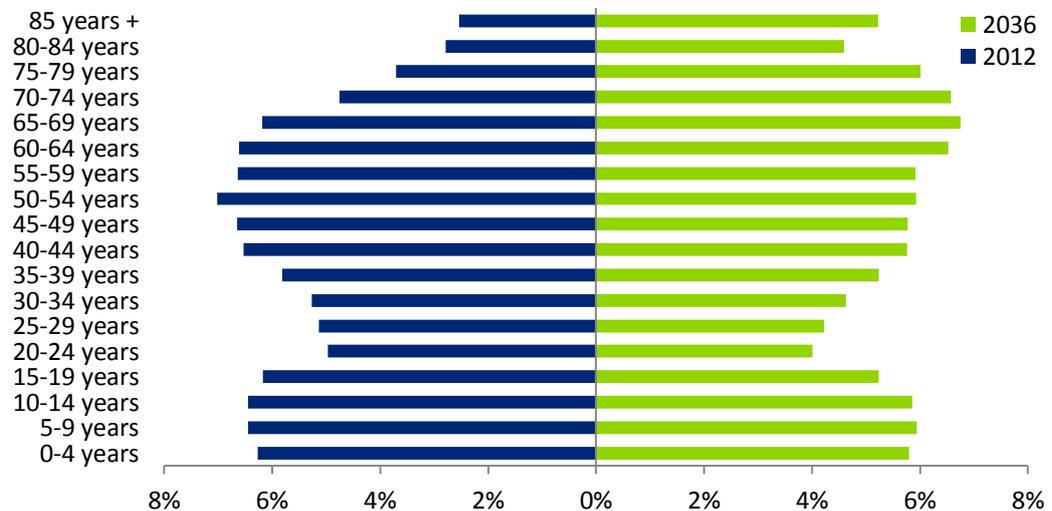
As a result of this coastal drift amongst retirees, the effects of the ageing population will be concentrated in these areas. This can be seen by comparing dependency ratios. The dependency ratio across Australia and in New South Wales is expected to steadily increase to 61.2% and 62.6% by 2036 respectively. The dependency ratio in the lower and upper Hunter is projected to increase to 74.6% and 87.8% respectively. Chart 3.5 and Chart 3.6 depict the demographic composition of the lower and upper Hunter in 2012 and 2036. These two charts show that while the lower Hunter population structure is ageing progressively, the upper Hunter is likely to experience a dramatic increase in the number of older residents.

Chart 3.5: Lower Hunter population projections



Source: Deloitte Access Economics

Chart 3.6: Upper Hunter population projections



Source: Deloitte Access Economics

The marked ageing of the Hunter impacts the economy through several channels:

- **Workforce** — The Hunter workforce is likely to be subject to various skills shortages, especially in sectors which already have a high proportion of older workers such as agriculture, health and education services.
- **Demand for goods and services** — As the population structure evolves so too will the demand of goods and services. More products will be tailored to suit the needs of an older population. For example, financial products, recreational services, retail offerings, will over time, increasingly reflect the preferences of older Australians.
- **Pressures on health services** — Naturally the demand for health care and aged facilities is expected to rise greatly. While this will generate considerable employment opportunities in the Hunter, a greater challenge will be the adequate provision of services to the elderly in rural and remote areas. Other key priorities will be the access of affordability of suitable ancillary services such as transport and dwellings.

International migration will become more important to the Hunter economy going forward. Unlike other parts of Australia where the growth in service industries has been associated with the greater international migration of high skilled workers, the regional workforce is comprised of a large number of born and raised Hunter residents. As opposed to natural population growth, international migration intakes can often be more responsive to changed labour supply and demand conditions. For instance, international migration allows for new workers to enter Australia to meet periods of high labour demand, such as the demand for skilled tradespeople associated with the mining and resources boom.

Importantly, Australia's migration program has focused on skilled and typically younger workers which act to develop human capital and arrest the effect of population ageing. This helps boost productivity and labour participation rates, both now and into the future.

As new migrants tend to be almost exclusively attracted to urban areas, policy settings around regional skilled migration mandates will play a significant role in developing the Hunter's outward commercial orientation, build on its export character and improve overall vibrancy.

If not addressed effectively, the Hunter's relatively older age profile may indeed become a competitive disadvantage — not only relative to Australian capitals but also other regional cities, with many key economies facing less acute ageing pressures. Differential ageing impacts and migration patterns can potentially lead to larger disparities between regional and national economic growth rates. Such factors, in which the Hunter continues to attract a higher share of older residents, may serve to hinder the region's economic diversification prospects.

Implications for the Hunter region

The scale of potential population increases is relatively uncertain. Much will depend on the balance of population shifts with the Sydney Metro area, with a relatively small movement of people between Sydney and the Hunter involving a far greater proportional increase for the region. As such, population growth in the Hunter will largely reflect decisions across the Sydney metro area, especially transport and planning, and their respective influences on the relative attractiveness of the Hunter.

Strong population growth in the Hunter has important implications for regional planning. Overall, population growth will require an expansion of infrastructure, including transport, water and energy, and urban services, such as health and education. At the same time, population expansion needs to be balanced against environmental considerations, particularly the pressures placed on fragile coastal environments.

The anticipated shift in the demographic profile of the region towards an older population will also present challenges for the Hunter economy. Adequate provisions of services for a larger population of retirees, including housing and health, and measures to address the implications of the projected rise in the dependency ratio are key challenges that will be faced by the region in coming decades.

The large difference between the demographic composition of the lower and upper Hunter also raises a range of social issues. The larger the demographic differences between the two, the larger are the economic outcomes. For instance, in the upper Hunter, continued mining expansion is likely to see higher incomes enjoyed by a younger workforce. This will raise the demand for essential goods and services in the region such as health and accommodation and housing. This can generate cost of living pressures for other parts of the community.

3.3 Growth of the digital economy

As seen over the past few years, there has been notable acceleration in the impact of the digital economy on businesses and individuals. In particular, the adoption and deployment of advanced information technologies (eg through social media applications) have driven rapid changes in certain industries such as retail and media.

This more recent pace of change is not expected to diminish and will effectively 'broaden out' across more sectors. Many of these advancements will be facilitated by new wireless network capabilities and the National Broadband Network (NBN), as well as the advent of more automated business systems.

The provision of health and education services stand as major areas of transformative change. While new digital based service delivery options in these sectors have taken some time to take hold (eg e-health records), they have the potential to induce large changes once they occur. These will influence how these services are accessed, allowing people to locate away from large metro centres.

While some industries are affected more than others, digital technology presents opportunities across all aspects of the economy and particularly for regional areas. The Hunter region is likely to benefit greatly from the ongoing development and adoption of information technologies. Digital technologies are enabling the region to diversify its economic base, and improve welfare by allowing residents to access a much greater range of goods and services. They also provide more flexibility for employees to telework and for businesses to access markets around Australia and around the world without needing a physical presence.

Impact of the National Broadband Network

Technological developments have been an important driver of productivity in recent decades, transforming virtually all aspects of the way businesses operate. As new innovations and applications are developed and adopted — eg broadband, smartphones, the cloud, smart technology and social media — business models will continue to evolve. However, more than just altering individual businesses structures, ICT innovations are driving structural adjustments throughout the economy with important implications for non-metropolitan areas.

The Australian Government is in the process of completing the NBN, a high-speed open access network that is being rolled out to virtually all Australian premises over the next decade. The NBN is expected to initially enable speeds up to 100 MBps over fibre to the premises, with the possibility of speeds of up to 1000mbps, to 93% of the Australian population. The remaining 7% of the population will have receive wireless and satellite technologies with speeds of up to 12 MBps. Around 50 suburbs in the Hunter region are expected to have access to the NBN by late 2013. Regional areas like the Hunter will potentially receive greater benefits from the NBN than metropolitan areas, where ubiquitous coverage of high speed broadband already exists in large parts. According to the 2011 Census, 75% of homes in the Hunter region had an internet connection, compared to 80% for Australia as a whole.

Benefits for the businesses and the economy

The NBN will provide faster and more reliable broadband connections than the current infrastructure in many regional areas, and together with associated technological advancements like cloud computing, has the potential to drive productivity improvements for businesses across the Hunter region, attract economic activity to region and diversify the economic base of the local economy.

While the vast majority of businesses in the Hunter region currently have access to the internet – over 90% according to a 2012 survey by the Hunter Valley Research Foundation (HVRF) – less than half (48%) had a website and less than one-quarter (24.5%) used their website to sell goods and services. A greater online presence for businesses in the region will open access to new markets across Australia and around the world.

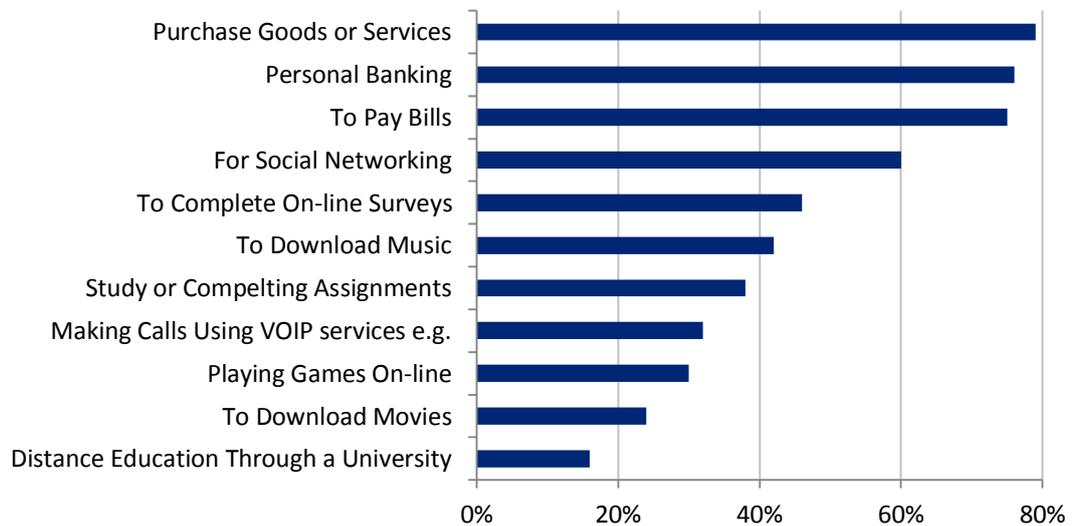
Digital technologies also enhance the appeal of the Hunter as a potential location for businesses. Traditionally, metropolitan areas offer businesses a greater pool of skilled labour and physical access to larger markets. However the advent of digital technologies allows businesses to access these markets without a physical presence, and provides employees with the flexibility to live and work in different locations. This allows businesses to take advantage of the lower commercial rent and other business costs in the Hunter region, while remaining close enough to Sydney to easily commute if necessary.

For the Hunter economy more generally, increased adoption of digital technologies has the potential to stimulate economic growth in the region and diversify activity.

Benefits for Hunter residents

Hunter residents also stand to benefit from increased uptake of digital technologies through a greater range of service offerings. There is considerable scope for the healthcare, education, government and retail service sectors to provide better access to services through digital technologies, especially across regional settings. For example, high-capacity broadband can help connect patients with specialised medical advice that they might otherwise require considerable travel, allow students to access a much greater range of educational opportunities without moving away from the region and improve the way residents interact with government.

Importantly for the Hunter, digital technologies also offer a range benefits for older Australians, particularly those who are less mobile. These range from easier access to health advice, to increased independence by enabling online bill payments, banking and shopping, and the ability to keep in touch with family, friends and the community. Survey data from the HVRF suggests that these are also the current most common internet uses in the Hunter (see Chart 3.7).

Chart 3.7: Personal internet use in the Hunter, 2012

Source: HVRF

Greater uptake of digital technologies will also allow access to a wider range of goods and services not typically found in the Hunter (and indeed Australia). The extent to which these economic gains are realised depends on the willingness and ability of businesses and individuals to adapt and take advantage of the opportunities that arise from the NBN and new digital platforms.

E-health

E-health is a potentially transformative application of the NBN, which is only viable with ubiquitous high-speed broadband. The provision of health services over the long term is a key challenge in the Hunter, considering the geographic size of the region, the increased ageing of the population and the difficulty in attracting skilled medical practitioners. If widely adopted, e-health has the potential to connect disparate and rural parts of the Hunter to a centralised health base in Newcastle, and do so at a substantial cost discount.

In recent times, the Hunter has been well-regarded as a leader in adopting e-health initiatives. For instance, earlier this year the Hunter GP organisation started implementing a new electronic health system for the region. The Personally Controlled Electronic Health Record (PCEHR) allows health records for patients to be assessed by doctors across the Hunter. Already half of the medical practitioners in the Hunter have indicated a willingness to participate with patients now being actively recruited (Hunter E-Health Network). E-health initiatives have also been applied at the Region's major hospital — John Hunter Hospital. In particular the neonatal intensive care unit has been developing outreach services aimed at providing remote reduction to more than 26 local facilities extending to areas as far as Tamworth, Coffs Harbour and Taree.

Remote mining

Remote mining involves controlling operations without physical presence at a location. Drivers and other operators of machinery are able to control equipment from an operations centre located away from the mine site itself, reducing the need for staff to be located in the rural areas where mines are typically located. As the mining industry continues to expand across Australia, more and more development is occurring in remote environments. These types of settings have also been associated with greater extraction, transport and wage premium expenditure. As such, the shift towards greater automation in the mining industry has been driven by cost management motivations, particularly as more lower-cost international competitors enter the global market.

Rio Tinto has opened a remote mining control centre in Perth which is trialling remote operations on an iron ore mine in the Pilbara. Based on the outcomes of the trial, Rio Tinto will consider opening remote mining centres in the Hunter and Gladstone. At present the bandwidth and speeds available in the remote locations in the upper Hunter where mining operations are based are a constraint to widespread adoption of remote services, however as fixed and wireless technologies improve through the NBN, and as automation technologies improve, remote operations may become more viable. Over the coming years remote mining is expected to become widely used for the extraction of CSG resources where the extraction process is already highly capital intensive. Highwall remote mining techniques have also been proposed for the Hunter's open-cut coal excavations. Underground coal mining operations are however less amenable with automotive processes and are likely to continue require a relatively large mine site presence.

Advanced smart electricity grids

Advanced smart grid electricity solutions provide consumers and producers with real-time data on electricity consumption and create increased efficiencies in both consumption and production. Potential network improvements involve:

- providing real-time information on generation and load throughout the network which can enable distributors to significantly reduce transmission losses
- improved reliability through more rapid isolation of network failures using real-time information, allowing for a shorter time to repair
- helping to manage demand in peak periods which not only can improve reliability but also reduce the capacity requirements for the network.

There appears to be tremendous scope for the widespread application of intelligent systems to other parts of the economy, including those areas where pre-existing and developed network systems are already in place. For example, a \$100 million Australian Government program is currently underway in the Hunter to test the smart electricity grid technology. Developments in smart electricity grids will create real-time services enabling electricity users to monitor their consumption of electricity on an ongoing basis, allowing them to better adjust consumption based on price signals.

Telework

As part of the National Digital Economy Strategy, the Federal Government has recently announced its goal to double the proportion of employees who have a formal teleworking arrangement with their employees, from 6% to 12%, by 2020 (Department of Broadband Communications and the Digital Economy). Presently, the rate of telework in Australia is well below international rates in Canada and the United Kingdom which are over 10%. To a larger extent, the fact Australia does not yet have a ubiquitous high capacity internet and communications environment has been constraining more frequent teleworking.

The potential benefits of teleworking are broad, and accrue across all parts of the Hunter economy. In general, these benefits can be seen to directly affect three main groups: employees, employers, and society as a whole.

- **Employee benefits** — The primary motive for teleworking centres on the employee and accommodating their needs. Access to telework arrangements can encourage greater participation in the workforce. This is particularly the case for mothers and those with carer responsibilities and older residents. Teleworking can also lead to cost savings, through lower commuting or housing costs. The reduced need to travel to work may allow greater flexibility in residential location as workers are able to reside in outer suburban or remote areas while pursuing their careers.
- **Employer benefits** — Teleworking arrangements bring various benefits to employers. By reducing geographical barriers to work, teleworking options can increase employee recruitment and retention, effectively reducing the costs of training and replacing workers. In addition, the productivity gains from less commuting and greater levels of employee satisfaction can flow on to better quality output. Telework can also enhance the business resilience of a firm, especially during emergencies such as natural disasters or epidemics, allowing business continuity to be maintained.
- **Social benefits** — Increased telework provides spillover benefits to the broader community. These benefits can manifest through reduced congestion within metro areas such as Newcastle and less pressure on infrastructure demand. Teleworking can also have positive environmental impacts via reduced energy consumption and greenhouse gas emissions.

Impact of teleworking on the Hunter economy

The geographical size and distance of the Hunter relative to commercially dense metropolitan areas dictates that telework opportunities in the Hunter are likely to be undertaken as part of a permanent arrangement rather than on a casual or needs basis. As a result there are two main groups of workers who are likely to utilise telework in the Hunter:

- those who have relocated from areas such as Sydney to enjoy a coastal and relaxed lifestyle
- workers who are required to frequently commute within regions in the Hunter.

In this way, increased use of teleworking has the potential to boost migration from Sydney to the Hunter. As mentioned above, teleworking allows employees greater flexibility to locate in areas like the Hunter, with lower average housing costs and reasonable access to Sydney.

Likewise, increased telework, along with other factors, may see a trend towards office decentralisation. If sufficient numbers of employees telework, businesses may require less office space in premium locations and instead choose to locate in outer city areas or regional areas like the Hunter, potentially enhancing strategic proximity to key clients or market segments. This is particularly the case for professional service companies who are seeking to relocate expertise closer to the mine gate.

Those workers who undertake extensive amounts of interregional travel are seemingly the most likely candidates for telework. However these same workers are typically employed in roles that are less amenable with telework. For instance, mining contractors who are employed in construction, or transport and wholesale trade industry workers by virtue of their role require full physical presence at work sites and are limited in their ability to telework.

3.4 Moving to a carbon constrained future

Impacts of a carbon price on the Hunter

The Hunter is likely to be heavily affected by climate change policy over the longer term. The Hunter comprises a number of major energy-intensive sectors, the most significant of which are electricity and aluminium production. Coal mining, steel production and other large-scale manufacturing sites (eg the Tomago belt) will also be affected.

Under Australian Government modelling, the introduction of a carbon price is expected to lead to a 9.6% fall in coal-fired electricity generation output by 2020. Likewise, coal mining and gas extraction were estimated to decline 2.3% and 1.5% below the base case by 2020. Reflecting current market conditions, mining and gas extraction was projected to expand over this period. Crucially, the reduction in output across these sectors is also likely to lead to a decline in employment in emissions-intensive industries. While measures to expand the clean energy sector in the Hunter may generate employment gains, the net result is likely lead to job losses. This is supported by additional modelling undertaken by the New South Wales Government which suggested that the introduction of a carbon price would result in 18,500 fewer jobs in the Hunter by 2020 across emissions intensive industries.

Over the long term, there is expected to be a more marked shift away from emissions-intensive sources of energy. By 2050, Australian Government modelling predicts that compared to a counterfactual with no carbon tax:

- gas extraction will be 7.2% smaller
- coal mining will be 17.1% smaller
- iron and steel manufacturing will be 21.3% smaller
- aluminium manufacturing will be 61.7% smaller
- coal-fired electricity generation will be 71.4% smaller.

Electricity generation

Currently, coal accounts for the vast majority of electricity generated in New South Wales, with around 80% of the state's electricity provided by the Hunter's power generation industry. The Australian Government's energy initiatives are designed to encourage a shift away from coal and gas towards cleaner energy sources in the coming decades, though industry assistance measures should go some way to assisting industry transition.

Over the longer term, the ongoing shift towards renewable energy sources is likely to continue to weigh on the electricity generation sector. However this is likely to be a gradual transition. Modelling released as part of the Australian Government's Energy White paper predicts that the amount electricity produced from black coal will be broadly stable in the next couple of decades before declining by around 2040. However its market share will decline in coming decades as the overall market grows (see Box 3).

Aluminium industry

The region's metals manufacturers are also likely to face considerable competitive pressure over the long term. Along with carbon pricing, the industry faces headwinds from the strong dollar and low metal prices.

The smaller of Hunter's two aluminium smelters closed in May 2012. Due to the size, of the remaining plant at Tomago relative to other smelters in Australia, the plant is at less risk of closure in the short to medium term. Indeed, a new \$30 million aluminium manufacturing facility has recently been announced. Nonetheless, the outlook for the smelter and the regions aluminium manufacturing industry remains highly uncertain, with new Chinese production coming online and higher power prices making it increasingly difficult for Tomago to compete.

Clean energy sector

The Hunter has positioned itself well to capture some of the market opportunities for emerging clean energy technologies, with the region aiming to become the home of Australia's leading clean energy sector. The Newcastle Institute for Energy and Resources is an important contributor, bringing together a range of industry expertise and research facilities. In addition to its research into sustainable production and energy use, it will also contribute to the regional skills base in the energy and resource sector. The CSIRO Energy Centre is also an important hub for energy research, with its solar research centre and projects with local electricity generators to reduce emissions. Over time, there are prospects for this sector as a new export industry, supplying technology and expertise to other regions in New South Wales, Australia and to global markets.

The Hunter is also the testing ground for new energy supply initiatives as part of the Australian Government's 'Smart Grid, Smart City' initiative. The project, which will be rolled out to around 30,000 households over three years, collects information about the costs and benefits of different smart technologies, like sensors, new back-end IT systems and smart meters.

Box 3: Energy White Paper 2012, Australia's energy transformation

The Australian Government released its Energy White Paper in November which puts forward a policy framework to guide the development of Australia's energy and energy resource sectors.

The White Paper sets out a range of projections regarding the transformation and expansion of Australia's domestic energy sector.

- Coal currently accounts for 75% and gas around 15% of electricity generation. While coal and gas fuelled generation are expected to underpin national energy security for many years, this balance is projected to change significantly in the coming decades.
- By 2050, most of Australia's conventional fossil fuel power generation is likely to have been replaced with clean energy technologies in the form of wind power; utility-scale and distributed solar power; geothermal energy; and coal- and gas-based carbon capture and storage systems.

An important implication of the expected direction of energy markets is that incumbent generators (including those in the Hunter) are likely to remain in the market for some time. Indeed, this may be further supported by the widespread adoption of carbon capture and storage technologies to complement fossil fuelled power generators (should such technologies prove commercially viable at scale).

Priority action areas

An overarching theme of the White Paper is a commitment to promote competitive and well-regulated markets as a means of delivering economic growth and energy security. A range of market-based energy policies were identified in the areas of improving market outcomes for consumers, accelerating the transformation to cleaner energy alternatives and developing critical energy resources.

For the Hunter region, and its emerging coal seam gas industry, some important policies in the White Paper were:

- Development of a nationally harmonised regulatory framework for the coal seam gas industry, and further work to build a better understanding of the direct and cumulative impacts of proposed coal mining and coal seam gas developments on groundwater and the environment.
- Development of a world-class multiple land-use framework to promote coexistence, rather than exclusion, as a key principle in land-use policy.

4 The Hunter economy in 2036

Over the next two decades, the Hunter economy will look rather different than it does today — just as the region is more urban and modernised than it was two decades ago. It will be considerably larger, with more workers, residents and have greater connectivity, both within the region itself and to broader parts of the state.

In a compositional sense, the Hunter economy is likely to continue expanding its services base, particularly in health and education. Given emerging economic opportunities, particularly those associated with Australia's deeper integration with Asia, the region's industry base and its services orientation is likely to be clustered around its strengths in mining, heavy industries and high value agriculture.

This broader development trajectory can be seen in this study's long term projections for the Hunter economy which are set out in this chapter. These estimates have drawn together various perspectives regarding future economic conditions such as population growth, productivity and output changes across the Hunter, New South Wales and the national economy within a consistent modelling framework.

Features of the central case projection

It should be noted that the projections represent a 'baseline' or central case estimate of the Hunter economy. This essentially highlights a realistic growth path for the Hunter in the absence of any major economic shocks or changes in the business cycle. Alternative development patterns reflecting materially different domestic and international economic factors have also been assessed alongside the core baseline projections (these are discussed in Chapter 5).

The projections are based on the empirical framework adopted in the Access Economics report *'The New South Wales economy in 2020 — A foresighting study'*, prepared for the New South Wales Innovation Council in August 2010. They also align with recent state level analysis undertaken by Deloitte Access Economics for Infrastructure New South Wales. Building on this methodology, the modelling for this study has disaggregated the upper Hunter and lower Hunter (which includes the city of Newcastle) as two discrete economic zones. This required a number of modelling enhancements:

- the analytical starting point was updated to 2012-13 (with prices in 2012-13 dollars) and data was updated to incorporate the most recent national account figures
- a national carbon price was incorporated applying from 2012-13
- ABS 2011 Census population levels were integrated with New South Wales Department of Planning population growth forecasts for the Hunter
- ABS 2011 Census data was used to calibrate compositional features of the lower and upper Hunter.

4.1 Aspects of the Hunter economy in 2036

A realistic scenario for the Hunter would be for the region to achieve an average annual growth of around 2.4% over the next two decades. This represents a solid pace of growth for the Hunter and, cumulatively, is equivalent to overall economic growth of about 76% to 2036.

Such growth is likely to be associated with the steady rise of incomes and living standards across the Hunter. Economic performance is projected to be similar across the upper and lower Hunter regions and is higher than the rest of New South Wales where annual economic growth is expected to be around 2.1% over the same period.

Disparities in economic growth between the Hunter and broader New South Wales reflect a combination of differences in population growth and marked variances in the structure of economies. The State's mining, agricultural and heavy industries are predominantly located in the Hunter and have rather different growth drivers than for large metropolitan centres like Sydney. While other areas of wider New South Wales are also expected to benefit considerably from emerging export opportunities, prevailing economic and demographic trends are expected to be relatively supportive to the Hunter's economic prospects.

Under baseline growth projections, economic output in the Hunter increases from around \$36.9 billion in 2012 to \$64.8 billion in 2036. This corresponds to about \$1.6 billion in additional value added being generated in the Hunter each year. Key output forecasts for the Hunter, the rest of New South Wales and the rest of Australia are set out in Table 4.1.

Table 4.1: Economic output projections to 2036 (2012-13 prices)

Region	2012 (\$b)	2020 (\$b)	2025 (\$b)	2030 (\$b)	2036 (\$b)	Average annual growth rate (%)
Hunter	36.9	45.7	51.7	58.1	64.8	2.4
Lower Hunter	27.0	33.4	37.7	42.4	47.2	2.4
Upper Hunter	9.9	12.3	14.0	15.7	17.6	2.4
Rest of NSW	421.6	516.2	575.8	633.0	692.7	2.1
Rest of Australia	942.6	1223.4	1434.5	1672.4	1998.9	3.2

Source: Deloitte Access Economics

The structural composition of the Hunter economy

The fundamental strengths of the Hunter region are expected to be reflected in its long term economic structure. Forward projections for the Hunter suggest the economy will continue to be driven by its primary and heavy industries such as mining, electricity generation and manufacturing.

In addition to harnessing the Hunter's traditionally strong industries, an important consideration for policymakers pertains to the development of relatively smaller or emerging growth sectors. For this reason, projections have been provided for each sector of the Hunter economy, at static points in time over the next two decades (see Table 4.2).

The forecasting suggests that the process of structural change that has so far shaped the Hunter's economic advancement is likely to continue into the next two decades. Namely, its services orientation is expected to intensify with sectors such as health, finance and education comprising around 20% of the regional economy in 2036. It can also be seen that the region's mining sector is expected to expand, accounting for a quarter of the Hunter economy by 2036. While the mining industry is projected to consolidate its industry share (by about 1.9%) over the next two decades, most other industries maintain relatively stable sector shares. For instance, there is only a 0.5% decrease in the contribution of the manufacturing sector (a modest decline compared to manufacturing projections for other parts of Australia). Importantly, while established service industries such as health and education show slight declines, higher value services such as finance and professional services increase.

In looking at the long term structural composition of the Hunter economy, projections have been aggregated to an industry level. This somewhat obscures more discernible changes that unfold within respective industries. In particular, there are likely to be substantial shifts in activity as new markets, consumer preferences and technologies emerge. For instance, within the broader resources sector, coal seam gas production in the region may develop at scale to complement the more established coal mining operations in the region.

Further, for comparability purposes, the industrial structure of the Hunter economy has been presented in share form. As the Hunter economy continues to grow, share based industry structures help disseminate changes in relative contribution more easily than output levels. It is quite possible to observe output increases in absolute terms yet see a decline in secular share. This means that while every industry in the Hunter economy is projected to grow relative to their size in 2012, industries simply grow at different rates, with faster growing industries increasing sector shares.

Table 4.2: Industries in the Hunter by value added (%) to 2036

Industry	2012	2020	2025	2030	2036
Agriculture, Forestry and Fishing	1.8	1.7	1.7	1.7	1.7
Mining	22.3	22.9	23.3	23.7	24.2
Manufacturing	11.7	11.5	11.4	11.3	11.2
Electricity, Gas, Water and Waste Services	3.5	3.4	3.3	3.3	3.2
Construction	6.0	6.1	6.1	6.1	6.1
Wholesale Trade	3.7	3.7	3.7	3.7	3.6
Retail Trade	5.0	5.0	5.0	4.9	4.9
Accommodation and Food Services	2.7	2.7	2.7	2.7	2.6
Transport, Postal and Warehousing	5.1	4.8	4.8	4.8	4.8
Information Media and Telecommunications	1.2	1.2	1.2	1.2	1.2
Financial and Insurance Services	6.5	6.4	6.3	6.3	6.3
Rental, Hiring and Real Estate Services	2.1	2.1	2.1	2.1	2.0
Professional, Scientific and Technical Services	4.8	4.7	4.7	4.6	4.6
Administrative and Support Services	2.0	1.9	1.8	1.7	1.7
Public Administration and Safety	5.4	5.1	4.9	4.8	4.7
Education and Training	5.6	5.9	6.1	6.1	6.1
Health Care and Social Assistance	7.7	8.0	8.2	8.3	8.4
Arts and Recreation Services	0.5	0.5	0.5	0.5	0.5
Other Services	2.4	2.3	2.2	2.2	2.2
Total	100.0	100.0	100.0	100.0	100.0

Source: Deloitte Access Economics

4.2 Impacts on strategic sectors

While there have been significant structural changes in the composition of the Hunter economy over the past two decades, there remains a small group of industries that form the core of the region's economy. These are mining, energy, health and education, agriculture and the Hunter's strategic airport and defence facilities. Together these industries contribute over 50% in economic output, 45% of the workforce and facilitate almost all of the Hunter's exports.

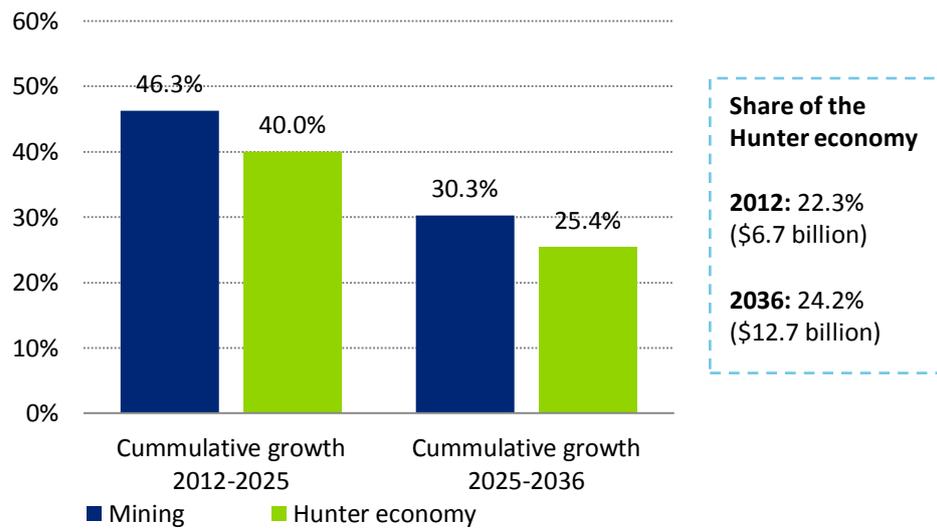
Mining and resources

Mining will continue to play a vital role in the Hunter's economic future. Planned increases to coal production and the development of coal seam gas (CSG) are projected to lead to the industry expanding over the next two decades — growing from 22.3% of the economy in 2012 to 24.2% in 2036 (see Chart 4.1).

Underpinning this growth is demand from rising Asian economies. Economic development and rapid industrialisation in emerging countries will fuel the demand for coal imports.

Already capacity enhancements to the Port of Newcastle have been made, with further expansions being considered for the future. In addition there has been growing interest in developing non-coal trade in the Port. This could involve establishing a larger and permanent cruise ship capacity, more bulk liquids and general cargo.

Chart 4.1: Economic overview of the mining industry



Source: Deloitte Access Economics

Over recent years, there has also been significant investment undertaken to identify and ‘unlock’ the state’s CSG resources. The resource industry in the Hunter is still in its infancy with no commercial production at this stage. It is believed that the upper Hunter region contains substantial CSG resources, with exploration in Gloucester and Singleton at more advanced stages. The development of CSG resources in combination with conventional gas has the potential to secure the State’s gas supply needs. The proposed Queensland-Hunter gas pipeline and Eastern Star Gas’ pipeline will expand the gas supply network in New South Wales and, possibly facilitate future liquefied natural gas (LNG) exports through terminals in Newcastle.

The rapid expansion of coal production and the impending development of CSG have intensified concerns over conflicts between the mining industry and other land use industries, particularly agriculture and viticulture.

The rising tensions have been recognised by the New South Wales Government which has recently unveiled its Strategic Regional Land Use Policy. The policy outlines close to 30 measures designed to control competing land uses, with a focus on reducing the impacts of mining on land and water resources. This includes the identification of Strategic Agricultural Land through a new Gateway process and an Agricultural Impact Statement as part of future environmental assessments for new developments.

The Hunter's strong mining and resource focus highlights acute vulnerabilities for the economy. The export orientation of most of its mining output means that any moderation in commodity prices will also cause a tapering off in the value of output for this sector. Despite a decline, commodity prices are still expected to remain above historical averages. In addition to this, over the longer term, as the Hunter mining industry transitions from its current capital intensive phase (expansion focus) to a operational phase (production focus), it is changes in the volume of output that will largely determine the contribution of the sector, not prices impacts.

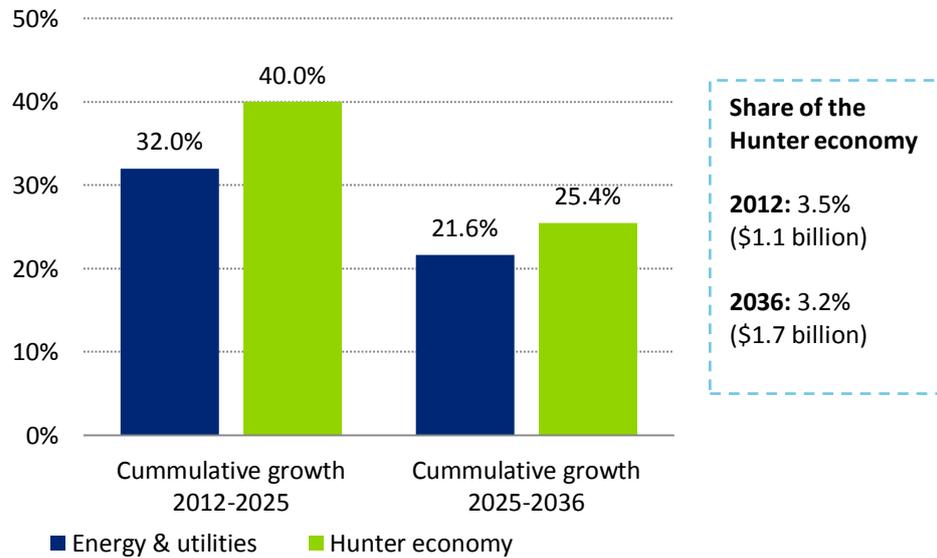
Hunter coal mines are some of the lowest cost producers in the world. Even under relatively high carbon price outcomes, and given robust export prices, production margins are likely to be high. While the fugitive emissions profile for prospective coal projects is not known, on the basis of current production and cost factors, there does not appear to be substantial risk of large reductions in capacity investments from a large range of carbon price outcomes. Rather, as noted it is the demand side factors (ie Asian demand) over the longer term which is most critical.

Similarly given the long term contracts underpinning CSG projects, the carbon price is unlikely to have a substantial adverse impact on the Hunter CSG sector and its forward investment plans. Other commercial issues, including technical supply issues with CSG and escalating costs of construction, are likely to be far more significant investment factors for the sector.

Energy and utilities

The Hunter's power generation industry produces around 80% of the state's electricity supply. In the medium term, it is unlikely that there will be material changes in electricity generation in the region. Coal currently accounts for 75% of electricity generation and gas around 15%. Though coal and gas are both expected to continue to underpin Australia's energy security for many years, the balance between the two is projected to change significantly in the coming decades. Over a longer time horizon there may be a possible structural shift away from coal generation towards gas-fired generation in the region. Indeed this is a point also emphasised in the Energy White Paper released earlier this month.

By 2020, renewable energy sources will account for at least 20% of Australia's electricity generation and is expected to rise to 40% by 2035. By 2050, most of Australia's conventional fossil fuel power generation is likely to have been replaced with clean energy technologies in the form of wind power; utility-scale and distributed solar power; geothermal energy; and coal- and gas-based carbon capture and storage systems. These structural changes occur at a subsector level and are not readily visible in the higher level modelling results. Overall, energy and utility sector is likely to maintain a relatively stable share of the economy at over 3% (see Chart 4.2).

Chart 4.2: Economic overview of the energy & utilities industry

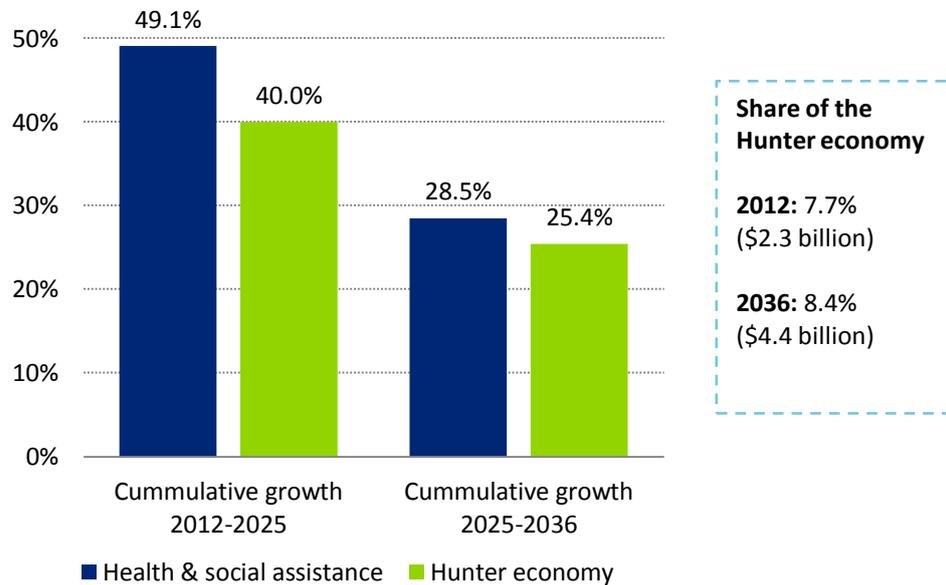
Source: Deloitte Access Economics

Health care and social assistance

In the coming two decades, demographic change is likely to place significant pressures on the Hunter's health sector. As a consequence, the importance of Newcastle's health base, especially the John Hunter Hospital will increase profoundly. Already, the John Hunter Hospital is a major regional provider of health services.

The ageing of the population, combined with the anticipated migration of lifestyle retirees will amplify the demand for aged and community care services. In general, these types of health care are more costly to provide. These challenges will be more prominent for residents in the upper Hunter who are on average older and face greater difficulties in accessing appropriate care. These are issues reflected in the modelling results in which the economic share health services increases by 0.7% to 8.4% in 2036 (see Chart 4.3).

Over the long term to 2036, it is likely that the provision of health services will change as new ICT technologies are implemented in the sector. This may help to improve health services in more rural locations around the Hunter through remote diagnostic and treatment facilities. It may also allow more home-based care for persons with mild disabilities.

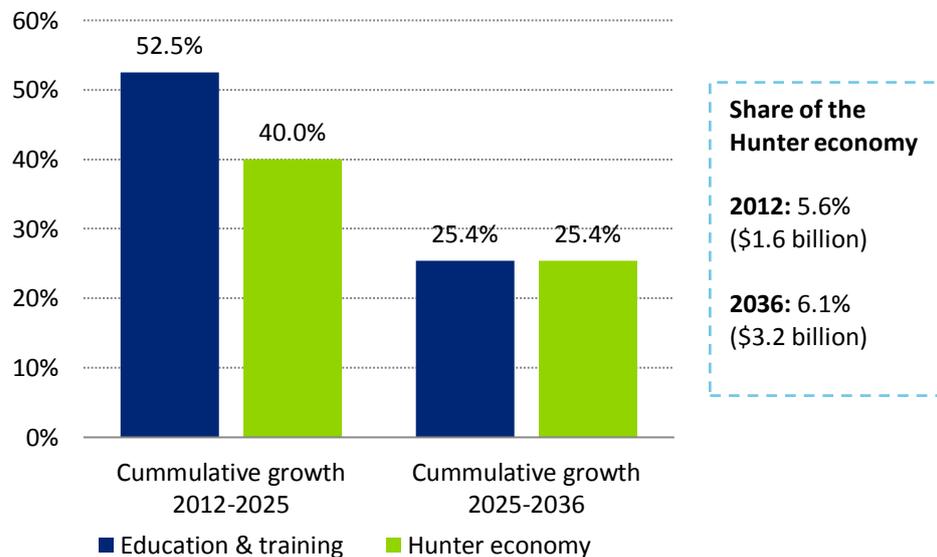
Chart 4.3: Economic overview of the health & social assistance industry

Source: Deloitte Access Economics

Education and training

Demographic changes will also influence the future shape of the education sector. The demand for education services generally declines with age. With the age profile of the Hunter becoming increasingly 'top heavy', there will be a relative reduction in demand for education and training. The impacts of an ageing population on education will depend on the ability of the Hunter to attract new markets. This includes building on the longstanding reputation of the University of Newcastle to draw in students from neighbouring population bases in Sydney and the North Coast.

International students will also be a significant source of demand in the coming decades. Already the share of international students enrolled in the University of Newcastle has increased from 10.6% in 2001 to 17.0% in 2011 (peaking at 19% in 2008). In comparison the share of international students across the rest of New South Wales has increased from 17.2% to around 24.1% over the same period. This provides a useful benchmark for the Hunter and alludes to the potential upside opportunities available through better engagement with Australia's growing Asian trade partners. By 2036, it is estimated that the contribution of the education sector in the Hunter will increase from 5.6% to 6.1% (see Chart 4.4).

Chart 4.4: Economic overview of the education & training industry

Source: Deloitte Access Economics

The strategic role of Newcastle University and the CSIRO within the region is important. The university has a strong base in the region and good linkages with the John Hunter Hospital. However there appears to be sizeable potential to improve the positioning and contribution of the university — particularly in terms of its regional leadership. This could involve revitalising its research and teaching focus, and strengthening its links with local industry.

Agriculture

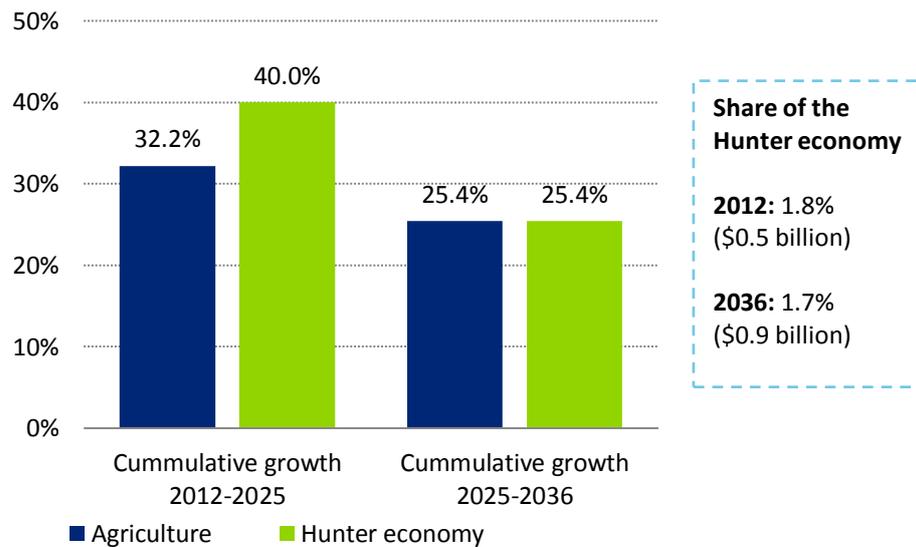
Despite comprising 2% of the area used for grazing and cropping in the State, the upper Hunter has some of the highest value and nationally significant agricultural commodities. The region's agricultural industries are supported by rich soils, a temperate climate, quality water supply and proximity and access to large population centres and markets.

The upper Hunter's key agriculture niches include dairy, beef cattle and pasture production. Focused around the eastern LGAs of Dungog and Gloucester, agriculture is expected to continue to define the rural character of these areas. The upper Hunter also has an established international thoroughbred breeding reputation and provides 80% of the total value of stud horses exported by Australia (mainly through Scone and the upper Hunter Shire). The largest equine hospital in Australia is also located in Scone.

Similarly, the wine industry enjoys a strong and expanding base in the Singleton and Muswellbrook LGAs as a result of their suitability for wine making and the vineyard tourism market. Most recently, the McLeish Estate winery from the Hunter beat out 14,000 international wines to claim the prestigious Best Semillon Trophy for 2012.

Over the period to 2036, the share of value added for agriculture in the upper Hunter decreases from 4.9% to 4.5%. This corresponds to a decline of 0.1% as a proportion of the overall Hunter economy (see Chart 4.5). In general, growth in the agriculture sector is lower than all industry growth in the Hunter, particularly over the short to medium term. On average the agriculture industry grows at an average annual rate of 1.7% to account for around \$0.9 billion of Hunter GRP by 2036.

Chart 4.5: Economic overview of the agriculture industry



Source: Deloitte Access Economics

As noted earlier, adequate safeguards around use of productive agricultural land for new mining and resource developments is a key challenge facing agriculture in the region. Other issues include more acute ageing in its workforce and the difficulty in attracting new workers to rural agricultural communities.

There does, however, seem to be significant opportunities for the Hunter agriculture sector. The premium focus of the Hunter’s agricultural goods means the industry is somewhat insulated from the persistence of the high exchange rate. In particular, the Hunter’s niche agricultural products are likely to benefit from the changing tastes and preferences of the burgeoning Asian market.

Strategic sectors

Newcastle Airport and aviation

Newcastle Airport is a key strategic infrastructure asset, jointly used by civilian aviation and the defence force. As one of Australia’s largest regional airports, it plays a critical role in enhancing broader economic performance and forms a focal point for a range of logistics, defence and aerospace services.

Beyond its immediate economic functions, Newcastle Airport serves an important social role in connecting individuals, families and rural communities in the Hunter with the rest of the country and the world.

Building on steady increases of around 5% per year, it is estimated that close to 1.2 million passengers passed through Newcastle Airport in 2012.

Over the medium to long term, there are a number of trends that are likely to impact of the growth of the Airport, especially the level of passenger, aircraft and freight movements. Factors such as a larger population, both in the Hunter and along airline routes, greater interest from domestic and international visitors and increasing high value service orientation will help stimulate growth. Certainly, these factors are also expected to underpin the overall growth prospects of the Hunter more broadly.

A potential growth area for the Airport is continued diversification of revenue streams away from core aeronautical sources. The development of the proposed airport hotel would benefit this agenda. Similarly, the ability to attract more low cost carriers — noting that such services have thus far being limited to a few large or specialist airports (ie the Gold Coast) — would allow Newcastle Airport to tap into this high growth market.

Defence

Defence is an important sector in the Hunter, both through its strategic role and due to the number of people who benefit directly and indirectly from local defence contracts. At present, the Hunter houses 15 defence establishments, including a RAAF Base at Williamstown, the Singleton Military Area and the Adamstown Army Base. The future home base for the Joint Strike Fighter is also slated to be located in the Hunter. Defence in the Hunter is supported by a number for specialised SMEs, including companies such as ADI, BAE Systems, Boeing and Tenix all located within the region. The Williamstown Aerospace Park is poised to become one of the premier aerospace hubs in the Asia-Pacific and currently employs close to 3,000 people.

In the medium term, fiscal pressures may lead to a consolidation of defence facilities across Australia. In the longer term, there may also be a repositioning of the defence facilities across Australia. A Force Posture Review has been commissioned to assess whether the Australian Defence Force is correctly geographically positioned to meet the nation's current and future strategic positions. Given the changing security environment, it is possible that some defence facilities may be relocated north. The review will inform the development of the 2013 Defence White Paper.

Part II: Future prospects and challenges for the Hunter

This part of the report discusses the major prospects for the Hunter economy over the next two decades, including in response to the transformational factors outlined in Part I. It also examines where the most pressing economic challenges are likely to arise. Scenario analysis is presented which highlight the main economic strengths and vulnerabilities of the region and their overall implications.

Building on this, various policy responses to leverage the region's advantages and improve economic prosperity are presented. These reflect areas where agencies, including RDA Hunter, can best promote an economic development agenda in the face of shifting circumstances.

5 Opportunities and challenges for the region

The realignment towards service industries and industrial downsizing has transformed the Hunter economy over the 15 years or so. Certainly from a regional context, the Hunter economy is relatively diversified and modernised. Despite these significant structural changes, energy resources and heavy industries still form the heart of the Hunter economy. In fact, mining and electricity generation are projected to remain important and will expand for some time to come.

Over the long term, forecasting analysis such as that undertaken for the Hunter economy to 2036 can provide valuable insights regarding the likely growth path of the economy, especially in the face of far reaching and systemic influences. However, there are of course considerable uncertainties about new events and external shocks which may eventuate in the future, some of which can be identified as key risks (both upside and down) and others which will be completely unforeseen.

Some of the more palpable opportunities (and vulnerabilities) depend on the Hunter's ability to extend its export relationship with emerging Asian economies, including those outside China, such as India and Indonesia. The core industries of mining and agriculture have already benefited from Australia's engagement with our neighbours. The next phase of Asia's development is likely to be associated with a significant rise in incomes and changing consumer preferences from which service sectors such as tourism and education can benefit from.

At the same time, these regional comparative advantages also highlight some of the main susceptibilities of the Hunter economy. Should there be weaker than expected demand for resources from Asian customers, production and related investment in the region would also decline. This would have knock-on effects on the cluster of mining and resource support industries in the region, with employment decreases across the construction, transport and wholesale trade sectors likely to ensue. Of course these impacts are not isolated to the Hunter alone. At a national level, this would entail some devaluation of the commodity driven Australian currency, causing a decline in real incomes and consumption.

In addition, the Hunter's comparative advantage in heavy and strategic industries may diminish over time. Following on from the industrial downsizing that has occurred over the past two decades, especially in the lower Hunter, industries such as manufacturing or defence could come under long term adjustment pressure. The transition to lower emission processes and broader strategic issues will play a critical role in determining whether these industries are forced to consolidate in the long term.

The identification of these risks should not to underplay the region's strengths or resilience. They are both inherent and unforeseen risks for any economy, irrespective of the activities undertaken and decisions made by governments. The more pertinent issue is whether the region will be able to manage and withstand external economic shocks should they occur.

Scenario analysis

To draw out some of the implications of an inherently uncertain future, four distinct scenarios have been examined. These were designed to capture specific elements of the major influences facing the Hunter economy over the next 20 years. In effect, each scenario describes a different way in which the uncertain aspects of the future could play out, thereby highlighting relevant dimensions of new opportunities and risks going forward.

These scenarios complement the baseline projections and aim to assess the reach of existing vulnerabilities (loss of a regional industrial base or reduced resource sector activity) and future opportunities for the Hunter (a larger population and better transport connections).

- **Bigger Hunter** — This scenario aims to draw out the economic upside/opportunities for the region associated with a larger population and employee base.
- **Moderating Asian demand** — This scenario explores the vulnerabilities associated with a softening of commodity demand from Asian economies and a resultant decrease in Australia's terms of trade.
- **Industrial downsize** — This scenario highlights the risks of a structural 'shock' to the region's industrial base. This could involve closing down or relocating part of the region's heavy industry base such as an existing electricity generator or aluminium plant.
- **Enhanced accessibility** — This scenario showcases the potential economic benefits of improving the accessibility of the Hunter, both in terms of intra and inter-regional linkages. These are predicated on investments being made in road and rail between the upper and lower Hunter, between Maitland and Newcastle, and to the Sydney metropolitan area.

Table 5.1 sets out the potential output and employment impacts across the four scenarios. Detailed modelling results, including how impacts could affect the lower and upper Hunter, are shown in Appendix A.

Table 5.1: Impacts of scenario modelling on the Hunter economy

Scenario	NPV	2015	2025	2036
<i>Central case</i>				
GRP in 2012-13 prices (\$billion)	556.9	40.0	44.6	64.8
Employment (FTE)		242,000	236,000	231,000
<i>Bigger Hunter</i>				
GRP in 2012-13 prices (\$billion)	578.4	40.4	46.8	70.1
Employment (FTE)		246,000	249,000	254,000
<i>Moderating Asian demand</i>				
GRP in 2012-13 prices (\$billion)	553.1	39.9	44.2	64.0
Employment (FTE)		241,000	235,000	230,000
<i>Industrial downsize</i>				
GRP in 2012-13 prices (\$billion)	556.3	39.9	44.5	64.8
Employment (FTE)		241,000	236,000	231,000
<i>Enhanced accessibility</i>				
GRP in 2012-13 prices (\$billion)	580.4	40.5	47.0	70.6
Employment (FTE)		246,000	249,000	254,000

Source: Deloitte Access Economics

Bigger Hunter

A major influence on the Hunter economy over the next two decades will be a considerable increase in the number of residents and workers, underpinned by the migration of retirees, sea change professionals and students from nearby centres or overseas. Under the central case projection, there are another 140,000 new residents and 75,000 more workers in the Hunter between 2012 and 2036.

Ultimately, the precise magnitude of population and workforce growth is uncertain over such a long timeframe, depending on a range of economic and policy factors (which affect population growth right across the country). For instance, more accommodating Federal immigration policies around student visa issuance and regional skilled migration may drive an even larger population increase in the Hunter region.

The economic outcomes of stronger population growth conditions have been explored under a 'bigger Hunter' scenario in which an additional 37,000 residents and 20,000 workers enter the Hunter region over the next two decades. These changes have been incorporated in the modelling through increases in the Hunter working population. As such, the growth in this scenario occurs over and above the core population growth parameters adopted for the baseline projections.

Notably, a substantial but not unrealistic population increase in the Hunter region has a large positive impact on the level of economic activity. In the lower Hunter, where the majority of new workers will likely reside, there is a projected increase in economic activity of 4.4% and 8.2% above baseline levels in 2025 and 2036 respectively. Given the upper Hunter's ageing population and difficulty in attracting workers outside the high paying mining sector, an increase in labour supply also has a significant positive impact for this region. Here economic activity is expected to increase 3.7% and 7.3% above baseline levels in 2025 and 2036 respectively. For the overall Hunter economy, this generates economic output of around \$578.4 billion in net present value terms over the next two decades, an increase of \$21.4 billion from the baseline.

More robust population growth in the Hunter will give rise to a number of challenges, including the provision of adequate housing, infrastructure and transport systems. These specifications will vary depending on whether population increases are driven by students, miners, professionals or retirees. For instance, older residents require smaller dwellings with easy access to basic facilities. A greater influx of miners on the other hand is likely to put pressure on local rental markets and increase demands for temporary accommodation and appropriate facilities for families.

These are core development issues which governments are currently grappling with, and which will unavoidably become more pressing, should stronger population growth conditions eventuate. Indeed, better connections between neighbouring urban centres and within the region itself can help drive increased migration into the Hunter. This emphasises the importance of integrated planning across the region that takes a long term view and enhances the lifestyle attractions of the region.

Moderating Asian demand

Over the last seven years or so, Australia's terms of trade have risen significantly and are currently at their highest level in 140 years (noting there has been some price moderation over the last six months or so). This is due to strong global demand and prices for large-scale resource exports (like coal, natural gas, iron ore and wheat) and falling world prices for manufactured goods, which have reduced the cost of imports.

Global demand for resources has enormous implications for the Hunter economy, particularly its coal and resource export base. This has become more apparent as recent moderation in the price of commodities has been followed by workforce reductions by major regional employers, including Rio Tinto and Xstrata.

There has been much and varied opinion by business and government on the onward trajectory of the terms of trade. A lot of this centres on forward expectations for economic growth in China and India and the degree to which global supply capacity in commodities is able to respond over the medium term. Since 2005, including through the temporary interruption caused by the global financial crisis, the gradual appreciation of Australia's terms of trade has been generally underestimated by market commentators, including the Reserve Bank of Australia and Commonwealth Treasury.

Reflecting the considerable uncertainty regarding the future terms of trade, a scenario examining the Hunter's exposure to economic development in key Asian economies, namely China and India, was conducted. The scenario incorporates core aspects of structural transformation currently underway in major Asian economies, but with lower commodity prices, which are taken to trend down from 2012 levels but remain high by historical standards. This price trajectory appears reasonable in the face of recent market conditions.

A decrease in commodity prices would significantly reduce profitability across the mining sector and the string of related industries which provide the materials and services required for mining and resource projects. This is demonstrated by the sizeable drop in regional output and other macroeconomic variables such as exports, wages and consumption levels.

Consistent with the location of mines in the region, the impacts are more acute in the upper Hunter where output falls by around 4.0% in 2036. Real wages and consumption also deviate more than 5% below the central case.

The reach of the mining sector is broad, with many of the supporting functions between the mine gate and export terminals undertaken by businesses based in the lower Hunter. A tapering off in commodity prices and a subsequent reduction in mining production would therefore adversely impact economic activity in the area. However, output decreases in the more diverse and service intensive lower Hunter are more modest, declining by around 0.6% in 2025 and 0.9% in 2036. Indeed, non-resource and trade exposed sectors such as tourism and education services are set to benefit from a depreciation in the Australian dollar — effectively becoming more competitively priced relative to other international destinations.

Overall, the combined impact on the Hunter economy is relatively modest, equating to a decrease in output of around \$4.0 billion between 2012 and 2036 in net present value terms.

Industrial downsize

For some time the Hunter economy has been in the process of industrial restructuring. Since the 1970s there has been an Australia-wide relative decline in manufacturing output. For the Hunter, base metal production has fallen significantly since the closure of raw steel-making at BHP in Newcastle in 1999, the cessation of lead production at Pasminco's Cockle Creek smelter in 1999, and zinc production at Pasminco when the plant closed in 2003.

This is consistent with ongoing economic development in Australia. This typically involves a shift towards knowledge-based high value activities and the decline in mature labour intensive activities. For instance, it is common for labour intensive functions like manufacturing to be predominantly undertaken in developing countries which have a competitive advantage in producing low value goods.

Despite its growing services orientation, and the decline of more mature industries, the importance of the Hunter's remaining industrial base in the context of the State's and indeed Australia's shrinking industrial asset portfolio has risen in both a relative and strategic sense.

The region has maintained its position as a major producer of aluminium, contributing 33% of the nation's aluminium output through the Tomago and Kurri Kurri facilities. The continued growth of these businesses has in part been enabled by nearby power generators which service both industrial users in the Hunter and the majority of the State's energy needs.

The manufacturing and energy sectors provide substantial contributions to the Hunter and national economies, both through their strategic functions and widespread employment opportunities. Factors such as carbon pricing and global competition present acute challenges to the long term viability of these industries in their present scale and composition.

A scenario highlighting the risks of a structural 'shock' to part of the Hunter's industrial base was undertaken. This examines the economic consequences of either an existing electricity generator or aluminium plant shutting down. Under this scenario, a \$160 million reduction in manufacturing output between 2012 and 2016 has been assessed.

As anticipated, any industrial downsize has a negative impact on regional output and employment. The adverse outcomes are mostly confined to the lower Hunter where the majority of the region's industrial facilities are located. Under this scenario, the structural downsize takes effect in 2012, and involves an immediate reduction of 550 full time workers by 2015, lessening to 80 fewer workers in 2036. In this respect, the economic impacts are rather abrupt, with large short term declines in employment and income followed by a rebound to more standard growth levels (a process which occurs almost as rapidly as the initial decline). On balance, regional output to 2036 declines by around \$630 million in net present value terms.

This recovery process is symptomatic of past industrial downsizes in which structural changes have led to severe adverse outcomes over the short run, followed by a strong economic recovery over the medium term. Throughout this process, excess labour capacity is absorbed by other expanding industries, either in the upper or lower Hunter.

This is not to say that the Hunter is immune to external shocks to its industrial asset base — indeed, these events typically involve various forms of economic dislocation and community hardship. Rather, it points to the region's continued economic resilience and the benefits of diversified employment opportunities.

Enhancing accessibility

This scenario examines aspects of the Hunter's future strategic development, exploring how new initiatives which address urban planning and connectivity can help capitalise on the opportunities from more people living and working in the region.

As a large and highly dispersed regional economy, a key issue is connectivity between the upper Hunter to coastal and metropolitan areas in the lower Hunter. Links to the upper Hunter could play a crucial part in improving the efficiency of the overall coal supply chain — allowing workers to readily commute from outside the region. This could involve, for example, better rail and road connections between Maitland and Newcastle.

Greater connectivity between Newcastle and the wider state (Sydney in particular) could also accelerate economic development and encourage more people and businesses to locate in the Hunter.

Scenario analysis highlighted the potentially large economic benefits associated with improving access to the Hunter and addressing regional transport pressures. It should be noted that this scenario does not explore the specifics of any initiative or approach, but rather highlights how approaches at a higher level could boost productivity and enhance the Hunter's economic prospects. Such initiatives could feasibly incorporate a range of infrastructure developments or more widespread uptake of telecommuting opportunities.

To capture the longer term economic benefits of improved regional accessibility, including the lead times required for requisite investments, this scenario incorporates a 1% productivity dividend per annum for 21 years from 2015. Strong population growth is also incorporated (consistent with the 'bigger Hunter' scenario).

Under this scenario, economic activity for the lower and upper Hunter at 2036 is projected to increase by 9.1% and 7.8% respectively above the central case levels. For the region overall, this represents higher economic output of around \$580.4 billion, an increase of \$23.5 billion in present value terms over the next two decades. This suggests that improving broader accessibility has the potential to 'unlock' many of the economic gains of having more people live and work in the Hunter — effectively allowing individuals to conduct their daily interactions with greater efficiency.

As noted, while the specifics and actual costs of possible infrastructure investments have not been examined in the analysis, results indicate that enhancing the regional linkages for the Hunter can be highly supportive in the context of favourable growth and regional economic conditions. However, should these conditions (namely population increases) not eventuate, or be substantially more modest than expected, improved accessibility still has the potential to yield important economic gains. This predominantly occurs through its role in reducing costs for existing activities, facilitating economic flexibility and, in itself, helping attract more people into the Hunter workforce.

6 Policy options and strategic priorities

Looking ahead, the Hunter region will continue to evolve, modernise and be shaped by a range of global and domestic factors. These will change the composition of economic activities undertaken across the Hunter. The most pervasive influences and their likely impacts on the Hunter economy, along with specific scenario analysis, were examined in preceding chapters.

Building on this earlier discussion, this chapter looks at some major strategic priorities that could be adopted and taken forward by RDA Hunter and other relevant bodies. Overall, these options seek to highlight areas where policymakers could focus attention to capitalise on emerging opportunities, accommodate future growth, enhance resilience and drive a dynamic and liveable economic region.

6.1 Framing the industry challenges

There will be significant pressures and challenges for the Hunter region in the years ahead. For the region's economic base, this will give rise to a number of risks as well as new opportunities. Importantly, the pace of economic change is expected to be large going forward. This has a number of dimensions, as discussed earlier in terms of the major influences on the region.

- Changes associated with the demand for commodities from Asia and developments in the digital economy may cause business conditions to change quite rapidly.
- In contrast, population growth and climate change related factors are slower moving and are likely to impart a more gradual influence on the shape and performance of the Hunter, especially over the medium to long term.

As a starting point, the Hunter has a solid base to flexibly absorb and respond to emerging economic circumstances. For instance, it has a relatively diverse economic base, a considerable pool of skilled workers and offers important lifestyle benefits and natural attractions.

Structural foundation

The Hunter economy has diversified and modernised over the last 15 years or so through structural adjustment and greater service orientation. However, this should not disguise that the heart of the Hunter economy is still very much focused on energy resources and related heavy industry.

In fact, mining (and electricity generation) will continue to be important (and expand) for some years, although the path beyond a decade or so becomes more uncertain. In this regard, while this industry foundation has provided substantial growth and strong employment opportunities over the last decade, these regional comparative advantages

also involve some economic vulnerability. Indeed, weaker demand for resources from Asian customers would lead to lower mining production and resources-based investment in the region. And, at a national level, would entail some devaluation of the currency and a decline in Australian real incomes.

The region's heavy industry base, especially in the lower Hunter, could also come under longer term adjustment pressure, through a transition to lower emissions activities and broader global competitiveness issues.

These risks are not to underplay the region's strengths. There are both inherent and unforeseen risks for any economy, irrespective of the activities undertaken. What it does point to is the region's ability to weather an economic shock or downturn where there is a core concentration of highly related industries.

The balance of risks

In considering the overall economic opportunities and risks for the Hunter over the next two decades, it should be noted they are unlikely to be balanced evenly. The economic upside for the region is likely to manifest in stronger and more balanced growth and consolidation. In effect, growth is driven by greater development prospects for the region's strategic industries.

In contrast, the downside risks are likely to be more abrupt — potentially involving the closure or substantial downscaling of parts of the region's industrial base and a large reduction in regional employment.

Responding to the challenges

The region's capacity to manage such pressures will be heavily dependent on how effective existing skill sets across the region can be leveraged and resources reallocated in response to changing economic circumstances. This might involve greater transfer of employment in high value manufacturing and defence services where workers in some heavy industries have readily transferable skills.

Maximising the Hunter's economic prospects over the long term will require building on its natural and acquired advantages and enhancing its industry diversification. This has a number of major elements:

- It will involve continued development of existing economic strengths in resources, energy generation and heavy industries, as well as growth in related supporting services.
- It will also involve exploring new areas of likely future comparative advantage such as in defence, selected high value manufacturing and premium agriculture, where existing capabilities and skill sets can be harnessed and built upon.
- Services, which are a large and expanding part of the regional economy, will generate a range of new opportunities. In particular, there will be greater prospects in areas such as high value tourism and education, and new initiatives to reinvigorate these areas could drive significant benefits.

- There will be substantial requirements to put in place a range of supporting infrastructure investments. These will need to have a focus on enabling greater regional mobility, managing the relocation of more people to the region and revitalising urban centres.

A range of major industry opportunities and challenges are summarised in Table 6.1 below.

Beyond specific sectors, there will be substantial requirements to put in place a range of supporting infrastructure investments. These will need to have a focus on enabling greater regional mobility, managing the relocation of more people to the region and revitalising urban centres.

Table 6.1: Industry opportunities and challenges

Industry area	Strengths and opportunities	Drivers	Challenges
Coal production	<ul style="list-style-type: none"> • Largest coal export supply chain in Australia • Substantial improvements in supply chain coordination have been secured 	<ul style="list-style-type: none"> • Strong investment driven by robust demand from industrialising Asian economies 	<ul style="list-style-type: none"> • Ensuring rail and road networks can support new mines and increased coal production • Managing development cost pressures which may threaten more marginal projects
Electricity generation	<ul style="list-style-type: none"> • Strong comparative generation due to proximity to coal fields • Low-cost baseload generation is competitive in low energy price environment • Sale of government owned generators may help secure longer term operation of key facilities 	<ul style="list-style-type: none"> • Population and industry growth in NSW and increased demand for electricity 	<ul style="list-style-type: none"> • Shift to lower emission generation (both renewable and gas-fired) is likely to limit expansion of the coal fired electricity sector
Viticulture	<ul style="list-style-type: none"> • Strong regional brand and world-class wine products • Ability to integrate with regional tourism services 	<ul style="list-style-type: none"> • Changing consumer tastes and preferences for higher quality products 	<ul style="list-style-type: none"> • Strengthening brand in the face of competition from other Australian and international wine regions • Managing issues regarding alternative land use
Agriculture and equine	<ul style="list-style-type: none"> • Reputation for clean and agricultural produce • World class precinct for thoroughbred breeding 	<ul style="list-style-type: none"> • Increased food demand from within Australia's region, with potential to be the 'food bowl' of Asia 	<ul style="list-style-type: none"> • Ensuring access to rail networks in conjunction with coal • Availability of water with potential for increased climatic variability • Ability to attract new foreign investment in agriculture • Ageing population of farmers

Industry area	Strengths and opportunities	Drivers	Challenges
Defence and Williamtown airport	<ul style="list-style-type: none"> • Strategic defence facilities, including Williamtown airport • Cluster of aerospace and defence services businesses around the airport • Potential to develop a feasible defence 'super base' concept for the region 	<ul style="list-style-type: none"> • Additional squadrons of Joint Strike Fighters and support requirements • Ongoing demand from FIFO services (especially related to future coal and CSG investment) 	<ul style="list-style-type: none"> • Long term realignment of Australia's defence posture to the north and consolidation of defence facilities • Securing long term operational agreement for Williamtown with the Royal Australian Air Force • Development of a second Sydney Airport may absorb some of the central coast market
Manufacturing and metals processing	<ul style="list-style-type: none"> • Availability of low cost and secure energy • Deepwater port and rail infrastructure • Localised pool of skilled workers 	<ul style="list-style-type: none"> • Emergence of high value niche manufacturing • Linkages with mining and defence and aerospace industries 	<ul style="list-style-type: none"> • Heavy industry and metals manufacturing are likely to come under long term pressure from global competition and the transition to a low carbon environment • Ensuring workers can take advantage of existing skills in managing any consolidation of the sector
Health	<ul style="list-style-type: none"> • Newcastle is a service hub for the Hunter region • Large regional employer 	<ul style="list-style-type: none"> • Population growth and ageing will increase demand for health services 	<ul style="list-style-type: none"> • Ensuring the availability of qualified medical personnel, and hospital and aged care facilities
Education	<ul style="list-style-type: none"> • Significant regional providers of tertiary education services 	<ul style="list-style-type: none"> • Regional population growth • Strong demand for education services from Asian markets 	<ul style="list-style-type: none"> • Ability to capitalise on potential growth from Asian markets • Ensure linkages with industry, research agencies and the CSIRO are deepened and have a focus on regional strengths and issues

Industry area	Strengths and opportunities	Drivers	Challenges
Tourism	<ul style="list-style-type: none"> Pristine coastal and inland tourism offerings 	<ul style="list-style-type: none"> Resurgence of local tourism Demand for high-quality tourism experiences, especially the expanding Asian middle class 	<ul style="list-style-type: none"> Better coordination of tourism promotion across the region Capacity to improve event offerings and coordination Lack of premium hotel accommodation
Port of Newcastle	<ul style="list-style-type: none"> Some existing capacity beyond coal Good location next to the city Prospects to develop regular cruise ship services (potentially integrated with local tourism offerings) 	<ul style="list-style-type: none"> Increased national trade and requirements for deep water berthing capacity on east coast Demand for high-quality tourism experiences, especially the expanding Asian middle class 	<ul style="list-style-type: none"> Better freight transport links to Sydney Managing pressures of a shared port facility
Coal seam gas	<ul style="list-style-type: none"> Highly encouraging resource prospectivity Ability learn from full scale development of CSG in Queensland 	<ul style="list-style-type: none"> Potential to support longer term investment in gas fired electricity generation in the region 	<ul style="list-style-type: none"> Environmental sensitivities and land use challenges need to be addressed Broader regulatory and planning costs, including overlap with Commonwealth legislation

6.2 Regional development issues

Long term planning frameworks

The economic linkages between the lower Hunter and the upper Hunter are substantial. Over the last decade these have intensified, principally as a result of increased coal production and export volumes shipped from the Port of Newcastle. This has involved larger requirements on the coal export supply chain (which traverses the upper and lower Hunter) and extensive use of drive-in drive-out workers to support new investments in mine capacity.

Much of the policy development and statistical analysis in the region remains partitioned into the lower and upper Hunter. This reflects that the two areas have different population bases and industrial structures — in effect, they have different starting points. However, this traditional distinction is becoming less representative of the modern Hunter economy (as discussed in the above chapters).

Discussions also suggested that the demarcation is contributing to a lack of cohesive and integrated planning within the region. For instance, it is impeding effective responses to community concerns on land use and transport investments, as well as helping entrench a more fragmented and piecemeal approach to tourism and event promotion.

In an overall sense, the planning and infrastructure frameworks embody an implicit tension between putting in place a grand vision for the region versus undertaking a more incremental approach to development. There are distinct advantages in pursuing a gradual development agenda. Among these is the ability to modify the approach, including deferring expenditures if needed, given uncertainty about future economic circumstances and requirements. In any event, these alternative approaches need not be inconsistent, and a key issue is that infrastructure priorities be firmly connected to where the Hunter economy is headed over the medium to long term.

Managing population challenges

The population of the Hunter is expected to increase significantly over the next 20 or so years, perhaps in the order of an additional 150,000 residents. This stands as a major economic opportunity for the region, enabling a greater range of commercial enterprises and generating additional areas of employment. More generally it will also help bring about greater dynamism in the region — new residents invariably bring new ideas and allow new sources of entertainment and culture to flourish.

A key policy and planning issue will involve where additional residents to the region will be located. Given current settlement patterns and likely changes in the region's industrial structure, most of the increases in the population base are likely to occur along the coast with some increases in Maitland (which is located conveniently between the lower and upper Hunter).

Population increases and a demographic shift towards smaller households are expected to increase the demand for new dwellings.

Regional strategic plans have estimated that up to 115,000 new dwellings will be required in the lower Hunter by 2031 and over 9,000 dwellings may be needed in the upper Hunter by 2036. Up to 69,000 new greenfield lots are expected to be released in the lower Hunter, with the remaining growth occurring in existing urban areas.

Strong population growth in the region will present issues for transport and other infrastructure planning — particularly rail and road linkages with Sydney and the upper Hunter, and to ensure the adequacy of regional water infrastructure. A major concern is that long term transport planning frameworks do not fully reflect future population growth and there is a need to prioritise a more integrated strategy to meet longer term capacity requirements.

Developing Newcastle as a vibrant metropolitan centre

Newcastle is Australia's second largest non-capital city (outside of the Gold Coast) and, located close to Sydney and to a lesser extent Brisbane, has substantial capacity to more deeply integrate into corporate Australia.

In many respects, the longer term opportunities for Newcastle are likely to be more favourable than Australia's other smaller capitals like Adelaide and Hobart.

Newcastle's growth path is intrinsically tied to developments in Sydney. This relates to the level of economic growth in Australia's largest and most international city but also the success of measures aimed at addressing transport in and out of the wider Sydney metro area.

Because of its size, amenities and proximity, Newcastle can play a big role in relieving the stresses on Sydney arising from urban growth. Its ability to attract new (especially younger) residents will depend much more than just being a place where people can escape the urban grind and living costs in Sydney. The city needs to position itself as a vibrant alternative in its own right — one which can nurture innovative small businesses and creative industries, and deliver a blend of 'metro' entertainment options.

Much of this centres on initiatives to improve the planning and connectivity of Newcastle, especially good infrastructure links and opportunities to more centrally locate, where possible, new business or education services.

There is also a role to play in promoting the development of a range of entertainment options such as cafés, festivals and events. In short, a dynamic events culture makes a place more liveable and cohesive.

In Newcastle and across the region there already exists a healthy program of events (eg the National Maritime Festival). This could be enhanced through more effective coordination and sequencing of the events timetable, to leverage existing events and maximise the economic and cultural benefits for the community, coupled with the potential development of a nationally recognised event for the region.

Discussions also pointed to possible gains from better promoting events in the region.

Currently, there is no central point where information on events across the Hunter can be obtained. This appears to be an area where practical improvements could be made at modest cost.

Promoting regional connectivity and economic inclusion

Many of the population centres in the lower Hunter surrounding Newcastle are particularly vulnerable to any slowdown or disruption in economic growth. These areas have lower incomes and rates of employment and labour participation than the state average, consistent with many other parts of regional New South Wales, and include pockets of particular social disadvantage.

As such, there exist major opportunities to promote economic inclusion by more closely integrating these centres into the more diversified and productive Newcastle economy. In a similar sense, better connecting the Hunter region, in particular Newcastle, with Sydney would also yield economic benefits and promote greater resilience.

This has various dimensions. Most directly, it involves infrastructure linkages, both transport and broadband related. It could also encompass initiatives to develop parts of Newcastle which would help open up greater economic 'pull' factors. Among other measures, a focus on further revitalising the Newcastle CBD, improving civic amenity and more centrally locating parts of Newcastle University (similar to the law school) would be important initiatives.

In terms of transport links, there appears to be considerable scope to improve connectivity between Maitland and Newcastle. It is expected that most of the population growth in the region will occur between Maitland and the coast. Enhancing transport connections will necessarily involve addressing how passenger and coal transport services can be better integrated on shared corridors, both to meet current and anticipated demand. Depending on how regional growth unfolds over the next five to ten years, the separation of coal and passenger lines could form part of a very long term transport priority but this is unlikely to be feasible over the next 10-15 years.

Links to the upper Hunter are also crucial for broader development in the region. For coal production, the adequacies of rail capacity connecting mines in the upper Hunter with port facilities in Newcastle (and the coordination of these activities), and road links (eg the New England Highway) which allow workers to commute daily from outside the region are both pivotal elements of the overall efficiency of the supply chain.

While there have been large improvements over the last five years to the performance of rail and port loader elements of the supply chain to address critical bottlenecks (as discussed above), more focus on the intra-regional road links would help drive further efficiencies. In this regard, projects such as the Scone Bypass appear to form crucial transport priorities. Importantly, this would also support the ongoing development of non-resource sectors of the regional economy.

There are substantial transport bottlenecks between Sydney and Newcastle. Rail passenger services take longer than necessary and there is substantial scope to improve the rail

connectivity between the two cities. Further, work to increase the capacity of the Pacific Highway will also benefit the region.

Early feasibility studies on a very fast train link between Sydney and Newcastle (and possibly further to Brisbane) are being undertaken by the Commonwealth Government. This infrastructure, if commercially viable, would be a 'game changer' with the potential to fundamentally shape the urban form along the east coast. However, there are substantial cost, demand and technology challenges to be resolved and the project remains, at best, a very long term proposition.

Workforce

This study has highlighted a number of issues regarding the future shape and composition of the Hunter economy. A range of sectoral changes are likely to unfold over the next two decades reflecting ongoing development of the region's substantial coal resources, an expanded services sector, and some consolidation of the region's heavy industry and manufacturing base. These developments will place new demands on the region's workforce, both in terms of the required skills and capability of workers and where they are located.

Crucially, employment across the region is strong, especially in the mining intensive parts of the upper Hunter where there is virtually full employment. This means there is very little spare labour capacity in the area in which to support expansion in strategic industries, such as resources and agriculture. The important point is that if industries are to develop, additional workers will be required to move into the region.

Strong population increases in the region are expected over coming decades, with growth being heavily tied to new business and employment prospects (for example, in coal and gas resources, and new service sectors) and new residents seeking to secure attractive lifestyle advantages. However, a considerable proportion of new residents are expected to be older, including retirees and those towards the end of their working careers. These residents will inevitably increase the demands and opportunities for service providers (say in health, retail and lifestyle industries) and other sectors such as construction, but they will need to be complemented by new younger and skilled workers (and their families).

To enable the significant increase in resources investment in the region, there has been large scale use of temporary workers, mostly on a drive-in drive-out basis. Nationally, the mining and gas sectors have been significant users of these temporary arrangements, and they have been successful in meeting the labour demands of project development (especially in remote areas), which is highly labour intensive in the initial construction phase but much less so once facilities become operational.

As the Hunter is closer to large population centres and has greater lifestyle appeal than many other parts of Australia where the resources boom is centred, there is less reliance on temporary workers coming from outside the region. Most of the labour demand has indeed been sourced from the lower Hunter.

This places a premium on ensuring that intra-regional linkages, such as the New England Highway, are adequate for facilitating the efficient movement of labour where it is

required. Among other things, it also means that a greater proportion of the economic benefits of the investment phase will be captured within the region.

The ability to attract new, especially younger, people to the region will also be affected by developments in and around Newcastle. The city is the commercial and industrial hub of the Hunter region and it will necessarily form a more attractive proposition for new workers if it is dynamic and functional.

Addressing areas of regional disadvantage

Economic profiles of the Hunter show that, on average, employment and incomes within the region compare favourably. However, there are significant divergences behind these numbers, with a large gap between the top and the bottom. In particular, there is a substantial part of the region's population base (especially in the lower Hunter) which is low income and has poor labour market participation.

The economic circumstances for some areas are particularly fragile. They have significant employment in the (lower value) manufacturing and retail sectors where the economic prospects look far more precarious and patchy and where ongoing structural change is likely to occur.

Bridging this gap is a significant challenge, with many sources of economic disadvantage being particularly intractable. Nonetheless, this represents an area where the economic and community welfare payoffs would be considerable.

It should be noted that many of the means to tackle these challenges fall within the policy responsibilities of the Commonwealth Government, for example those related to the tax and transfer system. Indeed, these are well tied into national policy priorities on productivity and education.

In effect, measures to embed underperforming parts of the region more deeply into higher-productivity and higher-participation centres like Newcastle would yield economic dividends. They would allow individuals to capture the benefits of higher transaction efficiencies, larger networks and access to services.

At a direct level the main avenues for influence are likely to involve investments in transport to promote better regional mobility, initiatives to grow a dynamic urban environment in Newcastle, and exploring ways to accelerate the rollout and uptake of the NBN.

Skills and innovation

The Hunter is a relatively diversified economy and much of the growth will be in areas where the region has strong existing advantages — principally, coal production and related services, high value agriculture, and education and health services.

Manufacturing is a large employer and it will have a large and strategic presence within the region going forward. However, its relative share of the region's economy is expected to decline somewhat, consistent with the broader trend among advanced economies.

Such structural developments present issues for workforce skills and broader industry capabilities. Crucially, much of the compositional change will be gradual, allowing workers and businesses to adjust according to emerging market opportunities.

A particular issue that many of the workers needed to support the continued expansion of the Hunter's resource and industrial base will come from within the region (mostly from population centres in the lower Hunter), this places an onus on ensuring that the availability of relevant training options is responsive to requirements. This mostly relates to the provision of TAFE and other vocational training, but also centres on the University of Newcastle — especially as a significant proportion of graduates come from within the region and seek employment locally upon completion of their studies.

At a broader industry level, there have been some positive developments in leveraging the Hunter's advantages in energy production and related activities, and in health services. This includes the establishment of:

- Australian Solar Institute and Clean Energy Innovation Centre, headquartered in Newcastle
- Newcastle Institute for Energy and Resources
- Hunter Medical Research Institute.

In addition, the recent relocation of laboratory services to the Hunter Valley Equine Research Centre adds to the region's world-class equine surgery, medicine, reproduction and intensive care facilities. These dedicated innovation and research centres play a crucial role within the regional economy. Firstly, they seek to nurture a high value and innovative environment which has the potential to generate key spillover benefits to other sectors. Second, they are effectively aligned with the core economic strengths of the region, improving the prospects of lasting gains and the development of meaningful industry clusters.

Despite some encouraging signs, much of this institutional development has the potential to be further consolidated and built on over the short to medium term. In particular, linkages between the University, CSIRO, the John Hunter Hospital and relevant industries can be deepened and re-focused. For instance, there appear opportunities to better integrate learning offerings for veterinary or biomedical students at the University of Newcastle and the clinical training provided by the Scone Equine Hospital. Certainly such strategic collaboration can play an important role in reinforcing the University's regional and national profile — particularly against strong competition from other regional education providers such as the University of Wollongong.

There are several practical challenges in promoting skills development and collaboration. One of the main obstacles faced in the Hunter is that many of these institutions essentially vie for the same education or research funding.

This effectively instils a sense of competition that can be counterproductive to an ethos of collaboration and capacity building. A more coordinated approach to pursuing new research initiatives and grant funding, where possible, could yield benefits for the region.

The role of innovation

In an overall sense, the development of high value activities, which embody greater innovation and technological advancement, is crucial to ensuring global competitiveness, economic efficiency and ongoing welfare gains to the community.

Certainly, this can be seen in the region's manufacturing sector. Manufacturing is a diverse sector and many businesses (for example, in the areas of mining and defence) have shown a sustained ability to innovate, adapt to changing market conditions, and carve out successful niches in a variety of manufacturing activities and across different locations. A further observation is that many successful endeavours include a high service element within their overall business and manufacturing activities.

The resilience of the region's manufacturing sector would not have been possible without the determination of industry participants and their focus on innovation. Over the past two decades, HunterNet has implemented a number of mechanisms to generate sustainable growth for the sector. This has included the provision of innovation training programs for local SMEs, developing a relationship with the University and TAFE and through participating in the local Innovation Festival.

Going forward, the region's capacity to innovate will be greatly determined by the skills and knowledge of its workforce. A skilled and healthy labour force will drive the ability of local firms to generate new ideas and tailor innovations to their particular enterprises. As such, education and training systems and the level of government support in these areas (including support to establish research institutes in the region) are crucial elements to the overall innovation environment.

In a regional context, in particular, small business can play a major role in driving innovation and broader business dynamism. Among other things, they can effectively align with existing areas of economic strength and provide supporting services to larger typically capital intensive activities such as manufacturing and resources.

The growth of creative industries embodies the overall trend towards knowledge-intensive activities. There is a small but growing presence of creative industries centred mainly in Newcastle (eg in ICT services). Such businesses often deliver broader spillover benefits in terms of enhancing the competitiveness of other sectors, through better products, processes and services, and in fostering a vibrant business environment.

As such, the sustainability and development of such sectors tends to attract substantial policy attention. While modest programs designed to support specific initiatives or promote industry clusters can be sensible in their own right and provide some positive signals for development priorities, there are clear risks in terms of 'picking winners'.

What can be more important is to ensure a supportive and low cost environment for small businesses to locate in the region (and the ability to withdraw their investments if need be). Further useful options could involve the provision of support for small and medium enterprises to utilise new technologies brought about from rollout of the NBN.

Measuring innovation

It is difficult to ascertain the actual innovation performance of the Hunter region (see Box 4). Innovation is often risky, complicated and unpredictable, and the process of

creating and implementing new ideas is typically complex. Moreover, the structure and composition of the economy has a large bearing on the level and nature of innovation. Australia has a relatively large service industry and relatively small high-technology manufacturing and pharmaceutical sectors, where significant technology and science based research occurs. There is also a higher share of smaller firms than many other developed countries. These factors all contribute to a tendency for local businesses to innovate in ways other than through traditional R&D.

As such, any future examination of the nature and extent of innovation in the region should cover a broad range of innovation activities and include a selection of input, output and outcome-based measures.

Box 4: Innovation measurement challenges

The nature of innovation means it is typically difficult to measure. Along with multiple dimensions, innovations can be complicated and unpredictable processes that involve numerous economic agents, linkages and complementarities. Innovation can be both incremental, with changes occurring in gradual steps based on previous knowledge accumulation and advances, or it can occur more randomly, involving discoveries and completely new products and markets.

A number of other factors add to the complexity of innovation measurement:

- There can be considerable time lags before innovation investments show returns, if at all. While some innovations have immediate and considerable economic impacts, many others take long periods before their commercial effects are evident.
- Innovation often involves intangible assets which, by their very nature, lack visibility and are difficult to quantify. The role of intangible elements can become more crucial to the innovative process as economies become more knowledge-intensive, and this can further add to measurement complexities.
- Economies are dynamic and do not innovate evenly — some sectors and firms will always innovate at greater intensities than others.
- Service firms often play a critical role in generating and diffusing innovation throughout the economy. When examining a particular sector, such as manufacturing, this vital service industry role can be overlooked.

Environment

The region's environment and coastline is diverse, attractive and offers enormous lifestyle and recreation opportunities for both residents and visitors. From a preservation and amenity perspective, building on the region's pristine and world-class environmental features is fundamental.

Some relatively low cost initiatives could be used to enhance the amenity and tourism value of the region's coastline. This could involve the development of an integrated network of environmental and walking tracks, perhaps linked over the longer term to the extensive Sydney coastal walking routes.

Across the region, there are some key environmental issues and risks:

- The impact of extended droughts in recent years has highlighted the need to make better use of what seems likely to be less and more variable water supplies. This has underpinned the focus on securing the region's long term water security.

- At the same time, the growing demand for high value added and high protein agricultural products from Asia points to prosperous communities if the adjustments can be made.

Perhaps the most pressing environmental issue facing the region concerns the competing land uses between agricultural producers and resource companies, particularly in the upper Hunter. These land conflict issues have become more visible and subject to heightened community concern in recent times associated with increased interest and activity in developing the region's highly prospective coal seam gas resources.

Under the New South Wales Government's land use policy released in September 2012, proposed coal seam gas projects in identified strategic agricultural land will be subject to a new 'gateway' process, while additional studies will be required on the effects of aquifers and land. An important aspect of the policy is that no areas have been declared absolutely off limits to coal seam gas projects and coal drilling.

The emergence of a significant coal seam gas industry offers enormous economic advantages to the region. This includes the potential to support electricity generation and local manufacturing in the Hunter, and contribute to exports of LNG. It may also provide important diversification to the exposure to coal production. However, these overall gains are highly contingent on such development being achieved with minimal disruption and risk to the region's keystone agriculture sector.

In many respects the surface footprint of large scale coal seam gas development can be less intensive, especially compared to open cut coal mining. For example, the extraction of gas involves much less dust and there are lower requirements for heavy transport. That said, there can be environmental disruption to livestock and cropping activities with the potential to increase fragmentation of the landscape.

The arrival of a large coal seam gas industry in the region will necessarily involve a range of development challenges. This has been the experience in Queensland where large scale production of coal seam gas is much more advanced and where many land use issues are still being confronted. At this stage, it is difficult to assess the impact of the New South Wales Government's policy settings and safeguards regarding coal seam gas, with many of the potential long term environment risks still being determined (including at an international level). Indeed, being a 'second mover' in the development of these resources can have considerable benefits. In this regard, the lessons from coal seam gas developments in Queensland are particularly important, especially once that State's LNG facilities in Gladstone are commissioned and export shipments commence.

6.3 Infrastructure

The development and long term prosperity of the Hunter is firmly linked to the performance and adequacy of its economic infrastructure. Strategic infrastructure facilities in the transport, energy, 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 vital for meeting future economic challenges such as climate change and population ageing, as well as more immediate concerns regarding capacity constraints.

A range of development strategies and agendas are already 'in play'

Over the past five years or so there have been a number of strategic agendas covering the Hunter region. Some of these have involved broader state-wide development and infrastructure plans while others have had a specific regional focus, examining issues affecting the lower or upper Hunter separately. Overall, these development strategies have concentrated on a number of key themes:

- Firstly, they have sought to address the expected strong increases in the region's population base and ensure that essential infrastructure services such as water, electricity and road capacity are planned well in advance of actual requirements. This includes the adequacy of key road connections and corridors within the region and to Sydney.
- Secondly, they have promoted a more coordinated approach to planning the region's export infrastructure, especially the capacity and management of the coal supply chain.

A summary of these strategic platforms is provided in Table 6.2.

Table 6.2: Overview of recent strategic regional reviews

Strategic plan	Major findings relevant for the Hunter region
State-wide strategic reports	
Draft NSW Freight and Ports Strategy <i>Transport for NSW</i> November 2012	<p><i>Outlines the Government's plans and targets for improving freight transportation in NSW. Improvements in the movement of coal from the Hunter region to Port Newcastle by rail and the movement of goods through the Hunter Region by road are priorities for the movement for freight within the State.</i></p> <ul style="list-style-type: none"> • Rail Freight: Projected freight task growth along Hunter Valley rail corridor is expected to more than double by 2031 with coal dominating rail freight task. • Shipping: Port Newcastle will have a significantly expanded port capacity with the development of Terminal 4 Coal Facility worth over \$5 billion. This will allow the port to cope with projected increases in coal volumes. • Road Freight: The Bridges for the Bush program commits \$39.5 million to upgrades to the Middle Falbrook Bridge, Dunmore Bridge and Brig O'Johnston. Separate Commonwealth funding to replace the Fitzgerald Bridge over the Hunter river has already been secured with work due to start in December 2012. These improvements will service increases in road freight passing through and coming from the Hunter Region.
State Infrastructure Strategy 2012-2032 <i>Infrastructure NSW</i> October 2012	<p><i>Provides independent advice on infrastructure investment priorities for NSW over the next 20 years. It envisions Newcastle and the Hunter region growing substantially over the next two decades, supported by significant infrastructure investment.</i></p> <ul style="list-style-type: none"> • Freight: Upgrade road and rail schemes affected by coal freight and complete Stage 1 of the Northern Sydney Rail Freight Corridor by 2017. Complete Hunter Valley Coal Chain improvements in Liverpool Ranges by 2022. • Passenger transport: The Hunter Expressway is due to open at the end of 2013. Construct an extension of the F3 to the Pacific Highway at Raymond Terrace by 2022 and reduce travel time and increase frequency of train service from Newcastle to Sydney by 2032. • Water and electricity: Augment water supply in the Hunter and regional areas by 2022 and augment interstate gas and electricity transmission by 2032.

Strategic plan	Major findings relevant for the Hunter region
<p>NSW 2021 – A Plan to Make NSW Number One NSW Premier & Cabinet September 2011</p>	<p><i>Sets out the NSW Government’s policy agenda for the next 10 years, including strategies to support growth in regional areas. As part of the Plan the Government has also released a Regional Action Plan: Community Discussion Papers for the Hunter region.</i></p> <ul style="list-style-type: none"> • Industry: Promote more economic diversification, particularly the clean energy, food production and innovation sectors. Develop and implement land use plan. • Passenger transport: Develop a Hunter Transport Strategy. Construct and upgrade major urban roads including Hunter Expressway; F3 and several bridge upgrades, and the inner City Bypass. • Freight: Develop NSW freight and port strategy, commence work on the Northern Sydney Freight Corridor and consider options for a Newcastle rail bypass. • Water and environment: Develop a lower Hunter Water Plan and improve environmental outcomes such as air quality.
<p>Draft NSW Long Term Transport Master Plan <i>Transport NSW</i> September 2012</p>	<p><i>Provides a framework for addressing NSW transport needs over the next 20 years, and was an input into the INSW Infrastructure Strategy. The Final Plan is due for released late this year.</i></p> <ul style="list-style-type: none"> • Passenger transport: Short term goals include development of road network for Newcastle, Lake Macquarie and Maitland, including Newcastle Inner Bypass; Newcastle Link Road; Hunter Expressway; F3 Freeway link and Newcastle Road corridor improvements; improve bus services; reduce travel time for train between Sydney and Newcastle to two hours. Medium term goal to extend F3 to Raymond Terrace and focus on rail services between regional centres. • Freight: Develop Port Growth Plan for Newcastle; in the medium term plan for the construction of the strategic rail freight corridor at Fassifern and the Hexham rail bypass; protect strategic freight corridors and separate passenger and freight rail movements. • Urban renewal: Develop plans to revitalise Newcastle city, including proposal to remove existing rail infrastructure from the city centre.
<p>Metropolitan Plan for Sydney 2036 <i>NSW Planning</i> December 2010</p>	<p><i>Released in 2010, the Plan is currently being updated to align with NSW 2021, Infrastructure NSW Infrastructure Strategy and other recent government planning initiatives.</i></p> <ul style="list-style-type: none"> • Climate change: New abatement technology proposed for the expansion of Orica’s Ammonium Nitrate Facility in the Hunter will reduce nitrous oxide emissions, which is projected to save the equivalent of 2% of Sydney’s total emissions. • Transport: Longer term objective to enable lower Hunter residents to travel to Newcastle within 30 minutes by public transport.

Strategic plan	Major findings relevant for the Hunter region
<p>State of Australian Cities Department of Infrastructure and Transport December 2011</p>	<p><i>A yearly report providing a snapshot of developments across Australian cities. Also informs the National Urban Policy—Our Cities, Our Future report, which sets out Australian Government’s urban policy objectives over the coming decade.</i></p> <ul style="list-style-type: none"> • Population: Alongside the established trend of older Australians moving away from cities, a similar trend is evident among younger Australians and higher skilled people moving to near-city and coastal regional areas, with housing affordability and less congestion reported as possible reasons.
Hunter strategic reports	
<p>Hunter Regional Plan 2012-2022 RDA – Hunter September 2012</p>	<p><i>The Plan, which was released in conjunction with ‘Urban Planning for the Hunter’s Future’, updates the 2010-2020 Regional Plan and sets out the top planning priorities for the region.</i></p> <ul style="list-style-type: none"> • Transport: Improved transit connectivity between the Port, airport, industrial areas and Kooragang Island for freight, commuters and tourism; construction of a freight bypass of Newcastle to improve freight transport and separate commuter and freight rail; development of the Lake Macquarie Transport Interchange, including new rail station and access roads on the Port of Newcastle rail line, and construct the Scone Rail overpass. • Workforce: Expand the Manufacturing and Engineering (ME) Program to support growth of the Hunter skilled workforce.
<p>Upper Hunter Draft Strategic Regional Land Use Plan NSW Government March 2012</p>	<p><i>Developed as part of the goals of NSW 2021, the Plan sets out challenges facing the region in the next 25 years and a planning framework to address the challenges.</i></p> <ul style="list-style-type: none"> • Infrastructure: Planned upgrades on the coal train network (next five years); construction of the Hunter Expressway; upgrade of the airstrip at Scone Airport to support the equine and agricultural industry; and construct a water supply pipeline from Glenbawn Dam to Scone. • Housing: The region’s population is expected to reach around 123,000 by 2036, and requires an estimated 8,500 and 9,200 additional dwellings.

Strategic plan	Major findings relevant for the Hunter region
<p>Lower Hunter Regional Strategy <i>NSW Planning</i> <i>October 2006</i></p>	<p><i>The Plan, developed in 2006, was re-endorsed by the NSW Government in 2010.</i></p> <ul style="list-style-type: none"> • Housing: Provide for up to 115 000 new dwellings by 2031 to cater for smaller households and increased demand, particularly in key centres. Enable release of up to 69,000 new greenfield lots. Overall, 60% of new housing will be in new release areas and 40% will be in existing urban areas. • Workforce: Provide capacity within strategic centres to accommodate up to 85% of the anticipated 66,000 jobs required by 2031. • Environment: Maintain or improve the Region's biodiversity through a Regional Conservation Plan, including identifying and protecting green corridors and other natural assets.
<p>Hunter Investment Prospectus 2012 <i>RDA – Hunter</i> <i>2012</i></p>	<p><i>Released in conjunction with the Hunter Regional Plan, the Prospectus sets out opportunities in the Hunter region.</i></p> <ul style="list-style-type: none"> • Infrastructure: Major projects include fourth coal loader; Queensland-Hunter gas pipeline; gas exploration well of Newcastle coast; Solar thermal project at Liddell; upgrade of coal rail network; upgrade of electricity infrastructure due for completion in 2014; Gloucester and Hunter coal seam gas projects; development of aerospace precinct; construction of Hunter Expressway.

Road infrastructure

The key transport infrastructure issues and priorities for the Hunter centre on freeing up bottlenecks and transport corridors, including around the ports and Newcastle.

The region's highway infrastructure is crucial to its connectivity and economic performance. The highway network — principally, the F3, the Pacific Highway and the New England Highway — carries a heavy mix of freight and commuter traffic and can be prone to disruption from road accidents and congestion (especially during holiday periods). There have been repeated calls, particularly on the basis of road safety and traffic management, for greater levels of freight to be carried by rail to take more trucks off the highway network.

Some important road infrastructure is currently under development. This includes the staged duplication of the Pacific Highway. This highway, which links Sydney to Brisbane, via Gosford, Newcastle, Port Macquarie, Coffs Harbour and the Gold Coast, carries over half the freight task between these two cities. Around 50% of the highway is still single carriageway and sections between Tweed Heads and Newcastle are being progressively widened and converted to freeway or dual carriageway standards.

In addition to connecting the Hunter with Sydney and northern population centres, intra-regional transport links are vital. For instance, the Hunter Expressway will provide a dual carriageway link between the F3 and the New England Highway near Branxton. The project, which is scheduled for completion in late 2013, will provide better connections to many industrial and population centres in the lower Hunter. It will also relieve congestion between Newcastle and Maitland and other proximate towns by allowing traffic to bypass these areas. Substantial funding for the project was provided through the Australian Government's Building Australia Fund.

Other projects of strategic significance include the F3 Freeway to Raymond Terrace project. This involves the development of a missing link connecting the F3 Freeway with the Raymond Terrace Bypass. The project provides uninterrupted highway access and better connectivity between the F3 and the Pacific Highway. The proposed link is not currently encompassed within the Pacific Highway Upgrade Program despite catering for relatively high volumes of traffic.

Much of the road transport task and planning in the region is linked to the coal sector. For example, Scone, which has the last rail level crossing on the New England Highway, has been heavily affected by coal trains. This has included a number of incidents where the town has been effectively cut off for significant periods by train failures. Further investment in the New England Highway may be needed over the medium to long term to handle additional traffic related to growth in coal volumes and the development of the coal seam gas industry.

Rail infrastructure

The rail network has a critical economic role in the region in transporting bulk freight, most notably the shipment of coal between mines and Port of Newcastle, as well as the movement of passengers within the region and to Sydney. The rail network is also used by grain trains, north-south freight trains crossing the network, and coal trains supplying domestic users such as power stations.

The Hunter Valley Coal Chain

The Hunter Valley Coal Chain is the largest coal export operation in the world and involves the coordination of over 30 mines, above and below rail operations, coal loaders and ships. The supply chain is a strategic component of Australia's economic infrastructure. Current forecasts indicate that more than 140 million tonnes will be exported in 2012, most of which moves through the Port of Newcastle, worth in excess of \$10 billion in export earnings.

The Hunter Valley Coal Chain Coordinator (HVCCC) coordinates day-to-day scheduling of vessel berthing, stockpile management and train sequencing to maximise throughput. Over the longer term, the HVCCC is charged with planning investments to ensure the adequacy of the coal chain infrastructure to meet future export demand. Since the HVCCC was established, operating capacity on the coal supply chain has been drastically increased through improved coordination and operational practices.

Over the next two decades, considerable investment will be required to increase the capacity of the coal export supply network. For example, as the Gunnedah coal fields develop, the Main North Line through the Liverpool Ranges will need to cater for increasing number of coal trains. The current single track alignment between Scone and Werris Creek traverses the Liverpool ranges, where gradients require additional locomotives to pull trains over the range, increasing operating costs and decreasing available track capacity.

Current strategies for capacity augmentation are based on a staged duplication of the existing line and alignment. It has been noted (eg State Infrastructure Plan) that the current governance arrangements favour incremental investments and may work against more expensive but economically optimal alternatives such as tunnelling options which would allow for higher line capacity to the Gunnedah Basin.

The ability of current governance and regulatory arrangements to facilitate appropriate long term capacity investments, including the ability to secure contractual commitments from potential rail users, warrants ongoing policy attention. The access arrangements and overall management of the rail network have worked well in recent times, but these need to remain effective at ensuring investments can be brought on line to meet future needs and that new coal field prospects can be developed.

Northern Sydney Freight Corridor

The rail network has a number of capacity and operational constraints that limit its efficiency as a transport link between the Hunter and Sydney. The key impediments involve the need for additional passing loops and challenging topography, with several steep inclines along the corridor.

There are also operational issues associated with the use of shared rail infrastructure for both freight and passenger services. This affects both passenger and freight services. Passenger services currently have priority over freight trains on the Sydney rail network. While it is unlikely that separation of coal and passenger services will be viable on economic grounds, further operational efficiencies are available across the network — for example, changes in stopping patterns combined with minor works may provide potential to reduce travel times effectively.

Another potential option involves a rail bypass of Newcastle. Under the current network configuration, all traffic must pass through Newcastle city. A bypass could improve journey times and ease demands on the urban rail network, especially in relation to increasing requirements along the coal export supply chain. The New South Wales Infrastructure Strategy noted that more detailed work on the viability of a rail bypass is needed.

East Coast High Speed Rail

A longer term transformational transport option for the region, and the nation, involves the possible development of a high speed rail network along the east coast of Australia connecting Brisbane, Newcastle, Sydney, Canberra and Melbourne. The Commonwealth Government has undertaken some early feasibility studies on the project, with the Newcastle-Sydney 'spine' being the core network element.

The high cost of high speed rail (possibly in the order of \$61 billion - \$108 billion) is clearly a key constraint in progressing the project's development. The economic case for high speed rail is dependent on the emergence of technology to reduce travel time to a level where it is a viable alternative to air transport. Globally, high speed rail travel has proven most successful where distances between cities are less than 500 km. This presents challenges given the greater distances between capitals along the east coast. There are further issues regarding the extent to which this transport option can promote regional connectivity and economic gains given the trade-off between decreasing travel times, which is instrumental to its commercial viability, and permitting intermediate stops.

It is difficult to see a high speed rail link being economically feasible in the foreseeable future, or indeed factoring in long term transport blueprints (beyond corridor preservation). While technological advancements may well improve some of the project's fundamentals, there are also likely to be substantial improvements in air transport efficiencies with faster, cheaper and more accessible air services helping to maintain or increase the cost differentials between modes.

Water infrastructure

In addition to road and rail infrastructure, water security is an important strategic issue for the region. Water services in New South Wales are undertaken by government, either through Hunter Water or local government-owned water utilities.

Water supplies in the Hunter have proven vulnerable to drought events and they are generally less secure than for the Sydney basin. The region has significant groundwater resources that could augment future supply, and a recently constructed water transfer pipeline between the central coast and Hunter allows water sharing. However, with the decision not to proceed with the Tillegra Dam, there is a need to consider alternative options to augment current water supplies over the medium term.

Increased population levels in the region and the potential for decreased water yield and higher variability associated with climate change, especially beyond the next two decades, will present particular challenges.

There are a range of options aimed at increasing water supply to augment current water sources in the Hunter, including:

- desalination
- water recycling
- new or upgraded storage facilities
- water sharing with the central coast
- demand management.

It is likely that multiple approaches to addressing regional water security will be needed going forward. This recognises that no one option is likely to offer the best solution. It also reflects the considerable difficulties (including community and political sensitivities) in securing large scale investments such as dams and desalination plants, and that capital expenditure constraints are likely to exist for some time.

Potential priority areas for a development agenda

Table 6.3: Priority areas for a regional development agenda

Priority area	Issues and strategic considerations	Development and reform options	Possible timeframes
Improving road connections	<p>The key transport infrastructure issues and priorities for the Hunter involve freeing up bottlenecks and transport corridors, including around the ports and Newcastle.</p> <p>Much of the road transport task and planning in the region is linked to the coal sector. For example, Scone, which has the last rail level crossing on the New England Highway, has been heavily affected by coal trains. Further investment in the New England Highway may be needed over the medium to long term to handle additional traffic related to growth in coal volumes and the development of the coal seam gas industry.</p>	<p>While there have been large improvements over the last five years to the performance of rail and port loader elements of the supply chain to address critical bottlenecks (as discussed above), more focus on the intra-regional road links would help drive further efficiencies.</p> <p>Other projects of strategic significance include the F3 Freeway to Raymond Terrace project. This involves the development of a missing link connecting the F3 Freeway with the Raymond Terrace Bypass. The proposed link is not currently encompassed within the Pacific Highway Upgrade Program.</p>	5 to 10 years

Priority area	Issues and strategic considerations	Development and reform options	Possible timeframes
Regional rail	<p>There are substantial transport bottlenecks between Sydney and Newcastle. Rail passenger services take longer than necessary and there is substantial scope to improve the rail connectivity between the two cities.</p> <p>There are also operational issues associated with the use of shared rail infrastructure for both freight and passenger services. This affects both passenger and freight services. Passenger services currently have priority over freight trains on the Sydney rail network. While it is unlikely that separation of coal and passenger services will be viable on economic grounds, further operational efficiencies are available across the network — for example, changes in stopping patterns combined with minor works may provide potential to reduce travel times effectively.</p>	<p>Projects such as the Scone Bypass also to form crucial transport priorities. Importantly, this would also support the ongoing development of non-resource sectors of the regional economy.</p> <p>Another potential option involves a rail bypass of Newcastle. Under the current network configuration, all traffic must pass through Newcastle city. A bypass could improve journey times and ease demands on the urban rail network, especially in relation to increasing requirements along the coal export supply chain. The NSW Infrastructure Strategy noted that more detailed work on the viability of a rail bypass is needed.</p>	5 to 10 years
Coal supply network	<p>Since the HVCCC was established, operating capacity on the coal supply chain has been drastically increased through improved coordination and operational practices.</p> <p>It is expected demand for Hunter coal will remain strong over the long term.</p>	<p>Over the next two decades, considerable investment will be required to increase the capacity of the coal export supply network. For example, as the Gunnedah coal fields develop, the Main North Line through the Liverpool Ranges will need to cater for increasing number of coal trains.</p>	5 to 10 years
East coast high speed rail	<p>Early feasibility studies on a very fast train link between Sydney and Newcastle (and possibly further to Brisbane) are being undertaken by the Commonwealth Government. This infrastructure, if commercially viable, would be a 'game changer' with the potential to fundamentally shape the urban form along the east coast. However, there are substantial cost, demand and technology challenges to be resolved and the project remains, at best, a very long term proposition.</p>	<p>It is difficult to see a high speed rail link being economically feasible in the foreseeable future, or indeed factoring in long term transport blueprints (beyond corridor preservation).</p>	Beyond 20 years

Priority area	Issues and strategic considerations	Development and reform options	Possible timeframes
Water security	Water supplies in the Hunter have proven vulnerable to drought events and they are generally less secure than for the Sydney basin. With the decision not to proceed with the Tillegra Dam, there is a need to consider alternative options to augment current water supplies over the medium term.	It is likely that multiple approaches to addressing regional water security will be needed going forward. This recognises that no one option is likely to offer the best solution. It also reflects the considerable difficulties (including community and political sensitivities) in securing large scale investments such as dams and desalination plants, and that capital expenditure constraints are likely to exist for some time.	5 to 10 years
Developing Newcastle	Newcastle can play a big role in relieving the stresses on Sydney arising from urban growth. Its ability to attract new (especially younger) residents will depend much more than just being a place where people can escape the urban grind and living costs in Sydney. The city needs to position itself as a vibrant alternative in its own right. This will involve initiatives to improve the planning and connectivity of Newcastle, especially good infrastructure links and opportunities to more centrally locate, where possible, new business or education services.	A focus on further revitalising the Newcastle CBD, improving civic amenity and more centrally locating parts of Newcastle University (similar to the law school) would be important initiatives. There is also a role to play in promoting the development of a range of entertainment options such as cafés, festivals and events. There are possible gains from better promoting events in the region. Currently, there is no central point where information on events across the Hunter can be obtained and this appears to be an area where practical improvements could be made at modest cost.	0 to 5 years
Skills and innovation	A particular issue that that many of the workers needed to support the continued expansion of the Hunter's resource and industrial base will come from within the region (mostly from population centres in the lower Hunter), this places an onus on ensuring that the availability of relevant training options is responsive to requirements.	This mostly relates to the provision of TAFE and other vocational training, but also centres on the University of Newcastle — especially as a significant proportion of graduates come from within the region and seek employment locally upon completion of their studies.	0 to 5 years

Priority area	Issues and strategic considerations	Development and reform options	Possible timeframes
Natural environment	From a preservation and amenity perspective, building on the region's pristine and world-class environmental features is fundamental.	Some relatively low cost initiatives could be used to enhance the amenity and tourism value of the region's coastline. This could involve the development of an integrated network of environmental and walking tracks, perhaps linked over the longer term to the extensive Sydney coastal walking routes.	0 to 5 years

Appendix A: Modelling framework and scenario analysis

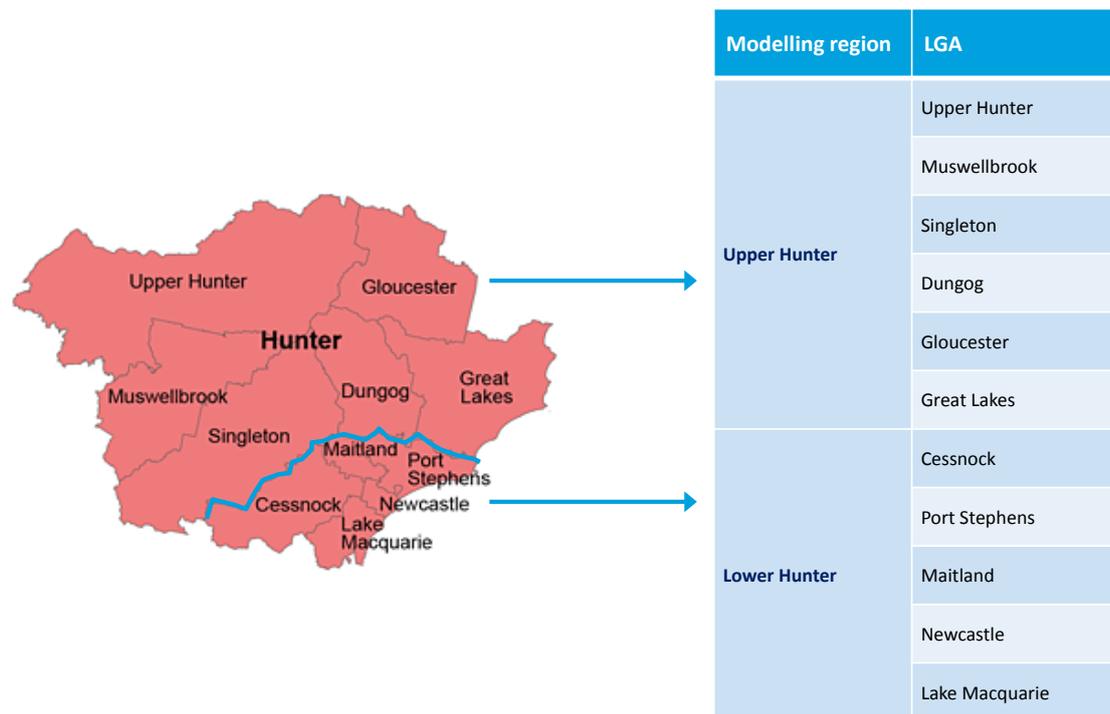
The projections for the Hunter economy have been undertaken using the Deloitte Access Economics in-house Computable General Equilibrium (CGE) model.

The modelling was conducted in four separate regions:

- Upper Hunter
- Lower Hunter, including Newcastle
- The rest of New South Wales
- The rest of Australia.

The composition of the Hunter region, including relevant LGAs, integrated within the modelling framework is shown in Figure A.1.

Figure A.1: Modelling regions and LGAs



Scenarios

To explore the potential effects of major global and domestic economic pressures likely to emerge over the next two decades, various scenarios were empirically modelled in a general equilibrium framework. These are aimed to complement the baseline analysis and draw out how the structure and composition of the Hunter economy might be affected over time. The scenario framework is set out in Table A.2 below.

Table A.2: Scenario modelling framework

	Bigger Hunter	Moderating Asian demand	Industrial downsize	Enhanced accessibility
Theme	Substantially larger resident and working population in the Hunter, driven by industry developments and enhanced transport linkages	A moderation in the terms of trade, coinciding with sustained strong growth in rapidly industrialising Asian economies	Structural shock to the region related to a significant part of the region's industrial base (eg heavy industry or defence) closing down or relocating	Improved regional and inter-regional transport linkages, involving: <ul style="list-style-type: none"> • rail and road connections between the upper and lower Hunter, between Maitland and Newcastle and to Sydney • Increased telecommuting
Central case	Trend growth in the Hunter population <ul style="list-style-type: none"> • Over 2012-2036 around 140,000 new residents and 75,000 workers 	Robust economic growth in China (8+% pa) and India (6-8% pa), with commodity prices trending down from around 2012-13 but still high by historical standards	Industrial composition of the Hunter shifts according to longer term trends <ul style="list-style-type: none"> • Economic growth remains at trend levels 	
Scenario profile	Additional 37,000 residents and 20,000 workers over the next decade <ul style="list-style-type: none"> • Incorporated through increase in Hunter region working population 	Materially lower commodity prices (approximately 30%), with growth rates for China and India unchanged from central case <ul style="list-style-type: none"> • Commodity export price reduction: 20% reduction over 8 years to 2020; 10% reduction over the 16 years to 2036 	Reduced employment, capital investment and industrial output <ul style="list-style-type: none"> • A \$160 million reduction in regional manufacturing (concentrated in the lower Hunter) over 2012 and 2016 	Increased productivity, reduced travel time and costs <ul style="list-style-type: none"> • Increased transport sector productivity: 1% per annum for 15 years, starting from 2015 • Coupled with a larger regional population, as parametised in the 'bigger Hunter' scenario

Modelling results

The tables below outline the potential macroeconomic implications of the four scenarios on the lower and upper Hunter. Results are presented as both level and percentage deviations from the baseline projections canvassed in Table A.3.

Table A.3: Baseline macroeconomic projections

Variable	2015	2025	2036
Lower Hunter			
GRP in 2010-11 prices (\$million)	29,250	37,700	47,250
Employment (FTE)	45,750	45,750	45,750
Upper Hunter			
GRP in 2010-11 prices (\$million)	10,750	13,950	17,550
Employment (FTE)	196,100	190,100	184,900

Source: Deloitte Access Economics

Table A.4: Macroeconomic impacts of a bigger Hunter scenario

Variable	NPV	2015	2025	2036
Lower Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	16,300	340	1,690	3,960
Employment (FTE)		3,090	10,750	19,100
<i>% Deviations from the baseline</i>				
GRP		1.1	4.4	8.2
Employment		1.6	5.7	10.3
Labour supply		1.6	5.7	10.3
Exports		0.3	3.1	6.8
Imports		1.2	3.3	5.5
Real wage		-0.4	-1.4	-2.5
Consumption		1.0	3.7	6.9
Upper Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	5,150	90	530	1,310
Employment (FTE)		700	2,530	4,620
<i>% Deviations from the baseline</i>				
GRP		0.8	3.7	7.3
Employment		1.5	5.5	10.1
Labour supply		1.5	5.5	10.1
Exports		0.5	3.1	6.6
Imports		1.1	3.1	5.4
Real wage		-0.9	-2.8	-4.7
Consumption		0.8	3.2	6.4

Source: Deloitte Access Economics

Table A.5: Macroeconomic impacts of a moderating Asian demand scenario

Variable	NPV	2015	2025	2036
Lower Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	-2,060	-60	-220	-450
Employment (FTE)		-290	-360	-400
<i>% Deviations from the baseline</i>				
GRP		-0.2	-0.6	-0.9
Employment		-0.1	-0.2	-0.2
Labour supply		0.0	-0.1	-0.1
Exports		0.0	-1.0	-2.1
Imports		-0.7	-1.7	-2.6
Real wage		-0.1	-0.6	-1.1
Consumption		-0.3	-0.9	-1.6
Upper Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	-1,750	-40	-190	-400
Employment (FTE)		-240	-470	-560
<i>% Deviations from the baseline</i>				
GRP		-0.6	-2.4	-4.0
Employment		-0.5	-1.0	-1.2
Labour supply		0.0	-0.2	-0.5
Exports		-0.7	-3.8	-6.5
Imports		-1.8	-5.0	-7.5
Real wage		-0.4	-2.5	-5.0
Consumption		-1.0	-3.8	-6.6

Source: Deloitte Access Economics

Table A.6: Macroeconomic impacts of the industrial downsize scenario

Variable	NPV	2015	2025	2036
Lower Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	-790	-80	-70	-80
Employment (FTE)		-550	-60	-20
<i>% Deviations from the baseline</i>				
GRP		-0.3	-0.2	-0.2
Employment		-0.3	0.0	0.0
Labour supply		0.0	0.0	0.0
Exports		-2.5	-3.3	-3.1
Imports		-1.8	-1.9	-1.9
Real wage		-0.2	-0.4	-0.4
Consumption		-0.5	-0.4	-0.4
Upper Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	160	10	20	20
Employment (FTE)		30	10	20
<i>% Deviations from the baseline</i>				
GRP		0.1	0.1	0.1
Employment		0.1	0.0	0.0
Labour supply		0.0	0.0	0.0
Exports		0.2	0.3	0.3
Imports		-0.2	-0.4	-0.4
Real wage		0.1	0.1	0.2
Consumption		0.1	0.2	0.2

Source: Deloitte Access Economics

Table A.7: Macroeconomic impacts of the enhanced accessibility scenario

Variable	NPV	2015	2025	2036
Lower Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	17,950	360	1,860	4,390
Employment (FTE)		3,090	10,750	19,100
<i>% Deviations from the baseline</i>				
GRP		1.2	4.8	9.1
Employment		1.6	5.7	10.3
Labour supply		1.6	5.7	10.3
Exports		0.0	3.3	7.9
Imports		1.5	3.6	5.6
Real wage		0.0	0.0	-0.2
Consumption		1.2	4.1	7.5
Upper Hunter				
<i>Level deviations from the baseline</i>				
GRP in 2010-11 prices (\$million)	5,500	100	560	1,400
Employment (FTE)		700	2,530	4,620
<i>% Deviations from the baseline</i>				
GRP		0.9	3.9	7.8
Employment		1.5	5.5	10.1
Labour supply		1.5	5.5	10.1
Exports		0.5	3.3	7.1
Imports		1.1	2.7	4.5
Real wage		-0.5	-1.6	-2.8
Consumption		0.8	3.3	6.6

Source: Deloitte Access Economics

Appendix B: General equilibrium model

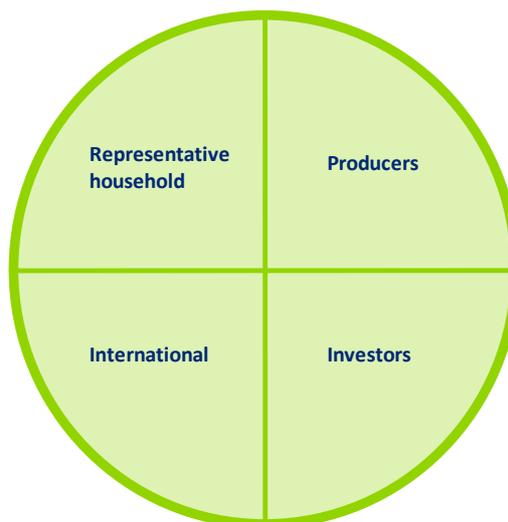
DAE-RGEM is a large scale, dynamic, multi-region, multi-commodity computable general equilibrium model of the world economy. The model allows policy analysis in a single, robust, integrated economic framework. It projects changes in macroeconomic aggregates such as for GDP, employment, export volumes, investment and private consumption. At a sectoral or industry level, detailed results such as output, trade flows and employment are also produced.

The model is based on a set of key underlying relationships between different groups of agents in the economy: households, producers, investors and international agents. Each of these groups is represented as a discrete *component* in the model. The relationships between components are solved simultaneously and, as such, there is no logical start or end point to conceptualise the model's operation.

Figure B.1 shows the key components of the model for an individual region. Regions can be specified for particular analyses and can be entire countries (or multi-country regions like the Eurozone or East Asia) or specific areas of a country like Australian States and Territories.

The model's database and broad economic foundations are outlined below.

Figure B.1: Key components of the DAE general equilibrium model



The database

DAE-RGEM is underpinned by a detailed global database. This is derived from the Global Trade Analysis Project (GTAP), which produces a global database for general equilibrium modelling that covers 113 regions or countries and 57 industry sectors (the base year is 2004).

The Australian component of the database is provided by the Productivity Commission and is based on Australian input-output tables developed by the Australian Bureau of Statistics. As noted, the model also splits Australian economic activity into States and Territories, thus allowing regional analysis to be undertaken.

The base data quantifies the economic flows between sectors, including bilateral trade, and also accounts for greenhouse gas emissions from fossil fuel combustion. The database is 'benchmarked' or calibrated so that an initial equilibrium solution exists that replicates actual sectoral production, consumption, trade and factor usage in the base year (2004).

Economic foundations of the model

Income, consumption and savings

- Each region contains a 'representative household' that receives all income from factor payments (labour, capital, land and natural resources), taxes and net foreign income from borrowing (lending).
- Under standard economic setting (otherwise known as the model's closure), savings are a function of the rate of return on capital which reflects the return on savings. Government consumption moves in line with national income. Household consumption, therefore, is determined as the residual of national income, savings and government consumption.
- At the detailed level, household consumption for composite goods is determined by minimising expenditure via a CDE (Constant Differences of Elasticities) expenditure function. For most regions, households can source consumption goods only from domestic and imported sources. In the Australian regions, households can also source goods from interstate. In all cases, the choice of commodities by source is determined by a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function.
- Government consumption for composite goods, and goods from different sources (domestic, imported and interstate), is determined by maximising utility via a C-D utility function.
- Producers supply goods by combining aggregate intermediate inputs and primary factors in fixed proportions (the Leontief assumption). Composite intermediate inputs are also combined in fixed proportions, whereas individual primary factors are combined using a CES (constant elasticity of substitution) production function.
- Producers are cost minimisers, and in doing so choose between domestic, imported and interstate intermediate inputs via a CRESH production function.
 - The model contains a more detailed treatment of the electricity sector that is based on the 'technology bundle' approach for general equilibrium modelling developed by ABARE (1996).
- The supply of labour is influenced by movements in the real wage rate and is governed by an elasticity of supply parameter. This implies that changes in the demand for

labour, positively or negatively, will impact both the level of employment and the wage rate.

Investment

- Investment takes place in a global market and allows for regions to have different rates of return that reflect their individual risk profiles and policy impediments to investment. A global investor ranks countries as investment destinations based on two factors: the current level of global economic growth and comparative regional rates of return.
- Once aggregate investment is determined in each region, the regional investor constructs capital goods by combining composite investment goods in fixed proportions, and minimises costs by choosing between domestic, imported and interstate sources for these goods via a CRESH production function.

Market clearing

- Prices are determined via competitive market-clearing conditions that require sectoral output (supply) to equal the amount sold (demand) to final users (households and government), intermediate users (firms and investors), foreigners (international exports), and other Australian regions (interstate exports).
- Internationally traded goods (imports and exports) are differentiated by the country of origin and treated as imperfect substitutes (according to the so-called Armington assumption). But in relative terms, imported goods from different regions are treated as closer substitutes than domestically-produced goods and imported composites. Goods traded interstate within the Australian regions are assumed to be closer substitutes again.

International

- Each of the components outlined above operate, simultaneously, in each region of the model. That is, for any simulation the model forecasts changes to trade and investment flows within, and between, regions subject to optimising behaviour by producers, consumers and investors. This implies some global conditions must be met such as balancing of global exports and imports and for global debt repayments and debt receipts to equalise each year.

Some stylised dynamics in the model

- **The representative household**

Moving clockwise around Figure A.1 from the top left quadrant, the representative household interacts with producers in two ways. First, in allocating expenditure across household and government consumption, demand for production is sustained. Second, the representative household owns and receives all income from factor payments (labour, capital, land and natural resources) as well as net taxes. Factors of production are used by producers as inputs into production along with intermediate inputs. The level of production, as well as supply of factors, determines the amount of income generated in each region.

The representative household interacts with investors through the supply of investable funds (that is, savings). Linkages with the international sector occur via trade in goods and capital. Importers compete with domestic producers in consumption markets, and regions lend or borrow money from each other.

- **Producers**

Apart from selling goods and services to households and government, producers sell products to each other (intermediate usage) and to investors.

Capital is an input into production. Investors respond to the conditions facing producers in a region to determine the amount of investment. Generally, increases in production are accompanied by increased investment. For example, making machinery, constructing buildings and other similar activities — which form the basis of a region's capital stock — are undertaken by producers. In this way, investment demand adds to household and government expenditure from the representative household, to determine the demand for goods and services in a region.

Producers also interact with international markets in two main ways. First, they compete with producers in overseas regions for export markets, as well as in their own region. Second, they use inputs from overseas in their production.

- **Investors**

Investment takes place in a global market, with regions having different rates of return based largely on their risk profile. Investors seek to optimise their investments by directing capital to countries according to prevailing levels of economic growth and the comparative attractiveness of countries as global investment destinations.

- **International**

Each of the components outlined above operate, simultaneously, in each region of the model. That is, for any simulation the model forecasts changes to trade and investment flows within, and between, regions subject to optimising behaviour by producers, consumers and investors. This implies some global conditions must be met such as balancing of global exports and imports and for global debt repayments and debt receipts to equalise each year.

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