LITHGOW EMERGING ECONOMY

Transition Plan

January 2023

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1 Introduction

1.1 Context of this report

The Lithgow LGA is the gateway from Sydney to the Central West and Orana region of New South Wales. Home to 21,500 people in 2020, Lithgow sits about 140 km west of Sydney and includes the strategic centre of Lithgow, the towns of Portland and Wallerawang, communities across the Seven Valleys, and large areas of National Parks and State Forests, including the Wollemi and Marrangaroo national parks, and Newnes State Forest.

The Lithgow LGA lies almost wholly within the Wiradjuri Aboriginal nation, with the Gundungurra nation situated to the south, and the Darug nation to the east. There are 406 declared Aboriginal sites, with many works of art including rock art and Aboriginal Places protected under the Aboriginal Heritage Act.

Since the late 1860s, Lithgow has been a centre for coal mining and, subsequently, coal-fired power generation, and has a long and rich history as a centre for industrial innovation and development. Mining and electricity generation remain pivotal to the local economy and identity, alongside public administration, health care and social services, and advanced manufacturing.

The Lithgow region supplies approximately 15 per cent of New South Wales's power needs and is an important supplier of coal, mining expertise and manufactured product. The local coal industry provides well paid jobs and a significant contribution to the area's GRP, and although current estimates local mine reserves have a 20-year horizon, the future of the industry is driven by costs, regulation and international commitments, and market needs.

Coal mining and coal-fired power generation represent a cornerstone industrial activity for the City of Lithgow, one that shaped the community itself. The extraneous threats to the industry have given cause for concern, and people are understandably apprehensive for the future of the City.

NSW Government has committed to supporting the coal mining industry and its regional communities, owing to the importance of the sector to the economy and the need to avoid undermining those businesses, jobs, and communities through action on climate change. The State's objective is to achieve net zero emissions by 2050 and, through its Net Zero Plan Stage 1: 2020-2030 is aiming to give confidence that the challenges posed by climate change can be solved by improving, and not eroding, the prosperity of NSW families and communities. The implementation of the plan is expected to provide 2,400 jobs and attract $11.6 billion of investment over the next 10-years. NSW has also established a coal innovation policy which is driving investment in capturing methane emissions from coal mining operations.

In the context of the global energy transition and a more diversified energy mix, Lithgow has potential to become a leading example of successful economic diversification, and capture advantages from new energy technologies. An inspiring vision for Lithgow's future leverages the city's unique competitive advantages including natural resource endowments, infrastructure, a solid base of the right sort of human capital, know-how and pivotal location in Australia's energy and transport system.

Economic diversification and transitions in technology and skills will require an inspiring vision and leadership, and a robust plan of action supported by strong local institutions in partnership with the State Government. It will require proactive investment and attraction of new industries within the established sectors of the economy. It will require new forms of engagement between employers, the workforce, and government, and new pathways to attract and retain a diverse and growing workforce.

In many cases, coal mining regions are already facing significant social and economic challenges. Coal transitions can be an opportunity to create an inclusive dialogue and strategy for the future generation in these communities. 'Just transition', therefore, needs to look beyond the immediate actions of mitigating the unwanted impacts of an expected decline in the coal economy.

Lithgow City Council recognises the need to plan for the transition out of coal and is committed to working on behalf of the community and in partnership with the Department of Regional NSW (DRNSW) plus other tiers of government and the private sector to enhance the area's economic momentum and community resilience through this Action Plan.

1.2 Purpose of this report

The Lithgow Emerging Economy Project (LEEP) has produced this Action Plan, which identifies opportunities for Lithgow's economic diversification and growth, and a set of short, medium and long-term actions and objectives to activate new opportunities for the local economy and its communities.

This report aims to inform the Lithgow City Council and NSW Government on the priorities and allow for planning and investment attraction activities to be aligned with growth opportunities.

The report is structured as follows:

- **Section 2: A foundation for growth.** This section includes a detailed overview of the demographic and economic makeup of the Lithgow region, as well as the current planning arrangements.
- **Section 3: An aspirational future for Lithgow.** This section includes a summary of Lithgow's unique advantages and opportunities, as well as discussion of a proposed vision of the future economy and the pathway to diversification.
- **Section 4: Ensuring a resilient, diverse economy.** This section identifies the key economic sectors for the transition and the actions required to achieve the growth objectives.
- **Section 5: Supporting the coal transition.**
- **Section 6: Leading the transformation.** This section identifies the enablers that will be required to achieve the transition; including investment attraction, governance, leadership and institutional capacity, and social change.
- **Section 7: Action Plan Summary.** This section presents a summary of the proposed actions.

2 A foundation for growth

Lithgow's current social, economic, and planning baseline provide the foundation for its future growth. Below is a summary of the key insights from research into these three factors, while a detailed assessment of Lithgow's baseline is provided in Appendix C.

2.1 Socio-demographic profile

It is important to understand Lithgow's socio-demographics when considering future growth as they provide part of the context within which the growth will need to be achieved and will affect the actions required. Lithgow's aging population and recent low unemployment levels indicate that a requirement for future growth will be the need to attract additional workers to the LGA. Factors like relatively affordable housing in Lithgow present a solid foundation for this. Figure 1 presents the key demographic insights from the baseline assessment.

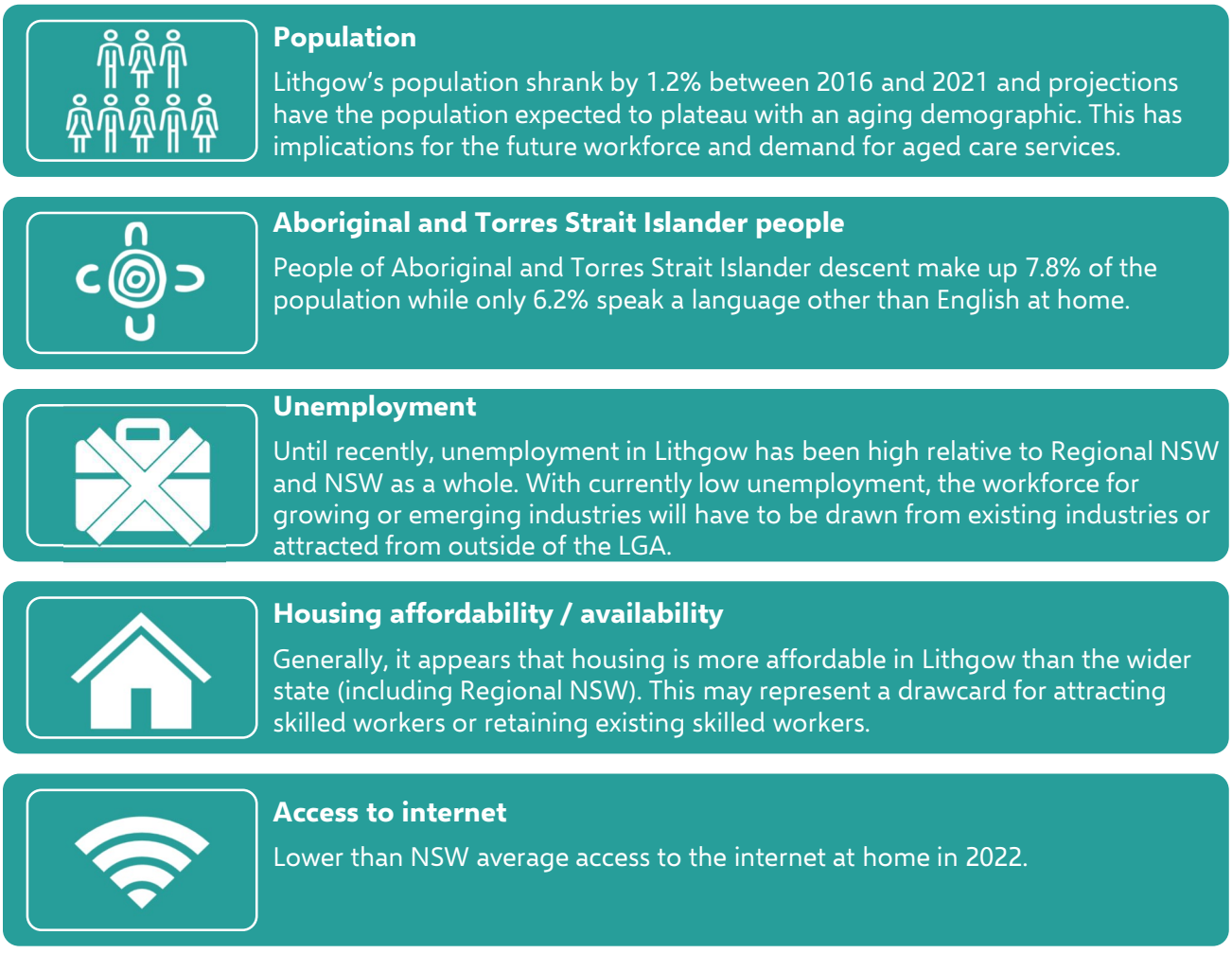

Figure 1. Socio-demographic profile

2.2 Economic profile

Equally as important, the current economic profile of Lithgow provides an indication of the sectors in which Lithgow has specialised and have historically been productive in the region. These historically productive sectors point to both opportunities and risks for the local economy. Figure 2 presents the key economic insights from the baseline assessment.

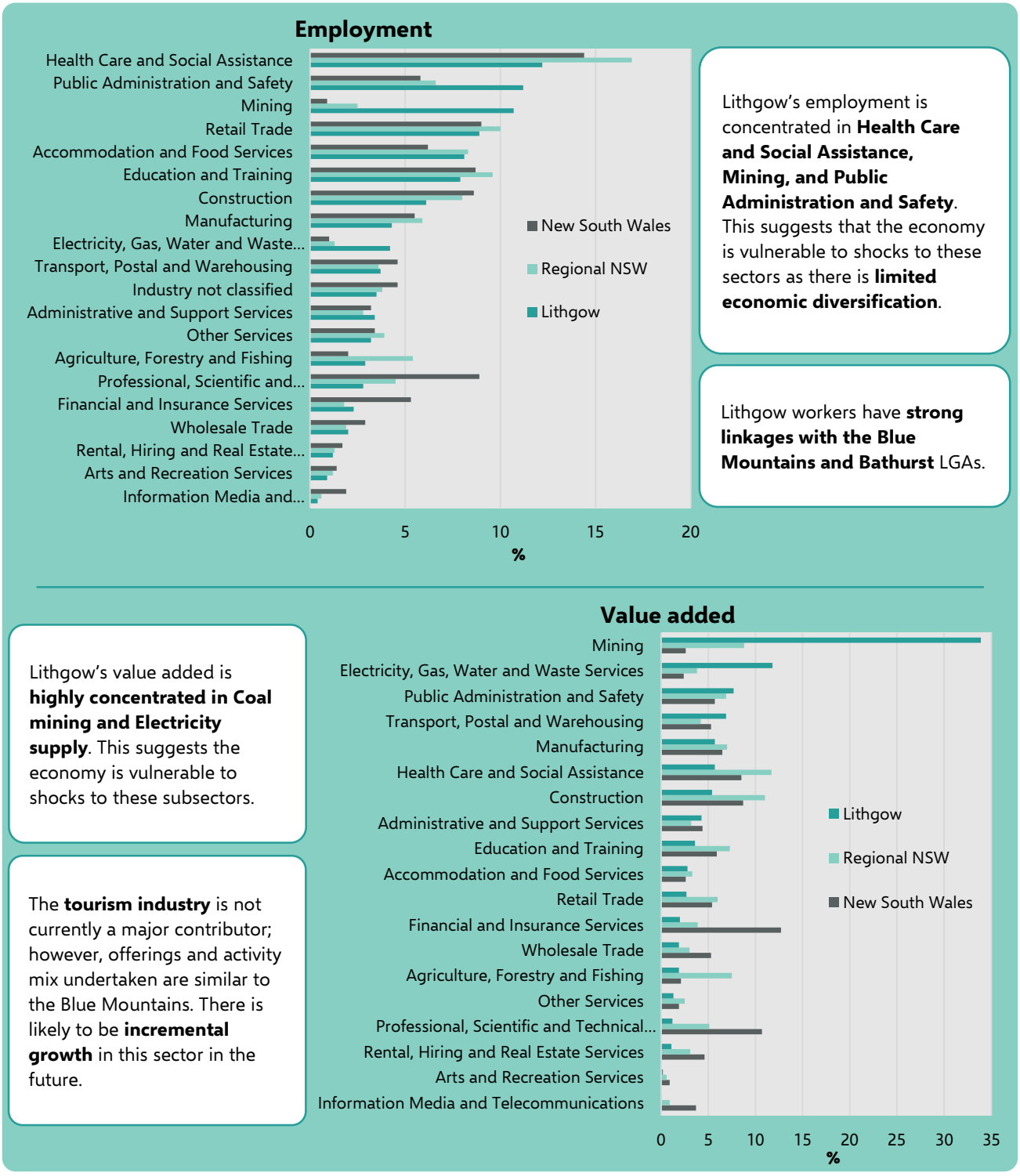

Figure 2. Economic profile

Figure 3 presents the economic baseline in terms of the value added of the economy by industry over the 10-year period up to FY21. The historical performance has demonstrated exposure to mining sector volatility and points to the influence that sector can have on the wider economy. Despite this the underlying diversified economy (excluding mining) has grown from $831 million to $952 million in value added (equivalent to a compound annual growth rate of 1.4%). It should also be noted that the dip in FY20 and following response in FY21 is consistent with the wider Australian economy response to the COVID-19 pandemic.

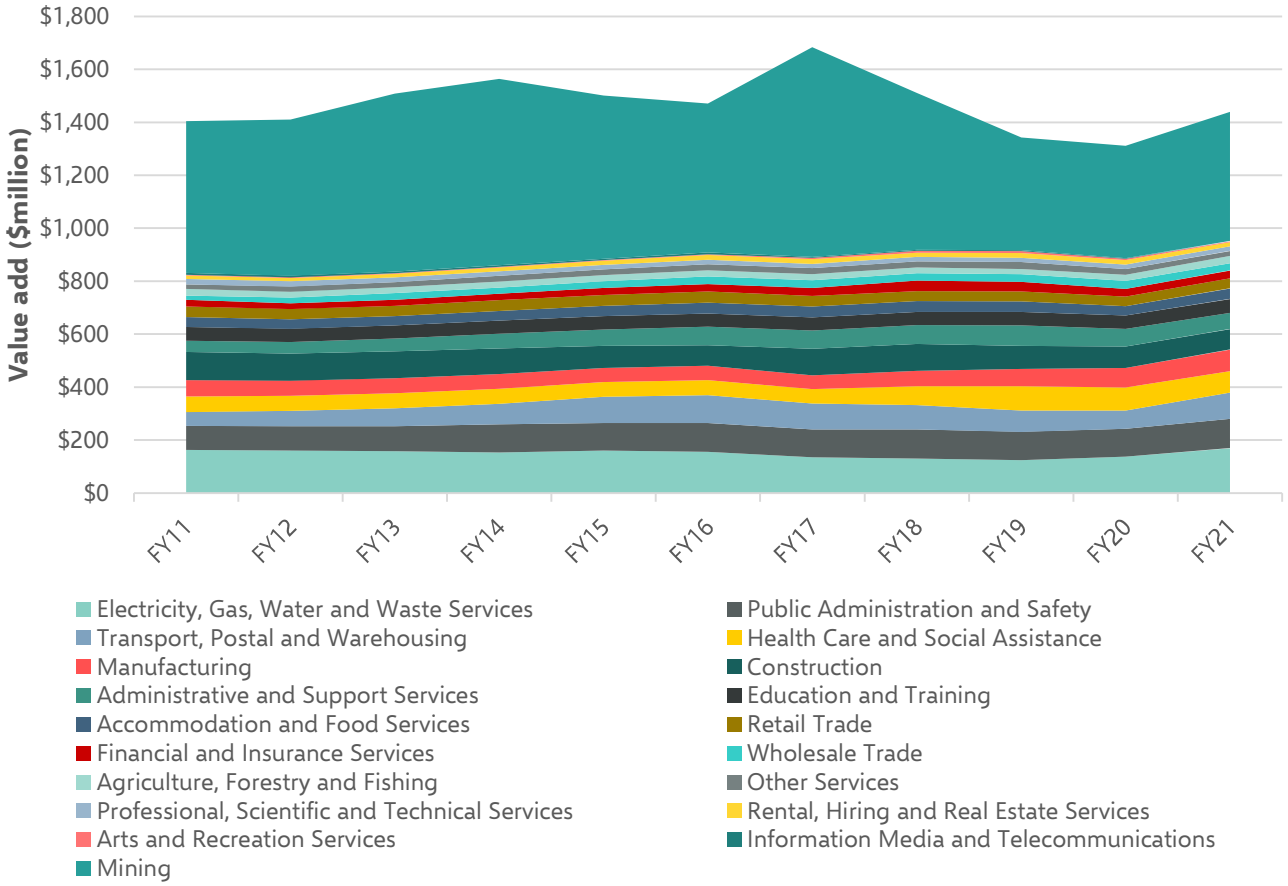

Figure 3. Economic baseline – economic value added ($million, 2021 dollars)

Source: NIEIR (2021)

2.3 Planning framework for Lithgow

2.3.1 Regional Planning

The NSW Government's vision for regional economies is articulated in a range of planning documents at the state and regional level. This is complemented by the Lithgow community's aspirations which are outlined at the local level under the Integrated Planning and Reporting Framework. Figure 4 outlines the relevant government and community aspirations for the future of Lithgow.

The *Central West and Orana Regional Plan 2041* emphasises Lithgow's location as the gateway between Sydney and the Central West and Orana region and its readiness for transformation[1]. The Regional Plan identifies that the LGA has the potential to build on its industrial heritage and infrastructure to grow renewable energy businesses such as pumped hydro, big batteries, and solar energy, and innovation in advanced, clean manufacturing. Lithgow is positioned as a regional transport interchange hub for road and rail, at the critical two-hour point from Sydney, and ready to leverage its world-class environment to build its tourism sector. The ageing population is also identified as an economic opportunity. Other opportunities identified include agriculture-based industries to supply the Sydney Basin and leveraging proximity to the Western Sydney International Airport and Aerotropolis.

The Regional Plan has prioritised collaboration activities between The Department of Regional NSW, Department of Planning, Industry and Environment, Training Services NSW, Lithgow City Council and industry representatives, to oversee the preparation of an economic transition and diversification plan for Lithgow through a dedicated project governance structure. The Lithgow Emerging Economy Project, established to deliver the diversification plan, engaged with stakeholders and both informed and was informed by the Regional Plan.

The *Lithgow Regional Economic Development Strategy (REDS) 2018-22* has six strategic priorities to deliver "a diverse robust economy, a skilled workforce and an attractive lifestyle creating opportunities for all and a community sharing its outstanding natural environment and heritage with the world":

1. Drive local business capability and inward business investment.
2. Activate and Cultivate a Community of Economic Development Leadership.
3. Create labour force capability in line with future business needs.
4. Prioritise lifestyle infrastructure and local place-making.
5. Foster a collaborative and vibrant community led by a diverse and inclusive culture.
6. Develop tourism and marketing opportunities.

2.3.2 Local planning

At the local level, the inaugural *Lithgow 2040 Local Strategic Planning (LSP) Statement*'s vision is that "the Lithgow region is an ideally located strategic centre with an evolving economy and a resilient and connected community which embraces its proud heritage and world class natural environment[2]". The LSP adopted four themes: Environment, Liveability, Infrastructure and Economy (the Community Strategic Plan noted the inclusion of Resilient).

The community's vision for Lithgow, outlined in *Our Place Our Future: Community Strategic Plan 2022-2032*, is that it is "A centre of regional excellence that:

- Encourages community growth and development

[1] New South Wales Government [NWS Government] (November 2021) Draft Central West and Orana Regional Plan 2041. Accessed at https://www.planningportal.nsw.gov.au/sites/default/files/documents/2021/Draft%20Central%20West%20and%20Orana%20Regional%20Plan%202041.pdf

[2] Lithgow City Council (June 2022). Our Place Our Future: Community Strategic Plan [CSP 2035]. P21, P22, P26, P28 & P29. Accessed at https://council.lithgow.com/council/ipr/

- Contributes to the efficient and effective management of the environment, community and economy for present and future generations[2]."

This has been structured around five themes:

1. Caring for our Community
2. Strengthening our Economy
3. Developing our Built Environment
4. Enhancing our Natural Environment
5. Responsible Governance & Civic Leadership.

Lithgow City Council has identified priorities for revitalising the main street and central business district, building on the historical character and heritage significance, whilst creating a sense of place in public spaces. The Strengthening the Economy theme was informed by strong prioritisation throughout the consultation process of economic development and tourism, attracting more businesses and creating more job opportunities over the next decade, alongside a shift to industries that take advantage of the rail and road infrastructure, proximity between Sydney and the Central West, and creating new value from alternative energy investments[2].

This theme aims to strengthen the economy, providing for sustainable and planned growth through the diversification of the economic base, the development of job opportunities and provision of a range of formal and non-formal educational services[2].

This report builds on the desktop analysis through consultations with state and local government, the private sector, universities and community and not-for-profit organisations. Acknowledgement is given to the foundational work of the *Transition Working Group* which delivered the *A Case for Change* report to diversify Lithgow's economy in the face of any decline in coal mining and coal-fired power generation, with particular consideration of the economic opportunities arising from Western Sydney.

20-year Economic vision for Regional NSW	Identifies Lithgow as a **Metro Satellite functional economic region** due to its proximity and connectivity to Sydney, in particular **Western Sydney**, and **eastern ports** as well as the concentration of **historical economic growth** in the mining industry.
Central West and Orana Regional Plan 2041	LGA has the potential to build on its **industrial heritage** and infrastructure to grow **renewable energy businesses** such as pumped hydro, big batteries, solar and wind energy, and **innovation in clean manufacturing**. Lithgow is positioned as a **transport interchange hub for road and rail**, at the critical two-hour point from Sydney, and ready to leverage its world-class environment to build its **tourism sector**.
Lithgow Regional Economic Development Strategy 2018-2022	"A **diverse robust economy**, a **skilled workforce** and an **attractive lifestyle** creating opportunities for all and a community sharing its outstanding **natural environment and heritage** with the world"
Lithgow 2040 Local Strategic Planning Statement	"Lithgow region is an ideally located strategic centre with an **evolving economy** and a **resilient and connected community** which **embraces its proud heritage** and world class natural environment ".
Lithgow Community Strategic Plan 2022 - 2032	A **centre of regional excellence** that encourages community growth and development; and contributes to the efficient and effective **management of the environment, community and economy** for present and future generations ."
Lithgow City Council CSP Research	What residents would like to see changed in Lithgow: • Upgrading / maintaining roads • **Economic development & Tourism (attract more business / job opportunities)** • More better shopping options

Figure 4. Government and community aspirations for Lithgow's future

2.3.3 Placemaking

"Placemaking is the process of creating quality places where people want to live, work, play, shop, learn, and visit." [3] Placemaking approaches generally address community design and development, focusing particularly on public spaces such as main streets, parks, public squares and neighbourhoods close to densely populated areas to engage the community in interesting activities. Placemaking can also be a valuable economic development tool, leveraging design to attract workers, shoppers, diners and tourists to business, retail and commercial areas, for example. Placemaking can also guide public infrastructure development.

Placemaking builds individual and collective experiences by taking into account issues and opportunities from a user perspective, including accessibility and dignity of access, intergenerational planning and needs, social inclusion and minimising social isolation, interaction with the natural environment and ecology, comfort and amenity, legibility and wayfinding, sense of safety, mental and physical health benefits, cultural sharing and expression through the public realm.

The purpose of a place making approach is to:

- Increase social engagement.
- Improve the use and activation of underutilised spaces, seeing them as an opportunity, not a problem.
- Increase economic growth and value by encouraging people to linger and lift the value of assets.
- Enhance the civic role of the public realm, building a sense of shared belonging and fostering community stewardship.
- Build social capital, community partnership and integrated approaches to the delivery of community services.
- Foster distinctive places that build upon community strengths and character and create a distinct brand and identity.

The recently published Central West Regional Plan 2041 includes several objectives and strategies that relate to placemaking contributing to healthy and prosperous centres and helping to attract and retain workers. Strategy 12.2 in particular includes the following initiatives that could be embedded in local strategic planning and local plans to strengthen commercial cores:

- Creating active streets with local character,

Case study: Germany

In a 2019 Climate Policy study, Oei et al evaluated the success of the policies used to phase-out coal mining in Germany. Oei et al argued that "the protection of a declining industry for decades caused increased transition costs compared to an earlier phase-out" and highlighted the importance of combining "not only policies addressing unemployment and the attraction of new energy corporations and investments, but also measures improving infrastructure, education, research facilities, and soft location factors." Soft location factors include "cultural and leisure time possibilities, as well as environmental issues (e.g. air pollution levels and clean rivers)" and influence the public perception of a region. Oei et al argued that improved soft location factors increased the quality of life in a region and persuaded people to stay and migrate there.

[3] https://www.canr.msu.edu/nci/uploads/files/pmguidebook_final_wcag2.0_v.01.06_metadata.pdf

- enabling night-time uses,
- supporting a mix of land uses so that local streets and spaces can adapt to the changing retail environment,
- activating underutilised sites and facilities for temporary uses or demonstration infill development projects,
- improving public open space, public facilities, green infrastructure and green walkable, liveable streets, and
- enhancing and protecting creative work and performance spaces and facilitating street art.

Placemaking initiatives, that are community driven, help to establish community ownership, create enhanced place identity and community cohesion, have the potential to increase visitation and tourism, and attract residents and businesses.

Lithgow Council acknowledges that transitions, if responded to poorly, can result in collective feelings of loss, marginalisation, loss of value and hopelessness. Global best practice points to:

- bold preservation of key items of heritage and local identity,
- strong, connected and connecting public spaces, and
- disruptive public art and architecture - presenting change as exciting.

These things are considered desirable as part of a community that embraces transition with pride and optimism.

3 An aspirational future for Lithgow

3.1 Advantages of natural endowments, infrastructure and human capital

3.1.1 What makes Lithgow unique?

Lithgow is located in a mountain valley surrounded by varied landscape characterised by seven valleys. The area has distinct natural values with seven National Parks (world heritage Blue Mountains, Wollemi home to the Jurassic age tree -Wollemi Pine, Gardens of Stone, Kanangra Boyd, Capertee, Turon and Marrangaroo), two Nature Reserve (Evans Crown and Winburndale), a State Conservation Area (Mugii Murum-ban) and a number of native hardwood and pine plantation State Forests.

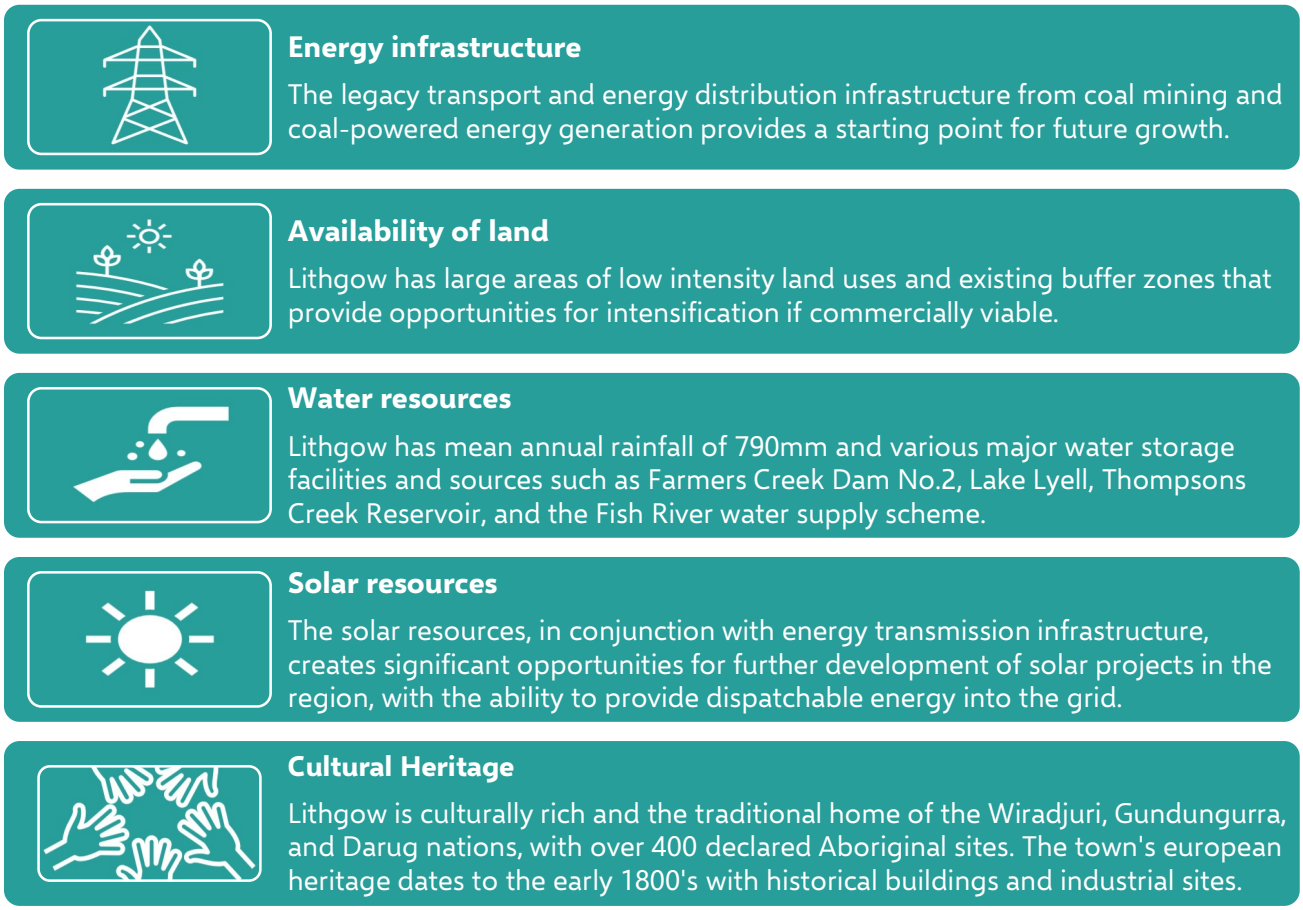

Figure 5. Natural endowments, build environment and infrastructure

The Lithgow LGA lies almost wholly within the Wiradjuri Aboriginal nation, with the Gundungurra nation situated to the south and the Darug nation to the east. There are 406 declared Aboriginal sites, with many works of art including rock art and Aboriginal Places protected under the Aboriginal Heritage Act.

Lithgow is known for its rich industrial and mining heritage. Lithgow has a number of heritage listed sites and is also adjacent to many attractions including Zig Zag railway, and Glen Davis in the Capertee Valley, the second largest canyon in the world. Lithgow also hosts a number of tourism and cultural events that attract large numbers of visitors.

In addition to the major urban areas of Lithgow, the wider LGA includes 12 villages/hamlets which provide rural residential living.

With its history of power generation and supply to Sydney, Lithgow has substantial high voltage electricity infrastructure and an exclusive water catchment with substantial water resources. Figure 5 presents a summary of the key regional endowments of Lithgow, including consideration of infrastructure, land, and natural resources.

3.1.2 Opportunities to establish Lithgow as a destination to improve visitation and exposure that will attract future residents

Revitalising the City of Lithgow and engaging in placemaking initiatives enhances the community and built environment for current residents and increases attraction for new residents. Key opportunities to improve visitation and exposure include:

- Lithgow has a well-established yet small tourism industry, based around attractions such as Lake Lyell and industrial heritage sites.
- It is less than an hour by road or train from the Blue Mountains, a well-established tourist destination of NSW which attracts 4 million visitors a year.
- The Lithgow Community Plan 2030 lists "Turning Lithgow into a hub for visitors to the Blue Mountains region, bringing more people to the area that stay for longer periods of time" as a Priority Project.
- Recently formed Gardens of Stone State Conservation Area which links Wollemi National Park and Blue Mountains National Park has great potential to be elevated as an international tourist attraction.
- The Region has a reasonably large visiting friends and relatives' market, providing the opportunity to put in place local and regional promotions to encourage residents to show their visitors around the area.
- It is likely that a significant proportion of visitors to Bathurst and the Mudgee area will have passed through Lithgow LGA. This provides an opportunity to use signage and other mediums to raise the profile of Lithgow and stimulate interest in the area.
- Main Street in Lithgow with its historic buildings making up the streetscape has potential to be utilised as social meeting places with outdoor dining spaces.
- The main streets of Lithgow have good views and vistas which could also be enhanced with seasonal flowering trees and other activation methods.

3.1.3 Opportunities to diversify the Lithgow economy around its natural endowments, human capital, and established infrastructure

All sectors of Lithgow's economy are important and contribute to the diversity and resilience of the local economy. The baseline analysis has identified that while the mining sector has demonstrated some volatility

over time, the majority of Lithgow's diverse economic activity has performed consistently over the last decade. In consideration of the endowments and constraints in the local environment, it is the view of the LEEP project team that new growth will not arise from a sector that is not currently present in the local economy. However, within the manufacturing sector, new industries may emerge such as the manufacturing of green building materials.

An analysis of the current sectors in the Lithgow economy has identified sectors that align with Lithgow's demographic trends, are existing specialisations, have demonstrated a local competitive effect in the recent past, or may derive some competitive or comparative advantage from the natural endowments, infrastructure, and human capital present in, or adjacent to, the LGA. These sectors were also considered for their capacity to absorb capital, benefit from infrastructure investments, and grow at inorganic rates – outlined in Table 1. The qualitative assessment represented by the ticks below can be interpreted as:

✓ = No unique advantages or a limited degree of advantage provided.

✓ ✓ = A moderate degree of advantage provided.

✓ ✓ ✓ = A high degree of advantage provided.

See Section 4.5 of Appendix C for further details on the scoring approach.

This identification is not exhaustive of the growth opportunities for Lithgow and does not constitute a 'selection' or picking of 'winners', nor does it exclude other sectors or limit growth opportunities outside of the sectors analysed in this report.

The actions identified in this Action Plan have been designed to enable NSW government and the Lithgow City Council to prioritise planning and enabler activities that will benefit all economic sectors. Furthermore, the sectors examined in depth within this report are aligned with those identified for Lithgow in the NSW Government *Regional Economic Development Strategy (REDS) 2018-22*.

Table 1. Lithgow's endowments and key sectors with potential to benefit

Sector	Industry	Historical advantages		Endowments			Rationale
		Demographic trends	Existing specialisation	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
Industrial	Electricity, Gas, Water and Waste Services (Alternative energy)	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	The alternative energy sector is likely to thrive because of the existence of an appropriate workforce, largescale energy infrastructure (which is likely to be underutilised in the future), and an abundance of natural resources (high solar exposure levels and an abundance of rivers, lakes and suitable land).
	Manufacturing	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓	✓ ✓	The manufacturing sector has potential to attract high capital investment, and benefits from the workforce, electricity and transportation networks, and suitable zoning. Natural endowments for renewable energy could enable a 'clean manufacturing' sector to emerge.
Health, Social and Public Services	Health Care and Social Services	✓ ✓ ✓	✓	✓ ✓ ✓	✓ ✓	✓	✓	Lithgow doesn't provide any considerable endowments for health care and social services, with the exception of a base of human capital. However, due to demographics and its position as the second largest workforce in the LGA, it is a foundational sector of the local economy.

Sector	Industry	Demographic trends	Historical advantages		Endowments			Rationale
			Existing specialisation	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
	Public Administration and Safety	✓	✓ ✓	✓	✓ ✓ ✓	✓	✓	Public administration and safety is a significant sector of employment in the LGA and a foundational sector of the economy. Government has a high level of influence over the sector's growth or decline.
Tourism	Retail Trade and Accommodation and Food Services	✓	✓	✓ ✓	✓ ✓	✓	✓ ✓ ✓	The regions natural endowments, historical buildings, proximity to a large population in Sydney, and enrolments in tourism and hospitality certificates (emerging workforce) present opportunities for tourism to drive retail trade and accommodation services. Upcoming improvements to the Great Western Highway will improve access to Lithgow.
	Arts and Recreation Services	✓	✓	✓ ✓	✓	✓	✓ ✓	Lithgow has a vibrant arts community that complements the heritage architecture of the place, Arts has the potential to shape the community and strengthen the development of a tourism industry. The natural endowment affords potential for recreation services.

3.1.4 Opportunities to incorporate placemaking priorities or initiatives into existing Council plans and strategies

Placemaking could be a useful tool to support Lithgow's transition by acting as the connection between the community and the economic transition bringing the community along on the transition journey and providing educational opportunities to enhance understanding of the transition. Specific community-scale projects could be explored such as community solar projects, to generally strengthen climate action and understanding of initiatives. Other opportunities for Lithgow could look at leveraging existing assets and revitalisation opportunities.

The following Council documents have aspects that intersect with a placemaking approach.

Engagement undertaken for the **Community Strategic Plan 2035** identified support for future projects and initiatives including:

- Main Street in Lithgow should be revitalised whilst maintaining its heritage look and feel.
- Efforts should be increased to attract more tourism to the LGA.
- More support for local volunteer groups.
- More community activities and events, such as Halloween.

A Councillor workshop also noted emphasis from participants on upgrading and maintenance of infrastructure and the local area.

The **Lithgow Land Use Strategy 2010-2030** has the following actions relating to tourism and land use:

- Identify areas of agglomeration of tourist related development or potential for such development and consider introducing a tourist zone over these areas in the Lithgow LGA 2011 LEP.
- Ensure that rural villages provide for a range of tourism support land uses such as restaurants, cafes, service stations etc.

The **Lithgow Regional Economic Development Strategy 2018-2022 (REDS)** advocates for a placemaking approach to attract new investment and for businesses to attract and retain skilled staff. The Strategy aims to 'achieve a critical mass in the villages and ensure Lithgow grows into a thriving city. It proposes landscape plans for the towns and villages, street trees, connected greenspaces, improved walk and cycle ways, main street revitalisation, improved local road network, utility services for the villages, and a network of unique playgrounds, parks and gardens for residents and visitors alike'.

This Strategy is closely linked to developing tourism opportunities and encouraging people travelling through Lithgow to think of it as a destination, rather than a thoroughfare.

The **Heritage Development Control Plan Study 2010** identifies opportunities for the introduction of significant conservation areas across the LGA. Each of the areas nominated has the potential to attract visitors and provide for heritage-based tourism. The significant areas include:

- The predominantly residential precincts in Lithgow of Cook Street, Eskbank Street, Hassans Walls Road, Inch Street, Silcock Street, Whitton and Mort Streets, as well as the Main Street shopping precinct.
- Wallerawang and Portland Town Centres.
- The villages of Rydal, Capertee, Little Hartley, and Hartley Vale.

The **Lithgow Cultural Precinct Study 2010** was undertaken to explore the potential for a number of Council owned facilities to support the development of cultural industries in the town of Lithgow. The facilities included: the Union Theatre, Eskbank Station (not owned by Council), Eskbank House, Blast Furnace Park and Lake Pillans. Key recommendations relevant to placemaking include:

- Develop and implement a wayfinding and signage scheme.
- Design and implement public space improvements.
- Revitalise and support cultural infrastructure on Bridge Street.
- Revitalise the top end of Main Street.
- Develop and support temporary programs and events north of the railway.
- Improve accessibility and circulation.
- Encourage a whole of community approach to supporting the growth of the cultural industries.
- Plan for future expansion of the cultural precinct.

The **Open Space and Recreational Needs Study** evaluates the open space, recreational and sporting facilities throughout the LGA, assesses likely future demand for access to open space and facilities and provides recommendations for the improvement of existing areas and facilities and development of additional facilities.

The Study identifies many parcels of lands used for both local and tourism related purposes. This includes sporting fields, parks, nature reserves and other recreational areas. Many of the areas are used for tourism purposes with activities including:

- Festivals and events
- Sporting events
- Bushwalking and picnicking
- Scenic Lookouts
- Walking and cycle trails
- Water sports
- General recreation.

The **Festival and Events Strategy** recognises the potential for events to generate significant economic and social benefits for the LGA. The Strategy provides a framework for the development and coordination of events in the Lithgow LGA. Events are becoming an increasingly significant generator of visitation to the LGA. The Strategy contains the following objectives:

- Identify and support the delivery of a diverse range of quality festivals and events.
- Ensure that Council procedures are reviewed and streamlined to assist with the smooth running of festivals and events ensuring quality and safety.
- Encourage participation from the community essential to the success and sustainability of events.
- Develop essential infrastructure to improve the region's capacity to harness, retain and deliver high quality festivals and events.

- Capture the social, cultural, environmental and economic benefits provided by events.
- Ensure effective marketing of events within the municipality and the effective communication of event related issues to relevant stakeholders.
- Evaluate and monitor festivals and events.

3.2 Establishing a working 'vision' for the Lithgow economy

Consistent with the aspirations of stakeholders, the following vision has been drafted to encapsulate the potential future economy of Lithgow and the social fabric that will support growth. These vision statements do not represent community or stakeholder endorsed language, rather were drawn from the consultation process to establish a working narrative for further consultation and refinement.

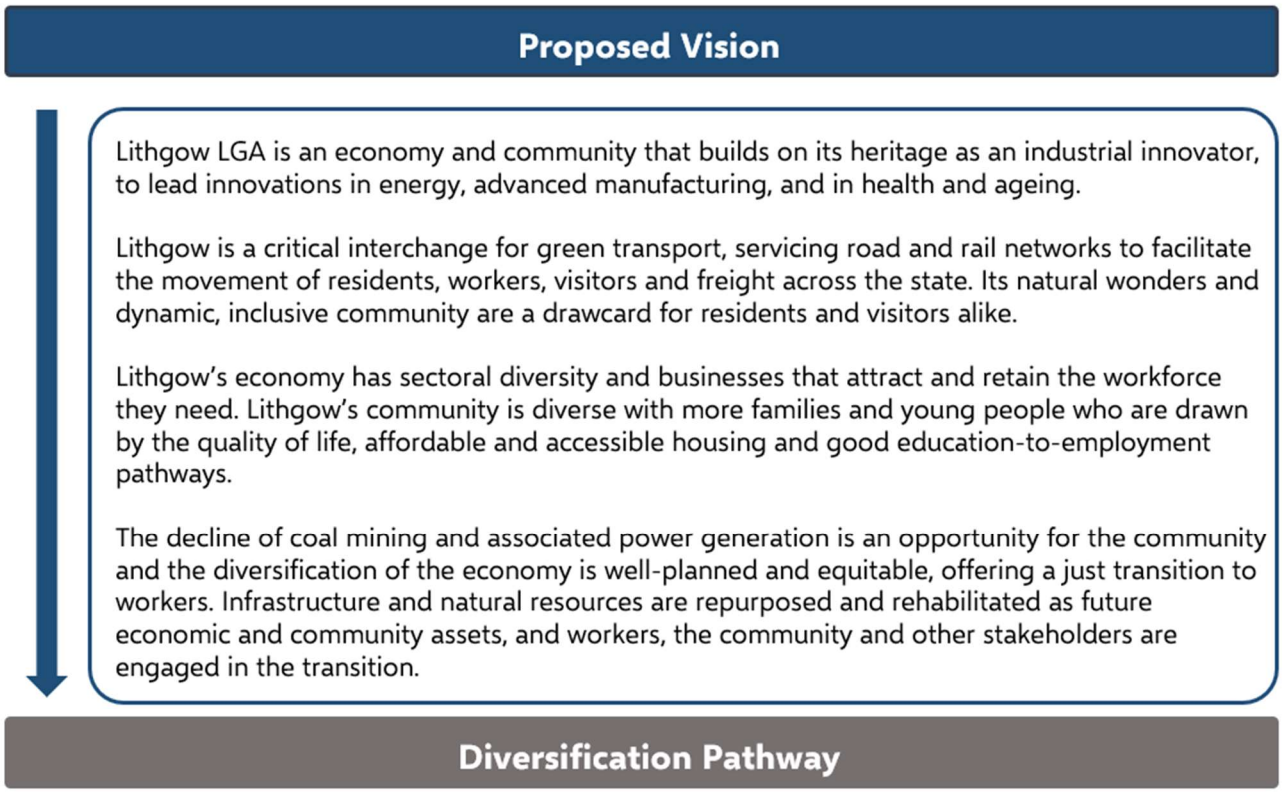

Figure 6. Proposed vision for the future Lithgow economy

3.3 The pathway to diversification in Lithgow

The Lithgow economy will transform, supported by opportunities and growth in established sectors, including innovation and emergence of new industries within sectors. An aspirational growth scenario for targeted sectors would enable Lithgow to sustain its economy through a transition from coal mining and coal-fired electricity generation.

Population growth rates are expected to broadly align with the NSW Government projections, with scenarios ranging from a CAGR of -0.1% used in common planning assumptions, up to 0.4% in the optimistic estimates, over the next 10 years. This means that under a successful transition, workers are empowered to transition to other jobs locally or new workers are attracted to the region. The forecasted high growth in the aged cohort will serve to drive some economic activity (e.g. aged care); however, successful transition will also be

represented by growth in jobs available for the younger cohort (e.g. tourism, innovation sectors, advanced manufacturing), shifting the demographic makeup of the region. Attracting families and retaining the younger generation will be key for Lithgow's future growth.

The transition will depend on the timing of any mine closures, the transient impacts of decommissioning, and the timing of new projects being implemented. Lessons learned from around the world (See Appendix B) highlight the importance of taking steps towards the transition as soon as possible to mitigate any downside risks. Achieving an aspirational growth scenario will require both the successful delivery of a range of projects that have been already identified, and the identification and delivery of projects that are unidentified at the time of this report.

Drawing on global lessons learned, and stakeholder engagement between February 2022 and August 2022, the proposed pathway to achieving the vision for the Lithgow economy is:

- **Ensuring a resilient, diverse economy**, with early and ongoing identification and stimulus of sectors and investments with strong growth potential to replace the economic contribution of mining and coal-fired power generation. This aligns with the Regional Plan objective of achieving prosperity, productivity, and innovation.
- **Supporting the coal transition** to optimise the outcomes for the economy, workers, supply chains, local infrastructure and resources, the environment and the community. This aligns with the Regional Plan objective of achieving prosperity, productivity, and innovation.
- **Leading for growth** through adaptive leadership and clear governance and implementation arrangements, underpinned by stakeholder engagement and monitoring, evaluation, learning and reporting. This aligns with the Regional Plan collaboration activities.

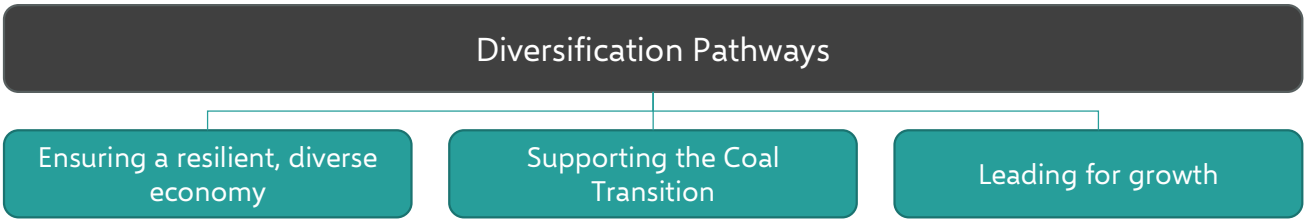

Figure 7. Diversification pathway to achieving the vision for the Lithgow economy

This report is structured around the diversification pathways to support and inform local government activity, as well as industry investment and capital attraction.

4 Ensuring a resilient, diverse economy

4.1 Analytical framework

Given the size of the economic contribution from mining and energy production, aggressive but realistic growth will be required to offset any future impacts on economic activity. Should any economy experience a relatively fast decline in a dominant industry, such as a shock to the coal mining industry, economic development effort would be required to attract investment into industries that can absorb capital and grow at an inorganic rate to offset the shock. Not all industries have capacity for rapid growth. For example, it takes time to attract and deploy capital across industries with low asset concentrations, because a large number of transactions are required across the industry to deploy capital. Services industries (with low asset intensity) also take time to attract, train and deploy human capital at scale. For example, it is difficult for an individual services business to scale from 5 to 100 to 200 personnel in the timeframes required to offset an economic shock – let alone achieving an industry-scale ramp up equivalent in size to the economic output the coal mining industry.

Key sectors for the future Lithgow economy

The assessment of sectors is summarised in Section 3.1.3 and outlined in detail in Appendix C. The energy, manufacturing and tourism sectors are identified in the REDS, and stand to benefit from the human, infrastructure, and natural endowments of the region and could be well positioned for investment and inorganic growth due to these advantages. The health care and social services and public administration sectors are foundational sectors for the Lithgow economy. These sectors represent high proportions of the local workforce and should be considered in the action plan due to the level of public sector control on local activity, providing opportunities to mitigate risks and respond to demographic trends driving demand (e.g. aging population).

Agriculture activity is present in the Central West region, however the prospects for the agriculture sector in Lithgow are less clear. While there is land and water available there are a number of other constraints and trends that indicate agriculture is not likely to experience outsized growth in Lithgow. These factors are discussed in the following section. The remaining sectors were not assessed to have any major advantages in Lithgow and may not represent areas of focus for future efforts. However, it should be noted that, their exclusion does not mean investment is unlikely to occur, rather they may be a lower priority for government efforts and are likely to continue with business-as-usual growth.

Figure 8 presents the sectors identified through our analysis using the above criteria and a high-level description of the vision for each. The draft proposed outcomes for each sector are summarised in Figure 9 below.

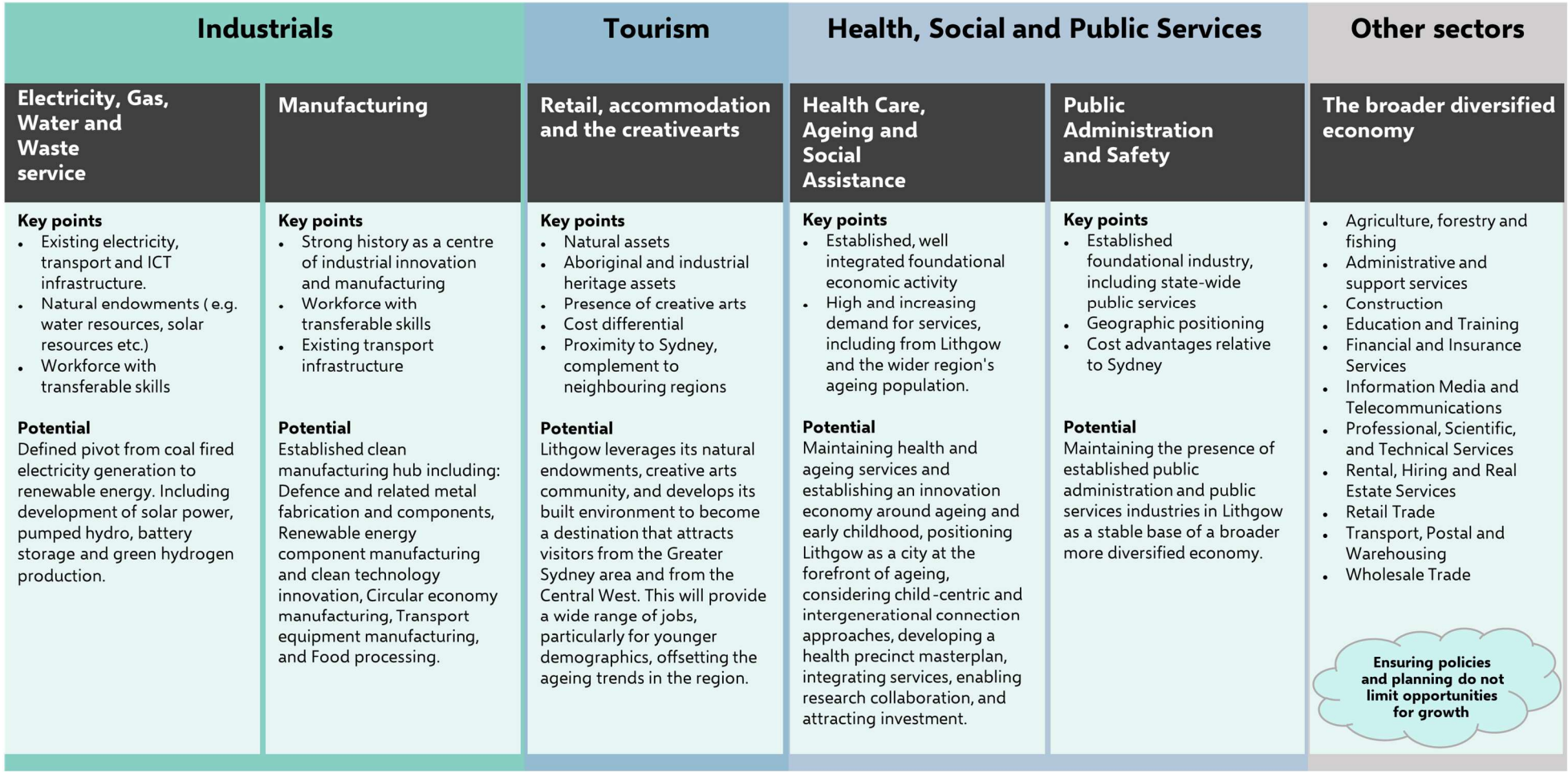

Figure 8. Key areas of focus for a strengthened Lithgow economy

Source: NCEconomics and Acclimate Partners

These priority sectors were used to develop future scenarios for Lithgow's transition. The scenarios consider:

- the proposed outcomes for the sector
- the current context
- key growth drivers and approaches
- infrastructure, land use, and workforce requirements
- economic target setting, including benchmarks for economic growth from comparable LGAs and consideration of economic impact of identified projects
- proposed key actions required to facilitate growth.

The analysis uses a target-based approach, where benchmarks from comparable LGAs were assessed to determine aspirational targets for each of the priority sectors in Lithgow. These targets were then used to develop an economy-wide aspirational scenario for the Lithgow economy, which informs the actions required to achieve those targets. Figure 9 presents the transition under this scenario over the next 10 years in terms of value added in the economy.

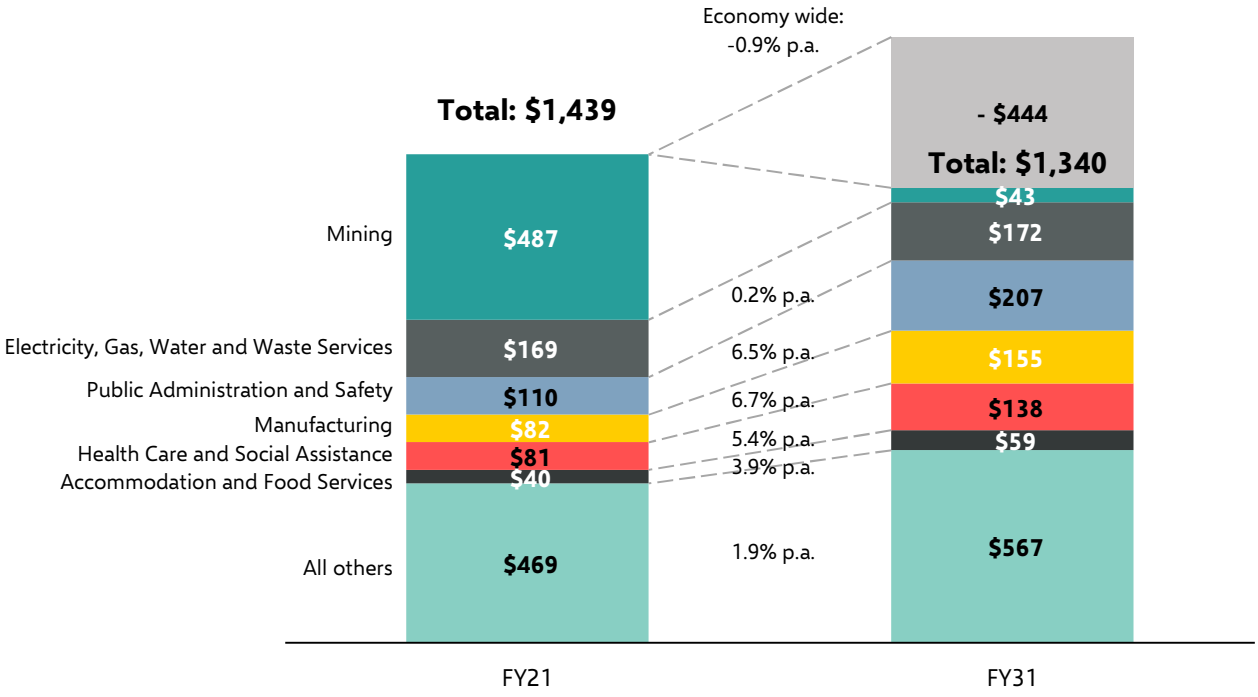

Figure 9. Lithgow 10-year aspirational growth scenario by sector value added ($millions, 2022 dollars)

Source: NCEconomics and Acclimate Partners

Sections 4.2 to 4.9 illustrate the future scenarios developed for the priority sectors in more detail, while Section 4.10 presents a number of whole of economy actions which cut across all sectors. It should be noted that to stand the best chance of a successful and smooth transition, the recommended actions should be implemented as soon as possible, rather than waiting until any closure of the coal mines and coal-fired power generation commences.

The following scenarios, including proposals for actions to stimulate economic activity, have been developed through extensive one-on-one stakeholder engagement and desktop analysis.

4.2 Industrials: Electricity, Water and Waste Sector

4.2.1 Proposed outcome

Lithgow becomes a global example of successful transition to a renewables-led, new energy economy.

4.2.2 Context

NSW Government has committed to achieve net-zero emissions by 2050 and to halve emissions by 2030 in line with global action to keep global warming as close to 1.5 degrees Celsius as possible. The Commonwealth Government recently increased Australia's Nationally Determined Commitments to a 43 per cent reduction on 2005 emissions by 2030. The Albanese Government is planning to implement its Powering Australia[4] plan which involves a major increase in the proportion of renewables in the electricity system from about 33 per cent to 82 per cent by 2030. A major step in this direction occurred in December 2022 when Australia's energy ministers unanimously agreed to establish a Capacity Investment Scheme (CIS) ('renewables generation and storage as the nation's coal-fired power stations exist the energy market. In the face of net zero commitments and a desire to increase renewables in Australia, Lithgow has the opportunity to transform to a renewables-led economy.

A key plank of the NSW Electricity Strategy[5] is to establish Renewable Energy Zones (REZs) across NSW. REZs have been designed to facilitate large scale investment in renewable energy 'hot spots' and share the costs and benefits of building transmission infrastructure to deliver the low-cost energy to demand centres. This will bring forward large-scale, low-cost and zero carbon energy to assist the decarbonisation of the NSW electricity grid. Solar and wind power are the major sources of power that will replace coal and gas fired electricity generation in NSW.

However, construction of high voltage transmission infrastructure to deliver the renewable energy into the national energy market will take time. For example, the Central West and Orana REZ, which will attract around $5.2 billion of private investment and support about 3900 peak construction jobs and 500 ongoing jobs[6] is expected to be operational by the mid-2020s. In December 2022, NSW Government declared its fourth REZ, the Hunter-Central Coast REZ with the Illawarra as the fifth REZ to follow.

Lithgow is not currently a designated REZ and that has the potential to distract investors from projects in the Lithgow area. Notwithstanding, Lithgow has the advantage of enabling the Central West Orana REZ through existing transmission lines to and from the major demand centres around Sydney and could provide a quicker solution to stress the current electricity system. Lithgow also has an existing highly skilled workforce which could assist in quickly unlocking new renewable generation and storage in line with the imminent Capacity Investment Scheme. A priority is for Lithgow City Council, NSW Government and local businesses and stakeholders, such as EA, Banpu and Greenspot, to develop proposals for accessing funding and leveraging off the CIS.

Lithgow's infrastructure includes a 550kV line to support the existing 1,400 MW Mount Piper power station and a 330kV line which was built to support the now closed 1,000 MW Wallerawang Power Station. There is the potential availability of more than 2,400 MW of transmission capacity available as the existing coal power

[4] Reputex Energy (December 2021). The Economic Impact of the ALP's Powering Australia Plan. Accessed at: https://www.reputex.com/wp-content/uploads/2021/12/REPUTEX_The-economic-impact-of-the-ALPs-Powering-Australia-Plan_Summary-Report-1221-2.pdf
[5] https://www.energy.nsw.gov.au/government-and-regulation/electricity-strategy
[6] https://www.environment.nsw.gov.au/news/central-west-orana-renewable-energy-zone-powers-ahead

stations continue to close. Closure of Wallerawang power station during 2013-2014 made substantial transmission capacity available for grid firming and additional renewable energy deployment.

4.2.3 Drivers of growth

The national electricity grid is currently under great strain as the proportion of renewable generation continues to accelerate. On 15 June 2022 AEMO took the unprecedented step of suspending the electricity market in all regions of the National Energy Market (NEM) because it became impossible to continue operating the spot market while ensuring a secure and reliable supply of electricity to consumers[7]. There was a real risk of large-scale blackouts in the NEM (similar to what was experienced in South Australia in 2017). The AEMO Electricity Statement of Opportunities released on 31 August 2022 again highlighted the need for urgent action to keep power supplies secure. NSW could breach reliability standards in 2024-25, 4 years earlier than forecast last year. Figure 10 presents the energy reliability standards and the forecasts for each state.

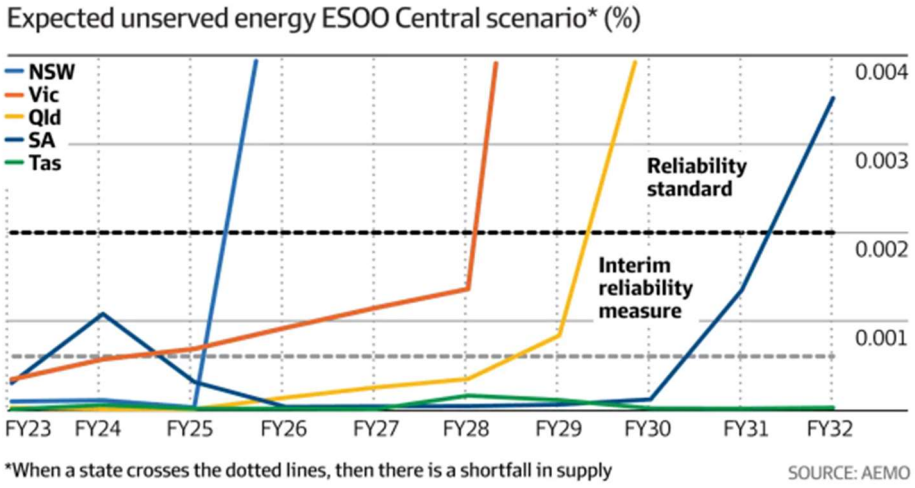

Figure 10. Energy reliability standards and state forecasts

Source: Australian Energy Market Operator

There is an immediate need for grid support infrastructure and ancillary services (such as inertia and frequency control). Currently, the NEM relies on 23 GW of dispatchable firm capacity from coal-fired generation, 11 GW from gas fired and liquid-fuelled generation, 7 GW from hydro generation (excluding those that rely solely on pumped hydro to operate), and 1.5 GW from dispatchable energy storage (including pumped hydro and battery storage). Providing large increases in storage are urgently needed to support the grid. Coal fired power stations are closing quicker than expected. In its 2022 Integrated System Plan (ISP), AEMO is expecting the 'step change' energy transition is the most likely scenario.[8] This will require an increase in storage capacity (batteries, virtual power plants, pumped hydro) will need to increase by a factor of 30. By 2030 storage capacity will need to increase from 2 GW to 15 GW. By 2050 an additional 61GW will be needed.

The ISP also identifies major transmission infrastructure which need to commence immediately such as the Sydney Ring to support an additional REZ development and 5000 MW transfer capacity into Sydney, Newcastle and Wollongong area. The Sydney Ring is estimated to cost between $0.9 billion and $2.25 billion and optimally timed for delivery in 2027-28. It is anticipated that the new Federal Government will support such projects as the Sydney Ring under its $20 billion 'Rewiring the Nation' plan which will involve an

[7] https://aemo.com.au/newsroom/media-release/aemo-suspends-nem-wholesale-market
[8] https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp

estimated 10,000 kilometres of new transmission lines. There is also the potential to use part of the funds on projects which avoid new transmission line such as demand energy response (DER) projects.

Lithgow is well-placed to be part of the solution to these challenges. It is recommended that Lithgow and key energy stakeholders (e.g. EnergyAustralia, Greenspot, Banpu, Neoen) investigate the feasibility of accessing some of the funding for projects that can be built immediately and delivered into the NEM via the existing under-utilised high voltage transmission lines.

4.2.4 Growth approaches

There are great opportunities for Lithgow by embracing a renewables-led economy while Australia and the world decarbonises. There is a major advantage of having existing high voltage transmission infrastructure which can be leveraged to provide greater grid support and help unlock the delivery of more renewable energy into the grid (generated at Lithgow and elsewhere).

Batteries

The Australian Energy Market Operator (AEMO) Integrated System Plan (ISP) states 17 GW of storage will be required to balance the variability in supply from renewable electricity generation. This level of storage is forecast to be met through a mix of battery storage and pumped hydropower. Lithgow, with its existing transmission lines and infrastructure, is very well placed to provide grid support in the form of energy storage – especially via batteries which can be deployed very quickly (e.g. 12-18 months) to help resolve current pressures on the system. This would also help unlock more renewable energy in NSW, including renewable power generated locally in Lithgow and from the Central-West Orana REZ. An ambitious and achievable aim could be to invest at least 2 GW of battery capacity in Lithgow by 2025.

Priority areas include reuse of the existing land at the old Wallerawang power station sites and working with EnergyAustralia and Centennial on opportunities for sites along the 550kV transmission line to Mt Piper power station and the 330 kV transmission line to the Wallerawang site. Subject to all necessary planning approvals opportunities can be considered around reuse of the existing electricity generation and mining land, and infrastructure.

There are currently two proposals for large-scale grid batteries in Lithgow.

- The Greenspot Battery Energy Storage System (BESS) has a capacity of 500 MW that would provide 1,000 MWh of energy storage. The project is located on the main transmission line between the Central West REZ and Sydney – which will provide important grid firming and help unlock the huge (3GW) additional renewable energy power generation by the mid-2020s.
- Neoen is proposing a 500MW battery to be known as the Great Western Battery. The Great Western Battery will be located in the Lithgow region of NSW, just north of Wallerawang and about a 40-minute drive from Bathurst. The Great Western Highway runs to the south of the proposed site.

On 4 August 2022 Greenspot received planning approval from NSW Government authorities to build the 500 MW / 1000 MWh Wallerawang Battery at the old power station site. The project requires $404 million CAPEX investment and will create 100 jobs during the construction. Greenspot proposes to develop the battery in stages – the first stage is a 300 MW facility with a likely storage capacity of 2 hours depending on market conditions. Greenspot also propose to provide $2 million towards local community enhancement projects via the LCC. The first stage of the battery could be operational by summer of 2023-24 prior to the closure of the Liddell power station located in the Hunter Valley. A financial close decision is expected later in 2022.

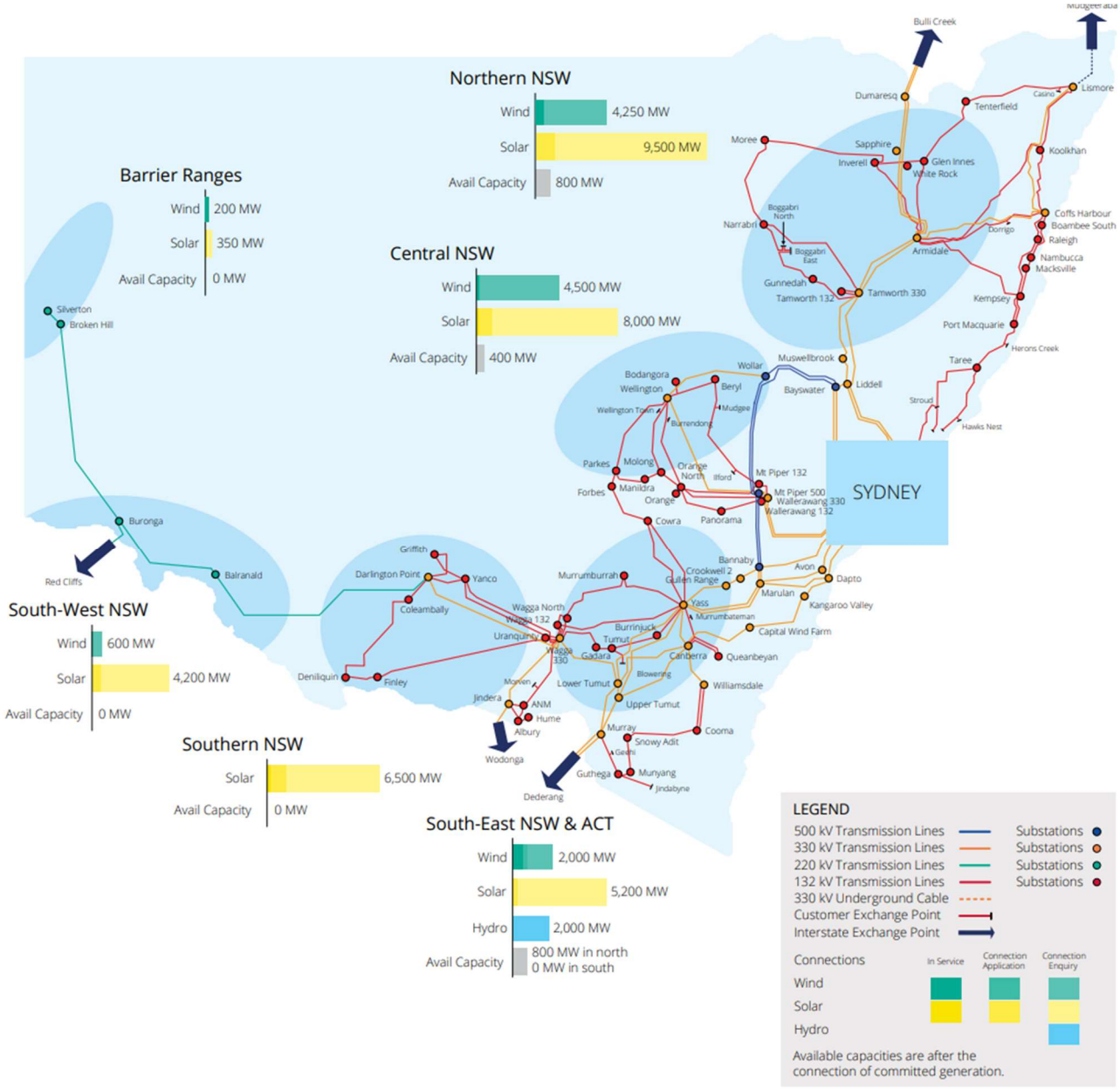

Figure 11. NSW transmission connection activity 2016-2019

Source: TransGrid, 2019

Solar

Solar is the cheapest source of power for electricity generation in Australia. Lithgow has good potential for support solar power generation. For this report the various locations for solar development in the Lithgow area have been mapped. Figure 12 shows a map of Lithgow's potential for solar power generation accounting proximity to transmission lines, land use, land slope, and solar exposure. The green shaded area represents the highest suitability land in the LGA, although there is an abundance of other suitable locations.

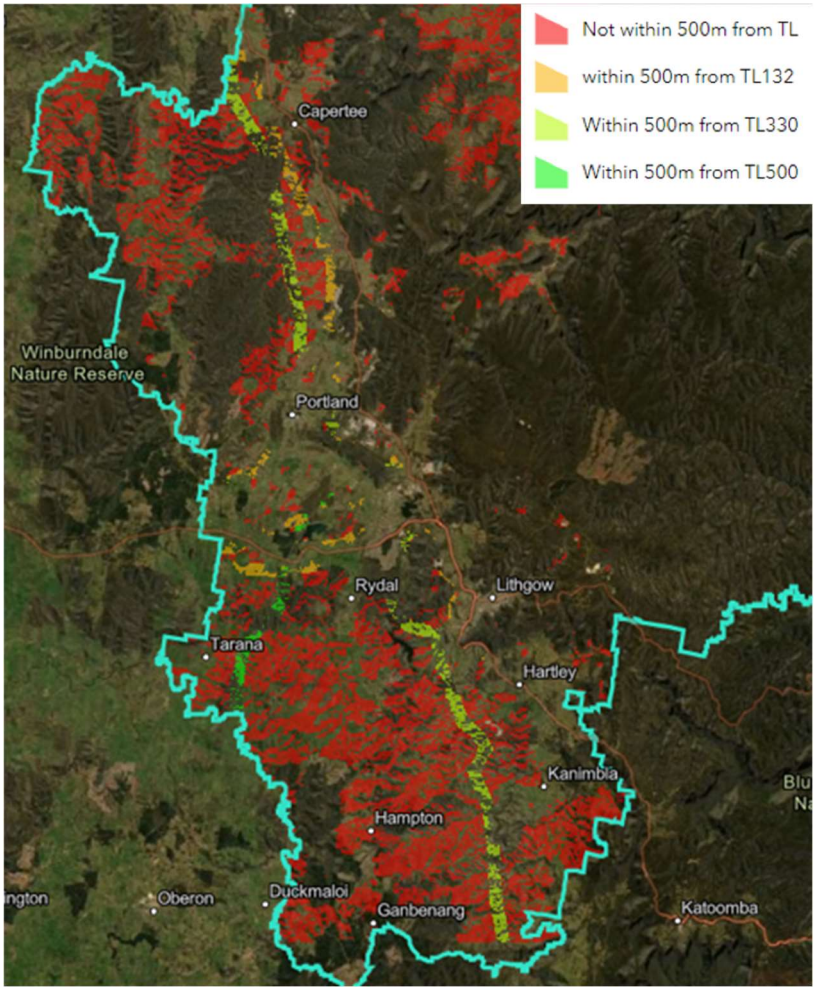

Figure 12. Map of Lithgow's potential for solar power generation

Source: Mosaic Insights analysis based on land use (Department of Planning and Environment, 2020), electricity transmission lines (Geoscience Australia, 2015)

The analysis found good potential for solar power generation in close proximity to high voltage transmission lines. The identified locations also represent suitable areas for the co-location of grid scale batteries. Table 2 shows the potential capacity for solar and storage in the being up to 2,400 MW and 5,500 MW, respectively regarded as 'Tier 2' sites (good sites close to transmission lines). A reasonable target for solar generation in Lithgow would be 1,600 MW and 1,000 MW of batteries by 2030. By comparison the first REZ in Central-West Orana announced in May 2020 attracted submissions for 27,000 MW (27GW) of wind, solar and storage projects for a region with the capacity for 3 GW[9].

Table 2. Potential solar generation and battery storage capacity in Lithgow area

Tier	Attribute	Min	Medium	Max
Tier 1 (near 500kV line)	Sites (no.)	-	2	2
	Capacity (MW)	-	158	236
	Average capacity (MW per site)	-	79	118
Tier 2 (near 330kV line)	Sites (no.)	8	14	15
	Capacity (MW)	555	1,566	2,393

[9] https://www.ecogeneration.com.au/nsw-launches-second-rez-at-8gw-after-first-zone-nine-times-oversubscribed/

Tier	Attribute	Min	Medium	Max
	Average capacity (MW per site)	69	112	160
Batteries (On Tier 1 areas only - 500MW facilities requiring 10ha each)	Sites (no.)			2
	Area (ha)			236
	Capacity (MW)			1,000
Batteries (On Tier 2 areas only - 500MW facilities requiring 10ha each)	Sites (no.)			15
	Area (ha)			2,393
	Capacity (MW)			7,500

Source: Mosaic Insights and NCEconomics analysis based on (Department of Planning and Environment, 2020), electricity transmission lines (Geoscience Australia, 2015)

Water & Pumped Hydro

Lithgow is at the top of the catchment and has relatively high-level water security compared to lower valleys and catchments. EnergyAustralia has access to a large volume of water (approx. 31,200ML) for use in electricity generation.[10] Closure of the Wallerawang Power Station potentially makes water available for other uses including industry, agribusiness, pumped hydro energy storage (PHES) and green hydrogen production. (It takes about 9 litres of water to produce about 1 kilogram of hydrogen.)

In addition benefits of the green hydrogen industry are also identified for the water sector. The need for water for hydrogen generation could stimulate better management of water resources including the efficiency of wastewater treatment, oxygenating hypoxic water bodies, improving the provision of drinking water supplies in arid regions, and making better use of the seawater resource.[11]

There is an abundance of opportunities for pumped hydro in the area. The NSW Pumped Hydro Opportunity Map identifies 1,500 reservoirs, 5,600 possible schemes and 2.2 TW of opportunities in the Central West area, with many of the best locations in close proximity to Lithgow. This is consistent with greenfield pumped hydro opportunities identified by the RE100 Group, Australian National University (ANU)[12]. The model has identified more than 70 potential new off-river PHES site options within Lithgow. Five of these projects are classified as class A (best cost-effectiveness class) and range from 15 GWh with 18 hours of storage to 150 GWh with 18 hours of storage. Of these five projects, four are located in the southern corner of the LGA, in close proximity to a 330kV transmission line. Although the model does not consider geological conditions, land tenure, environmental/social values, or opportunity cost, it identifies opportunities that could be further explored (Figure 13).

[10] GHD (2016). Springvale Water Treatment Project. Report for EnergyAustralia. Retrieved: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-7592%2120190227T234217.337%20GMT

[11] Marcus Newborough, Graham Cooley (2021). Green hydrogen: water use implications and opportunities, Fuel Cells Bulletin, Volume 2021, Issue 12, 2021, Pages 12-15, ISSN 1464-2859, https://doi.org/10.1016/S1464-2859(21)00658-1.

[12] Australian National University (2022). Global Greenfield Pumped Hydro Energy Storage Atlas. 100% Renewable Energy Group. Retrieved: https://re100.eng.anu.edu.au/index.html

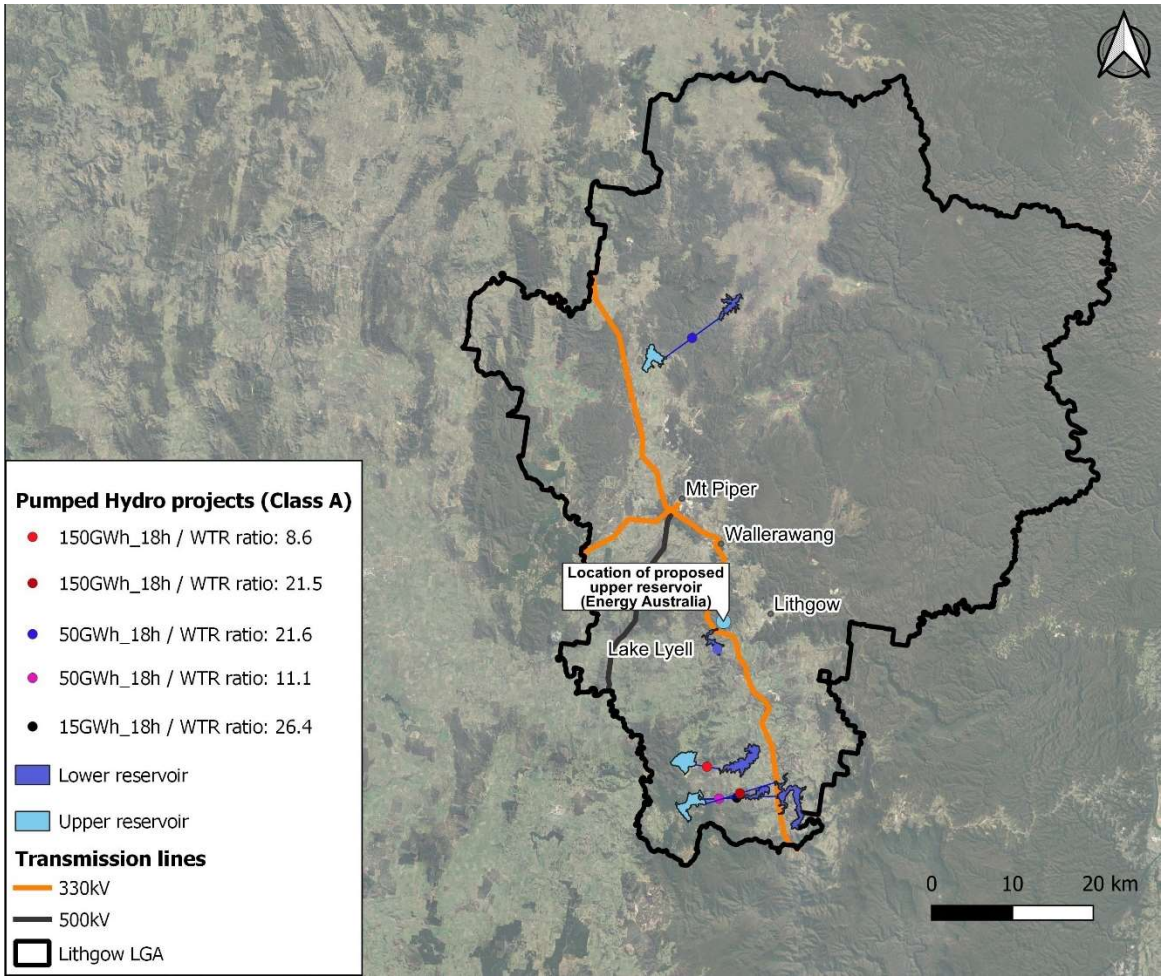

Figure 13. Potential sites for PHES projects within Lithgow

Source: RE100 Group (Australian National University) and EnergyAustralia.

Note: WTR represents Water to Rock ratio, which is a key driver of cost-effectiveness.

Pumped hydro energy storage can use existing differences in topography between a hill where a turkey nest storage can be built and a lower lake or reservoir where water can be pumped from. Ideally a difference (or "head') of about 300m is needed. Past coal and gold mines will also be opportunities for PHES. Analysis completed by Centennial indicated that coal mines in the Lithgow area are too gaseous for application of PHES technology. The most likely form of PHES in the area is to use lakes previously using for coal mining and coal fired electricity for PHES with the creation of elevated turkey nest dams on nearby hills.

EnergyAustralia is currently undertaking a feasibility study using Lake Lyell (Figure 13) for a 350 MW PHES with around eight hours storage, enough to power over 150,000 households during peak demand. The proposal has applied for grant funding and EA has received development approval from LCC to take bore samples to see if the geology is suitable for a PHES system.

Having substantial high quality water availability is critical to development of new industries (e.g. green hydrogen manufacturing, agribusiness etc). EnergyAustralia retained the water rights in Lake Wallace, for example, when the Wallerawang power station was closed. There are current restrictions for what this water may be used for (i.e. electricity generation). Under current arrangements this water could be used for pumped hydro energy storage, for example, but not green hydrogen production (unless the hydrogen was being used for electricity generation). Water availability is also a critical asset in a warmer, drying continent. Council, the NSW Government, industry, community and indigenous people will need to carefully consider the best use of

current and future water availability as a result of climate change and energy transition. Any plans for water for the Lithgow region should consider the full implications for that water use and possible reuse and impacts on the catchments, communities and ecosystems that it serves. There are also opportunities to for governments to address social and cultural issues as water is allocated during energy transition. For example, in January 2021, the Victorian Government made water ownership available to Traditional Owners from the Gunaikurnai Land and Waters Aboriginal Corporation. The traditional owners received 2GL of unallocated water in the Mitchel River, Gippsland, a region undergoing major energy transition.

Transport and logistics

Lithgow is very well placed as a 'gateway' for future long haul transport vehicles using zero carbon powerfuels and electric vehicles. Lithgow is strategically located as a road transport hub for long-haul trucks travelling between Sydney-Dubbo, to and from Newcastle or to and from Port Kembla. Lithgow also has rail connection which could be zero carbon powered in the future.

The NSW Government is currently investing $70 million in hydrogen hubs in the Illawarra (Port Kembla) and Hunter and rolling out hydrogen refuelling stations[13]. NSW Government has begun the shortlisting process for projects in the hydrogen hubs. Lithgow has good potential to be an earlier offtake from the Hunter and Illawarra plants and become one of the next hydrogen hubs in NSW.

Renewable hydrogen will likely be used for long haul transport using heavy vehicles, trains and ships – rather than electric vehicles, which are more suited to smaller passenger vehicles. The NSW Government aims to have 10,000 heavy vehicles and 20 percent of the government fleet powered by green hydrogen by 2030.

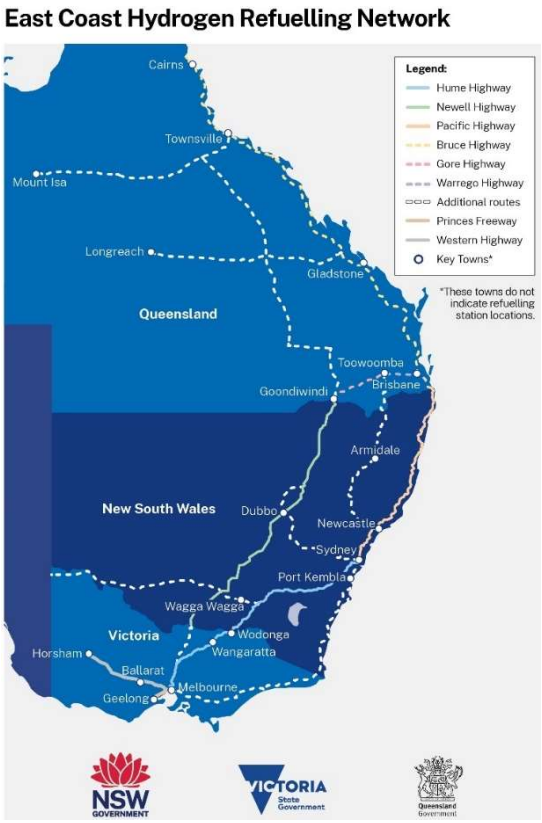

Figure 14. East-coast hydrogen superhighway – strategic location

Source: NSW Government, 2022. Accessed at: https://www.energy.nsw.gov.au/renewables/renewable-generation/hydrogen

[13] https://www.energysaver.nsw.gov.au/reducing-emissions-nsw/net-zero-industry-and-innovation/hydrogen-hubs

'Hydrogen highways' form part of the NSW Government's hydrogen strategy. In March 2022, the NSW Government signed an MoU to build an East Coast Hydrogen Refuelling Network (see Figure 14 above). Whilst Lithgow is not identified on the current map, it is placed in an excellent location for refuelling hydrogen trucks travelling between Sydney and Dubbo. It is also well placed for refuelling hydrogen powered buses and trains (in future).

Lithgow is also well placed to support the development of renewable hydrogen hubs in the Hunter Valley and Illawarra regions. In particular, Lithgow could be a potential 'early off-taker' from one or both of these hubs for a refuelling station to be located in Lithgow as part of the East-coast hydrogen superhighway. There have been preliminary discussions with companies, such as BOC, as a potential technology and infrastructure partner for Lithgow.

In July 2022 the Hume Hydrogen Highway Initiative was launched jointly by the Victorian and NSW governments to support the development of 4 renewable hydrogen refuelling stations along the Hume Highway. It is recommended that a similar initiative be established to establish refuelling stations between the east-coast of NSW and Western NSW (e.g. Dubbo).

Renewable Energy Diversification Scenarios

These are two renewable diversification scenarios that leverage the opportunities to Lithgow. The scenarios are not dependent on each other nor are they mutually exclusive. Different elements of the scenarios also do not have to be developed in series, and in fact are already occurring concurrently. For example, EnergyAustralia is already conducting a feasibility study on PHES. Neoen and Greenspot have plans for batteries, and Banpu is developing the Pinecrest solar farm. Each of the scenarios is about energy diversification from a coal-based to renewables-led new economy. Some of the earlier steps, such as batteries and solar plants support energy diversification but will not be substantial in terms of economic diversification. The diversification scenarios provide guidance on timing and sequencing of effort to lead to higher value jobs in the community. It is the potential to use these early steps, e.g. Solar power plants, to build a pipeline of manufacturing and other businesses supported by zero-carbon energy.

Solar to Green Hydrogen scenario

This scenario is based on driving significant investment (at least 1600 MW) of solar generation, which would be used to generate green hydrogen as the lynchpin for a pipeline of high value jobs in Lithgow.

Solar generation would mostly be through developments such as the Pinecrest solar farm. It should also include developing a solar virtual power plant using roof tops (and other areas) of residents and businesses. The amount of solar power Lithgow can generate – whilst significant – is not as large as that likely to be built in REZs such as the Central-West Orana zone but can be built and delivered to major demand centres using the existing transmission infrastructure, potentially more quickly than the REZs can activate. Another key advantage of this solar generation investment is its ability to provide zero carbon power for storage in batteries and especially PHES. PHES traditionally uses cheap grid power at night (currently with a large greenhouse footprint) to pump the water up the hill. Investment in batteries can be very deployed quickly and provide much needed grid support and help unlock the burgeoning renewable wind and solar power being developed in REZs and elsewhere. However, there are not many jobs associated with batteries. PHES takes longer to develop and involves more high values jobs, especially during the construction phase.

Investment in a first electrolyser plant is an important step for conversion to green hydrogen to potentially provide a zero-carbon vehicle and offtake for other industry, including the potential manufacture of fertilizer and/or green metals in Lithgow. Engaging in the emerging green hydrogen industry also provides potential

manufacturing of electrolysers, fuel cell and other parts of the green hydrogen supply chain. Zero carbon electricity generation and green hydrogen can also support other advanced manufacturing businesses in Lithgow (refer to Section 4.3 Manufacturing).

Green Hydrogen Primed Transport and Logistics Scenario

Lithgow is about a two-hour train trip or drive from Sydney and potentially an important hub for refuelling long haul trucks and train with zero carbon power fuels. This could be large long-haul trucks swapping the large lithium-ion batteries enroute from Sydney to Dubbo or a green hydrogen refuelling station on the east coast hydrogen superhighway. Under this scenario the focus is on building a renewable hydrogen refuelling station and investment in a large electrolyser to produce the zero carbon powerfuel. There is also great potential to leverage the existing train line and provide zero carbon fuel for trains. Under this scenario Lithgow would focus on potential for entering the zero-carbon transport supply chain – potentially converting and building freight rollingstock and parts thereof in a decarbonised transport future (refer to Section 4.3.4 Manufacturing Growth approaches).

4.2.5 Infrastructure and land use needs

Infrastructure and land use needs have been identified within each scenario, focused around maximising the repurposing of transmission lines, water supply (particularly Lake Lyell, Thompsons Creek Dam, and Lake Wallace) and land owned by EnergyAustralia (including Mt Piper and Lake Lyell surrounds), Greenspot (Wallerawang) and Centennial Coal. Road and rail transport connections are also critical enablers.

Establishing a green hydrogen plant and associated manufacturing will require land access and appropriate planning approvals. There will be a need to build and maintain a strong social licence for these emerging industries.

4.2.6 Workforce considerations

While renewables could inject important GVA to the Lithgow economy, the opportunities for the workforce are mixed. Job creation during construction has the potential to be significant, numbering in the high hundreds; however, ongoing operations require very few jobs.

Skills are likely to be in high demand across Australia due to the proliferation of renewable energy projects in the pipeline, with the sector already flagging anticipated skills shortages. This is likely to mean that roles attract high salaries, potentially on par with those currently paid to workers in the energy and mining sectors.

The skills required by renewable energy operators and supply chain businesses will align with or be adjacent to existing trades and disciplines held by the region's workforce, requiring adaptation to the different energy systems. New roles and skills will also be required, which will continue to evolve as the technologies for renewable energy production evolve. This will require an adaptable workforce, supported by an adaptable education and training sector, including schools, VET and universities, industry bodies, unions and employers, as well as workers and communities themselves.

Skills will be needed across planning and design, manufacturing of equipment, construction, operations and logistics. This will range from industrial designers and engineers to tradespeople and construction workers, such as electricians, plumbers and fitters and turners, to project managers, plant operators and quality assurance (not exhaustive). Workplace health and safety will need to be adapted to the energy production type, such as management of hazardous materials and emergency response for hydrogen production. New roles will include skills such as hydrogen fuel cell operators.

The readiness and availability of the workforce is critical to the success of renewable projects, so all stakeholders will need to plan for local worker skills while attracting additional resources. Building a pipeline of skilled workers will involve:

- recognition of the existing workforce's skills, including certification where relevant
- retraining in new skills areas
- science, technology, engineering and mathematics (STEM) education for school students for pathways to vocational education, apprenticeships and traineeships, as well as to university in related fields of study.

Workforce strategies, training facilities and programs are progressively being developed. For example, TAFE NSW launched a Diploma of Renewable Energy Engineering in 2022 along with five new micro-credentials, aligned with high-demand jobs in solar, energy storage systems, and wind technology. The courses are on offer at Ultimo and Newcastle through virtual classroom learning and face-to-face workshops[14]. Universities are also tailoring their undergraduate and postgraduate programs.

The Queensland Government's *Hydrogen Industry Workforce Development Roadmap* launched in July 2022 highlights the importance of maximising local benefits when building a pipeline of skilled, adaptable workers, including planning for diversity from the outset[15]. It also focuses on sharing knowledge between operators, technology and equipment manufacturers and training providers to support hydrogen skills, training and safety and using data insights to plan industry workforce needs over time. The Plumbing Industry Climate Action Centre's (PICAC's) Hydrogen Training Centre of Excellence at Beenleigh in south-east Queensland will be Australia's first, focused on the safe maintenance and installation of hydrogen systems, including fire protection, gas, electrical and plumbing skills.

Lithgow will need to develop a workforce plan that taps into state and national approaches (such as the New Energy Skills Program) for implementation with relevant stakeholders.

4.2.7 Economic target setting

The total potential growth of the sector has been modelled against benchmarks and to maintain the sector through the loss of the coal-fired power generation activities. A target of $147 million in GVA growth has been modelled. This includes a pipeline of potential new projects which have been identified, which could contribute an additional $54m in GVA over the next decade if they are successful. These include:

1. Banpu's Pinecrest 100MW Solar Farm[16]
2. Neoen's Great Western Battery Energy Storage System (500MW/1000MWh)[17]
3. Greenspot's Battery (500MW/1000MWh) (300MW first phase)[18]
4. EA's Lake Lyell 200-350MW Pumped Hydro Project[19]

A number of other potential projects have been identified including:

1. Electrolyser with on-site solar production: 10 MW electrolyser (Yara-type project) or larger (e.g. 40 MW which is the largest currently being developed in Australia – Port of Newcastle Green Hydrogen Hub).

[14]New South Wales Government [NSW Government] (2021). Career Training Addresses Renewable Energy Jobs Boom. Published: 7 December 2021. Retrieved: https://www.nsw.gov.au/news/renewable-energy-job-training
[15] Queensland Government (2022). Hydrogen Industry Workforce Development Roadmap 2022-2032. Accessed at https://www.publications.qld.gov.au/dataset/hydrogen-industry-workforce-development-roadmap-2022-2032/resource/11162290-c0d7-4cc2-91fb-02b33d90a362
[16] https://www.coronium.com.au/projects1.html
[17] https://pp.planningportal.nsw.gov.au/major-projects/projects/great-western-battery-energy-storage-system
[18] https://reneweconomy.com.au/huge-1000mwh-battery-at-site-of-closed-coal-plant-gets-nsw-planning-approval/
[19] https://www.energyaustralia.com.au/about-us/energy-generation/energy-projects/lake-lyell-pumped-hydro

2. Hydrogen refuelling station 220 kW (ActewAGL or BOC type project). Electrolyser requires 100kW solar array and would produce up to 2,400 kg of hydrogen per month.
3. Freight long-haul electric truck charging stations.

These could bring an additional $93 million in GVA over the coming decade in order to achieve the aspirational growth target for this sector.

Figure 16 presents the 10-year value added growth for the Electricity, water and waste sector by growth source ($million, 2022 dollars).

Figure 15. Lithgow 10-year value added growth for the Electricity, water and waste sector, by growth source ($million, 2022 dollars)

Source: Acclimate Capital and NCEconomics analysis

4.3 Industrials: Manufacturing Sector

4.3.1 Proposed outcome

Lithgow develops an advanced, circular manufacturing sector that is an anchor of the future economy, building on the region's history of industrial innovation and leveraging its skilled workforce, transport infrastructure and potential for renewable energy production.

4.3.2 Context

Lithgow has a proud industrial heritage spanning more than 150 years from the first commercially viable steel mill in Australia, to cement production that Portland proudly proclaims built Sydney, to manufacturing for Australia's defence forces. Today the Lithgow LGA is home to 46 manufacturers, some of which are large-scale, global enterprises, including Thales and Ferrero.[20]. Manufacturing in Lithgow is focused on fabricating metal product, primarily for small arms (Thales), as well as transport equipment manufacturing (e.g., Uni-lock, Lithgow Railway Workshop). Other important manufacturing includes food product manufacturing, hosting

[20] Lithgow City Council [LCC] (n.d). Economic Profile: Businesses by Industry. Accessed at https://economy.id.com.au/lithgow/number-of-businesses-by-industry

Ferrero's Australia-New Zealand headquarters, as well as printing (e.g. Flying Pig Productions), and non-metallic mineral production.

Manufacturing is the equal fourth largest contributor to Lithgow's economy, with value added of $81.5 million or 5.8% in 2020-21, lower than for NSW (6.5%) and NSW Regional (7%). Growth over the past decade has been strong however, averaging 2.5% each year, predominantly due to Thales' production. Contributions to growth from other types of manufacturing are much lower.

The significance of manufacturing to Lithgow is much higher for employment, with 696 people – or 8% of the population – working in the sector. This is a higher proportion of the population than the average for NSW (6%) and for Regional NSW (6.9%). In the last 10 years, the CAGR for FTE in metal products manufacturing has been 7.4%, while for transport equipment manufacturing it has been 4.13% (NIER, 2022). The skills in the local community, including from the mining and energy sectors, have good application for growth in the manufacturing sector.

Productivity in the sector is broadly comparable to NSW, at $117,360 value generated per worker, compared with $126,338 for NSW and $107,228 for regional NSW. However, as the 10th most productive sector in Lithgow, there are opportunities to increase value added through advanced manufacturing processes and business models.

Lithgow offers access to affordable industrial land, water, energy (including potential renewable energy and green hydrogen) and a workforce that is skilled in relevant trades. Its proximity to Western Sydney, including the new Western Sydney International (Nancy-Bird Walton) Airport and Aerotropolis industry and jobs hub also presents opportunities.

Manufacturing is undergoing a transformation world-wide.

Traditional attention to the factory floor is being rebalanced by a stronger focus on research and development (R&D), design, supply chain and logistics, and post-sales support and services. This shift to *advanced manufacturing* – a focus on *how* goods are produced in order to create value – is occurring across all types of goods and is being driven by new technologies and business models. Artificial intelligence, robotics, blockchain and 3D printing are just some of the tools of what is known as the Industry 4.0 revolution.

According to the Advanced Manufacturing Growth Centre (AMGC), the most competitive manufacturing companies around the world have the following characteristics[21]:

- *Advanced knowledge*: they continuously innovate with a high degree of R&D investment
- *Advanced processes*: they focus on using state-of-the-art technology and become familiar with digitalisation
- *Advanced business models*: they offer niche solutions, often highly customised and highly valuable.

Governments at all levels have long been supporters of local manufacturing.

The Productivity Commission's *Trade and Assistance Review 2020-21* found that manufacturing, along with primary production, received the most assistance relative to net value add. The manufacturing sector received 23.3 per cent of allocatable net assistance (about $2.8 billion) despite accounting for only 6 per cent of value added. About 40 per cent of this support was in the form of tariff assistance[22], but also included tax concessions; R&D; industry specific assistance; sectoral assistance; assistance to regional areas; export

[21] Advanced Manufacturing Growth Centre [AMGC] (n.d). About Advanced Manufacturing. Accessed at https://www.amgc.org.au/our-purpose/about-advanced-manufacturing/

[22] Australian Government Productivity Commission (2022). Trade And Assistance Review 2020-21, Annual Report, p7. Accessed at https://www.pc.gov.au/research/ongoing/trade-assistance/2020-21/trade-assistance-review-2020-21.pdf

assistance; and other measures. However, support has been at an historic low for the past five years, reflecting a decline in tariff restrictions on imported manufactured goods and inputs and support for the motor vehicle industry[23].

Governments are strongly promoting the adoption of advanced manufacturing, complemented by an emphasis on integrating circular economy principles into manufacturing. For example, the NSW Government is promoting Clean Manufacturing Precincts to attract and create new low carbon industries, while helping existing high emitting industries fast-track their emissions reduction through clean infrastructure and technology.

This approach to precinct development is reflected in broader approaches to promote industry clusters of related businesses and organisations in a location to promote productivity and competitiveness. In NSW, this includes the creation of Special Activation Precincts and Regional Jobs Precincts.

4.3.3 Drivers of growth

Supply chain issues resulting from COVID movement restrictions, the Russia-Ukraine conflict and Chinese trade bans have heightened concern about the progressive movement of manufacturing to cheaper markets offshore and focused attention on building a stronger Australian manufacturing base. The new Australian Government has committed to invest in developing sovereign manufacturing capability to promote value adding, employment and buying local. Industries of focus include resources, defence capability, renewables and low emissions technologies and transport, in which Lithgow has a competitive advantage.

Lithgow is well-placed to meet domestic and export demand for Australian-made goods in several of these target industries. Economic growth in the manufacturing sector in Lithgow will be driven by expansion of current companies and attraction of new market actors, complemented by a focus on adopting advanced, clean manufacturing approaches to drive value creation.

In line with the NSW Government's *Advanced Manufacturing Strategy* and informed by AMGC guidance, this will be supported by:

- developing precincts of related industries, including manufacturers of component parts
- increasing collaboration and research within the manufacturing sector and with research institutions, which can improve capital efficiency and reduce overhead costs
- promoting the adoption of advanced manufacturing processes, including capital investment in new technologies and process improvements, and supporting skills development
- supporting the implementation of advanced service-oriented business models that lead to high-value manufacturing solutions and create high-value products that reach untapped markets and segments.

Manufacturing also has a large positive "spill over" effect through supply chains and professional services, such as for legal advice. Across NSW, it's estimated that manufacturing indirectly supports another 109,000 workers, equivalent to 40% of the direct manufacturing workforce[24].

[23] Australian Government Productivity Commission (2022). Trade And Assistance Review 2020-21, Annual Report, p8. Accessed at https://www.pc.gov.au/research/ongoing/trade-assistance/2020-21/trade-assistance-review-2020-21.pdf

[24] New South Wales Government [NSW Government] (May 2018). *NSW Advanced Manufacturing Industry Development Strategy*, p22. Accessed at https://www.investment.nsw.gov.au/assets/Industry-sectors/Advanced-manufacturing/NSW-advanced-manufacturing-industry-development-strategy.pdf

4.3.4 Growth approaches

Key manufacturing industries of focus

Building on the capabilities of Thales and its available industrial real estate, as well as Greenspot's Wallerawang masterplan and future plans for the Mt Piper site, it is recommended that a future advanced, clean manufacturing sector focuses on existing and adjacent areas of strength:

- Defence and related metal fabrication and components
- Renewable energy component manufacturing and clean technology innovation, such as green building materials manufacturing
- Circular economy manufacturing
- Transport equipment manufacturing.

While some efforts will leverage existing growth proposals, many opportunities in the manufacturing sector will require approaches to market seeking expressions of interest.

Develop a plan for a Defence and Innovation Precinct with Thales at the Lithgow Arms facility to attract associated businesses, particularly in metal fabrication, and research, development and skills collaborations

Thales carries on a tradition of small arms manufacturing which began in Lithgow in 1912. Since 2021, the company has made several announcements of plans to transform the Lithgow Arms facility to create a precinct, attracting associated businesses to the site. In addition to seeking collaboration and shared expertise, Thales offers vacant industrial buildings, high-level security, a Defence-compliant restricted network, and an on-site dam for water-reliant production. The site also includes Timberfix, a supplier of fasteners, hardware and site supplies to construction and industry, and Grocorp, which designs and manufactures education furniture.

The first phase, with a $6.5 million investment, is intended to establish a modern manufacturing and integration hub for the design, development and precision manufacture of next generation weapons systems for the Australian Defence Force, industrial partners and export customers[25]. This will involve the integration of traditional precision manufacturing and digital technologies, including 3D printing and Artificial Intelligence, and the installation of automated electro-plating and other metal treatment capabilities.

In July 2022, the NSW Government committed $1.12 million from the Regional Job Creation Fund towards a $2.3 million stage of the expansion, co-funded with Thales[26]. The project will create up to 56 full-time positions, (bringing the workforce to approximately 200) and enable procurement of machinery and equipment. Thales projects will triple exports by 2025.

Thales has also established a Small Arms Collaboration and Cooperation Centre (C^3) to help its Australian SME and industrial partners by breaking down barriers to entry and providing access to its resources, equipment, engineering skills and expertise for prototyping, test and evaluation, qualification, industrialisation and advanced manufacturing[27]. The intention is for C^3 partners to securely share areas of expertise to advance

[25] Thales Australia (November 2021). Thales Australia To Invest $6.5m To Expand Precision Manufacturing In Regional NSW. Published: November 2021. Retrieved https://www.thalesgroup.com/en/australia/press-release/thales-australia-invest-65m-expand-precision-manufacturing-regional-nsw

[26] Toole, P MP (August 2022), Regional Jobs Grow with Company Expansion. Press Release. Accessed at https://www.paultoolemp.com.au/post/regional-jobs-grow-with-company-expansion

[27] Thales Australia (June 2022), Lithgow Arms Launches Defence Industry Collaboration and Cooperation Centre. Press Release. Accessed at https://www.thalesgroup.com/en/australia/press-release/lithgow-arms-launches-defence-industry-collaboration-and-cooperation-centre

skills, collaborate on research and design, and seek manufacturing support to accelerate innovation and design. Early partners include global and local manufacturers of small arms, precision light metal and injection moulded components and casting solutions.

Expanding on this model, LEEP could support Thales to accelerate the establishment of a Defence and Innovation Precinct, with potential for specialisation in fine-tolerance precision computer numerically controlled (CNC) processes which build on current capabilities in Lithgow. Secure facilities and logistics capacity could attract relevant businesses and project teams to establish production on-site. It could also include research, development and skills collaborations with universities, such as Western Sydney University, with which Thales collaborates on engineering, and TAFE for vocational education. These approaches would need to complement the development of the Aerospace and Defence Industries Precinct adjacent to the Western Sydney Airport and the Special Activation Precinct in Williamtown.

Promote the manufacturing of Renewable Energy Components and Clean Technology Innovation

Proposed commercial, community and household renewable energy production in Lithgow and in Renewable Energy Zones, including in Central West Orana, present opportunities to manufacture components required for the technology. This could include research, development, design and manufacturing of products such as solar panels and inverters and electrolysers for hydrogen production. The NSW Government's $1.05 billion Net Zero Industry and Innovation Program[28], includes the Renewable Manufacturing Fund ($250 million over five years) to stimulate local manufacturing of these components to secure supply chains for the transition of the sector.

Alongside this, Lithgow could focus on supporting the development and commercialisation of clean technologies that will drive down emissions, particularly for the energy and manufacturing sectors. In addition to green hydrogen, this could include production of green building materials such as cement. This could include attracting start-ups and research collaborations to the industry precincts in the Lithgow LGA.

It is recommended that Lithgow positions to become a Clean Manufacturing Precinct[29] to promote collaboration between new low carbon industries and decarbonising high emitters to accelerate shared access to clean infrastructure and technology, such as centralised and shared industrial heat or cooling facilities. Businesses would work together to develop a plan for low carbon production. To date, EOIs have been called in the Hunter and Illawarra.

Target circular economy businesses and integrate circular economy principles into manufacturing

The CSP 2022-32 includes a commitment to minimise the environmental footprint of the Lithgow region, live more sustainably and use resources more wisely. Key to this is developing a circular economy to minimise waste and promote continual reuse of resources. Economic growth could be driven by the development of new industries, with the following streams proposed for Lithgow:

1. Breaking products down to their components, such as plastics and fabrics, suitable for recycling and remanufacturing or as regenerative resources for nature
2. Manufacturing new products from recovered materials
3. Promoting the integration of circular economy principles across all forms of manufacturing.

[28] New South Wales Government [NSW Government] (2022) Net Zero Industry and Innovation. Website. Accessed at https://www.energy.nsw.gov.au/business-and-industry/ways-get-started/net-zero-industry-and-innovation
[29] New South Wales Government [NSW Government] (2022) Clean Manufacturing Precincts. Website. Accessed at https://www.energy.nsw.gov.au/business-and-industry/programs-grants-and-schemes/clean-manufacturing-precincts

While waste has become a challenging policy area, the NSW Government's priority for establishing circular economy activities creates opportunity for Lithgow. Integrating circular economy manufacturing would create additional value added on recycling activities which create a source of employment. For example, a report by Access Economics estimated that for every 10,000 tonnes of waste recycled, 9.2 full-time equivalent positions are created[30].

The NSW Government's *Waste and Sustainable Materials Strategy: A guide to future infrastructure needs* identifies needs for reprocessing plastic, paper, e-waste, tyres and organic materials by 2030. It is proposed that Lithgow consider a specialisation, including opportunities linked to waste from local manufacturing, such as use of ash by-product from energy production, metal and cardboard. Other opportunities may be linked to the construction sector, such as manufacturing of household tiles made of repurposed glass and fabric.

For example, EnergyAustralia and Nu-Rock have collaborated to build a pilot plant at Mt Piper that uses fly-ash from the power station to manufacture building materials such as bricks, pavers and concrete blocks for use in residential and commercial properties and civil works. Nu-Rock anticipates it will have its first permanent module operational in early 2023 to produce commercial quantities, using 250,000 tonnes of fly-ash to produce 30 million 200 series hollow blocks or 200 million bricks a year. Production on the module will employ 35 full time jobs in operations and a further 60 in distribution. NuRock advises that the bricks are significantly lighter and cheaper than standard bricks and are completely recyclable at end of life into a full-strength new product. Nu-Rock projects that the volume of ash from Mt Piper and at Wallerawang could support production on eight modules.

Partnerships with universities and industry, including co-location, could position this as a high value, future industry. For example, UNSW's Centre for Sustainable Materials Research & Technology (SMaRT) leads the NSW Circular Economy Innovation Network and has the ARC Green Manufacturing Hub. It has developed world-leading approaches to e-waste, green steel production, and production of construction materials from waste, including developing a micro factory, a model which may have strong application in Lithgow. A university partnership would also present opportunities to attract students and develop local engineering and manufacturing skills.

These opportunities would require transport and sorting infrastructure, including leveraging the rail network, smeltering for reprocessing potentially using existing infrastructure and tapping into clean energy production in the area. The NSW Government's strategy indicates that infrastructure of this nature often takes a decade to commission, but this may be able to be fast-tracked with appropriate community engagement, planning processes and investment incentives.

Transport Equipment Manufacturing

Lithgow City Council has been advocating strongly to the NSW Government for Lithgow to have a pivotal role as a multi-modal transport hub for the east-west transport arterials that connect Greater Sydney to the Central West of NSW. This will be enhanced by the upgrade of the Great Western Highway between Katoomba and Lithgow, including an 11-kilometre toll-free tunnel from Blackheath to Little Hartley with dual carriageways in separate twin tunnels. The gentler gradient will cut travel times and improve freight efficiencies.

Lithgow City Council has proposed additional investments to improve its hub functionality further:

- Extend the Great Western Highway upgrade beyond Little Hartley to support the continued development of South Bowenfels and the Marrangaroo urban release

[30] Access Economics Pty Ltd (July 2009) Employment in Waste Management and Recycling, Report for the Department of the Environment, Water, Heritage and the Arts. P2

- Establish faster passenger rail services between Sydney and Central West-Orana (Region 6), extend the intercity services to terminate at Lithgow, and provide multi-modal interchange facilities at Lithgow, including maintenance and servicing
- Establish Lithgow as a strategic centre for EV connectivity & charging infrastructure, given its critical location at 2 hours travel from Sydney
- Establish a Green Hydrogen Rail Conversion facility, potentially at Lithgow Rail Yards, to convert diesel freight trains to hydrogen.

Lithgow is well positioned to support the manufacturing of green transport solutions for the state, leveraging its historic strengths in rail rollingstock manufacturing and maintenance and the presence of relevant companies and their skilled workforces. This is supported by projected development of hydrogen and other renewable energy production in the LGA, with proximity to the high voltage power lines that connect Sydney to the Wallerawang and Mt Piper stations.

It is noted that the NSW Government has awarded a contract to Momentum Trains to develop a new purpose-built maintenance facility in Dubbo to replace the intercity and regional passenger fleet, operating on a diesel-electric hybrid. The manufacturing opportunity for Lithgow is therefore focused on the freight fleet, converting diesel powered freight locomotives to run on hydrogen fuel cells.

By 2036, the volume of freight moving through Greater Sydney is projected to grow by 48 percent, but the NSW Audit Office considers that the state will struggle to meet this increasing demand unless rail plays a larger role[31]. The Draft Central West and Orana Transport Plan projects a significant decline in coal freight through the region, but the network will need to transition to the needs of new commodities and manage growth in non-coal freight from 10 million tonnes in 2016 to 17 million tonnes in 2056[32]. This will require timely conversions.

Lithgow is well placed to deliver on this need. A Green Hydrogen Rail Conversion and maintenance facility, located on the main line, would need to be developed. This is forecast to create an additional 100 jobs.

UTS has been doing substantial work on this approach for Lithgow and may be a strong collaborator and partner for industry.

4.3.5 Infrastructure and land use needs

Lithgow LGA has four core areas where lands are zoned for industry and economic activity: Lithgow East and Lithgow West; Portland; Marrangaroo; and Wallerawang. While Lithgow has a number of assets that would enable manufacturing and heavy industry, including good access to energy, water and transport routes, stakeholders report that access to available and ready industrial land is an issue. Key challenges for the growth of industry and the manufacturing sector come from the access to land that is appropriately zoned. There are a number of zonings for manufacturing / industrial activities in Lithgow. Table 3 outlines the zones and the current uses of the land (i.e. industrial use, residential use or vacant)[33] with further detail in Appendix D Planning and Land Use.

[31] The Audit Office New South Wales [NSW] (October 2021). Rail freight and Greater Sydney. Accessed at https://www.audit.nsw.gov.au/our-work/reports/rail-freight-and-greater-sydney
[32] New South Wales Government [NSW Government] (2022). Future Transport Strategy 2056. Accessed at https://future.transport.nsw.gov.au/future-transport-strategy
[33] LEEP Industrial Lands Enquiry, LCC (2022)

Table 3. Lithgow industrial zones and current land uses

Zone	Total area (ha)	Current area of use (ha)			Comments
		Industrial	Residential	Vacant	
IN1 – General Industrial	141.7	55.28	53.97	26.20	All vacant IN1 zoned land is in Wallerawang
IN2 – Light Industrial	81.17	48.72	2.69	17.77	The majority of the vacant IN2 zoned land is in Wallerawang
IN3 – Heavy Industrial	103.48	12.39	-	90.64	All IN3 zoned land has been localised to south of the former Wallerawang Power Station. There is no IN3 zoned land in Lithgow or Portland.
B4 – Mixed use	53.39	22.10	4.88	5.69	B4 zoned land is found in Lithgow and Portland with the majority of the vacant sites to be found in Lithgow. Some new B4 zoned land is anticipated in the Portland area that has not been included in this assessment.
B6 – Enterprise Corridor	41.24	8.01	23.08	9.20	All the B6 zoned land is in the Lithgow area in Marrangaroo Urban Release Area, the total of B6 zoned land will reduce to 18.24ha on completion of the Planning Proposal for Marrangaroo URA.
B7 – Business Park	10.28	10.28	-	-	All the B7 land is in Lithgow around the Thales site

4.3.6 Workforce considerations

Key skill areas required by the manufacturing sector are broad, a subset of which are:

- *Research, development, design and prototyping*, including materials engineers, chemists, graphic and product designers, data analysts,
- *Production*, including product assembler, engineering production worker, metal engineering process worker, plastics and rubber production machine operator, quality assurance and compliance managers, environmental monitoring and technology, workplace health and safety
- *Logistics*, including transport and warehousing, supply chain specialists, purchasing managers, packagers
- *Sales and services*, including sales managers, product trainers, customer service assistants, product maintenance.

In new fields of manufacturing, such as circular economy production, advanced manufacturing and renewable energy components, skills and roles are evolving. For example, as advanced manufacturing technologies and processes are adopted, workers are needing to upskill in areas such as digitalisation, robotics and artificial intelligence. This is leading manufacturers, training organisations, peak bodies and unions to approaches such as prioritising reskilling and upgrading of skills for existing workers, recognition of micro-credentials and development of new training programs in emerging areas.

Whether roles are trade-based, more highly technical or managerial, this requires a focus on STEM subjects in the school system, and access to vocational education and university qualifications, depending on the role. This underscores the skills benefits of industry collaboration with the education and training sector to develop pathways to higher qualifications, learning (including on the job) and employment. This not only helps meets the needs of employers but enables education and skill providers to anticipate and respond to emergent industry needs.

In Lithgow, the manufacturing sector has access to unskilled and low skilled workers, able to be trained, and to workers transitioning from coal mining and power generation, who have relevant or adjacent skills. However, manufacturers have difficulties attracting and retaining higher qualifications, such as engineering, particularly for younger workers who seek a more vibrant lifestyle than Lithgow currently offers.

Companies are using a range of strategies to attract workers, such as engaging in the NSW Government's Regional Industry Education Partnerships program to attract school-level apprentices and trainees, working with skills providers such as TAFE and Skillset, and partnering with universities. For example, Thales partners with Western Sydney University's School of Engineering, Design and Built Environment to attract graduates.

4.3.7 Economic target setting

Based on these opportunities, a target growth rate of 6.7% p.a. for the manufacturing sector has been modelled, based on benchmarks of investment and GVA in similar sized manufacturing zones around Australia. Some projects have been identified to support this growth forecast, such as Nu-Rock's green construction materials pilot and Thales' expansion. However, to achieve the full high growth scenario, Lithgow will need to attract projects that can add an additional $33 million in GVA over the 10-year forecast period.

Figure 17 presents the 10-year value added growth for the Manufacturing sector by growth source ($million, 2022 dollars).

Figure 16. Lithgow 10-year value added growth for the Manufacturing sector, by growth source ($million, 2022 dollars)

Source: Acclimate Capital and NCEconomics analysis

4.4 Combined Actions for Lithgow's Industrials Sector (Energy and Manufacturing)

Action (0-5 years)	Description
Engage the community in the vision for Lithgow's industrial innovation potential	Establish a platform for social license and engagement between community groups and the transition governance structure, to enable deliberative decision-making and informed consent from the community over strategies and plans for Lithgow's industrial future.
Ensure adequate supply of employment land zonings in planning	Review existing employment land zonings and potential candidate sites to ensure suitability of supply in consideration of likely demand, serviceability, infrastructure re-use, co-location and supply chain value capture, environmental and community factors and constraints.
Align planning instruments with energy sector vision	Review planning instruments, including Council's development control plans, which seek to manage the impact of utility-scale renewable energy projects, including evaluation of potential tier 1 and tier 2 sites for solar generation.
Plan precincts around priority industrial activities in advanced clean manufacturing and renewable energy	Undertake precinct planning for the repurposing of the region's redundant mining and coal-based energy land and built infrastructure to grow regional capabilities in renewable energy, circular economy processing and clean manufacturing.
Plan a precinct to consolidate advanced manufacturing for the Defence industry	Undertake precinct planning for manufacturing and industrial uses, including a Defence and Innovation Precinct plan.
Promote industrial investment opportunities	Develop and publish an industrial sector investment prospectus and review and update to maintain currency.
Identify planning opportunities for renewable energy sites around the Lithgow LGA	Identify suitable locations for operation of emerging renewable energy and associated technologies including PHES, particularly where reuse and repurposing of existing infrastructure is available.
Engage renewable energy project developers early in the process	Where identified renewable energy sites are assessed to have economic, environmental and social merit, engage calls for expression of interest for site investigation and pre-feasibility assessment.

Establish capacity to evaluate project proposals against non-financial outcome areas	Prepare a framework and guideline for renewable energy projects which considers amongst other things the principle of "benefit sharing" including capturing value add into the local economy and the locality most immediately impacted by proposed developments, consultation arrangements – including, importantly, consultation with the locality most immediately impacted by proposed developments and the wider community and Council.
Support industrial business development processes through an "open for business" approach	The Council and State Government to work together with industry to provide business case, due diligence and planning support to industry for reuse of the existing electricity generation and mining land, and infrastructure for new emerging industries (inc. Batteries, Pumped Hydro, Green Hydrogen production, Heavy industry).
Position Lithgow in the hydrogen economy	Engage in NSW Government's Hydrogen Hubs initiative, including establishing potential partnerships with project proponents currently shortlisted with Lithgow as a potential off-taker.

Intermediate outcomes (5–15 years)	**Description**
Established water infrastructure for connectivity with industrial activities in Lithgow	Invest in connectivity infrastructure that ensures Lithgow's relative advantage in affordable and reliable water is strengthened with consideration of emerging and growing businesses across all areas of Lithgow's industrial economy.
Ongoing capacity for triple-bottom-line thinking is integrated across all planning activities	Lithgow has developed a capacity for integrating triple-bottom-line reviews in masterplan and precinct planning processes, to ensure precinct boundaries are optimized to allow for eco-industrial innovation, for example, to ensure co-located down and up-stream eco-industrial and resource recovery enterprises can achieve economic, environmental and social outcomes.
An initial circular economy has been established between manufacturers in the LGA through a strategy facilitated by the local transition governance arrangements	A strategy for attracting circular economy manufacturing to Lithgow, including mapping Lithgow's competitive advantage by waste streams and opportunities associated with current manufacturing operations has been established and engagement between local manufacturers has

	commenced.
Lithgow is established with battery projects for grid and supply firming	Lithgow has maximised its advantage of having existing high voltage transmission infrastructure and has advocated for, attracted investment and efficiently contributed to firm the NSW electricity grid and deliver additional firmed renewables from Lithgow and the Central West to the system.
Lithgow has an established PHES site in operation to firm the NSW electricity grid supply	Lithgow has established a PHES site with a capacity of up to 1000MW by 2030.
Lithgow has identified and attracted investment in electricity, water and waste industries	Projects and capital investment that has potential to generate $93m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for the local electricity, water and waste industries.
Lithgow has identified and attracted investment in manufacturing industries	Projects and capital investment that has potential to generate $33m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local manufacturing industries.

Long-term outcomes (15+ years)	**Description**
Lithgow has established itself as one of the NSW Hydrogen Hubs and operates economically feasible hydrogen production and fuel operations that service the region.	Lithgow draws on its comparative advantages in energy infrastructure, water resources, associated employment lands, and geographic location, to become a hydrogen hub that serves regional freight routes and trains.
Lithgow has secured and delivered a pipeline of projects in the electricity, water and waste industries	New projects and capital investment in electricity, water and waste industries have been delivered, generating $93m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the electricity, water and waste sector to more than $147m in gross value added over 10 years in real 2022 dollars.
Lithgow has secured and delivered a pipeline of manufacturing investments in the LGA and has an established circular economy	New projects and capital investment in manufacturing industries have been delivered, generating $33m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the manufacturing sector to more than $74m in gross value added over 10 years in real 2022 dollars.

4.5 Tourism: Retail, Accommodation, Arts and Recreational Services Industries

4.5.1 Proposed outcome

The relevance of tourism to Lithgow's economy and the employment of young workers is enhanced by strategic investment and strong marketing initiatives that capitalize on the diversity and uniqueness of local natural, historical and cultural tourism opportunities.

4.5.2 Context

Tourism is not an explicit category in the Australia and New Zealand Standard Industry Classifications (ANZSIC), as it is a demand side definition (as opposed to the sectors in the ANZSIC which are defined by the goods and services they supply.[34] However, estimates indicate that the tourism industry contributes to 2% of total value added in Lithgow (which would rank it at 12th out of 20 industries) and provides 4% of total employment..[35] This economic contribution is picked up in a number of sectors in the ANZSIC sectors, including Accommodation and Food Services, Arts and Recreation Services, and Retail Trade. Tourism in Lithgow, which supports around 204 mostly locally owned businesses and receives approximately 598,000 visitors annually, will likely play a significant role in the future local economy (Table 4). Considered the gateway between the Blue Mountains and the central west (Bathurst, Orange and Mudgee regions), Lithgow is anticipated to leverage its many natural resources, industrial and aboriginal heritage, and favourable conditions for investment (i.e., relatively low living costs and competitive land prices) to develop an effective tourism strategy for the next decades.

Ensuring a significant contribution of tourism to future development largely depends on strategic investments and aggressive marketing to create a competitive profile for the region. Lithgow's development as a tourist centre has been further supported by the community in local consultations[36]. Further marketing could include joint approaches with the Blue Mountains, Bathurst, Orange and Mudgee.

Table 4. Key tourism indicators - Lithgow LGA and Blue Mountains LGA

Indicator	Lithgow	Blue Mountains
Total tourism businesses	204	905
Total visitors (% of visitors international)	598,000 (0.8%)	3,570,000 (3.1%)
Average spend per trip	$167	$167
Average nights	3	3
Key activities (based on overnight visitors)	Social activities (46%), Outdoor/nature (20%), and Active outdoor/sports (14%)	Social activities (44%), Outdoor/nature (28%), and Active outdoor/sports (10%)

Source: TRA (2020) & TRA (2022)

Lithgow's diversified tourism portfolio offers immense growth opportunities. Its offering not only includes natural attractions similar to those provided by the neighbouring LGAs, but its rural character and history have the potential to transform it into a competitive destination. Lithgow offers a wide range of services and

[34] Tourism value added is reported through the Tourism Satellite Accounts (TSA). NIEIR (2020) tourism data are based on the Tourism Satellite Accounts.
[35]NIEIR (2021). Lithgow City Council Economic Profile. Retrieved: https://economy.id.com.au/lithgow
[36] Community Strategic Plan 2035. Our Place Our Future.

accommodation to cater for a diverse spectrum of tourists ranging from camping facilities to luxury services such as Black Gold Motel at Wallerawang, Emirates One&Only Wolgan Valley, and Bubbletent.

Nearly two thirds of the region is national park or state forest

Lithgow has several National Parks (i.e. Wollemi National Park, Gardens of Stone National Park, Capertee National Park, Turon National Park, Marrangaroo National Park), Wilderness Areas, and State Forests that offer a wide range of outdoor activities such as rock climbing, bird watching, hiking, orienteering and recovery, camping, off road 4WD, etc. Some of the iconic sites in the region, include Capertee Valley, the second largest canyon in the world, and the rock pagodas in Gardens of Stone.

Natural and artificial waterbodies such as Lake Lyell, Lake Wallace, Thompson's Creek Dam, Cox's River, and Fish River offer a variety of water-based recreational activities (e.g., water skiing, sailing, fishing, canoeing, swimming, dragon boat rides).

The region hosts numerous extreme sport events in natural areas

Lithgow has positioned itself as a destination for sporting events that leverage natural attractions. Some examples include mountain biking in Rydal's Lidsdale State Forest (e.g., Jetblack 24 Hour MTB) and running events (e.g., Glow Worm Trail running festival, The Lithgow Ridgy-Didge trail running, Portland Born to Run Festival).

Rich historical and cultural heritage

Located within the Wiradjuri Aboriginal Nation, and with the Gundungurra Nation to the south and the Darug Nation to the east, Lithgow has a rich aboriginal cultural heritage and unique tourist attractions including rock engravings, rock art, fish traps, carved trees, stone arrangements and spiritual sites (e.g., Maiyingu Marragu (Blackfellows Hands) sacred site and rock art, Bird Rock).

Lithgow's long mining and industrial history is embodied in numerous tourist sites such as the shale oil refinery Newnes in the Wolgan Valley, Eskbank House, Hartley historic site, The Foundations Portland, Lithgow Small Arms Factory Museum, National Small Arms Factory, Inland heavy anti-aircraft gun batteries, Blast Furnace, Lithgow State Mine Heritage Park, and Hoskin Memorial Church.

Lithgow has a growing art and cultural movement evidenced by its several art galleries and theatres (e.g., Talisman Gallery, Gang Gallery, Union Theatre, Theatre Royal) and various events, festivals, and trails (e.g., Lithgow Arts Trail, Portland Signs of Yesteryear, Ironfest, Lithglow, Lithgow Halloween).

4.5.3 Drivers of growth

Approximately 598,000 tourists visit Lithgow each year, well below the numbers in the neighbouring Blue Mountains, which receive around 2 million tourists a year, and the cities of Bathurst and Orange, with approximately 1.2 million visits a year. Lithgow not only has the natural resources to capture part of the mass of tourists that already visit the region, but it can also exploit its rural character as an advantage that differentiates it from the saturation and overload of the main tourist centres like the Blue Mountains. This can be supported by placemaking activities that heighten the appeal of the LGA.

With the opening of Western Sydney Airport in 2026 (100km from Lithgow), a significant passenger increase is projected in the coming decades, which, added to the growing population trends in the region, offers a demand opportunity for tourism.

4.5.4 Growth approaches

Lithgow as an eco-tourism destination

Lithgow has several unique natural conditions and is home to endangered/endemic species and sites of geological significance such as Capertee Valley, the second largest canyon in the world, and the rock pagodas in Gardens of Stone. Those natural assets can be capitalised on to attract the growing and specialised market for naturalist tourism (e.g., birdwatching), school camps, interpretive centres, and research.

Some of the current initiatives include:

In 2021, the NSW Government announced a plan to invest $50 million to promote the expansion of the state conservation area around the Gardens of Stone and Wollemi National Parks and its further development as an adventure and ecotourism destination. Planning to attract 200,000 visitors a year, this project is expected to create around 200 jobs for the Lithgow area.

The recent launch of a new brand – the Seven Valleys- to complement the Lithgow City Council touristic promotion has raised the profile of the diversified offerings to explore in the region, highlighting the character of the different valleys in the LGA to expand visitor perceptions of Lithgow.

Lithgow as an extreme sport destination

Lithgow could become a trail running and mountain bike destination given the numerous local mountain biking clubs and the excellent natural conditions for the sports. Current initiatives in this direction include Rocky Trail Destination, which promotes the development of a mountain bike tourism scheme in the Hassan Wall Reserve[37].

Council has obtained funding in recent years to "develop the Adventure Playground and Pump Track in Endeavour Park and skateparks in Wallerawang and Portland. The facilities are major drawcards for visitors to our area. Endeavour Park provides an opportunity to create a Recreation Precinct for youth and families not only for residents but as a major tourist drawcard."[38]

Improve and expand existing tourist attractions

Improvement and development of existing attractions to expand the type of experience offered. Some examples include:

- The construction of accommodation, restaurants, and cafes around Lake Lyell to broaden the tourist experience from a recreational site to a place of stay.
- Equip Capertee Canyon with better infrastructure and services (e.g., museums, cafes, tours, interpretive centre) to increase its commercial potential.
- Developing Lake Wallace Recreation Area and Farmers Creek Walking/Cycleway.
- Support and enhance the marketing strategy for the reopening of the Zig Zag Railway.

Lithgow as a destination for corporate events

Expand Lithgow's tourism offering into the business events market taking advantage of its proximity to Sydney and its rural character. The current facilities available to develop the tourism industry include Hartley Historic

[37] Mountain Bike Trail Development (2020). Concept Plan. Rocky Trail Destination. Hassans Wall Reserve
[38] Lithgow City Council (June 2022). Mayor's Message in Community Strategic Plan [CSP 2035]. Accessed at https://council.lithgow.com/council/ipr/

Village, the trip-advisor awarded Black Gold Motel at Wallerawang, and Emirates One&Only Wolgan Valley, one of Australia's premiere luxury destinations.

Lithgow as a destination for festivals

Strengthen and diversify the capacity of Lithgow to organise massive events such as the annual festivals currently taking place: Lithglow, Lithgow Halloween, and Ironfest, the biggest annual arts festival in the Central West NSW. A calendar of events that complements those in neighbouring tourism regions will focus marketing campaigns and investment efforts.

Lithgow as a cultural hub

Lithgow's rich industrial, European and Aboriginal history and the presence of a growing artistic and cultural scene offer opportunities to expand the number of museums and educational tours. Some examples include the potential Powerhouse Museum Development next to the Lithgow Small Arms Museum, and the ongoing transformation of The Foundations Portland into a cultural hub.

Include Lithgow in regional tourism marketing

Considering Lithgow's unique features and the projections of population and visitors growth in neighbouring large centres (i.e., Sydney, Western Sydney), it could be promoted as a complementary point to visit for regional tourism or as a weekend getaway for domestic/local tourists.

The growing local gourmet and gastro-pub scene (e.g., Jannei Artisan Cheese Makers, Craft Works Distillery) could open opportunities for Lithgow to become part of regional foodie tails linked to neighbouring tourism areas such as Bathurst, Orange, and Mudgee.

4.5.5 Infrastructure and land use needs

Promoting Lithgow as a tourist destination must go hand in hand with investment to ensure adequate facilities and infrastructure. Some areas to focus include:

- Improve and promote the services offered by the Lithgow Visitor Information Centre.
- Improve and expand the extension of trails, signage, mapping, bike paths, parklands, and parking at access points.
- Improve regional public services, such as water supply and Internet access in remote areas.
- Increase the offering of 4-5 stars accommodation, targeting high-income and international tourists.
- Upgrade roads to key attractions to ensure safe and efficient access to sites
- Increase the range of transport options, extend Sydney Metro line to Lithgow
- Guarantee suitable land use planning that avoids conflicts.

4.5.6 Workforce considerations

The impact of investments in tourism on the local workforce is not easy to measure given the wide range of services involved. The expected effects are transversal across the region and include benefits to various industries such as hospitality, transport, accommodation, food production, education, and tourism operation.

Some of the challenges and opportunities for the local workforce in a scenario of growing and diversifying tourism include:

- With tourism and hospitality certificates among the most popular VET courses for Lithgow high school students[39], it is expected to have a relatively solid cohort of young locals capable of filling new positions in an increasing tourism scenario (noting that jobs in the tourism industry tend to have a high concentration of younger demographics). However, it is noted that while enrolments in these subjects are high, completion rates are lower, so further analysis is required to improve these outcomes.
- Cultural and nature tourism development could provide an opportunity for Aboriginal operators, rangers, and tour guides to leverage traditional knowledge and increase their involvement in the tourism industry.
- Within the workforce employed in hospitality, Lithgow shows a higher proportion of workers in restaurant service areas (e.g., cooks, kitchen assistants, bar attendants) than NSW, but there is still a relatively lack of staff trained in areas such as arts/culture promotion that will be key for the tourism industry's diversification. This limitation may require a strategy to retain people with that profile or target training for local labour.
- The construction and maintenance of infrastructure for eco-tourism and sporting events (e.g., trails, signalling, bridges) could provide job opportunities for the youth.
- The expansion of existing museums and the possible opening of new ones may represent an employment opportunity for the growing population of retirees or former employees of the mining industry.
- With the low presence of people from different ethnic backgrounds in Lithgow, expanding into international tourism (especially Asian markets) might require retaining bilingual population, strategic partnerships, and training.

4.5.7 Economic target setting

Lithgow has seen moderate growth in tourism sales in its recent history (i.e. CAGR of 2.5% between FY09 and FY19[40]); however, does not receive as high visitation numbers as some of its neighbouring LGAs (e.g. Blue Mountains). If Lithgow wishes to diversify by growing its tourism industry an aspirational target would be to achieve a similar proportion of contribution to employment as the Blue Mountains (7.5% of total employment compared to 5.0% of total employment for Lithgow, pre-COVID). This would represent 131 extra jobs over the next 10 years, in addition to any other identified projects. The aforementioned plan to invest $50 million in the Gardens of Stone and Wollemi National Parks is the only identified project with quantified economic impacts. This project has been estimated to create an additional 117 jobs.[41]

As discussed in Section 4.5.2, the tourism industry is not explicitly reported in the standard sector breakdown. As a result, the economic impacts for the tourism industry were run through the Accommodation and Food Services sector, which is where a large proportion of tourism economic activity is captured.

Figure 18 presents the 10-year value added growth for the Accommodation and Food Services sector by growth source ($million, 2022 dollars).

[39] My School website. Australian Curriculum, Assessment and Reporting Authority (ACARA). Accessed at https://www.myschool.edu.au/
[40] NIEIR (2021). Lithgow City Council Tourism Value. Retrieved: https://economy.id.com.au/lithgow/tourism-value
[41] Gardens of Stone Alliance (2019). Destination Pagoda. Retrieved: https://treasury.gov.au/sites/default/files/2020-09/115786_COLONG_FOUNDATION_FOR_WILDERNESS_-_Supporting_document.pdf

Figure 17. Lithgow 10-year value added growth for the Accommodation and Food Services sector, by growth source ($million, 2022 dollars)

Source: Acclimate Capital and NCEconomics analysis

4.6 Actions for the Tourism Industry

Action (0-5 years)	Description
Promote tourism investment opportunities	Develop and publish a tourism industry investment prospectus, review and update it at appropriate points in the economy's development to maintain currency.
Review and update all tourism planning and strategy documents to reflect the outcomes of the LEEP process	Review and update the Lithgow Destination Management Plan (2013). Consider strategies to coordinate events and other key tourism product and maximise the local value capture from committed government investment.
Investigate initial feasibility and develop an early business case to establish Lithgow as the regional train interchange.	Currently Mt Victoria is the regional train interchange point, while Lithgow may be better positioned at the 2-hour point from Sydney and with geographic advantages for the regional train service to operate a "pulse" schedule with Sydney metro from Lithgow.
Investigate options to improve walking and cycling infrastructure around Lithgow LGA.	Explore opportunities for the promotion and enhancement of walking and cycling infrastructure both at a local and regional scale, including off-road trail routes from Lithgow down the Blue Mountains (loop with train service).
Engage local operators in establishing the Lithgow marketing strategy	Facilitate the establishment of an industry-led destination marketing strategy in conjunction with tour operators and the community

Intermediate outcomes (5–15 years)	Description
Lithgow is established as the regional train interchange between Central-West and Sydney metro	Lithgow becomes the regional train interchange between Central-West and Sydney metro services, with intercity train servicing, maintenance and certification capabilities established in Lithgow.
Lithgow has established itself as a regional destination with distinctive character and points of differentiation	Lithgow operates a tourism industry and has established partnerships with neighbouring LGAs to integrate Lithgow in the regional tourism offering.
Lithgow has identified and attracted investment in tourism industries	Projects and capital investment that has the potential to generate $8m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local tourism industries.

Long-term outcomes (15+ years)	Description
Lithgow is a vibrant and distinctive place, it has secured and delivered a pipeline of investments in the LGA's tourism industry and has established its brand and reputation in line with the vision set out by its community	New projects and capital investment in tourism industries have been delivered, generating $8m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the tourism industry to more than $19m in gross value added over 10 years in real 2022 dollars.

4.7 Health, Social and Public Services: Healthcare and Social Assistance Sector

4.7.1 Proposed outcome

Lithgow's health care and social assistance sector remains the LGA's largest employer and provides priority specialist and general services, centred around a Health, Ageing and Innovation Precinct, to promote the health and wellbeing of the community and consumers from neighbouring areas, including ageing and vulnerable people.

4.7.2 Context

The health care and social services sector is the largest employer in the LGA but makes a lower contribution to the economy.

Although Lithgow is considered a mining town with a rich heritage in industrial innovation and development, today the health and social assistance sector, including aged care, is Lithgow's largest employer, with 1,232

workers or 14.2% of the workforce. However, due to the nature of the health sector, its contribution to the regional economy is only equal fourth at 5.8% of GVA in 2020-21[42].

Lithgow residents have access to a range of locally delivered public and private health services.

The epicentre of health and ageing services in the Lithgow LGA is a public-private multi-facility campus at South Bowenfels. The site is focused around the 46-bed Lithgow Hospital, which provides district-level care for lower complexity patients, and the not-for-profit Lithgow Community Private day surgery and specialist centre, which shares the hospital's operating theatres. There are no specialists based in the LGA and inpatient services of both hospitals are provided under a Visiting Medical Officer model of care.

The site also includes specialist consulting rooms, allied health services and a residential aged care facility. The Lithgow campus of the University of Notre Dame's Rural Clinical School uses Lithgow Hospital as its teaching facility for fourth-year medical students and also provides student accommodation.

Other public health and aged care services provided by the Nepean Blue Mountains Local Health District (NBMLHD) in the LGA include[43]:

- Portland Tabulam Health Service, providing sub-acute care and residential aged care with a co-located health centre, aged day care program and general practice unit
- Lithgow Community Health Centre, providing community health, mental health, drug and alcohol services, and oral health.

Primary health care in the area is supported by the Nepean Blue Mountains Primary Health Network, delivered by Wentworth Healthcare, a local not-for-profit organisation[44]. It is focused on supporting general practitioners and other health care providers in the area, commissioning and funding services as required, and promoting integrated services across the health care system. Lithgow is also the headquarters for Westfund, a not-for-profit health insurance provider.

A high proportion of Lithgow residents seek medical care outside the LGA.

Patients are referred for more complex services to the tertiary-level Nepean Hospital, a 90-minute drive away in Western Sydney, which is undergoing significant redevelopment. Many residents also attend Bathurst Health Service in the neighbouring Western NSW LHD.

Lithgow has "unique challenges for healthcare delivery" reflecting its ageing population and social and economic indicators.

Lithgow has a higher-than-average population aged over 65, who make up 22% of residents, and is ageing faster than the average across the State, forecast to grow to 29% by 2031. NSW Health has forecast that by 2041, across the State, this cohort will "likely account for 45% of health activity if current models and settings of care remain as they are today"[45]. First Nations peoples and Culturally and Linguistically Diverse (CALD) communities in the LGA have lower health outcomes. Furthermore, the inmate and related transient population associated with the Lithgow Correctional Centre, and those experiencing socio-economic disadvantage, also experience lower health outcomes than the general community.[46]

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[42] NIEIR (2021). Lithgow City Council Economic Profile. Retrieved: https://economy.id.com.au/lithgow

[43] New South Wales Government [NSW Government] (January 2013). Nepean Blue Mountains Local Health District [NBMLHD] Healthcare Services Plan 2012-2022, ES8. Accessed at https://www.nbmlhd.health.nsw.gov.au/about-us/nbmlhd-strategic-plans-and-reports

[44]Wentworth Healthcare Limited (n.d) Who We Are. Accessed at https://www.nbmphn.com.au/About/Who-We-Are

[45] New South Wales Government [NSW Government] (May 2022). Future Health: Guiding The Next Decade Of Care In NSW 2022-2032..Report, p7. Accessed At https://www.health.nsw.gov.au/about/nswhealth/Publications/future-health-report.PDF

[46] New South Wales Health Nepean Blue Mountains Local Health District (2012) Nepean Blue Mountains Local Health District Healthcare Services Plan 2012 to 2022, pp2.1, 2.11, 7.14

Lithgow has a range of services to meet the needs of the ageing population.

The LGA is well catered for in residential aged care services and retirement villages, including:

- Three Tree Lodge (62 beds, including dementia facility, operating at almost 100% capacity)
- Portland Tabulam Health Centre (22 low care beds)
- Respect Cooinda Aged People's Home, formerly Lithgow Aged Care, including Cooinda and Tanderra nursing homes (84 single rooms, including a secure dementia care unit).

Lithgow is also home to Treeview Estates, a 160-villa retirement village, the largest across the Blue Mountains and the Central West. It is located next to the hospital precinct and Three Tree Lodge, meaning people can transition from independent living to the aged care facility, and get medical attention at the hospital. The co-located health and ageing services ensure high continuity of care, which is well regarded by operators.

4.7.3 Drivers of growth

Health care and social services, including aged care, is one of the major growth sectors across the broader Australian economy. With an ageing population, Lithgow is well placed to build on the growing demand. Western Sydney residents who are 65 years or older currently number 348,918 and this is projected to grow by 2031. Lithgow's lifestyle and potential for more affordable housing is likely to attract retirees who may also want to remain close to services, family and friends in Sydney. Equally, as the gateway from the Central West and Orana, Lithgow could be positioned as enabling older residents to retain their connection to their region, while also being within a two-hour proximity to family in Sydney.

Opportunities for economic growth in the sector in Lithgow LGA can be grouped as follows:

- Increased capacity of current services and attraction of new services, in response to growing demand from population growth in Lithgow and from neighbouring areas, including Western Sydney, Blue Mountains and Central West
- New models of service delivery that improve patient and ageing outcomes and optimise efficiency and productivity, through precinct planning, better integrated services, technological and digital advances, and research collaborations
- Increased commercial activity in developing products and services to improve healthcare and ageing outcomes
- Increased local employment, either due to increased demand for services, or to relocation of providers to the LGA.

Improved health and wellbeing will also indirectly lead to increased participation in the workforce and lower demand for public healthcare and other services.

4.7.4 Growth approaches

Contribute to the NBMLHD Healthcare Services Plan 2023-28, to influence expansion of local services

Public health and related aged care services are delivered in accordance with NBMLHD's *Healthcare Services Plan*. The 2023-28 HSP is currently being prepared in consultation with stakeholders and is expected to be launched by the end of 2023. It will prioritise services and infrastructure investment in the LHD, including in Lithgow LGA, and it is critical that Lithgow influences the HSP's development.

Stakeholders report there is unmet demand in areas of need specific to the community that could be effectively delivered locally, including:

- Expanded mental health care, including for the prison population and families, and other vulnerable groups
- Paediatric services, with NBMLHD considering how patients can be diverted from the Westmead Children's Hospital to more localised care
- More complex orthopaedics, including for the ageing community, and enhanced rehabilitation and transitional care with capacity for dementia secure models
- Other allied health services
- Lung function tests, particularly relevant for mining and industrial-related health conditions
- More complex surgical procedures, requiring more complex anaesthetist services.

Determining how these needs are best met and by whom will require a coordinated effort across the primary health network, public and private providers.

Update the Lithgow Ageing Strategy

LCC's *Lithgow Ageing Strategy* was last updated in 2011-12 and while the more current *Disability Inclusion Action Plan 2022-2026* considers a wide range of issues that impact on older people including health, access to services, housing, transport, wellbeing and social connectedness, the Ageing Strategy needs to be updated[47]. Positioning Lithgow as a city at the forefront of ageing could support business attraction, growth of the sector servicing the ageing population, and potentially attract older people and their families to the LGA.

The Strategy should reflect the increasing push to promote healthy, active and better ageing to support prolonged wellbeing and enable people to remain in their homes and communities longer. This needs to be complemented by a focus on aged care in people's homes, in the community and in residential aged care settings.

The Royal Commission into Aged Care Quality and Safety recommended specific attention to Aboriginal and Torres Strait Islander people and others from diverse backgrounds, who have problems accessing services that meet their needs. This includes people from CALD backgrounds, veterans, people who are homeless or at risk of becoming homeless, care leavers, and people from the lesbian, gay, bisexual, transgender and/or intersex (LGBTI) communities. Single older women are also a significant and growing cohort[48].

Ageing and aged care needs should also be considered across other LCC policies as relevant, such as for community planning, transport and design of public spaces for access and dementia considerations.

Consider child-centric and intergenerational connection approaches

Health and wellbeing outcomes throughout our lifetimes are significantly affected by childhood, particularly the first 1,000 days of a child's life, but continuing throughout our development, including at home, at school and in the community. The Associate Dean of Rural Clinical Schools at The University of Notre Dame and former Chief Executive of the Sydney Children's Hospitals Network has recommended consideration be given to Lithgow taking a child-centric approach to improving the social determinants and economic outcomes in the community over the long term. For example, Scotland's Getting It Right for Every Child (GIRFEC) policy framework[49] sought to position the country as the best place in the world to raise a child, with approaches

[47] Lithgow City Council [LCC] (n.d). *Lithgow Ageing Strategy.* Accessed at https://council.lithgow.com/council/ipr/other-plan-documents/
[48] Royal Commission into Aged Care Quality and Safety (March 2021), Final Report: Care, Dignity and Respect Volume 1: Summary and recommendations, p67. Accessed at https://agedcare.royalcommission.gov.au/publications/final-report-volume-1
[49] Scottish Government, Getting it Right for Every Child policy framework, Accessed at https://www.gov.scot/policies/girfec/

integrated across the whole of government. The model is complex – and potentially difficult to implement from a community level, rather than driven by state or national policy – but the principles could be considered.

Consideration could also be given to positioning Lithgow as an exemplar of active intergenerational connection to improve outcomes across generations and build community. An example is being piloted on the ABC's "Old People's Home for Four Year Olds" and "Old People's Home for Teenagers", leveraging the research led by Professor Susan Kurrle, Curran Chair in Health Care of Older People in the Faculty of Medicine and Health at the University of Sydney.

Develop a Lithgow Health, Ageing and Innovation Precinct Masterplan

NSW Health Infrastructure and NSW Health strongly emphasise developing integrated and innovative public-private health precincts, with holistic planning and investment attraction. The approach includes co-location of clinical service delivery with related education, training and research activities and enables health assets to be managed and leveraged to improve health, social and economic outcomes.[50]. For example, Orange, Dubbo, Bathurst and Mudgee have health precincts, combined with a focus on innovation, education and research, including in adjacent areas such as agriculture research.

While a precinct has emerged organically at Lithgow, it is proposed that the updated HSP and Lithgow Ageing Strategy concurrently inform the development of a formalised Health, Ageing and Innovation Precinct Masterplan for the LGA with a broader footprint. In addition to the South Bowenfels site, it could include a second campus focused on commercial ventures – such as on greenfield employment lands on the Marrangaroo site or at the nearby Thales site – as well as service delivery areas in Lithgow and Portland. This may require zoning changes and acquisition of land adjacent to existing sites.

The Masterplan would articulate the priorities for the LGA, informed by the HSP and LCC Ageing Strategy to:

- support integrated health, ageing and aged care
- the attraction of medical, allied health and aged care services
- plan for infrastructure needs (refer to Section 4.7.5 for more information)
- identify research collaborations and commercialisation
- prioritise workforce and education requirements.

Integrate services for improved health outcomes

The integration of services at the South Bowenfels site is considered a strength that provides continuity of care that should be built on in the Masterplan. Co-location on the precinct means people can transition from independent living in the retirement village to the aged care facility, and get medical care at the hospital, health service and specialist providers throughout. For example, the hospital's geriatrician sees patients on-site at Three Tree Lodge, and when they do need hospitalisation, they are often released early as they are able to receive ongoing care on the precinct.

A core element of integrated services is the shared services arrangements between Lithgow Hospital and Lithgow Community Private, including sharing of theatres and associated staffing arrangements. While Lithgow Community Private's visiting specialists are able to operate at the theatres, they are assisted by NBMLHD nursing staff. It is recommended that these arrangements be reviewed as part of the Masterplan development, potentially by NSW Health Infrastructure, to support ongoing effectiveness and efficiency. For example, modifications to the resourcing model may increase the number of surgeries able to be performed locally, a critical requirement for Lithgow Community Private to access growth revenue.

[50] New South Wales Health Infrastructure [NSW Government] (n.d). *Commercial Partnerships*. Accessed at https://www.hinfra.health.nsw.gov.au/about/strategy/commercial-partnerships

New models of health and aged care delivered locally, enabled by technology

NSW Health has identified that two-thirds of the disease burden in NSW is due to conditions that could largely be managed outside the hospital setting, and that hospitalisation can exacerbate some conditions[51]. It is therefore working towards more people accessing services in the home, community and virtual settings, through partnerships with GPs and non-government organisations and enabled by technology. This could lead to more services being provided locally, rather than patients having to travel outside the LGA.

For example, the new 24/7 Telestroke at Lithgow Hospital enables the rapid diagnosis and treatment of patients who present with stroke-related symptoms by connecting local doctors to specialist stroke physicians via video consultation in the local emergency department. Likewise, the new MRI will mean that patients no longer have to travel to Bathurst, enabling improved diagnostic services for orthopaedics, soft tissue analysis, and cancer/tumours. Enhancing the capacity for telehealth and other digitally and technology-enabled services will become increasingly important.

Likewise in the aged care sector, remote in-home telehealth and assistive technologies are increasingly part of the solutions enabling people to stay in their homes longer. For example, they enable telemedicine appointments, automation of some care tasks, monitoring of health indicators, alerts to enable early intervention of accidents, such as falls, or management of chronic conditions. This may lead to efficiencies in services, but also requires new models of service delivery and providers.

Enhance the focus on research collaboration

R&D is a critical contributor to improving health and ageing outcomes. The University of Notre Dame and Western Sydney University have identified an interest in building local research collaborations with health and aged care providers, focused on the needs of the Lithgow community but with broader insights for health and ageing. This could include research on the effects of integrated services for health and ageing/aged care in the precinct or the effects of the transition from coal mining and coal-fired power generation on community health. This could also support the education of students and the workforce and promote retention in the LGA.

Attract commercial investment for in-home health and aged care services and manufacturing

Economic growth in Lithgow could be supported by the attraction of manufacturers and service providers focused on in-home health care, ageing and aged care, which could also benefit people with disability and other vulnerable groups. This could include "smart home" products, such as smart devices, home automation and remote safety and telehealth monitoring products. It could also include manufacturers of equipment and home modifications, such as handrails, leveraging metal fabrication and construction material manufacturing already occurring in Lithgow.

Other targets may include healthy ageing and aged care service providers, such as fitness and lifestyle services, and others aimed at providing assistance with everyday living activities and respite care, including inter-disciplinary teams.

Attract investment in retirement villages, in-community ageing and residential aged care services

[51] New South Wales Government [NSW Government] (May 2022). Future Health: Guiding The Next Decade Of Care In NSW 2022-2032, p7 Report. Accessed At https://www.health.nsw.gov.au/about/nswhealth/Publications/future-health-report.PDF

Lithgow has strong potential for growth in retirement villages and residential aged care, given the growing ageing population in the LGA and surrounds. As housing costs have increased in Sydney, people are increasingly selling and moving to Lithgow, particularly from the Blue Mountains and Western Sydney. There is also a potential market from Central West and Orana, such as those moving off the land who want to remain in the regions but be closer to family in Sydney.

However, as retirees increasingly prefer to stay independent and not move into villages, there is also the opportunity to attract targeted investment in integrated living in residential areas. For example, Council could require ageing appropriate (and affordable) housing to be integrated into planning or precinct controls for greenfield mixed dwelling developments such as those at Marrangaroo and Portland, given the challenges in retrofitting homes to meet accessibility and electronics requirements of "smart homes". This would be a selling point for the developments to attract residents and provide commercial incentive for potential investors and service providers. Amenities and transport offerings in these communities would also need to be tailored for the ageing cohort.

It is nonetheless recognised that it is a difficult environment for investment in residential aged care. Reforms to the sector recommended by the Royal Commission are progressively being rolled out and complex liability issues make the sector less feasible for the not-for-profit sector, which has been the dominant provider given the limited return on investment for the private sector. A 2022 report by the University of Technology Sydney found that "many aged care service providers face increasing and acute threats to their financial viability, with more than 60 per cent of residential aged care homes operating at a loss", continuing a medium term trend.[52]

4.7.5 Infrastructure and land use needs

It is not expected that major new public health infrastructure will be a significant feature of future growth. Population projections remain fairly stable, there is surplus capacity at the relatively modern 46-bed Lithgow Hospital, and significant investment is being made in the Nepean and Bathurst Hospitals to which patients are referred. Instead, upgrades to support service improvements and expansion are likely to be required. For example, work is currently underway at Lithgow Hospital on a $3 million expansion to accommodate a new MRI, which is due for completion by the end of 2022[53].

This may change should plans to merge the ageing Blue Mountains and Springwood Hospitals on a new site in Springwood, a further 30km from Lithgow, result in a relocation/reprioritisation of services to Lithgow. This could include relocation of short-term staff accommodation, with service providers to Lithgow currently using Katoomba-based facilities. This could be done in conjunction with expanded student accommodation, should the education offering be expanded (refer to Workforce considerations). It is noted that proposed housing developments in Marrangaroo and Portland may increase demand and this will need to be monitored.

Lithgow Community Private reports growing demand for overnight inpatient care, including from the Blue Mountains. It closed this service in 2012 as it was not commercially viable, and Lithgow Hospital absorbed the demand. However, over the coming decade, demand could be sufficient to warrant reopening, potentially commencing with an outsourced, funded arrangement with Lithgow Hospital, and in the long term, potentially building a new hospital on the South Bowenfels site. This would require land rezoning and acquisition.

The residential aged care sector is also serviced by Treeview Estates, the largest provider of retirement villages in the region. In residential aged care, expansion plans include:

[52] Sutton, N., Ma, N., Yang, J.S., Lewis, R., McAllister G., Brown, D., Woods, M., (2022) Australia's Aged Care Sector: Mid-Year Report (2021–22). P9 The University of Technology Sydney.
[53] Lithgow City Council (15 October 2021), Consultants Brief-Request For Tender: Lithgow Emerging Economy Project [TEN14/21].

- Three Tree Lodge has plans for a $2.2 million expansion for an extra 11 beds to open in 2023; this will be the maximum feasible for the site; and
- Respect, the owners of Lithgow Aged Care, have committed to the continued development of the site up to 108 rooms plus a specialist secure dementia area of 30 rooms.

Further expansion would require large tranches of land, with consideration for integration into greenfield development sites, including Marrangaroo and Portland.

4.7.6 Workforce implications

One of the biggest barriers to growth in the Health Care and Social Services Sector in Lithgow is attraction and retention of qualified and trained medical practitioners and staff, including specialists, nurses, aged care workers, clinical management and administration staff. This mirrors challenges experienced in many rural and regional centres. Issues include:

- An ageing workforce, who have reached or are nearing retirement and proving difficult to replace
- Impacts of COVID on the workforce
- Willingness to relocate to Lithgow – for example, none of the medical specialists working at the Lithgow Community Private are resident in the LGA.

New models of care present both opportunities and challenges. For example, the introduction of standard minutes of care for residents in aged care homes will require some providers to increase staffing profiles, which may present issues. New services will require new roles and upskilling, such as a workforce trained in telehealth and integrated home care service provision. As telehealth expands, there will be a re-emergence of generalist medical roles working alongside specialist roles and a rise of roles such as nurse practitioners, assistants in nursing and allied health aides[54].

Governments, peak medical bodies and unions, and providers are looking for solutions. For example, NSW Treasurer the Honourable Matt Kean MP announced in the 2022 state budget a $4.5 billion investment to hire 4,000 more staff for NSW Health in the next four years. Local medical practices are offering incentives to GPs willing to relocate. However, some changes risk exacerbating the challenges, such as the recent Federal Government decision to no longer require overseas trained doctors to spend time in rural and remote communities before receiving an unrestricted Medicare provider number.

A traditional pathway has been through links with education providers. Lithgow Hospital is a teaching hospital for the University of Notre Dame's Rural Clinical School, which trains final-year medical students on a residential basis (6 students annually) and on rotations of at least four weeks. Each year, Notre Dame trains 36 students in total. It is understood that retention of newly trained nurses is a significant issue for Lithgow.

The University of Notre Dame has interest in expanding its offering in Lithgow, including expansion of faculties, such as nursing, paramedics, midwifery and allied health, including considering a specialisation in aged care physiotherapy, with a rotation with Three Tree Lodge. This is proposed to be done in coordination with Charles Sturt University and Western Sydney University. While there is demand currently, larger facilities would be required, with an infrastructure expansion. This would need to include additional student accommodation, which could also accommodate visiting medical staff.

However, not all workers require tertiary-level skills or are able to make a direct pathway from school to university. Lithgow employers in the sector recommend that pathways need to be developed to allow

[54] New South Wales Government [NSW Government] (January 2013). Nepean Blue Mountains Local Health District [NBMLHD] Healthcare Services Plan 2012-2022. Accessed at https://www.nbmlhd.health.nsw.gov.au/about-us/nbmlhd-strategic-plans-and-reports

secondary students (in school or post-school) and mature-aged students to earn qualifications from local VET providers that can then be leveraged to progress to undergraduate studies, as relevant. This includes a need for staff to have digital literacy. Pathways to employment are also critical, ranging from school-level placements to internships for medical, nursing and allied health tertiary graduates.

4.7.7 Economic target setting

Health care and social services, including aged care, is one of the major growth sectors across the broader Australian economy. However, in Lithgow, current projections of 3% growth over the next decade is lower than the CAGR of the last 10 years. Benchmarking with high growth regions with similar demographics and context, such as Kempsey and the Atherton Tablelands, suggests up to 5.4% CAGR is achievable. These benchmarks have been used to establish an aspirational target for Lithgow of $56 million growth in value added over a 10-year period. It is noted that while some roles in the sector are high paying, such as specialists, overall the salaries are lower, so jobs in this sector alone will not replace the loss of high paying mining jobs and economic inputs. Figure 19 presents the 10-year growth potential for the sector.

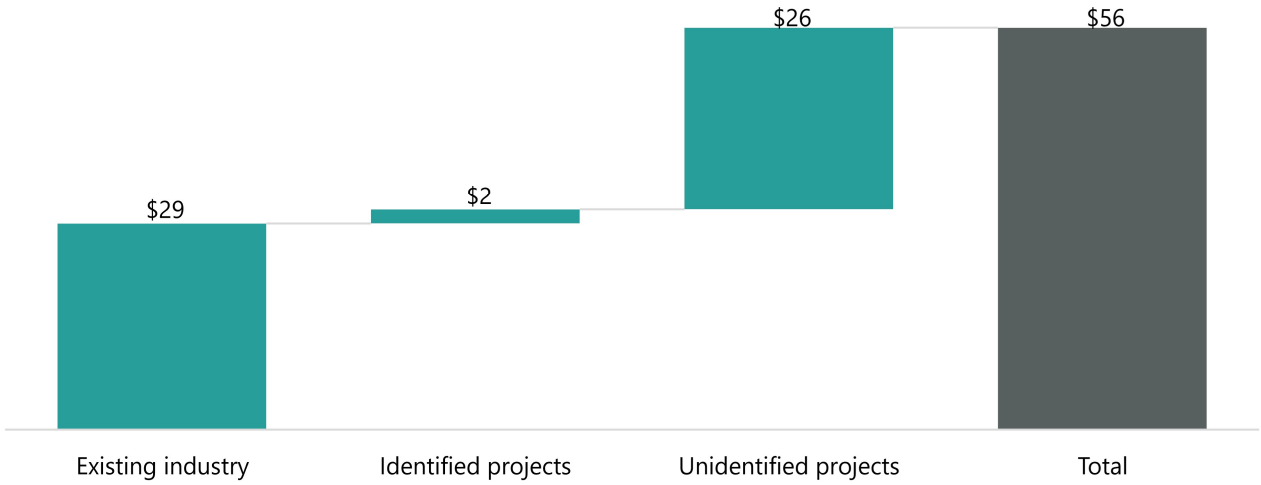

Figure 18. Lithgow 10-year value added growth for the Health care, ageing and social assistance sector, by growth source ($million, 2022 dollars) Source: Acclimate Capital and NCEconomics analysis

4.8 Health, Social and Public Services: Public Administration and Safety Sector

4.8.1 Proposed outcome

Lithgow is respected as a base for decentralised government services, which provide a steady economic foundation for the community.

4.8.2 Context

Lithgow LGA is the base for a range of executive, service delivery, judicial, and public safety, security and defence activities of the Commonwealth and NSW Governments and Lithgow City Council, including:

- Lithgow City Council
- State Debt Recovery Centre
- Services such as the Commonwealth Department of Human Services (Centrelink, Medicare), Services NSW, NSW Department of Family and Community Services, NSW Local Land Services
- Emergency services, including the PoliceLink multi-media contact centre for NSW
- Lithgow Local Court
- Lithgow Correctional Centre maximum security facility for men
- Marrangaroo Training Area for the Australian Defence Forces.

Collectively, these services employed 930 people or 10.7% of the workforce in 2020-21. This is significantly higher than for NSW and Regional NSW where it accounts for around 6.2% of total employment. Public administration and safety contributed $110.4 million to GVA. At 7.8% this is significantly higher than for NSW and Regional NSW and makes this sector the third largest in Lithgow[55].

4.8.3 Drivers of economic growth

The public administration and safety sector is driven by the decisions of government to expand existing services and/or establish new services in Lithgow. Lithgow may represent a comparative cost advantage where cost of living including accommodation provides workforce with benefits over other regional competitors. Operating regional services hubs in a decentralised public sector can improve services and policy development, create social and economic opportunities for communities, and reduce operating costs for government[56].

4.8.4 Growth approaches

Government will have ultimate responsibility for identifying opportunities for economic growth in the sector

The Australian Parliament's House of Representatives Select Committee on Regional Development and Decentralisation (2018) recommended that decentralisation be part of a broader strategy for regional development. It recommended that every Federal Government agency should assess the possibility for relocation whenever appropriate, but always when one of the following occurs:

[55] NCEconomics (July 2022). Lithgow Emerging Economy Baseline Assessment
[56] Parliament Of the Commonwealth of Australia (June 2018). *Regions at the Ready: Investing in Australia's Future*. Accessed at https://www.aph.gov.au/Parliamentary_Business/Committees/House/Former_Committees/Regional_Development_and_Decentralisation/RDD/Final_Report

- a new unit, agency or organisation is created;
- an organisation is merged or reorganised; or
- a significant property break occurs such as the termination of a lease.[57]

Prior to coming to government, the Labor Party's policy platform committed to "sensible relocation of Australian Government functions and jobs.[58]"

The NSW Government has had a commitment to decentralisation since coming to office, through its Decade of Decentralisation. When the NSW Government launched the *20-Year Economic Vision for Regional NSW* in 2021, it announced the Regional Workforce Principles which would see public sector roles advertised from any location with 'regional location encouraged'. It also committed to increase the proportion of senior government roles in the regions by 2023.[59]

Opportunities in the sector could be explored that leverage Lithgow's strength in service provision

Given the proximity of Lithgow to Sydney and particularly to the growing Western City metropolis, Lithgow offers convenience to the seat of government combined with potential for affordability.

It is recommended that services that leverage existing operations be considered. For example, the contact centre capacity of PoliceLink and the State Debt Recovery Centre's processing and collection of fees and fines on behalf of over 250 organisations in NSW could demonstrate the area's ability to offer similar services to other government agencies (and the private sector).

Similarly, opportunities could be sought where Lithgow's infrastructure demonstrates competitive advantage. For example, the Thales site offers secure warehousing and Defence-compliant network capacity that may be suitable for records management and archiving, including warehousing, logistics and digitisation. This would be consistent with the State Archives' approach to decentralisation, with a network of Regional Archives Centres across the State[60].

Minor growth is anticipated from Defence plans to expand the Marrangaroo Training Area to increase its capacity to accommodate 100 visiting training officers (up from 60) participating in dry training manoeuvres.

4.8.5 Infrastructure and land use needs

Subject to the type of public administration and safety offering, it may be possible to house the service in existing, but vacant or underutilised buildings, or store frontage on the main street. Information security will likely be critical. The State Office Block, opened in 2004, currently houses PoliceLink and the State Debt Recovery Centre.

Lithgow's potential role as a future multi-modal transport hub would also support the mobility and engagement of workers between public administration hubs in the city, the region and in Sydney.

[57] Parliament Of the Commonwealth of Australia (June 2018), Recommendation 5.
[58] Labor's 2021 National Platform (March 2021). ALP National Platform: As adopted at the 2021 Special Platform Conference. Report, p12. Accessed at https://alp.org.au/media/2594/2021-alp-national-platform-final-endorsed-platform.pdf
[59] New South Wales Government [NSW Government] (2021). Deputy Premier Media Release: *A New Era For The Public Service In Regional NSW.* Published: 3 February 2021. Retrieved https://www.nsw.gov.au/media-releases/a-new-era-for-public-service-regional-nsw
[60] New South Wales State Archives and Records [NSW State Archives & Records] (n.d). Regional Archives Centres. Accessed at https://www.records.nsw.gov.au/archives/collections-and-research/guides-and-indexes/regional-repositories

4.8.6 Workforce

The current profile of employers is already generating a workforce with suitable skills for public administration and safety. Attraction of further government services would create Lithgow as an attractive location for people to pursue a public service career, enabling mobility between agencies while retaining skills in the community.

4.8.7 Economic target setting

The public administration sector has demonstrated good historical growth. Maintaining this growth could add an additional $22 million in GVA to the local economy over the next decade. Using sector benchmarks from regions comparable to Lithgow (benchmarks suggest a compound annual growth rate of 6.5% could be possible), a target of an additional $96 million in GVA was modelled. This indicates that an additional $62 million in GVA will need to be identified and attracted through new public administration and safety sector projects in order for Lithgow to achieve the high growth benchmark. While this is aspirational, the location of a single additional agency in Lithgow may go a significant way towards meeting this target. To compensate for the potential decline in economic activity in other sectors, this sector is one which the government has considerable influence to drive growth, noting that this sector can also include some private industry.

Figure 20 presents the 10-year value added growth for the Public administration and safety sector by growth source ($million, 2022 dollars).

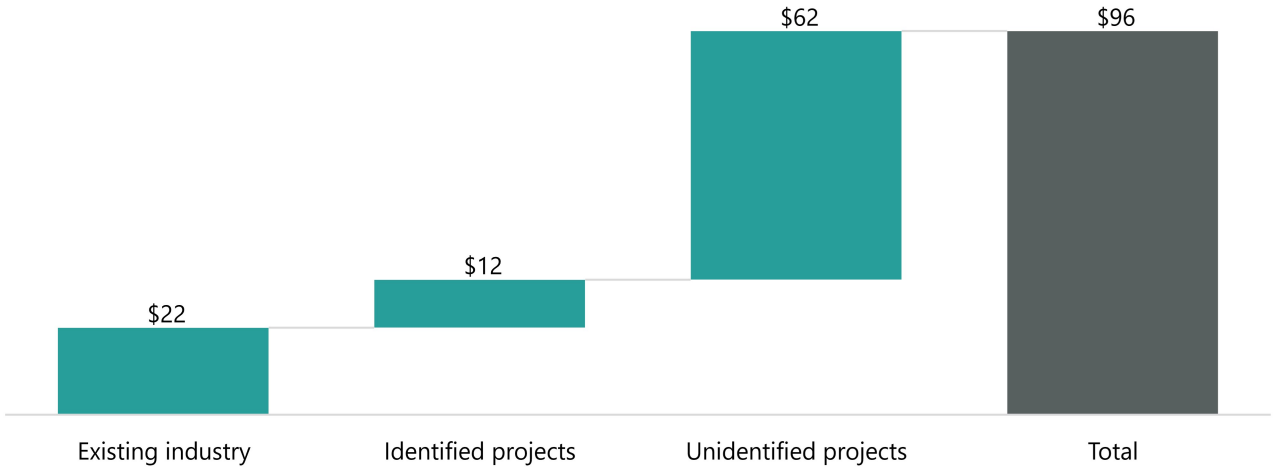

Figure 19. Lithgow 10-year value added growth for the Public administration sector, by growth source ($million, 2022 dollars)

Source: Acclimate Capital and NCEconomics analysis

4.9 Combined Actions for the Health, Social and Public Services Sectors

Action (0-5 years)	Description
Plan a precinct plan to catalyse and consolidate an industry around innovation in health and ageing in Lithgow	Develop a Lithgow Health, Ageing and Innovation Precinct Masterplan including an infrastructure plan to investigate, support and foster growth in the health and ageing sector:

	a. Focus on delivery of expanded and ongoing services outlined in the NBMLHD Health Services Plan 2023-2028 b. Prioritise services to be delivered by Lithgow Community Private, specialists and the primary health network c. Review the partnership between Lithgow Hospital and Lithgow Community Private d. Develop an infrastructure plan, including consideration of staff accommodation for VMOs and nursing staff, potentially as part of expanded accommodation for University of Notre Dame students. e. Potential expansion of the Notre Dame Clinical School, to include more courses, collaborative courses with other education providers, such as Western Sydney University and Charles Sturt University f. Prioritise precinct research collaborations and commercial investment attraction approaches.
Incorporate future land use needs into the precinct planning process	Engage with hospital and health care services to further understand demand and potential land use requirements.
Audit potential occupied and vacant buildings suitable for accommodating public services operations across the LGA	Position Lithgow and its towns as a viable option for future regionalisation of public services, maintaining and promoting a current inventory of building stock suitable for commercial use by health, social and public services.
The health, ageing and social services sector has been engaged in the update of relevant strategies affecting the sector in Lithgow	Update strategies for health and ageing a. Lithgow stakeholders to contribute to NBMLHD's development of the Health Services Plan 2023-2028. b. Update LCC's Lithgow Ageing Strategy, including lateral thinking around the design of housing, urban environments, and public transport services. c. Consider child-centric and intergenerational connection approaches.

Develop an investment attraction plan for the sector	Engage stakeholders and facilitate the development of an investment attraction plan, seeking commercial investment for life sciences manufacturing and services, new and expanded retirement villages, integrated ageing in new housing developments (Marrangaroo and Portland), and residential aged care services.

Intermediate outcomes (5–15 years)	Description
Capture opportunities for public service regionalisation	Capture opportunities to integrate Lithgow into government regional service planning to identify opportunities for service growth in the city.
Adaptive management of sector investment attraction strategy over time	Identify and monitor success of strategies to attract new specialists and services, aligned with the regional plan.
Lithgow has identified and attracted investment in health, ageing and social services industries	Projects and capital investment that has the potential to generate $26m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local health, ageing and social services industries.
Lithgow has identified and attracted investment in public administration and safety services industries	Projects and capital investment that has the potential to generate $62m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local public administration and safety services industries.

Long-term outcomes (15+ years)	Description
Lithgow's health care and social assistance sector remains the LGA's largest employer and provides priority specialist and general services to promote the health and wellbeing of the community and consumers from neighbouring areas, including ageing and vulnerable people	New projects and capital investment in health, ageing and social services industries have been delivered, generating $26m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the sector to more than $56m in gross value added over 10 years in real 2022 dollars.
Lithgow has a stable and foundational public administration services sector that builds on the LGA's cost advantages and geographic location between Sydney and the Central West	New projects and capital investment in public administration and safety services industries have been delivered, generating $62m or more in gross value over 10 years to the Lithgow local economy, bringing the total contribution of the sector to more than $96m in gross value added over 10 years in real 2022 dollars.

4.10 Whole of economy actions

Action (0-5 years)	Description
Residential land zoning	Review existing residential land zonings and potential candidate sites to ensure suitability of supply having regard, amongst other things, to likely demand, serviceability, environmental and community factors and constraints.
Align developers with public infrastructure	Review (or, where applicable, draft and adopt) Part 7 infrastructure contribution agreements or plans for proposed residential and employment land release areas identifying key infrastructure step issues and infrastructure barriers to development.
Establish a regional skills baseline	Undertake a regional manufacturing sector skills and training audit in consultation with industry and the education and training sector.
Engage in regional workforce planning early, and align with priority economic growth areas	Undertake a long-term regional workforce plan identifying likely skills requirements, training and pathway gaps, other opportunities, and potential disruptions, leveraging state and national approaches and initiatives, and engaging local manufacturers, schools, vocational and higher education organisations, peak bodies and unions.
Focus workforce development on skills to improve adaptive capacity	Develop a regional workforce adaptive capacity plan for focusing on strengthening flexible, innovative, and STEAM skills in the emerging workforce. Facilitate university, TAFE and industry partnerships to complement and stimulate innovation opportunities.
Establish pilot programs for new models of engagement around STEAM skills	Leverage the Maldhan Ngurr Ngurra Lithgow Transformation Hub to explore piloting a regional 'tech school' to accelerate STEAM and adaptive skills in the emerging regional workforce.
Established co-working innovation hub facilities in the LGA	Lithgow has established a co-working innovation hub in collaboration with the knowledge sector and local manufacturing enterprises to strengthen research, development innovation and commercialisation opportunities and which leverage additional value from existing value chains.
Engage early in positioning Lithgow in the region's major transport infrastructure planning processes	Undertake detailed feasibility assessment for Lithgow's role in the East Coast Hydrogen Refueling Network. Explore opportunities with NSW Government for an 'East Coast to Western NSW Hydrogen Highway

	Initiative' similar to the Hume Hydrogen Hume Highway initiative.

Intermediate outcomes (5–15 years)	Description
Improved telephone and internet capacity in the Lithgow LGA	Undertake a study to determine mobile phone coverage dead-zones, and opportunities to enhance internet connectivity across the LGA to attract and enable remote working and tourism.
Understand skills issues and future needs	Engage in forums and with appropriate coordinating agencies on the skills and training agenda, focusing on regional skills requirements for renewable hydrogen, and advanced manufacturing opportunities.

5 Supporting the coal transition

5.1 Proposed outcome

Any decline in coal mining and coal-fired power generation in Lithgow is planned and equitable, offers a just transition to workers, ensures infrastructure and natural resources are repurposed or rehabilitated as future economic and community assets, and engages workers, the community and other stakeholders in shaping future opportunities.

5.2 Context

Coal mining accounts for 99% of mining value added in Lithgow and provides a significant number of direct, high-paid jobs and support services.

Despite an expected 6% increase in global coal demand in 2021, the coal industry is declining worldwide with substitution of renewable energy.[61]. In the past decade, Australia has faced the closure of several coal-fired plants.[62], and in a recent report, the Australian Energy Market Operator (AEMO) has stated that Australia is likely to exit coal-fired power entirely by 2043.[63]. Mt Piper is the last remaining coal fired power station in Lithgow, following the closure of the Wallerawang Power Station.

The NSW Government's *Strategic Statement on Coal Exploration and Mining* recognises the importance and economic contribution of coal mining in regional economies and outlines the Government's intent to support continued coal mining where there is demand.[64] The Statement outlines the Government's intent to support diversification of coal-reliant regional economies, adopting a systematic, place-based approach to transition planning, beginning with coal regions that may experience the earliest coal production declines, including Lithgow.

NSW Government has put in place policies to support the reduction of emissions from mining and the use of coal and see low emissions coal technologies as playing a key role in reaching the State's emissions targets. Investment in these initiatives has begun through the Coal Innovation Program and these initiatives will support research, commercialisation and demonstration of low-emissions coal technologies.[65]

Mt Piper power station is a relatively modern power station, built over two stages in 1992 and 1993. The station has two 700 MW coal-fired steam turbine generators (combined capacity of 1,400MWh), with one of

[61] IEA (2021), Coal 2021, Accessed at: https://www.iea.org/reports/coal-2021
[62] Burke, P. J., Best, R., & Jotzo, F. (2019). Closures of coal-fired power stations in Australia: local unemployment effects. Australian Journal of Agricultural and Resource Economics,63(1), 142-165.
[63] Australian Energy Market Operator [AEMO] (2021) Draft 2022 Integrated System Plan. Accessed at https://aemo.com.au/-/media/files/major-publications/isp/2022/draft-2022-integrated-system-plan.pdf
[64] Department of Regional NSW (2020). Strategic Statement on Coal Exploration and Mining. Department of Regional NSW - Mining, Exploration and Geoscience. Accessed at https://www.resourcesregulator.nsw.gov.au/sites/default/files/2022-11/strategic-statement-on-coal-exploration-and-mining-in-nsw.pdf
[65] Department of Regional NSW (2022). Coal Innovation NSW. Department of Regional NSW - Mining, Exploration and Geoscience. Accessed at https://meg.resourcesregulator.nsw.gov.au/invest-nsw/coal-innovation-nsw

the generators having recently undergone a major refurbishment. It has the capacity to meet the energy needs of approximately 1.18 million NSW homes every year[66], or 15 per cent of the state's power needs[67].

In September 2021, EnergyAustralia announced that it would "transition out of coal assets by 2040", which brought forward the retirement date for Mt Piper[68]. Managing Director Mark Collette noted that "the ultimate retirement date would be determined by several factors"[69]. The Australian Energy Regulator requires National Electricity Market generators to provide at least 42 months' advance notice of their intention to close, unless granted an exemption[70]. EnergyAustralia provided seven years notice for the closure of Yallourn Power Station in the Latrobe Valley in 2028.

Importantly, the generators at Mt Piper can operate at much lower than maximum capacity (unlike many other generators), which provides more flexibility for energy market participation and may serve to extend their economic life. This means the power station could be an important component of EnergyAustralia's strategy in the medium term, as they seek to establish themselves as suppliers of dispatchable energy and energy storage in the long term as part of a move to renewable energy.

While some of Mt Piper's coal requirements have been met by EnergyAustralia's Pine Dale Mine/Yarraboldy Extension in the past, it is in care and maintenance and a rehabilitation plan was due for submission to the Department of Regional NSW Resources Regulator (DRNSW-RR) on 31 July 2022[71]. EnergyAustralia has also submitted an application to relinquish related mining leases to the DRNSW-RR.

The bulk of coal has been sourced from Centennial Coal's Springvale Mine, supplemented by their other local mines, linking the future of the Mt Piper Power Station to Centennial's operations among other considerations. In the Lithgow and Mid-Western Regions, most of the coal mines are expected to close within the next 20 years, and much of the output is used domestically for power generation. The CEO of Centennial's parent company Banpu has announced that it will not invest in any new coal projects, but exploration and extension of existing reserves can be pursued[72].

Consents for the major underground coal mines currently operating – Clarence, Springvale and Airly Coal Mines – will expire in 2036, 2036 and 2042. Angus Place is currently in care and maintenance mode, however Centennial is seeking approval to extend its underground mining operations with the proposed Angus Place West Project (current consent is till 2024). The project is intended to coincide with late-stage operations at Springvale Mine to support continuity of coal supply to Mt Piper. This would also involve the redeployment of the Springvale workforce to Angus Place[73]. Plans for continuity of coal supply beyond the closure of the nearest mines may increase costs due to the increased transport distance and mode (road rather than conveyer belt).

Both EnergyAustralia and Centennial are making plans for investment in renewable energy production and storage on their sites in the Lithgow LGA, as well as new manufacturing opportunities. EnergyAustralia is considering installing a 500MW battery at its Mt Piper coal-powered station site, with plans to install the

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[66] EnergyAustralia, n.d). Mt Piper Power Station. Accessed at: https://www.energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station

[67] Lithgow City Council (15 October 2021), Consultants Brief-Request For Tender: Lithgow Emerging Economy Project [TEN14/21]. P3.

[68] EnergyAustralia, (2021-a). EnergyAustralia Climate Change Statement. Published: September 2021. Retrieved: https://www.energyaustralia.com.au/about-us/media/fact-sheets

[69] EnergyAustralia, (2021-b). EnergyAustralia Pledges to Accelerate the Clean Energy Transition. Published: 23 September 2021. Retrieved: https://www.energyaustralia.com.au/about-us/media/news/energyaustralia-pledges-accelerate-clean-energy-transition

[70] https://www.aer.gov.au/wholesale-markets/notice-of-closure-exemptions

[71] EnergyAustralia, (2022). Mt Piper Community; Lithgow Community Consultative Committee Meeting Minutes, p3. Published: 18 July 2022. Retrieved: https://www.energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station/mt-piper-community

[72] https://www.banpu.com/wp-content/uploads/2022/03/Banpu_One-Report-2021_EN_15_Aug-22_Updated.pdf

[73] https://www.centennialcoal.com.au/angus-place-west-a-new-proposed-project/

battery by 2026. EnergyAustralia last year said it would install a 350MW battery at its Yallourn power station in Victoria's Latrobe Valley when announcing the early retirement of the brown coal plant in mid-2028.[74].

These are addressed in Section 4.2 Electricity, water and waste and Section 4.3 Manufacturing. Centennial Coal has also begun selling residential and rural properties that are superfluous to its needs, including Lidsdale House.

Any consideration of transition planning while engaging with EnergyAustralia and Centennial Coal should support the continued operations of those projects while planning is underway.

5.3 Coal's contribution to Lithgow

5.3.1 Economic contribution of coal

Background

The West Centennial Coalfields, which include Lithgow and Mid-Western Regional Operations, currently employ about 800 FTE workers plus more than 100 FTE contractor positions. Centennial's internal analysis estimates the contribution of direct jobs to the regional economy to range from $5.0 million to $7.2 million per year, supporting an estimated 1,910 to 2,468 residents in the region..[75]

The contribution of the mining sector is further extended considering that each producing site (Airly, Clarence and Springvale) trades with an average of 73 (local), 92 (regional) and 387 (NSW) supplier companies each year. Over the last three years, the combined operations of the active mines are estimated to have contributed about $63.4 million, $69.4 million and $458.5 million on average to the local, regional and State economy, respectively..[76]

Additionally, Centennial's western operations also contribute payments in the form of taxes and other fees to local, regional and federal governments. For example, in fiscal year 2020, the three producing mines paid a total of $3.4 million to Lithgow City Council for fees and charges, $4.7 million to the State of NSW for payroll taxes, and a total of $30.7 million to the State for royalties..[77]

This analysis does not include offsetting impacts from projects proposed by EnergyAustralia and Centennial Coal/Banpu Energy.

Economic Impact Assessment approach

To assess the economic impact of changes in the local economy attributable to changes in the coal mining and coal-fired power generation industries, the approach used draws on a national accounting approach, scaled down to the regional level, to estimate the economic impacts of the developments on the Lithgow City Council regional economy (in terms of value added).

To estimate the economic impact of a step change in economic activity, an Input-Output (I-O) model of the Lithgow City Council regional economy was used.[78] This allows changes in economic activity in one sector to be traced through to resulting economic activity in another sector. An existing model was used as the purpose

[74] https://www.afr.com/companies/energy/energyaustralia-explores-grid-scale-battery-at-mt-piper-station-20221012-p5bpaa#:~:text=Australia%20is%20rapidly%20moving%20away,previously%20announced%20closure%20of%202043.
[75] Socioeconomic Profile Centennial Coal Western Operations, Centennial Coal Company Limited, August 2021.
[76] Socioeconomic Profile Centennial Coal Western Operations, Centennial Coal Company Limited, August 2021.
[77] Socioeconomic Profile Centennial Coal Western Operations, Centennial Coal Company Limited, August 2021.
[78] Economy.id – Lithgow City Council Economic Impact Model

of this project is not to establish a model – rather to use available information to better understand the challenges facing the Lithgow economy and community.

To understand the potential magnitude of the impact to the local economy and employment, it is important to model the potential impacts if *no transition actions are undertaken (including company plans to diversify into renewables at these sites) – a worst-case scenario.* The inputs to the I-O model are the changes to employment levels resulting from coal mine closures and the power station closure. This does not include an assessment of the transient workforce required for rehabilitation.

The timing of this scenario is unclear at this stage, and as such, **three different timeframe scenarios** for Lithgow are considered here:

1. **Mine closures in the near term (2028 to 2032)** – This period broadly aligns with the 42-month minimum legal notice required for closures of power stations. This does not signal that closure will occur in 2028, but considers the impact should an announcement be made in the future to bring closure forward to this timeframe. Assuming the mines' and power station's production and employment levels were similar to current levels at the time of any closure, this would equate to a decline in sector employment of approximately 900 jobs between 2028 and 2032 (approx. 650 in Coal mining [approx. no. of employees at Clarence and Springvale mines] and 250 in Electricity supply [approx. no. of employees at Mt Piper]).
2. **Mine closures in the medium term (2032 to 2036)** – This period may represent a scenario where coal prices are sufficient to incentivise further mining with insufficient drivers for the power station and mines to remain operational for the period to 2040.
3. **Mine closures in the long term (2036 to 2040)** – This period represents the most recent formal announcement from EnergyAustralia around the closure of Mt Piper (2040) and represents an upper bound for the decline in the coal mining and coal-fired energy generation industries.

Factors affecting mine closures and the extent of the impacts will be determined by:

- The actual rate of utilisation of the remaining coal reserves, and the actual volume of commercially viable reserves available. This is also influenced by the current consent dates and the ability to amend them. It should be noted that Centennial are developing contingencies to redeploy staff to other local operations if Clarence and Springvale Coal Mines were to close (potentially including underground mining operations at Angus Place).
- The prevailing coal price, and the ability of the mines to profitably sell coal from production levels above the volume required for Mount Piper power station into the broader market.
- The future wholesale price of electricity and the ability of Mount Piper power station to generate electricity at a marginal cost below the wholesale market price. This will be further influenced by the degree to which the two units at Mount Piper continue to operate efficiently, and at levels that match market demand for their output, noting that the power station is a relatively modern facility. It is also noted that EnergyAustralia gave seven years' notice for closure of the Yallourn power station in Victoria.
- The dedicated sector-wide effort to manage the transition of energy generation and energy sources at minimal disruption to both consumers and producers (e.g. through the Australian Energy Market Operator Integrated System Plan).

The key point is that the I-O modelling approach requires assumptions to be made with respect to inputs, and that the point of the modelling exercise is to understand the implications of a worst-case scenario where no transition actions are undertaken. There are a range of limitations associated with the use of the I-O approach,

which influence the interpretation of the results. For a detailed discussion of these limitations, refer to Appendix C.

Analysis

If mine closures are to occur in the near term (2028-2032), they would likely result in a 10-year CAGR of -4.2% p.a. out to 2030, as opposed to the 10-year historical CAGR of 0.9% p.a. If the closure happens at a different time period (highly possible) and no transition arrangements have been implemented, the order of magnitude of the impacts will be similar.

The modelling indicates the economic impact of a sudden closure and reinforces the need to establish a transition strategy to mitigate the impacts of closures, regardless of the expected timing. Key insights derived from the above projections are as follows:

- **Economy trending upwards in the absence of future shocks.** Despite much variability in the last 10 years, the general trend in value add has been positive (CAGR of 0.9% p.a.). Without any major shocks in the future this may continue.
- **The modelled impact of mining job losses results in considerable impacts for the Lithgow economy.** The potential loss of up to 900 jobs in the Coal mining and Electricity supply industries has large direct and flow on impacts for the local economy value add. These job losses will be offset by other economic activity including post-closure remediation of sites and developments in other industries.
- **Decommissioning of mines and power station provides short-term economic stimulus.** The decommissioning of these assets will generate employment in the construction sector for the duration of those projects; however, it is possible that a large proportion of this employment will be sourced from outside of the Lithgow LGA. Furthermore, there may be insufficient ongoing benefits to offset the job losses. This reinforces the need for an active transition plan for the region.

Economic transition can take a long time and therefore, regardless of the exact timing of mine and power station closures, Lithgow should be working towards their transition as soon as possible to stand the greatest chance of mitigating job losses.

5.3.2 Workforce considerations

The workforce impacts that are likely to result from the closures are significant. Continuing with the potential loss of up to 900 jobs as above, the potential flow on impacts to other sectors will result in the shrinkage of the wider economy of approximately 2,150 jobs in total. It is also important to consider that the jobs lost in these sectors represent a large proportion of the high-paying jobs in Lithgow. Figure 21 and Figure 22 present the distribution of incomes by occupation for the Coal mining and Electricity supply sub-sectors respectively.

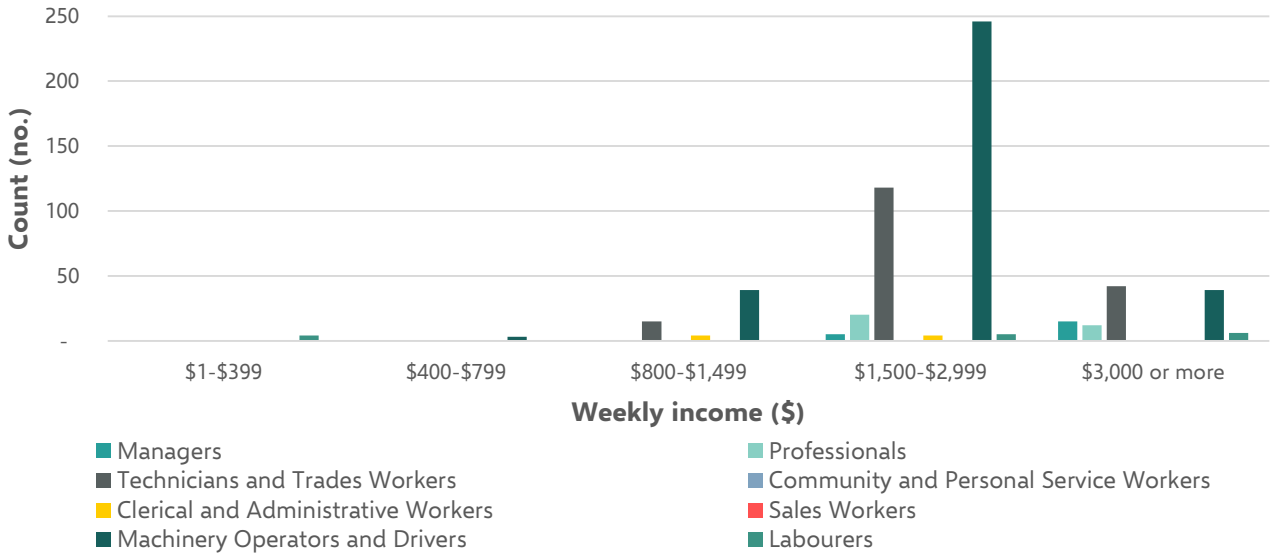

Figure 20. Weekly income by occupation in the Coal mining industry in 2016

Source: ABS (2022)

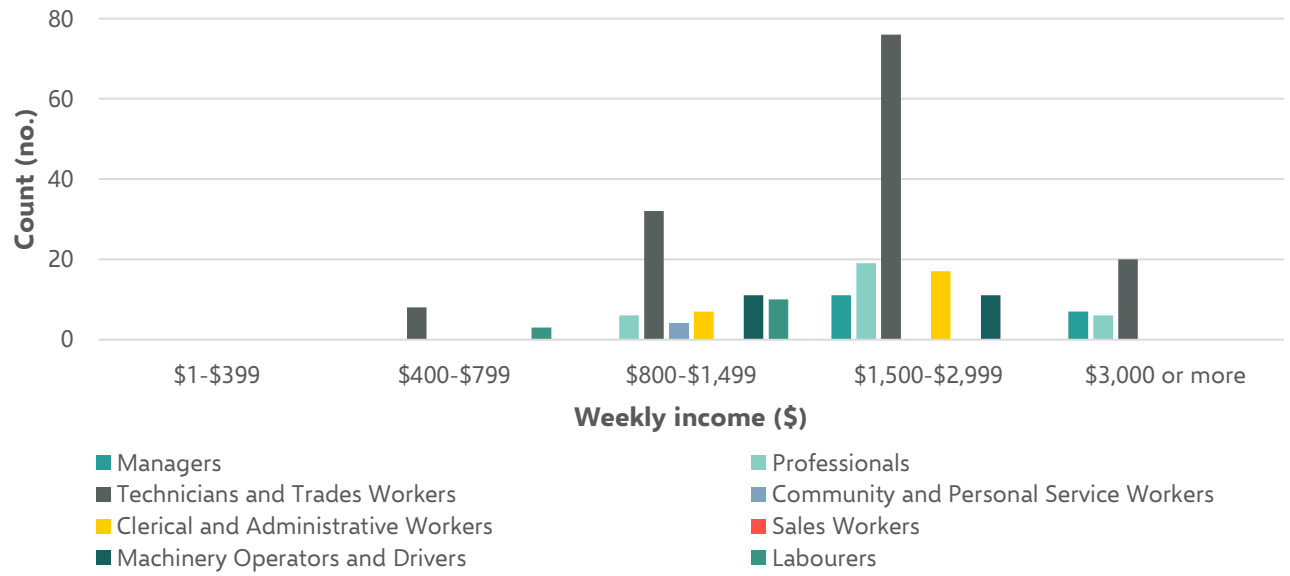

Figure 21. Weekly income by occupation in the Electricity supply industry in 2016

Source: ABS (2022)

The Coal mining and Electricity supply sub-sectors concentrate a high share of well-paying jobs in the region, but also an industry-specific skilled workforce represented primarily by machine operators, drivers, and technicians, and a small proportion of labourers. There are also a range of local suppliers to the mining sector and a more detailed analysis of their composition and the impacts of closure on them will need to be undertaken. Social media monitoring indicates workers are already considering their futures.

More detailed analysis of the workforce impacts needs to be undertaken with consideration for workers' skills, qualifications, age, and aspirations. Importantly it needs to consider their individual adaptive capacity – their ability to respond purposely and positively when confronted with a challenge, adjust, and identify opportunities[79]. This can be demonstrated by[80]:

- *an ability to draw on assets in times of need*: this can include (but is not limited to) support provided by the company; financial assets such as savings, superannuation, alternative income in the household; and social assets such as family, friends, community, colleagues and counselling services
- *the flexibility to change strategies*: this may include consideration of how transferable workers' skills are to other jobs in the community; ability to access training; whether they are able to move location to find work; how dependent their family is on their income, for example
- *the ability to organize and act collectively as appropriate*: this may include organising through their workplace, with colleagues or with their union to influence and access training in relevant areas, or with their community to influence support for workers and their families
- *learning to recognize and respond to change*: this may include understanding the different types of change a worker faces (e.g. job loss or change, income change), the ways in which that could impact them (including the physical, mental and emotional impacts for them, their families and colleagues), and tools for responding to that change
- *the agency to determine whether to change or not*: while some individuals will be naturally inclined to take agency, others may need to be empowered to do so. Approaches to supporting workers should be informed by their views on what they need and optimise opportunities for individual choice.

5.3.3 Social context

The social impact of the loss of coal mining and coal fired power generation, if the workers and current investment are lost to the community, includes:

- Changing demographics in the community
- Loss of worker contributions to the community
- Loss of company funding contributions to community organisations.

Figure 23 shows the Mining workforce is reasonably well spread across age groups but compared with workers in Health Care and Public Administration Sectors, which employ a significant proportion of the population, the Mining workforce is relatively younger.

[79] Harrison, D (2021). How to use adaptive capacity to improve recruitment. Published 6 May 2021. The HRDirector. Retrieved: https://www.thehrdirector.com/3-ways-to-use-adaptive-capacity-to-improve-recruitment-efforts/

[80] Inclusive Growth Partners Adaptation of adaptive capacity framework by Cinner, J.E., Adger, W.N., Allison, E.H. et al. (2018). Building adaptive capacity to climate change in tropical coastal communities. Nature Clim Change 8, 117–123. Accessed at https://www.nature.com/articles/s41558-017-0065-x#citeas

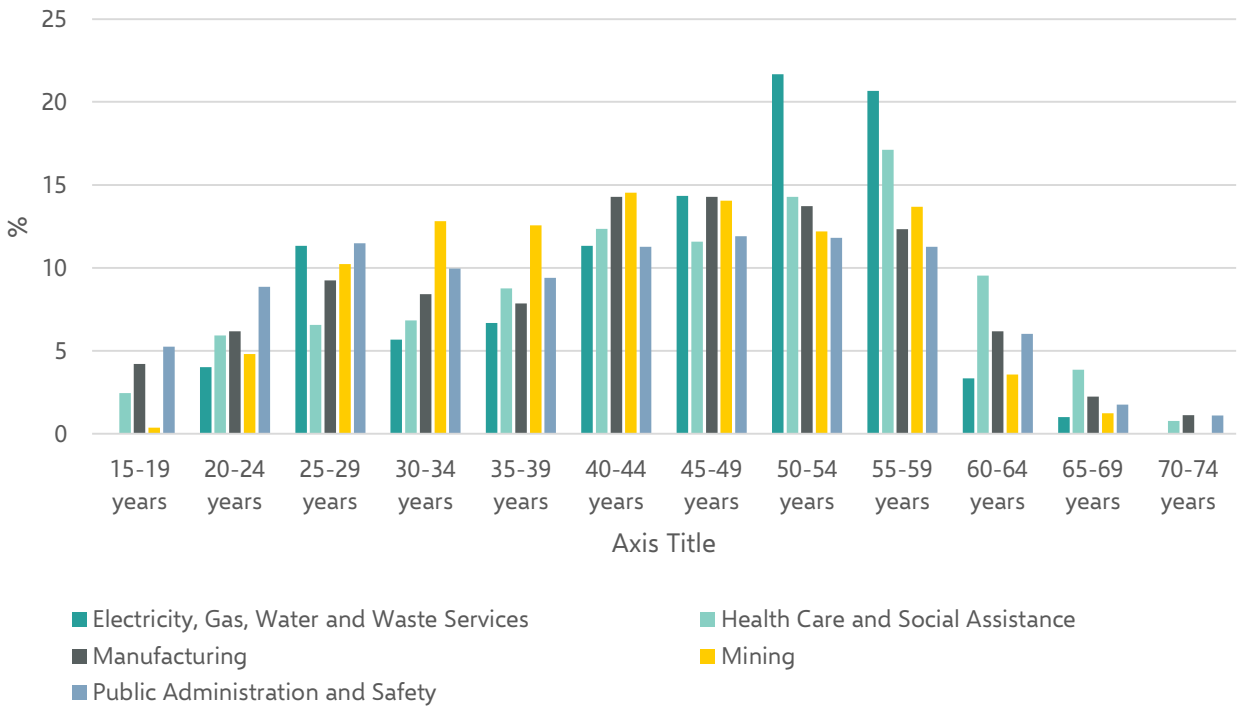

Figure 22. Age by occupation in Lithgow (2016)

Source: ABS (2022)

Workers in the coal mining and coal-fired power generation industries live in communities across Lithgow LGA and their families are an important part of the region's demographic profile, which influences the services that are delivered to meet community needs. Generally, the households of mining families are younger and larger than the average in the LGA. An internal survey conducted by Centennial at Springvale in 2016-17 determined an average household size of 3.1 persons per household, including children, compared with 2.4 for the LGA.[81] It could be expected that were workers' families to move out of the LGA, this could have an impact on local schools, which in some villages such as Wallerawang could impact on student: teacher ratios. Mining employees also play an important role in the local community in roles such as volunteer work in the fire and emergency services, support to schools and community and sporting associations[81].

Centennial Coal and EnergyAustralia also provide community funding for local organisations and initiatives. EnergyAustralia supports education programs, such as those with a social or environmental focus, and organisations which support career or skill development. It also supports initiatives that facilitate social inclusion, such as men's sheds, upgrading communal facilities, and supporting vulnerable community members. Centennial Coal provides similar support to schools, sporting and community organisations.

More detailed analysis would be required to anticipate and mitigate such impacts.

5.4 Adaptive capacity of Lithgow

Adaptive capacity of communities relates to the capacity of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences[82]. The Productivity Commission's (PC) Transitioning Regional Economies report defines relative adaptive capacity as

[81] Centennial Coal Company Limited, August 2021, Socioeconomic Profile Centennial Coal Western Operations
[82] Intergovernmental Panel on Climate Change.

"a summary of the complex set of factors considered to influence the capacity of regions to be resilient", but "not a guarantee of resilience to disruptive events".[83] The PC have constructed an index based on a range of factors (at both the individual and wider economy level), including skills and education of the regional workforce, access to infrastructure and services, availability of natural resources, availability of financial resources, and industry diversity.

The index has been constructed for a range of Functional Economic Regions (FERs) in Australia and is not reported at the LGA level. The Lithgow LGA lies entirely within the Bathurst – Orange FER and the research indicates that the Bathurst – Orange FER has a slightly higher than average adaptive capacity. However, for some key indicators, Lithgow performs considerably below the average, indicating a lower level of adaptive capacity than that of the Bathurst – Orange FER as a whole (see Appendix C for detailed comparison of indicators).

The Lithgow LGA appears more similar to the Mudgee FER, which has an index of -0.11 and is ranked 44th out of the 77 FERs – a lower than average adaptive capacity. Figure 24 displays index values and their 90% confidence intervals for each FER, sorted from lowest to highest. The positions of the Bathurst – Orange and Mudgee FERs in the distribution are indicated using arrows and respective labels.

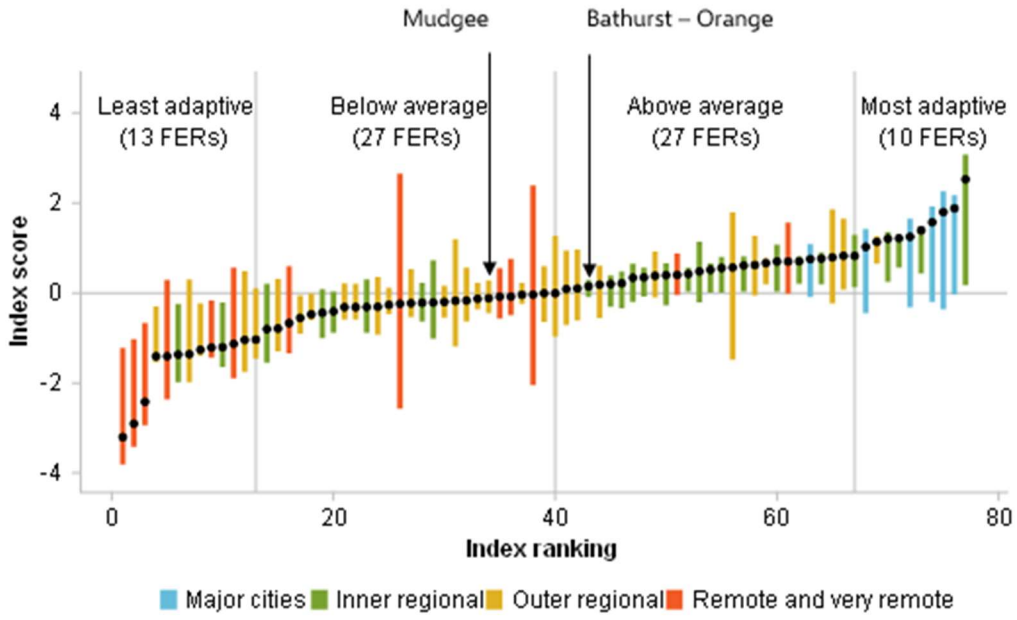

Figure 23. Adaptive capacity index values and their 90% confidence intervals for each FER, sorted from lowest to highest

Source: Productivity Commission (2017)

Lithgow has an adaptive capacity that is below average. **Consequently, Lithgow will likely need focused support to transition successfully following an economic disruption.**

[83] Productivity Commission (2017). Transitioning Regional Economies Productivity Commission Study Report. Australian Government. Accessed at: https://www.pc.gov.au/inquiries/completed/transitioning-regions/report

5.5 Transition approaches

Early planning and support for industry, worker and community transition will increase the likelihood that there are no "stranded assets, stranded workers and stranded communities[84]" in Lithgow. Given the uncertainty of the timeframes involved, there are two key stages for managing the transition - early planning and preparation prior to active closure activities, and intensive transition approaches following formalisation of closure timeframes.

Seek Royalties for Rejuvenation allocation for Lithgow and engage with Central West Expert Panel

The NSW Government has established a Royalties for Rejuvenation Fund to ensure coal mining communities can make targeted investments towards strategic planning, workforce development programs, constructing enabling infrastructure, and establishing new industries and employment opportunities. The NSW Government will set aside at least $25 million a year from royalties to support all affected communities in NSW, including strategic planning, workforce development programs, constructing enabling infrastructure, and establishing new industries and employment opportunities[85]. Regional Expert Panels have been established[85], including for Central West (covering Lithgow City Council and Mid-Western Regional Council). The Regional Expert Panels will provide advice and recommendations to the Deputy Premier on applications received through the Fund, as well as advising the Minister about the following[85]:

- The consequences and opportunities associated with moving away from coal mining, particularly in relation to the impact on employment and economic activity in the affected coal mining region;
- alternative land uses of coal mining sites; and
- options to support the economic diversification of the affected coal mining region in alternative industries.

While much of the focus of this investment is on economic diversification (refer to Section 4: Building a resilient, diverse economy), it is critical that the workforce development opportunities for the coal mining workers are also addressed as a priority.

Engage with EnergyAustralia and Centennial Coal on closures and repurposing, with a strong focus on workforce and supply chain planning

EnergyAustralia has committed to "long term planning and supporting the transition for workers and local communities" [86]; however, given the current timeframe for retiring Mt Piper is 2040, the company has advised that planning has not commenced. Centennial has also advised that it has not commenced planning for closure during the next decade, due to its plans to transition operations from Springvale to Angus Place, including the majority of the workforce.

Insights to EnergyAustralia's likely approach could be gained from monitoring its approach to retiring Yallourn in mid-2028, as well as considering lessons learned from the closure of the Wallerawang Power Station in 2014. EnergyAustralia's commitments in relation to Yallourn[87] are to:

[84] Briggs, C. & Mey, F. (2020). Just transition: Implications for the Corporate Sector and Financial Institutions in Australia. Report prepared by ISF for Global Compact Network Australia and National Australia Bank. Sydney. Accessed at https://unglobalcompact.org.au/wp-content/uploads/2020/10/2020.10.28_Just-Transition-Report_Final.pdf

[85] New South Wales Government [NSW Government] (August 2022). Royalties for Rejuvenation Fund Regional Expert Panel Member Position Description. Accessed at https://www.nsw.gov.au/regional-nsw/programs-and-grants/royalties-for-rejuvenation-fund

[86] EnergyAustralia (2021-b). EnergyAustralia Pledges to Accelerate the Clean Energy Transition. Published: 23 September 2021. Retrieved: https://www.energyaustralia.com.au/about-us/media/news/energyaustralia-pledges-accelerate-clean-energy-transition

[87] EnergyAustralia (2021-c). Yallourn Fact Sheet. Accessed at: https://www.energyaustralia.com.au/sites/default/files/2021-04/EA_016_Fact%20Sheet%20Yallourn_vF.pdf

- **Build new storage capacity** through a 350 MW, four-hour, utility-scale battery project that will be completed by 2026 before Yallourn exits the system
- **Support the workforce through a multi-million-dollar package**, in addition to workers' entitlements. According to EnergyAustralia, the package would include training and skills development, career planning, assistance for redeployment, and financial and personal counselling, which would also be available to family members. The company would be seeking workers' views on how this should be delivered, commencing in 2021[88].
- **Engage suppliers**, including the 240 small businesses it contracts
- **Engage the community and stakeholders** to understand and manage impacts and ensure different interest groups and locals understand company plans.
- **Progressive rehabilitation and revegetation** of the site
- **Continue community grant and sponsorship programs**
- Participate in the **broader transition in the Latrobe Valley.**

These commitments are in line with good practice from transitions around the world. Lessons learned from implementation could inform proactive consideration of the approaches required for Lithgow, including tailoring for local characteristics.

Options for engagement include:

- Regionally led by NSW Regional Development: NSW Regional Development to convene stakeholders, involving the Expert Panels, LCC and private sector stakeholders. Engagement would likely be at the program level with periodic reporting on use of any available royalties funding for transition activities.
- Operationally led between LCC and the private sector: Establishing regular meetings between LCC and the most appropriate representatives from NSW Government, with EnergyAustralia and Centennial Coal (separately or together, potentially quarterly) on transition planning. This could include updates on timelines, intentions for site repurposing or closure including renewable energy proposals, worker strategies, infrastructure plans including asset sales, discussion of planning and regulatory considerations and updates on the Yallourn transition. Consideration should be given to including the unions in these discussions, particularly when worker strategies are on the agenda.
- Private sector led: Transition planning could be integrated into the agendas of the community consultation meetings EnergyAustralia and Centennial Coal host. It will be important to have appropriate LCC and NSW Government attendance at these meetings. This would enable broader community engagement on the transition.

Monitor coal mining and coal-fired power generation outlook for the region

Independent monitoring of national and international markets for coal and the national energy market will be important to anticipate potential changes in the timing of closures. This will necessarily include monitoring changes to the carbon market, the growth of renewables and the level of security and reliability of the supply of low-cost electricity to consumers. This may be supported through DRNSW (MEG), NSW Treasury Office of Energy and Climate Change and EnergyCo.

Undertake early workforce planning and preparation

It is recommended that early workforce planning be undertaken with EnergyAustralia, Centennial Coal, unions, training and education providers, and potential employers and contractors in the LGA, including proponents and projects in the emerging economy. This would need to consider ongoing requirements for mining and

[88] EnergyAustralia (2021-d)/ Supporting the workforce and community Fact Sheet. Accessed at: https://www.energyaustralia.com.au/about-us/energy-generation/yallourn-power-station/energy-transition

energy production. Recommendations may be made to the Expert Panel for funding of initiatives under the Royalties for Rejuvenation scheme, and other funding opportunities include through Training Services NSW and Federal workforce transition programs.

The approach could include a survey of worker aspirations in relation to future closures (noting these may change over time) and analysis of current skills including formal qualifications and on-the-job experience. This should also include engaging with workers on their adaptive capacity. Based on this analysis a program of skills development would be designed, including recognition of prior learning, and formal and on-the-job training that matches aspirations.

This approach could leverage training offered and funded by Training Services NSW under the government's Skilling for Recovery program, focusing on skills required for adjacent sectors and sub-sectors, such as renewable energy, manufacturing, construction, and transport and logistics, in which affected workers will have relevant skills. However, personal preferences may require other training. Specific workforce opportunities identified as part of diversification are outlined under each sector in Section 4. Corporate staff, including administration and management, will have broader opportunities as their skills are relevant across industries.

Consideration could be given to coordination with other affected communities, state and territory governments and training organisations to optimise collaboration on minimise unnecessary duplication. It is noted that there are a number of concurrent activities, including the Jobs and Skills Summit hosted by the Australian Government in early September 2022 that is considering a range of issues, including transitions, worker shortages and skills development, that will be relevant for Lithgow's approaches.

Other supports may also be identified to respond to issues and opportunities identified in the worker survey. Critically, counselling services – both psychological and financial – should be offered throughout, for workers and their families.

Undertake early supply chain mapping and planning for diversification

It is recommended that LCC and the NSW Government work with EnergyAustralia, Centennial Coal and their local sub-contractors as well as the Lithgow District Chamber of Commerce and potential contractors in the LGA and beyond, including proponents and projects in the emerging economy. This would include understanding the dependence of businesses on coal and coal-fired power generation and their plans for pivoting their businesses in the face of impending closures, including to the potential areas of growth identified in this report. Approaches may include:

- skills-related activities for workforce planning and development
- business planning support
- stimulus funding to complement infrastructure and equipment investment
- brokering of procurement opportunities that link suppliers with contractors.

Analyse social impacts of closures, including engaging the community to co-design their futures

A more detailed understanding of the likely impacts at a household level will need to be developed, including consideration of the differential potential impacts on the families of workers and the flow-on effects for the communities in which they live. This could include understanding family composition, employment of workers' partners and other income-earning family members, participation in and contribution to the community including to schools and other organisations. This would complement the considerations of workers' adaptive capacity.

The household-level analysis would inform an assessment of the social impact at a community level, including the differential impacts on villages in the LGA and their social infrastructure, such as schools (including student numbers and financial support), health services, sporting and other community groups.

This will require planned and sensitive engagement with residents that keeps them informed and empowers them to co-design the future for their community and the LGA as a whole. It will inform community building approaches, to protect and enhance to the extent possible their way of life. It will also inform approaches related to economic diversification – including how investment attraction may offset localised impacts, such as through location-based incentives.

Engage in proactive planning around forecast declines in coal mining and coal-fired power generation, and undertake detailed transition planning once closures have been announced

- Developing a transition plan for each asset, its workers, supply chain and for the economy and community more generally, considering cross-impacts and phasing of scale-down or closure activities
- Site rehabilitation
- Infrastructure reuse and repurposing
- Community engagement.

5.6 Actions

Action (0-5 years)	Description
Establish a rapid response framework for any unplanned early closures	Early planning of a rapid response hub for the provision of information on commonwealth employment and other support services in the event of an unplanned early closure.
Engage in the NSW Government transition response	Engage with Central West Expert Panel and look for opportunities to engage in strategic projects aligned with the regional plans, for the benefit of Lithgow.
Develop insights from local experiences and incorporate into transition planning	Review lessons learned from the closure of the Wallerawang power station in 2014, and engage in peer-to-peer discussions with other local authorities in transition regions.

Intermediate outcomes (5–15 years)	Description
Embed processes for formal dialogue between industry, transition governance arrangements, and other key government agencies on closure planning	Formalise dialogue arrangements between key industry actors, the governance vehicle and other key actors and agencies on closure planning and repurposing. Framework discussions should include: a. early Intervention, b. tailoring assistance to the family unit of displaced workers including workers in the displaced supply chain,

	c. placement assistance, d. skills assessments and training, e. supply chain management, f. site decommissioning and re-use, and g. broader community support and assistance.
Engage early following any announcement of a closure	Facilitate where possible early and ongoing workforce support, including skills recognition, training, career planning, assistance for redeployment, and financial and personal counselling on the announcement of any closures.

Long-term outcomes (15+ years)	**Description**
The Lithgow community has engaged in and embraced the LGA's potential as an advanced industrial innovator	The community has established 'community–based' renewable energy generation projects, including virtual power plants and solar banks and is fully engaged in the opportunities around new energy technologies.
The Lithgow economy and community has embraced new emerging opportunities in the LGA and built economic resilience that enables a just transition through any decline in coal mining and coal-fired power generation in the LGA	The transition action plan has been implemented successfully.

6 Leading the transformation

6.1 Considerations for Governance and Leadership

Leading the diversification of Lithgow's economy, with consideration for the social and economic enablers and consequences, will be a complex task. It will require adaptive leadership and clear governance and implementation arrangements, underpinned by stakeholder engagement and monitoring, evaluation, learning and reporting.

The governance framework will outline authority, accountability, leadership, direction and control of the Lithgow transition at the local level, fitting with the context of a NSW Government governance structure for the regional transition, as established through the Royalties for Rejuvenation Fund and the Expert Panel for the Central West.

The local leadership of the transition needs to be focused on a place-based approach, drawing on local resources and stakeholders to mobilise change and investment. The local model needs to be grounded in the local context and informed by what has worked well (and not) in the region, as well as internationally.

As highlighted in Appendix B, lessons from transitions around the world demonstrate the need to build off existing frameworks under which communities are governed. However, these need to be adapted as necessary to ensure they are fit for the diversification purpose and provide stakeholders with clarity on implementation and engagement, enable timely decision-making, and provide one stop shops rather than siloed service providers.

Importantly, the governance and implementation model – and the leaders and teams within it – need to be flexible to adapt to evolving needs. Adaptive leadership has emerged as a practice for leaders to mobilise organisations and communities to adapt to significant change. It emphasises the *importance of adaptation to a complex and rapidly changing environment*, and focuses on adapting implementation of strategy to evidence of its successes and challenges.

The ANZSOG highlights that adaptive leadership hinges on four key arguments[89]:

- Leadership is a practice, not an inherent characteristic
- Power is dispersed and leadership must therefore be a cooperative activity
- Leadership is about addressing problems that lack known solutions
- Organisations often need to face uncomfortable realities to progress.

The local governance model needs to consider:

- What is the best model to deliver on the vision for Lithgow's economic diversification that facilitates market forces, optimizes opportunity and mitigates risk, including unintended consequences? What are the functions, roles and responsibilities required?

89 Public admin explainer: What is adaptive leadership? | ANZSOG

- Are the existing governance frameworks sufficient or is a new or adapted model needed? Is there any risk of duplication of roles and responsibilities, and if so, how will this be addressed?
- Who are the key stakeholders responsible for implementing and overseeing the transition and how do they need to work together?
- Who is funding the transition and its implementation?
- What are the accountability expectations, from whom?
- What is the balance between top-down policy-driven approaches and bottom-up local and regional approaches?
- Is there a need for or benefit in establishing collaborations with other communities in transition?
- How will the governance framework monitor and report on progress?
- What decisions need to be made?
- How can decisions be made efficiently and proactively, rather than reactively? Is authority delegated appropriately? What powers are required?
- Is it clear to business, industry, investors and the community how they can engage, get information and influence decisions?
- Is the operation transparent to stakeholders?

6.2 Placemaking and Integrated Planning

Leadership of changes to Lithgow's local built environment will be an important symbol and visible manifestation of the program of change that the community is engaged in. It will be important for the local governance mechanism and local leadership to focus on inclusive placemaking, addressing the barriers to economic growth and creating positive social and economic change. This aligns with the NSW Regional Plan objective of people, centres, housing and communities.

Placemaking is a collaborative process involving the local community and key stakeholders. It is suggested that future community engagement around the LEEP explore placemaking opportunities and initiatives that could complement the transition and support the community through the change process.

Based on existing Council plans and strategies, and community values and recommendations from previous engagement, a future placemaking engagement process could be centred around the following:

- Place identity: community values, local character, brand, place assets (natural environment, heritage, etc.).
- Physical environment: including such things as public realm improvements, revitalisation of main streets, activation of underutilised community spaces, accessibility and wayfinding, interaction with the natural environment.
- People's experiences: celebration of culture and history (art, architecture, etc.), volunteer groups, community festivals and events.

Integrated planning actions are recommended in this section.

6.3 Monitoring, evaluation, learning and reporting

The Action Plan is based on a theory of change, including a clear articulation of the impact being sought by 2030, and the end of program outcomes that will contribute to that.

This should be used to inform the development of a Monitoring, Evaluation, Reporting and Learning Framework (the MERL Framework) for the transition. The MERL Framework should be developed with key

stakeholders to ensure a shared understanding of what is anticipated to be achieved, how it will be achieved, and how it will be reported.

6.4 Designing and implementing the governance model

Place-based governance models have emerged in Australia and are associated with the key successes of transitions globally. Global examples point to national or regional transition authorities, and examples of local transition authorities exist in Australia – such as the Latrobe Valley Authority. Other place-based models of governance include those implemented for City Deals, which include all scopes of government. The Western Sydney City Deal is considered an innovative model on this basis.

Consultation between Lithgow City Council and NSW Government should consider model options that enable a broad range of key stakeholder to participate in the governance arrangements. Participants should include multi-government, cross-sectoral industry and knowledge sector representation, and governance needs to link to an executive capacity to progress the transition and economic diversification agenda.

As the governance model is designed, it will need to incorporate considerations to fulfil key tasks of:

a. Building and broadcasting a proactive and inclusive narrative of the diversification initiative,
b. maintaining the active commitment of various stakeholders to proactive diversification initiatives,
c. engaging in dialogue around the policy settings of governments to facilitate local action,
d. bringing together government and private interests to build support for innovative projects,
e. taking responsibility for attracting public and private funding, especially for already identified enabling infrastructure and other projects,
f. ensuring that the governance of the diversification initiative is integrated as seamlessly as possible with the pre-existing and ongoing structures of government,
g. providing advice on the local impact of major infrastructure sequencing, and
h. instituting continuous monitoring and evaluation processes.

6.5 Governance actions

Action (0-5 years)	**Description**
Establish a governance vehicle for collaboratively managing the regional diversification initiative including actions arising from this Action Plan.	Participants should include multi- government, cross-sectoral industry and knowledge sector representation. Key tasks include: a. building and broadcasting a proactive and inclusive narrative of the diversification initiative, b. maintaining the active commitment of various stakeholders to proactive diversification initiatives, c. engaging in dialogue around the policy settings of governments to facilitate local action, d. bringing together government and private interests to build support for innovative projects,

	e. taking responsibility for attracting government funding, especially for already identified enabling infrastructure and other projects, f. ensuring that the governance of the diversification initiative is integrated as seamlessly as possible with the pre-existing and ongoing structures of government, g. providing advice on the local impact of major infrastructure sequencing, and h. instituting continuous monitoring and evaluation processes.
Ensure a coordinated approach	Establish formal mechanisms for collaboration between the governance vehicle and key actors and agencies with responsibility for aspects of the diversification initiative.
Setting targets and objectives across key stakeholders and executive operations of the governance model	Consider targets set by this action plan and allocate responsibilities and accountability to the designated executive functions associated with the end-state governance model.

6.6 Integrated Planning Actions

Action (0-5 years)	**Description**
Integrate resilience practices across infrastructure and urban planning	Develop and adopt an infrastructure staging and funding plan to support the actions of the Lithgow Floodplain Risk Management Strategy, facilitating greater urban residential densification.
Engage in master planning around Lithgow's vision of Place	Engage the community and develop and adopt a masterplan and staging plan, subject to funding, for delivering on the key place-making and tourism recommendations of this Action Plan. Explore how planning for township main streets incorporates tourism, supporting uses such as dining and combined with street revitalisation initiatives.
Maintain alignment of Lithgow planning and strategy documents with the regional framework	Ensure broad alignment of all plans and strategic documents produced as a result of this Action Plan with the Lithgow Functional Economic Area Regional Economic Development Strategy.

Ensure "water" is incorporated into planning activities where appropriate	Consider and incorporate, where appropriate, key actions of the City's Integrated Water Management Plan, including considerations for pumped hydro energy storage (PHES) and green hydrogen.
Engage early and take a proactive approach to environmental planning.	Take a proactive approach to engagement with LEP processes (including most appropriate zones) for enabling diverse accommodation, tourism, renewables and new investment opportunities in Lithgow LGA and look at the potential to identify suitable land in Council mapping.

7 Action Plan Summary

This section presents a summary of the actions proposed in this report. Whilst acknowledging the NSW Government requires recommendations in the report template provided, it is our view that the actions identified for the first 0-5 years are implemented as a priority within the first twelve months.

7.1 Industrials sectors actions

Action (0-5 years)	Description
Engage the community in the vision for Lithgow's industrial innovation potential	Establish a platform for social license and engagement between community groups and the transition governance structure, to enable deliberative decision-making and informed consent from the community over strategies and plans for Lithgow's industrial future.
Ensure adequate supply of employment land zonings in planning	Review existing employment land zonings and potential candidate sites to ensure suitability of supply in consideration of likely demand, serviceability, infrastructure re-use, co-location and supply chain value capture, environmental and community factors and constraints.
Align planning instruments with energy sector vision	Review planning instruments, including Council's development control plans, which seek to manage the impact of utility-scale renewable energy projects, including evaluation of potential tier 1 and tier 2 sites for solar generation.
Plan precincts around priority industrial activities in advanced clean manufacturing and renewable energy	Undertake precinct planning for the repurposing of the region's redundant mining and coal-based energy land and built infrastructure to grow regional capabilities in renewable energy, circular economy processing and clean manufacturing.
Plan a precinct to consolidate advanced manufacturing for the Defence industry	Undertake precinct planning for manufacturing and industrial uses, including a Defence and Innovation Precinct plan.
Promote industrial investment opportunities	Develop and publish an industrial sector investment prospectus and review and update to maintain currency.

Identify planning opportunities for renewable energy sites around the Lithgow LGA	Identify suitable locations for operation of emerging renewable energy and associated technologies including PHES, particularly where reuse and repurposing of existing infrastructure is available.
Engage renewable energy project developers early in the process	Where identified renewable energy sites are assessed to have economic, environmental and social merit, engage calls for expression of interest for site investigation and pre-feasibility assessment.
Establish capacity to evaluate project proposals against non-financial outcome areas	Prepare a framework and guideline for renewable energy projects which considers amongst other things the principle of "benefit sharing" including capturing value add into the local economy and the locality most immediately impacted by proposed developments, consultation arrangements – including, importantly, consultation with the locality most immediately impacted by proposed developments and the wider community and Council.
Support industrial business development processes through an "open for business" approach	The Council and State Government to work together with industry to provide business case, due diligence and planning support to industry for reuse of the existing, electricity generation and mining land, and infrastructure for new emerging industries (inc. Batteries, Pumped Hydro, Green Hydrogen production, Heavy industry).
Position Lithgow in the hydrogen economy	Engage in NSW Government's Hydrogen Hubs initiative, including establishing potential partnerships with project proponents currently shortlisted with Lithgow as a potential off-taker.

Intermediate outcomes (5–15 years)	**Description**
Established water infrastructure for connectivity with industrial activities in Lithgow	Invest in connectivity infrastructure that ensures Lithgow's relative advantage in affordable and reliable water is strengthened with consideration of emerging and growing businesses across all areas of Lithgow's industrial economy.
Ongoing capacity for triple-bottom-line thinking is integrated across all planning activities	Lithgow has developed a capacity for integrating triple-bottom-line reviews in masterplan and precinct planning processes, to ensure precinct boundaries are optimized to allow for eco-industrial innovation, for example, to ensure co-located down and up-stream eco-industrial and resource recovery enterprises can

	achieve economic, environmental and social outcomes.
An initial circular economy has been established between manufacturers in the LGA through a strategy facilitated by the local transition governance arrangements	A strategy for attracting circular economy manufacturing to Lithgow, including mapping Lithgow's competitive advantage by waste streams and opportunities associated with current manufacturing operations has been established and engagement between local manufacturers has commenced.
Lithgow is established with battery projects for grid and supply firming	Lithgow has maximised its advantage of having existing high voltage transmission infrastructure and has advocated for, attracted investment and efficiently contributed to firm the NSW electricity grid and deliver additional firmed renewables from Lithgow and the Central West to the system.
Lithgow has an established PHES site in operation to firm the NSW electricity grid supply	Lithgow has established a PHES site with a capacity of up to 1000MW by 2030.
Lithgow has identified and attracted investment in electricity, water and waste industries	Projects and capital investment that has potential to generate $93m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for the local electricity, water and waste industries.
Lithgow has identified and attracted investment in manufacturing industries	Projects and capital investment that has potential to generate $33m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local manufacturing industries.

Long-term outcomes (15+ years)	**Description**
Lithgow has established itself as one of the NSW Hydrogen Hubs and operates economically feasible hydrogen production and fuel operations that service the region.	Lithgow draws on its comparative advantages in energy infrastructure, water resources, associated employment lands, and geographic location, to become a hydrogen hub that serves regional freight routes and trains.
Lithgow has secured and delivered a pipeline of projects in the electricity, water and waste industries	New projects and capital investment in electricity, water and waste industries have been delivered, generating $93m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the electricity, water and waste sector to more than $147m in gross value added over 10 years in real 2022 dollars.

Lithgow has secured and delivered a pipeline of manufacturing investments in the LGA and has an established circular economy	New projects and capital investment in manufacturing industries have been delivered, generating $33m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the manufacturing industry to more than $74m in gross value added over 10 years in real 2022 dollars.

7.2 Tourism industry actions

Action (0-5 years)	Description
Promote tourism investment opportunities	Develop and publish a tourism industry investment prospectus and review and update it at appropriate points in the economy's development to maintain currency.
Review and update all tourism planning and strategy documents to reflect the outcomes of the LEEP process	Review and update the Lithgow Destination Management Plan (2013). Consider strategies to coordinate events and other key tourism product and maximise the local value capture from committed government investment.
Investigate initial feasibility and develop an early business case to establish Lithgow as the regional train interchange.	Current Mt Victoria is the regional train interchange point, while Lithgow may be better positioned at the 2-hour point from Sydney and with geographic advantages for the regional train service to operate a "pulse" schedule with Sydney metro from Lithgow.
Investigate options to improve walking and cycling infrastructure around Lithgow LGA.	Explore opportunities for the promotion and enhancement of walking and cycling infrastructure both at a local and regional scale, including off-road trail routes from Lithgow down the Blue Mountains (loop with train service).
Engage local operators in establishing the Lithgow marketing strategy	Facilitate the establishment of an industry-led destination marketing strategy in conjunction with tour operators and the community

Intermediate outcomes (5–15 years)	Description
Lithgow is established as the regional train interchange between Central-West and Sydney metro	Lithgow becomes the regional train interchange between Central-West and Sydney metro services, with intercity train servicing, maintenance and certification capabilities established in Lithgow.

Lithgow has established itself as a regional destination with distinctive character and points of differentiation	Lithgow operates a tourism industry and has established partnerships with neighbouring LGAs to integrate Lithgow in the regional tourism offering.
Lithgow has identified and attracted investment in tourism industries	Projects and capital investment that has the potential to generate $8m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local tourism industries.

Long-term outcomes (15+ years)	Description
Lithgow is a vibrant and distinctive place, it has secured and delivered a pipeline of investments in the LGA's tourism industry and has established its brand and reputation in line with the vision set out by its community	New projects and capital investment in tourism industries have been delivered, generating $8m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the tourism industry to more than $19m in gross value added over 10 years in real 2022 dollars.

7.3 Health, Social and Public Services actions

Action (0-5 years)	Description
Plan a precinct plan to catalyse and consolidate an industry around innovation in health and ageing in Lithgow	Develop a Lithgow Health, Ageing and Innovation Precinct Masterplan including an infrastructure plan to investigate, support and foster growth in the health and ageing sector: a. Focus on delivery of expanded and ongoing services outlined in the NBMLHD Health Services Plan 2023-2028 b. Prioritise services to be delivered by Lithgow Community Private, specialists and the primary health network c. Review the partnership between Lithgow Hospital and Lithgow Community Private d. Develop an infrastructure plan, including consideration of staff accommodation for VMOs and nursing staff, potentially as part of expanded accommodation for University of Notre Dame students. e. Potential expansion of the Notre Dame Clinical School, to include more courses, collaborative courses with other education providers, such as Western

	Sydney University and Charles Sturt University f. Prioritise precinct research collaborations and commercial investment attraction approaches.
Incorporate future land use needs into the precinct planning process	Engage with hospital and health care services to further understand demand and potential land use requirements.
Audit potential occupied and vacant buildings suitable for accommodating public services operations across the LGA	Position Lithgow and its towns as a viable option for future regionalisation of public services, maintaining and promoting a current inventory of building stock suitable for commercial use by health, social and public services.
The health, ageing and social services sector has been engaged in the update of relevant strategies affecting the sector in Lithgow	Update strategies for health and ageing: a. Lithgow stakeholders to contribute to NBMLHD's development of the Health Services Plan 2023-2028. b. Update LCC's Lithgow Ageing Strategy, including lateral thinking around the design of housing, urban environments, and public transport services. c. Consider child-centric and intergenerational connection approaches.
Develop an investment attraction plan for the sector	Engage stakeholders and facilitate the development of an investment attraction plan, seeking commercial investment for life sciences manufacturing and services, new and expanded retirement villages, integrated ageing in new housing developments (Marrangaroo and Portland), and residential aged care services.

Intermediate outcomes (5–15 years)	**Description**
Capture opportunities for public service regionalisation	Capture opportunities to integrate Lithgow into government regional service planning to identify opportunities for service growth in the city.
Adaptive management of sector investment attraction strategy over time	Identify and monitor success of strategies to attract new specialists and services, aligned with the regional plan.
Lithgow has identified and attracted investment in health, ageing and social services industries	Projects and capital investment that has the potential to generate $26m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local health, ageing and social services industries.

Lithgow has identified and attracted investment in public administration and safety services industries	Projects and capital investment that has the potential to generate $62m in gross value added over 10 years in the Lithgow economy have been identified and are in negotiation or secured for local public administration and safety services industries.

Long-term outcomes (15+ years)	Description
Lithgow's health care and social assistance sector remains the LGA's largest employer and provides priority specialist and general services to promote the health and wellbeing of the community and consumers from neighbouring areas, including ageing and vulnerable people	New projects and capital investment in health, ageing and social services industries have been delivered, generating $26m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the sector to more than $56m in gross value added over 10 years in real 2022 dollars.
Lithgow has a stable and foundational public administration services sector that builds on the LGA's cost advantages and geographic location between Sydney and the Central West	New projects and capital investment in public administration and safety services industries have been delivered, generating $62m or more in gross value added over 10 years to the Lithgow local economy, bringing the total contribution of the sector to more than $96m in gross value added over 10 years in real 2022 dollars.

7.4 Whole of economy actions

Action (0-5 years)	Description
Residential land zoning	Review existing residential land zonings and potential candidate sites to ensure suitability of supply having regard, amongst other things, to likely demand, serviceability, environmental and community factors and constraints.
Align developers with public infrastructure	Review (or, where applicable, draft and adopt) Part 7 infrastructure contribution agreements or plans for proposed residential and employment land release areas identifying key infrastructure step issues and infrastructure barriers to development.
Establish a regional skills baseline	Undertake a regional manufacturing sector skills and training audit in consultation with industry and the education and training sector.
Engage in regional workforce planning early, and align with priority economic growth areas	Undertake a long-term regional workforce plan identifying likely skills requirements, training and pathway gaps, other opportunities, and potential

	disruptions, leveraging state and national approaches and initiatives, and engaging local manufacturers, schools, vocational and higher education organisations, peak bodies and unions.
Focus workforce development on skills to improve adaptive capacity	Develop a regional workforce adaptive capacity plan for focusing on strengthening flexible, innovative, and STEAM skills in the emerging workforce. Facilitate university, TAFE and industry partnerships to complement and stimulate innovation opportunities.
Establish pilot programs for new models of engagement around STEAM skills	Leverage the Maldhan Ngurr Ngurra Lithgow Transformation Hub to explore piloting a regional 'tech school' to accelerate STEAM and adaptive skills in the emerging regional workforce.
Establish co-working innovation hub facilities in the LGA	Lithgow has established a co-working innovation hub in collaboration with the knowledge sector and local manufacturing enterprises to strengthen research, development innovation and commercialisation opportunities and which leverage additional value from existing value chains.
Identify rail and road transport constraints and opportunities to enhance Lithgow's attractiveness as an investment destination	Progress consultations with the NSW Government's Transport Working Group and Lithgow City Council on opportunities for green hydrogen conversion of rail freight, including consideration of infrastructure and land-use needs. Undertake initial studies on where opportunities for improved road and rail infrastructure can support the enhancement of comparative advantage through increased supply chain connectivity into the Central West, as well as into Sydney, and to export points of sea- and airports.
Engage with key agencies on electric vehicle infrastructure	Undertake transport and logistics study with TfNSW and Regional NSW, including a feasibility analysis of electric vehicle charging infrastructure – including the scope of Lithgow producing zero carbon powerfuels.
Engage early in positioning Lithgow in the region's major transport infrastructure planning processes	Undertake detailed feasibility assessment for Lithgow's role in the East Coast Hydrogen Refueling Network. Explore opportunities with NSW Government for an 'East Coast to Western NSW Hydrogen Highway Initiative' similar to the Hume Hydrogen Hume Highway initiative.

Intermediate outcomes (5–15 years)	Description
Improved telephone and internet capacity in the Lithgow LGA	Undertake a study to determine mobile phone coverage dead-zones, and opportunities to enhance internet connectivity across the LGA to attract and enable remote working and tourism.
Understand skills issues and future needs	Engage in forums and with appropriate coordinating agencies on the skills and training agenda, focusing on regional skills requirements for renewable hydrogen, and advanced manufacturing opportunities.

7.5 Transition actions

Action (0-5 years)	Description
Establish a rapid response framework for any unplanned early closures	Early planning of a rapid response hub for the provision of information on commonwealth employment and other support services in the event of an unplanned early closure.
Engage in the NSW Government transition response	Engage with Central West Expert Panel and look for opportunities to engage in strategic projects aligned with the regional plans, for the benefit of Lithgow.
Develop insights from local experiences and incorporate into transition planning	Review lessons learned from the closure of the Wallerawang power station in 2014, and engage in peer-to-peer discussions with other local authorities in transition regions.

Intermediate outcomes (5–15 years)	Description
Embed processes for formal dialogue between industry, transition governance arrangements, and other key government agencies on closure planning	Formalise dialogue arrangements between key industry actors, the governance vehicle and other key actors and agencies on closure planning and repurposing. Framework discussions should include: a. early Intervention, b. tailoring assistance to the family unit of displaced workers including workers in the displaced supply chain, c. placement assistance, d. skills assessments and training, e. supply chain management, f. site decommissioning and re-use, and g. broader community support and assistance.
Engage early following any announcement of a closure	Facilitate where possible early and ongoing workforce support, including skills recognition, training, career

	planning, assistance for redeployment, and financial and personal counselling on the announcement of any closures.

Long-term outcomes (15+ years)	Description
The Lithgow community has engaged in and embraced the LGA's potential as an advanced industrial innovator	The community has established 'community–based' renewable energy generation projects, including virtual power plants and solar banks and is fully engaged in the opportunities around new energy technologies.
The Lithgow economy and community has embraced new emerging opportunities in the LGA and built economic resilience that enables a just transition through any decline in coal mining and coal-fired power generation in the LGA	The transition action plan has been implemented successfully.

7.6 Governance actions

Action (0-5 years)	Description
Establish a governance vehicle for collaboratively managing the regional diversification initiative including actions arising from this Action Plan.	Participants should include multi- government, cross-sectoral industry and knowledge sector representation. Key tasks include: a. building and broadcasting a proactive and inclusive narrative of the diversification initiative, b. maintaining the active commitment of various stakeholders to proactive diversification initiatives, c. engaging in dialogue around the policy settings of governments to facilitate local action, d. bringing together government and private interests to build support for innovative projects, e. taking responsibility for attracting government funding, especially for already identified enabling infrastructure and other projects, f. ensuring that the governance of the diversification initiative is integrated as seamlessly as possible with the pre-existing and ongoing structures of government, g. providing advice on the local impact of major

	infrastructure sequencing, and h. instituting continuous monitoring and evaluation processes.
Ensure a coordinated approach	Establish formal mechanisms for collaboration between the governance vehicle and key actors and agencies with responsibility for aspects of the diversification initiative.
Setting targets and objectives across key stakeholders and executive operations of the governance model	Consider targets set by this action plan and allocate responsibilities and accountability to the designated executive functions associated with the end-state governance model.

7.7 Integrated planning actions

Action (0-5 years)	**Description**
Integrate resilience practices across infrastructure and urban planning	Develop and adopt an infrastructure staging and funding plan to support the actions of the Lithgow Floodplain Risk Management Strategy, facilitating greater urban residential densification.
Engage in master planning around Lithgow's vision of Place	Engage the community and develop and adopt a masterplan and staging plan, subject to funding, for delivering on the key place-making and tourism recommendations of this Action Plan. Explore how planning for township main streets incorporates tourism, supporting uses such as dining and combined with street revitalisation initiatives.
Maintain alignment of Lithgow planning and strategy documents with the regional framework	Ensure broad alignment of all plans and strategic documents produced as a result of this Action Plan with the Lithgow Functional Economic Area Regional Economic Development Strategy.
Ensure "water" is incorporated into planning activities where appropriate	Consider and incorporate, where appropriate, key actions of the City's Integrated Water Management Plan, including considerations for pumped hydro energy storage (PHES) and green hydrogen.
Engage early and take a proactive approach to environmental planning.	Take a proactive approach to engagement with LEP processes (including most appropriate zones) for enabling diverse accommodation, tourism, renewables and new investment opportunities in Lithgow LGA and look at the potential to identify suitable land in Council mapping.

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9 About the project team

Natural Capital Economics (www.nceconomics.com.au): Natural Capital Economics delivers true integration of science and economic thinking into project delivery and has a focus to help clients to understand and resolve the most complex and pressing challenges related to natural resources, climate change and risk assessments, and sectors that are directly and indirectly reliant on the natural resource base for ongoing prosperity. We have some of the best economic practitioners in industry and academia, which means that our advice is practical and grounded in a genuine desire to deliver sound management decisions.

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Appendix A: Consultation list

Table 1 presents a list of the key stakeholders consulted through the project. We have spoken or held meetings with these stakeholders, one-on-one over the phone or in person at meetings. **The findings of this report reflect the consultation however does not imply any endorsement by those consulted.**

Table 1. Consultation list

Table withheld.

Appendix B: Global lessons-learned

Appendix B: Global lessons-learned

There are a growing number of communities around the world that have made or are making the transition from economies dependent on coal and coal-fired power generation to greener, lower carbon futures, based on economic diversification. This is accelerating with national, state and company commitments to achieving net zero by 2050 or sooner, including the NSW Government's net zero commitment by 2050. Desktop analysis has been conducted of transition plans and analysis of the implementation of these processes. This has been complemented by engagement with stakeholders regarding communities in transition in Australia.

Steps to achieving a successful transition

Broadly, transitions have followed three steps, evolving in different ways with diverse leadership and governance models.

1. **Identify the need for transition**: This generally occurs in one of three ways that respond to declining or changing market demand:
    a. The owners of coal mines or coal-fired power generators announce a timeline for closure or repurposing of assets, with a minimum of 42 months' notice now legislated in Australia.
    b. Local, state or national governments anticipate changes in an economic sector that will have a major community impact and plan for the change.
    c. Unanticipated market changes leading to industry collapse, or failure of companies to be proactive often results in government stepping in to mitigate the social and economic impact.
2. **Build transition roadmaps**: Roadmaps are developed at multiple levels, with place-based community-level planning at the core:
    a. *Industry and assets*: Companies or state-owned operators will plan transitions for and with their business, customers, employees, unions, supply chains and investors. Where multiple businesses are affected, joint ventures and marketing may be adopted within and between regions, in collaboration with research organisations to pursue innovations.
    b. *Places*: Councils, industry and other local businesses, government service providers and community organisations will collaboratively develop a vision for their community. This generally involves economic diversification to minimise impact on the local economy and jobs and optimise opportunities
    c. *State and national*: Government policies and programs, such as net zero targets, energy strategies, planning frameworks and regional development policies and initiatives provide the governance framework with which roadmaps must comply. These are often adapted to remove barriers to investment and inclusive diversification.
3. **Attract investment and implement transition**:
    a. Public and private investment is needed to stimulate inclusive economic growth and jobs and to attract businesses, residents and workers for a vibrant community. Clear points of entry – usually through a government or co-funded authority – are necessary to coordinate efforts attraction efforts.

Managing successful transitions

Lessons learned in communities as diverse as Germany's Ruhr Valley to the Appalachians in the US to Minjerribah/Stradbroke Island in Australia and many in between have led to a growing consensus around the characteristics that contribute to a successful transition and what to avoid. Nonetheless, all transitions need to be tailored to the specific context for change.

Governance should provide clear top-down leadership, while supporting bottom-up innovation

- Models vary and evolve – some are private sector-led (such as in Humber in the UK)[1], other are government-led with transformation authorities (Latrobe Valley, Ruhr)[2] and some develop intra and inter regional collaborations (Upper Hunter; East Coast, UK)[3].
- Government has a stronger role when the impact is wider and more complex.
- Build off existing governance, but ensure fit for purpose, clarity, timely decisions, and one stop shops rather than siloed service providers.
- The path will not always be smooth; be prepared for issues to arise and manage and lead adaptively.

Plan early for closure

- Longer lead times allow planning to minimise impacts on those most affected and help to build social compact.
- Resistance to change delays the inevitable and increases the impact; engaging resistance is critical.

Ensure "decent" work

- Transitions should include a focus on "decent" work - work that is "productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, including equal opportunities in the workplace"[4]. This includes conditions that meet community standards[5], usually with consideration for comparable stability and earnings, the location needs and career preferences of workers.
- While individuals need to be offered alternatives, they should be empowered to make choices that suit them.
- Planning a range of options for pathways for workers to re-employment or retirement is critical, including to prevent intergenerational issues for the children of workers.
- Approaches include recognition of prior experience, retraining, labour pools, education pathways, early retirement, financial and personal counselling including for families, setting local recruitment targets for new businesses coming into the area.
- Demand for labour needs to be considered as strongly as supply.

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[1] Zerocarbon Humber (November 2019). Capture For Growth: a roadmap for the world's first zero carbon industrial cluster: protecting jobs, fighting climate change, competing on the world stage. Report. Accessed at https://www.drax.com/carbon-capture/capture-for-growth-zero-carbon-humber-report/#chapter-1

[2] New South Wales Government, Hunter Joint Organisation Councils and University of Newcastle (2020). Upper Hunter Economic Diversification Action Plan: Implementation Priorities. Report. Accessed at https://www.hunterjo.com.au/wp-content/uploads/2020/03/20180719-UH-Economic-Diversification-Action-Plan-Implemtation-Priorities-FINAL_Compressed.pdf

[3] Energy Transition Hub, An Australian-German innovation partnership (February 2020). Creating a well managed, just transition from coal fired power to a secure and prosperous zero-carbon economy. Prof John Wiseman, University of Melbourne and ANU. Power and Pollution National Summit.

[4] United Nations (2015) Sustainable Development Goal 8: Decent Work and Economic Growth. Fact Sheet.

[5] Briggs, C. & Mey, F. (2020). Just transition: Implications for the Corporate Sector and Financial Institutions in Australia, p33.

- The impact on supply chains is also important, supporting sub-contractors to adapt their business models and customer base, including through local procurement requirements.
- Having an economic development focus at the expense of a focus on worker transition is less successful.

Build social compact

- Multi-stakeholder approaches are critical, ensuring engagement and trust building with different groups to define a vision for the future, including workers and their families, unions, business, the education sector and government.
- It is important to engage with and be open to diverse voices, including the dissenters.
- Most coal-based communities have strong identities based on their industrial heritage that should be respected, even while repositioning the local economy.
- Ensure clear communication on different stages of planning and implementation, as well as on how ideas generated through consultation will be converted into priorities (or not).

Diversify economies over time

- Economic diversification takes time and should start ahead of planned closures where possible.
- Prioritising sectors needs to account for regional competitive advantages and be realistic about growth opportunities.
- Clusters and innovation ecosystem approaches, which co-locate a range of businesses and promote collaborations including research, development, education and training, such as the European Commission's Smart Specialisation Platform[6] and precincts such as Tonsley Park in South Australia, have higher success than standalone business attraction[7].
- Connectivity –transport, IT and energy– for business and communities is a core enabler and reusing infrastructure from coal mining and power generation can facilitate this.
- Monitor vested commercial and political interests and unintended consequences that may derail efforts.

Leverage a mix of public and private investment in growth

- Organisations able to demonstrate real environmental and social objectives and ultimately performance have access to a broader pool of investment capital – whether it is ESG investment, blended finance or outcomes-based finance.
- Investors and boards have greater confidence when there is a clear – and positive – connection between policy, strategy, initiatives and the outcomes for each natural capital, social or economic asset affected by an organisation. Stakeholders in the communities where these assets are located also have a role in validating these outcomes.
- Approaches to stimulate investment in local economies include government business attraction and investment facilitation, such as co-funding for business case development, tax relief, fee reimbursements, infrastructure access, and planning facilitation.

Ensure inclusion and equity to stimulate dynamic communities

- Leaders should consider the distribution of costs and benefits in the transition. For example, coal workers should not bear all the cost of a transition.

[6] European Commission Smart Specialisation Platform Accessed at https://s3platform.jrc.ec.europa.eu/what-we-do
[7] Tonsley Innovation District (n.d). Bring Together Leading-Edge Research and Education Institutions and Established Businesses and Start-Ups. Report. Accessed at https://tonsley.com.au/content/uploads/2020/07/Tonsley-Brochure-June-2019.pdf

- Ensure that stakeholders are set up to succeed. Don't overburden capacity – even if intentions are good (e.g. with indigenous operators or community groups) and ensure any assets that are handed over are in a suitable condition for those who are taking them forward.
- Most plans explicitly address disadvantage within communities and promote diversity and inclusion in their approaches, including for employment.
- A focus on aged care, health services and improved work opportunities for vulnerable people are common and tend to be viewed through a social lens.

Optimise environmental rehabilitation to improve health, amenity and attraction

- Strategies to rehabilitate mining land and the broader landscape are linked strongly to public health improvements.
- This is a visible symbol of the change in the community that can be linked to repositioning of the economy and community.
- Improved amenity can contribute to attracting new residents and workers.

Appendix C: Baseline assessment

Appendix C: Baseline Assessment

1 Introduction

1.1 Purpose

A baseline assessment for Lithgow has been undertaken and is outlined in this report. This assessment determines the starting point for Lithgow and helps to inform the potential pathway for its economy without any intervention. The scope includes the Lithgow economy and assets, including workforce and natural endowments. This report, along with the extensive consultation and other reports (planning and place making), inform the development of the transition plan.

1.2 Approach

The assessment involved the collation and analysis of a range of data, including demographic, economic, and biophysical information. Information sources included official statistics, industry and research reports, and insight from consultation. Where relevant data was collected, collated and analysed both for Lithgow and for comparative regions. The collated datasets were then studied to understand their meaning for Lithgow's transition. Where necessary, detailed approaches are outlined in the relevant sections. A range of analytical techniques have been adopted and they are outlined in the relevant sections of this report. This enabled a lines of evidence approach to be adopted for the analysis incorporating information and data from multiple sources.

Key point

Information and data was collated from a range of sources and analysis to understand the baseline for Lithgow's transition.

1.3 Report structure

This baseline report is structured as follows:

- **Section 2 – Lithgow's baseline.** This section includes a detailed overview of the demographic and economic makeup of the Lithgow region.
- **Section 3 – Baseline projection.** This section explores the economic risks to the Lithgow economy of any future closure of coal-fired power generation and coal mining in the absence of any actions to mitigate the economic risks through transition (developed within the significant information and data constraints and uncertainty underpinning the region). This section provides an order of magnitude indication of economic challenge facing the region.

- **Section 4 – Looking forward: Regional endowments.** This section provides an overview of the region's demographic trends, historical competitiveness, and regional endowments (human capital, infrastructure, and natural capital) – the basic building blocks in the region that can be utilised to underpin future economic development opportunities. This analysis provides a basis for focussing of efforts in later stages of this project and the development of the Lithgow Emerging Economy Project (LEEP) more generally.

2 Lithgow's baseline

This section briefly outlines key information and data to enable a robust understanding of the current socio-economic baseline conditions in the Lithgow LGA, including comparative and benchmarking data where applicable.

2.1 Demographics

The Lithgow Local Government Area (LGA) is currently home to an estimated 21,585 people residing across its two populated SA2s (Lithgow and Lithgow Region) (DPE, 2022; ABS, 2022-a). By population alone, this makes the Lithgow LGA the 67th largest in NSW, out of the 127 LGAs within the State. Lithgow's population is split evenly amongst males and females (DPE, 2022) (Table 1).[1]

Table 1. Demographic profile Lithgow LGA (Census 2016)

Variable		Lithgow		Regional NSW	NSW
		Number	%	%	%
Population summary	Total residents	21,090	100.0	100.0	100.0
	Males	10,689	50.7	49.2	49.3
	Females	10,401	49.3	50.8	50.7
Age structure	0 - 14 years	3,591	17.0	18.4	18.5
	15 - 24 years	2,293	10.9	11.6	12.5
	25 - 54 years	7,459	35.4	35.7	40.8
	55 - 64 Years	3,089	14.6	13.8	11.9
	65 years and over	4,644	22.0	20.6	16.3
Education institute attending	Primary school	1,489	7.1	8.2	8.1
	Secondary school	1,145	5.4	6.2	6.2
	TAFE	461	2.2	1.9	1.9
	University	355	1.7	3.1	5.0
Diversity	Total overseas born	1,962	9.3	11.2	27.6
	Speaks language other than	722	3.4	5.7	25.1
	Speaks another language, and	97	0.5	0.9	4.5
	Bachelor or higher degree	1,524	8.7	14.5	23.4

[1] Note: As data releases from the 2021 Census are gradually released, these baseline figures will need to be periodically updated. The figures presented in this report should be treated as a current snapshot.

Variable		Lithgow		Regional NSW	NSW
		Number	%	%	%
Qualifications	Advanced Diploma or	1,146	6.6	8.2	8.9
	Certificate level	4,294	24.6	23.6	18.1
	No qualification	7,572	43.3	41.7	39.1
Household income	Nil to $649	2,223	27.9	22.0	17.8
	$650 to $1,499	2,544	32.0	33.0	27.5
	$1,500 to $2,449	1,348	16.9	19.6	21.2
	$2,500 or more	1,023	12.8	14.6	23.1
Housing tenure	Owned	3,318	38.4	35.5	30.7
	Purchasing	2,320	26.9	28.6	30.4
	Renting	1,962	22.7	26.5	30.3
Dwelling structure	Separate house	8,240	85.0	80.2	64.9
	Medium house	889	9.2	14.3	17.9
	High density	34	0.4	2.5	15.3

Source: This material was compiled and presented by .id, the population experts. www.id.com.au. This material is a derivative of National Institute of Economic and Industry Research (NIEIR) data, as detailed at economy.id.com.au/lithgow/topic-notes. *Comparative % value that a sector typically adds to the NSW state economy.

Age profile, aging and population growth

The Lithgow LGA's median age exceeds that of NSW (37.9), with a median age of 45.9 (ABS, 2016). Figure 1 shows the percentages of population age groups for 2016 and projections for 2041 for the Lithgow LGA. Lithgow's current aging population is expected to intensify by 2041, with residents over 50 years old increasing from 45% to 51.2% (DPE, 2022). Although this demographic shift in Lithgow in the next two decades will likely place pressure on the Health and Social systems (i.e., labour-force shortages, income security in older groups), the increased demand for Health Care could offer economic opportunities for the Health Care and Social Assistance Industry and supporting services.

Projections of population growth based on low, high, and common planning assumptions suggest that, in the absence of positive action, by 2041, the population growth in Lithgow is expected to experience a slight decrease or to stagnate (Figure 2). In comparison, NSW is expected to grow at a rate of around 1.3% per annum (Table 2).

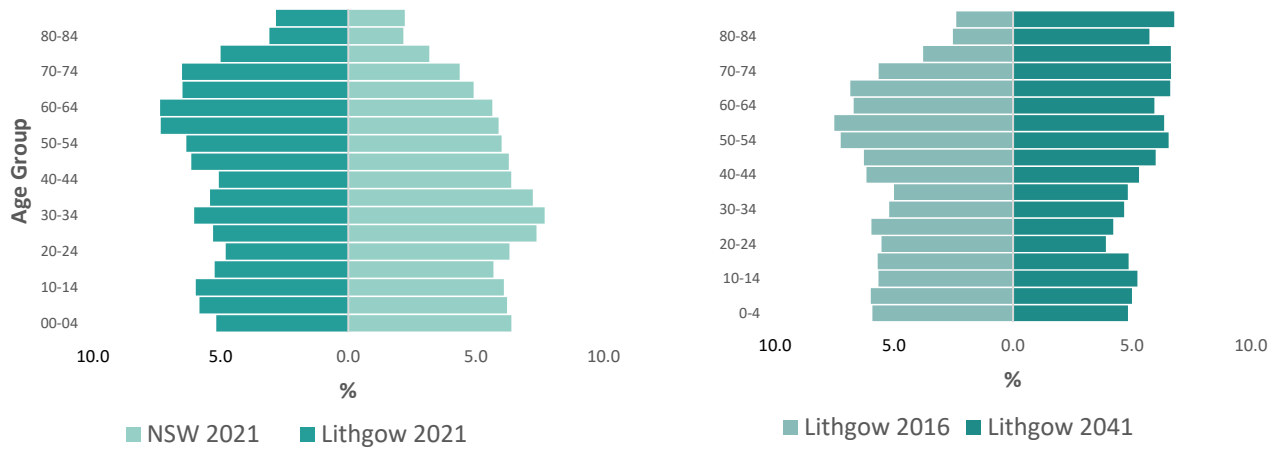

Figure 1. Lithgow LGA and NSW population age groups and projections

Source: DPE (2022)

Table 2. Lithgow LGA population projections (compound annual growth rate – CAGR)

	2011 to 2016 CAGR	2016 to 2041 CAGR*	2020/2021 to 2041 CAGR
Lithgow	0.6% p.a.	-0.1% p.a.	-3.6% p.a.
NSW	2.3% p.a.	1.3% p.a.	1.15% p.a.

*Based on Common Planning Assumption. Under the High growth scenario, the CAGR to 2041 is 0.3% p.a.

Source: NCEconomics estimates based on DPE (2022) data

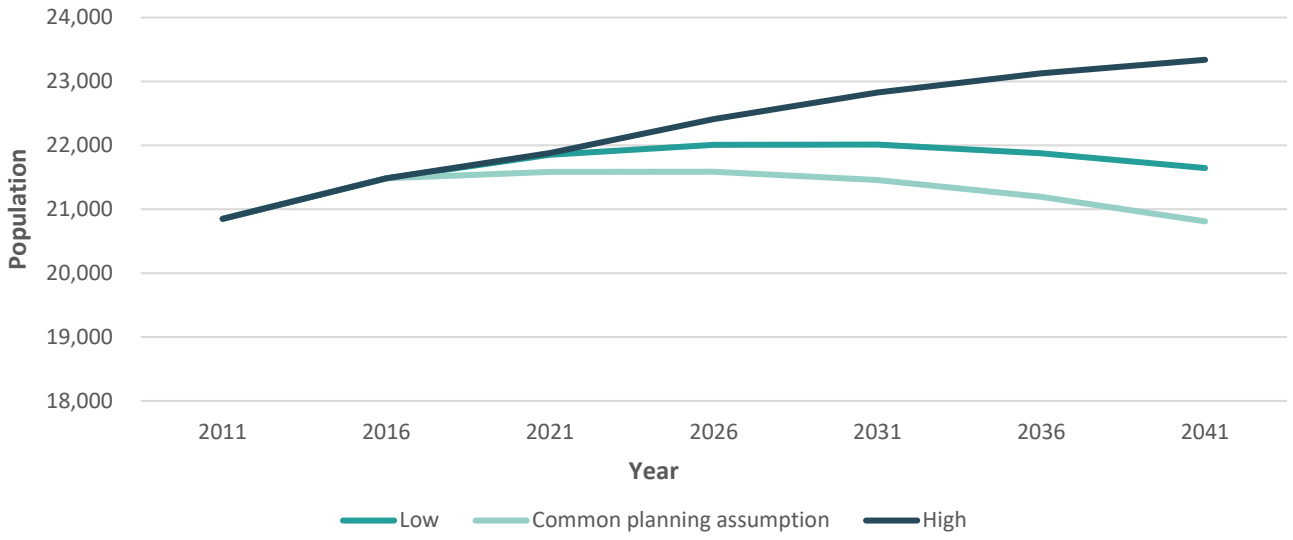

Figure 2. Lithgow LGA population projections.

Source: DPE (2022)

What does this mean for Lithgow's transition?

Lithgow's overall population is expected to plateau in the next 20 years, with an aging demographic. This has implications for the future workforce and demand for aged care and associated services.

Socio-economic advantage and disadvantage

Different measures of living standards can be used to improve the understanding of the socio-economic context within the Lithgow LGA. These measures are unable to capture every aspect of wellbeing; however, they provide valuable insights about a community's capacity to deal with social, environmental, and economic shocks and the likely need for government intervention. One of these measures are the Socio-economic Indexes for Areas (SEIFA)[2] developed by the Australian Bureau of Statistics (ABS) using census data. Figure 3 below details the various SEIFAs utilising 2016 Census data for the two populated SA2s within the Lithgow LGA – the SA2 of Lithgow and the SA2 of Lithgow Region. The figure indicates a relative socio-economic disadvantage, limitation of access to economic resources, and lower education and occupation status for both SA2s (slightly higher disadvantage in Lithgow township than Lithgow region) compared to the NSW median scores.

Figure 3. SEIFA for the SA2's of the Lithgow LGA

Source: ABS (2022-b)

Looking further into the most recent census data, some relevant demographic indicators for the Lithgow LGA include:

- The median weekly income per household in Lithgow ($834) is lower than NSW ($1,486) and Regional NSW ($1,168). Also, a significantly lower proportion of people in Lithgow (13%) is represented in the top salary categories (over $2500) compared to the State level (23%).

[2]The IRSD is a general socio-economic index that summarises a range of information about the economic and social conditions of people and households within an area. The IRSAD summarises information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures. The IER focuses on the financial aspects of relative socio-economic advantage and disadvantage, by summarising variables related to income and wealth. The IEO is designed to reflect the educational and occupational level of communities. For further information on SEIFA scores please see: https://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/756EE3DBEFA869EFCA258259000BA746/$File/SEIFA%202016%20Technical%20Paper.pdf

- Lithgow recorded a rate of 29 homeless persons per 10,000 people. In comparison, NSW recorded a rate of 50.5 homeless persons per 10,000 people.
- 71.8% residents within the Lithgow LGA reported having access to the internet from their dwelling, which is below the NSW average of 82.5%.
- 6.6% of people in the Lithgow LGA require assistance with core activities compared to 5.4% in NSW.
- 5.7% of the population in Lithgow LGA identified as Aboriginal and Torres Strait Islander Peoples, greater than NSW at 2.9%.
- Lithgow LGA has 3.4% of people who speak a language other than English at home, significantly less than the NSW state average of 25.2%.
- Inward and outward migration was found to be dominated by domestic movement (i.e. limited overseas migration) (ABS, 2022-a).

What does this mean for Lithgow's transition?

Socio-Economic Indexes for Areas (SEIFA) indicate relative socio-economic disadvantage (slightly higher disadvantage in Lithgow township than Lithgow region).

Unemployment

The unemployment rate, the proportion of the resident labour force who are looking for work, is an important indicator of the economic success of an area and the social characteristics of the local population (i.e. education, employment opportunities). The unemployment rate for Local Government Areas, published quarterly, is derived from the ABS labour force survey and Centrelink data and compiled by the Department of Employment. A low level of unemployment may indicate a high rate of access to jobs and a higher proportion of the population willing to remain residents. In contrast, high levels of unemployment suggest the low presence of industries and a disadvantaged population. As shown in Figure 4, although the labour force in Lithgow has increased slightly in the last decade, the unemployment rate has decreased significantly in the recent years, especially since 2016. As of that year, the unemployment rate in Lithgow has been declining, from substantially higher than Regional NSW and NSW to today, with Lithgow showing a comparatively lower value.

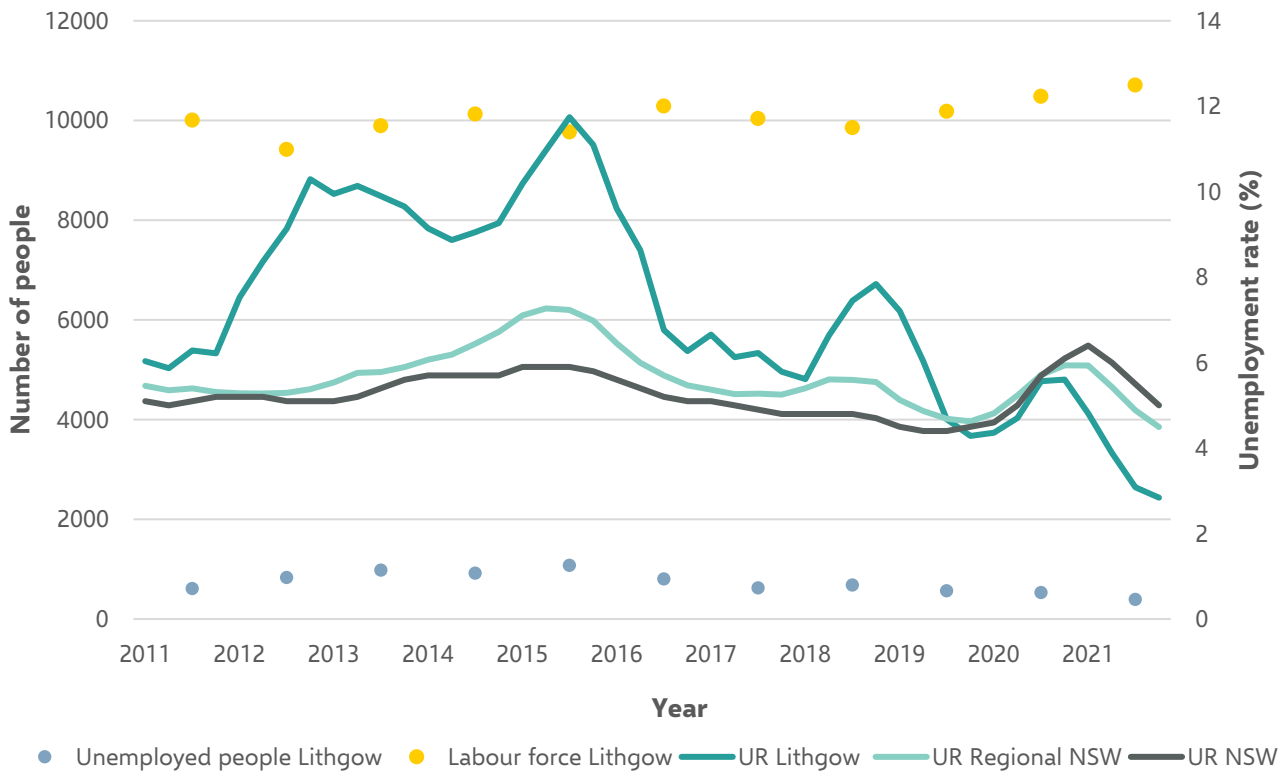

Figure 4. Unemployment in Lithgow LGA (2011 – 2021)

*UR = Unemployment rate

Source: NIEIR (2022)

What does this mean for Lithgow's transition?

Until recently, unemployment in Lithgow has been high relative to Regional NSW and NSW as a whole. With low unemployment, the workforce for growing or emerging industries will have to be drawn from existing industries or attracted from outside of the LGA.

Home ownership and housing affordability

Home ownership is a fundamental component of wealth and wellbeing as it affords owners with security and both long-term social and economic benefits. A wide variety of factors influence home ownership, including age, household composition, and housing affordability; however, tenure type rates are strongly related to the different stages of the life cycle in a pattern of rental during the early years, moving to purchase and mortgage during the family formation stage, and followed by outright ownership in old age.

Unsurprisingly, considering its high proportion of residents over 50 years of age, outright ownership in Lithgow (41.8%) is noticeable higher than Regional NSW (35.5%), and the State of NSW (32%) (Table 3).

The profile of home ownership and tenure in Lithgow differs substantially from the scenario in NSW, where the three categories (e.g., outright owners, owner with mortgage, renters) are evenly distributed at around 32% each. The inverted balance between renters and owners in Lithgow and NSW is likely related to the average higher housing costs in densely populated metropolis and the major presence of young residents.

In the case of the Mining Industry, total ownership (outright or mortgaged) is higher than the average values for the LGA, which is expected given that mining employees' income is higher than mean income in Lithgow (AIGIS Group, 2021). For example, total ownership for Springvale Coal Mine employees (92.7%) is notably

higher than the LGA (71.1%). Assuming that most people prefer to minimise the time spent travelling to work, it is likely that those working in the mining industry will continue to remain as residents of the area in the future (AIGIS Group, 2021).

Table 3. Home ownership in Lithgow LGA (Census 2016).

Statistic	Lithgow	Blue Mountains	Regional NSW	NSW
Owned outright (%)	41.8	37.8	35.5	32.2
Owned with a mortgage (%)	29.3	37.9	28.6	32.3
Rented (%)	24.6	17.8	26.5	31.8
Other or not stated (%)	4.3	6.5	9.4	3.7

Source: ABS (2022)

The cost of housing, a significant element of the cost of living, is lower in Lithgow than in NSW and Regional NSW as a whole (Figure 5). Aligned with national trends, housing costs in Lithgow have increased over the last decade; however, as shown in Table 4, this growth has been slower than at the State level.

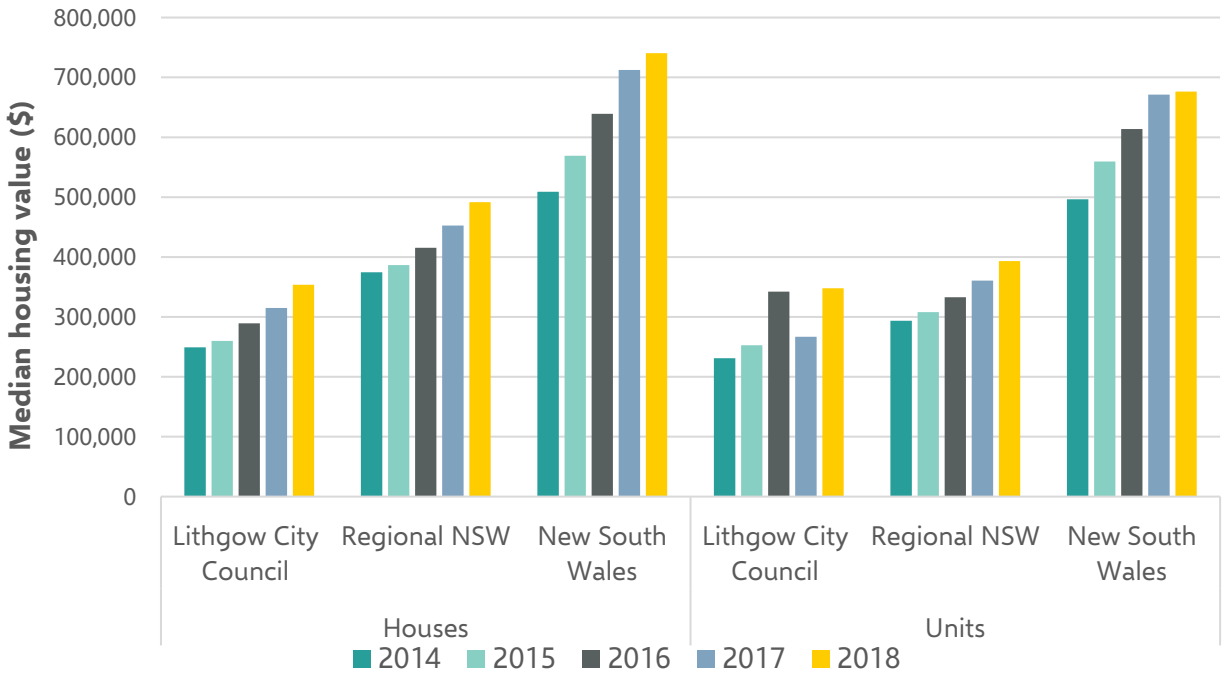

Figure 5. Housing value 2014-2018

Source: NCEconomics estimates using NIEIR (2022) data

Table 4. Growth rates of median housing prices 2014-2018

	Lithgow		NSW		Regional NSW	
Dwelling	**House**	**Unit**	**House**	**Unit**	**House**	**Unit**
Rent	1.34	0.02	1.72	0.04	1.51	0.03
Buy	0.09	0.11	0.10	0.08	0.07	0.08

Source: NIEIR (2022)

Housing affordability refers to the ratio of housing spending to household income. It measures a household's ability to maintain an acceptable standard of living after housing costs. Closely related to the rise in house prices in recent decades, housing affordability in Australia has declined widely since the early 1980s (APH, 2022). Table 5 shows that although Lithgow is in a favourable position compared to NSW and Regional NSW, this advantage depends on the type of dwelling and tenure. In general, rent is more affordable in Lithgow than in NSW and Regional NSW, with Lithgow households spending an average of 37-44% of their weekly income on rent, compared to the 41-50% in Regional NSW and the approx. 50% in NSW. For buyers, Lithgow shows higher affordability for houses, but not for units, which values fall between those for NSW and Regional NSW (ABS, 2022).

Table 5. House affordability in 2016

	Rent/income*			Housing values/income*		
Dwelling	**Lithgow**	**NSW**	**Regional NSW**	**Lithgow**	**NSW**	**Regional NSW**
House	0.44	0.49	0.49	447.11	717.39	561.31
Unit	0.37	0.52	0.41	529.09	688.98	449.80

Source: ABS (2022)

*Median housing value / Median equivalised total household income per week

What does this mean for Lithgow's transition?

Generally, it appears that housing is more affordable in Lithgow than the wider state (including Regional NSW). This may represent a drawcard for attracting skilled workers onto the region or retaining existing skilled workers.

2.2 The wider economy

Employment

Based on LGA-level economic data for Lithgow, total employment in 2020/21 was approximately 8,690 (NIEIR, 2021). A breakdown by sectors (Table 6) shows that the four most significant industries are Health and Social

Assistance, Mining, Public Administration and Security, and Manufacturing. Together, these industries account for 44% of employment in the area. For comparison, the top four sectors in NSW and Regional NSW contribute 42% and 46% of employment, respectively.

Table 6. Employment by industry in 2020/2021

Industry	Lithgow		NSW	Regional NSW
	Number	%	%	%
Health Care and Social Assistance	1,232	14.2	13.2	15.8
Mining	968	11.1	1	3
Public Administration and Safety	933	10.7	6.1	6.3
Manufacturing	696	8	6.6	6.9
Retail Trade	682	7.9	9.5	10.3
Accommodation and Food Services	665	7.7	6.5	7.6
Education and Training	636	7.3	8.7	9.4
Construction	487	5.6	9	10.4
Electricity, Gas, Water and Waste Services	444	5.1	1	1.4
Transport, Postal and Warehousing	401	4.6	5	3.8
Agriculture, Forestry and Fishing	348	4	2.1	6.2
Other Services	265	3.1	3.7	4.3
Administrative and Support Services	246	2.8	3.3	2.9
Professional, Scientific and Technical Services	202	2.3	10.1	4.6
Financial and Insurance Services	172	2	5.1	1.8
Wholesale Trade	152	1.8	3.4	1.9
Rental, Hiring and Real Estate Services	91	1.1	1.7	1.2
Arts and Recreation Services	55	0.6	1.7	1.3
Information Media and Telecommunications	16	0.2	2.2	0.8
Total industries	**8,690**	**100**	**100**	**100**

Source: NIEIR (2022)

The dominant employer in Lithgow is the Health Care and Social Assistance sector. This industry accounts for about 14% (1,200 people) of total employment and has shown steady growth over the last ten years, with a Compound Annual Growth Rate (CAGR)[3] of 3.4% in Full Time Equivalent (FTE)[4], compared to 13.2% for NSW and 15.8 % for Regional NSW (NIEIR, 2022). Considering the growing aging population in the region and the

[3] The compound annual growth rate (CAGR) is the annualised average rate of growth between two given years, assuming growth takes place at an exponentially compounded rate. The CAGR between given years A and B, where B - A = N, is the number of years between the two given years, is calculated as follows: CAGR, year A to year B = [(value in year B/value in year A) ^ (1/N)-1].

[4] FTE employment is calculated by dividing the total hours worked in each industry by 38, which is the average number of hours full-time employees work in Australia (ABS, 2016.

associated supporting services required (e.g., accommodation, advanced manufacturing), this sector is expected to remain one of the largest contributors to local employment in the future.

Although employment forecasts in the Mining Industry show a downward trend over the last ten years (CAGR of -3.7% p.a. in FTE) (NIEIR, 2022), this industry still plays a particularly important role in Lithgow, with a relative contribution that is disproportionately higher when compared to the State level. Mining accounts for around 11% of local employment (968 workers) in Lithgow, compared to its marginal contribution in NSW (1%) and Regional NSW (3%). Closely linked to the importance of the Mining sector in Lithgow, the Electricity, Gas, Water and Waste Services industry is relatively over-represented in the region. This sector employs around 5% of the workforce in Lithgow, while being one of the lowest employers in NSW (1%) and Regional NSW (1.4%). In addition, as Table 7 shows, the combined proportion of the workforce employed in the sub-sectors Coal Mining and Electricity Supply in Lithgow (1,322 people) represents around 15% of total employment. For comparison, these sectors combined in NSW and Regional NSW account for 2.4% and 1.2% of total employment, respectively. Lithgow's workforce reliance on the Mining and Energy sectors reflects its vulnerability to shocks affecting these key industries.

The Public Administration and Security Industry employs around 930 workers (10.7% of total employment) and is relatively over-represented compared to NSW and Regional NSW, where it accounts for around 6.2% of total employment. This prominence can be attributed to the presence of three major facilities in Lithgow: the Lithgow Correctional Centre, a maximum-security precinct with a max capacity for over 350 inmates, the Police Helpline, and the State Debt Recovery Centre. Employment forecasts shows a CAGR of 1.6% in FTEs over the last ten years, mainly driven by the 16% increase in the Defence sector (NIEIR, 2022).

Among the underrepresented sectors in Lithgow's economy are key industries for human capital development and innovation, such as Professional, Scientific and Technical Services, and Education and Training (Figure 6). For example, the Professional, Scientific and Technical Services sector employs just 2% of the workforce (202 workers), half the regional values of NSW (4.6%) and five times less than NSW (10%).

Table 7. Employment for key sub-sectors 2020/2021

Industry	Lithgow		*NSW*	Regional NSW
	Number	%	*%*	%
Health Care and Social Assistance	***1,232***	***14.2***	***13.2***	***15.8***
Social Assistance Services	405	4.7	3.8	4.7
Medical and Other Health Care Services	384	4.4	3.9	4.3
Hospitals	256	3	3.6	4.1
Residential Care Services	187	2.2	1.9	2.8
Mining	**968**	**11.1**	**1**	**3.0**
Coal Mining	900	10.4	0.5	1.5
Non-Metallic Mineral Mining and Quarrying	43	0.5	0.1	0.3
Exploration and Other Mining Support Services	23	0.3	0.2	0.4
Metal Ore Mining	2	0	0.3	0.8
Oil and Gas Extraction	0	0	0	0.0

Industry	Lithgow		*NSW*	Regional NSW
	Number	%	%	%
Public Administration and Safety	***933***	***10.7***	***6.1***	***6.3***
Public Administration	492	5.7	4.1	4.2
Public Order, Safety and Regulatory Services	354	4.1	1.5	1.4
Defence	88	1	0.5	0.7
Manufacturing	*696*	*8*	*6.6*	*6.9*
Fabricated Metal Product	315	3.6	0.5	0.6
Food Product Manufacturing	84	1	1.4	2.1
Printing (including the Reproduction of Recorded Media)	55	0.6	0.3	0.1
Non-Metallic Mineral Product	46	0.5	0.3	0.3
Electricity, Gas, Water and Waste Services	***444***	***5.1***	***1***	***1.4***
Electricity Supply	422	4.9	0.5	0.8
Water Supply, Sewerage and Drainage Services	14	0.2	0.2	0.3
Waste Collection, Treatment and Disposal Services	8	0.1	0.3	0.3

Source: NIEIR (2022)

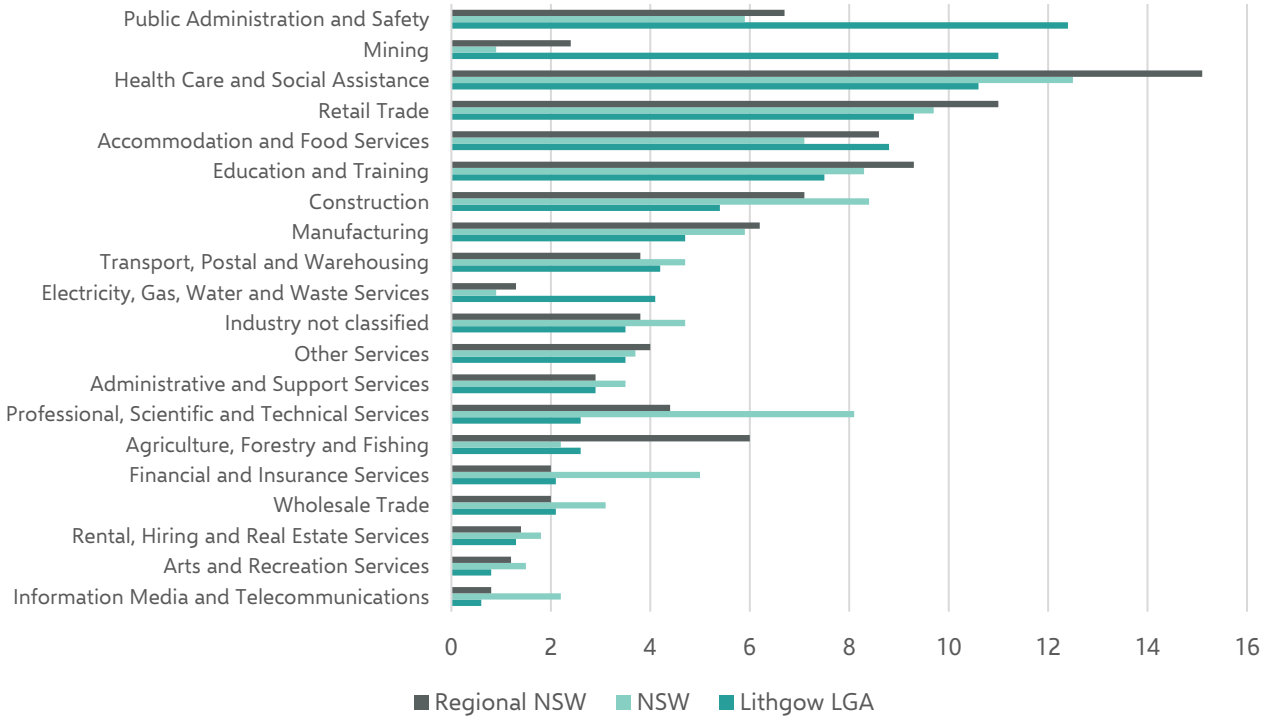

Figure 6. Employment per industry 2020/2021

Source: NIEIR (2022)

Based on the projection of employment forecast over the last ten years (CAGR for FTE), some industries with marginal representation in current local employment could play a role in Lithgow's future. Some examples are the Manufacture of Metal Products (7.4%) (mainly represented by the Lithgow small arms factory owned by Thales Australia), Adult, Community and Other Education (6.6%), Transport Equipment Manufacturing (4.13%) and Agriculture (3.4%) (NIEIR, 2022).

What does this mean for Lithgow's transition?

Lithgow's employment is concentrated in Health Care and Social Assistance, Mining, and Public Administration and Safety. This suggests that the economy is vulnerable to shocks to these sectors as there is limited economic diversification.

Workers' place of residence

The relationship between the place of work and the place of residence is a critical factor for development planning. In the case of Lithgow, it helps predict future commercial and residential areas and understand functional elements such as traffic patterns, communication, and economic interdependence with other LGAs.

A large proportion of the workforce in Lithgow resides and works in the LGA (76%, 5,926 people) (ABS, 2022). As shown in Table 8, for those residents who work outside (19.8%; 1,538 workers), the most frequent destinations are the neighbouring LGAs of Blue Mountains (C) (508 workers) and Bathurst Regional (A) (394 workers), followed by Mid-Western Regional (A) (112 workers) and Oberon (A) (87 workers). The rest of the residents who work longer distances outside of Lithgow are distributed mainly in eastern LGAs.

At the same time, Lithgow employs a total of 1,477 non-residents (ABS, 2022). Unsurprisingly, most of these workers reside in neighbouring LGAs in similar proportions to Lithgow residents working outside Lithgow, with the exception of Singleton, which contributes 52 workers to the Lithgow workforce without receiving any regular influx of labour from Lithgow.

Table 8. Workers' residence 2016

Location	Lithgow residents working outside		No-residents working in Lithgow	
	Number	%	Number	%
Blue Mountains (C)	508	6.5	527	7.1
Bathurst Regional (A)	394	5.1	446	6
Mid-Western Regional (A)	112	1.4	92	1.2
Oberon (A)	87	1.1	48	0.6
Penrith (C)	66	0.9	32	0.4
Sydney (C)	50	0.6	-	-
Blacktown (C)	40	0.5	19	0.3
Parramatta (C)	25	0.3	13	0.2
Hawkesbury (C)	24	0.3	26	0.4
Cumberland (A)	15	0.2	-	-
The Hills Shire (A)	15	0.2	-	-

Location	Lithgow residents working outside		No-residents working in Lithgow	
	Number	%	Number	%
Orange (C)	14	0.2	16	0.2
Ryde (C)	13	0.2	-	-
Campbelltown (C) (NSW)	11	0.1	-	-
Central Coast (C) (NSW)	11	0.1	-	-
Singleton (A)	-	-	52	0.7
Newcastle (C)	-	-	14	0.2
Canterbury-Bankstown (A)	-	-	13	0.2
Cessnock (C)	-	-	10	0.1

Source: ABS (2022)

In the case of the mining sector, the workforce is significantly made up of locals, with over 94% of workers residing in regional LGAs (eg, Lithgow, Bathurst, Mid-Western, and Blue Mountains). For the Centennial's workforce, composed by approx. 796 FTE workers, this proportion rises to 98.1%, with Lithgow contributing the majority of workers (75%), followed by Bathurst (11%), Mid-Western (7%) and Blue Mountains. (7%) (AIGIS Group, 2021).

What does this mean for Lithgow's transition?

Lithgow workers also have strong linkages with the Blue Mountains and Bathurst LGAs.

Value added

Value added by industry is an indicator of business productivity. It reflects the value generated by the production of goods and services and is estimated as the value of output minus the value of intermediate consumption. Comparing the relative contribution of each industry to total output, relative to a regional benchmark, gives an indication of the structure of an economy (NIEIR, 2022).

The total value added in Lithgow is around $1.41 billion, with a GRP of $1.62 billion, representing 0.25% of the state's GSP. Total value added and GRP have contracted in the last five years by -0.8% per year, and -0.5% (CAGR), respectively, suggesting a decline in economic activity (NIEIR, 2022).

As shown in Table 9 and Figure 7, the five industries that dominate employment in Lithgow are also the ones that contribute the most to the local economy in terms of value added. Together, Mining, Electricity, Gas, Water and Waste Services, Public Administration and Security, Manufacturing, Health and Social Assistance contribute 66% of the total value added in Lithgow. The highest growth rates are found in Manufacturing and in Health Care and Social Assistance, with values of 8.2% p.a. and 7.6% per year, respectively. On the other hand, the sectors with the most significant decreasing growth rates were Information Media and Telecommunications (-30.1% per year) and Transport, Postal and Warehousing (-6.7% per year).

Table 9. Value added per industry 2020/2021

Industry	*Lithgow*		*NSW*	Regional NSW
	$m	*%*	*%*	*%*
Mining	488.8	34.6	2.6	8.8
Electricity, Gas, Water and Waste Services	169.5	12	2.4	3.8
Public Administration and Safety	110.4	7.8	5.7	6.9
Manufacturing	81.5	5.8	6.5	7
Health Care and Social Assistance	81.3	5.8	8.5	11.7
Construction	77.1	5.5	8.7	11
Transport, Postal and Warehousing	74.3	5.3	5.3	4.2
Administrative and Support Services	61.5	4.4	4.4	3.2
Education and Training	52.3	3.7	5.9	7.3
Retail Trade	38.3	2.7	5.4	6
Accommodation and Food Services	35.1	2.5	2.6	3.3
Financial and Insurance Services	29.5	2.1	12.7	3.9
Agriculture, Forestry and Fishing	27.9	2	2.1	7.5
Wholesale Trade	27	1.9	5.3	3
Other Services	19.1	1.4	1.9	2.5
Professional, Scientific and Technical Services	17.5	1.2	10.7	5.1
Rental, Hiring and Real Estate Services	15.8	1.1	4.6	3.1
Arts and Recreation Services	2.8	0.2	0.9	0.6
Information Media and Telecommunications	1.1	0.1	3.7	0.9
Total industries	**1,410.80**	**100**	**100**	**100**

Source: NIEIR (2022)

As shown in Table 10, Mining (mainly coal mining); and Electricity Gas, Water, and Waste Services (particularly Electricity supply) are the main contributors to value added in Lithgow, with a much higher relative relevance than at the State level. With a contribution of $488.8 million ($480.7 million from Coal Mining) to the local economy, Mining represents 34.6% of the total added value. In turn, Electricity, Gas, Water and Waste Services make up 12% with $170 million (NIEIR, 2022). For comparison, those two sectors contribute around 2.5% each to the NSW economy.

Despite the relevance of Health Care and Social Assistance, and Public Administration and Security Industries to the local employment, their contribution to Lithgow's economy in terms of value added is significantly less than that of Energy and Mining sectors. The Public Administration and Security industry contributes a total of $110.4 million, which represents 7.8% of Lithgow's total value added. In the case of Health Care and Social Assistance, despite being the largest employer in Lithgow and one of the industries showing the highest growth in the last ten years (7.6% per year), its relative contribution to total value added is secondary. This

sector contributes $81.3 million to the local economy, representing 5.8% of total value added, a considerably lower proportion than regionally (8.5% in NSW and 11.7% in Regional NSW).

Table 10. Value added per sub-sector 2020/2021

Industry	*Lithgow*		*NSW*	Regional NSW
	$m	*%*	*%*	*%*
Mining	**488.8**	**34.6**	**2.6**	**8.8**
Coal Mining	480.7	34.1	1.7	6.7
Non-Metallic Mineral Mining and Quarrying	4.2	0.3	0.1	0.4
Exploration and Other Mining Support Services	3.6	0.3	0.2	0.5
Electricity, Gas, Water and Waste Services	**169.5**	**12**	**2.4**	**3.8**
Electricity Supply	165.1	11.7	1.4	2.7
Water Supply, Sewerage and Drainage Services	3.8	0.3	0.7	0.7
Public Administration and Safety	**110.4**	**7.8**	**5.7**	**6.9**
Public Order, Safety and Regulatory Services	61.5	4.4	2.2	2.4
Public Administration	31.5	2.2	2.5	2.7
Defence	17.5	1.2	1	1.7
Manufacturing	**81.5**	**5.8**	**6.5**	**7.0**
Fabricated Metal Product	43.2	3.1	0.6	0.8
Non-Metallic Mineral Product	7.5	0.5	0.4	0.4
Printing (including the Reproduction of Recorded Media)	4.1	0.3	0.2	0.1
Transport Equipment	4	0.3	0.7	0.8
Machinery and Equipment	2.7	0.2	1	0.8
Health Care and Social Assistance	**81.3**	**5.8**	**8.5**	**11.7**
Social Assistance Services	24	1.7	2.1	3.1
Hospitals	23.5	1.7	3.1	3.9
Medical and Other Health Care Services	17.5	1.2	1.8	2.2
Residential Care Services	16.3	1.2	1.5	2.5

Source: NIEIR (2022)

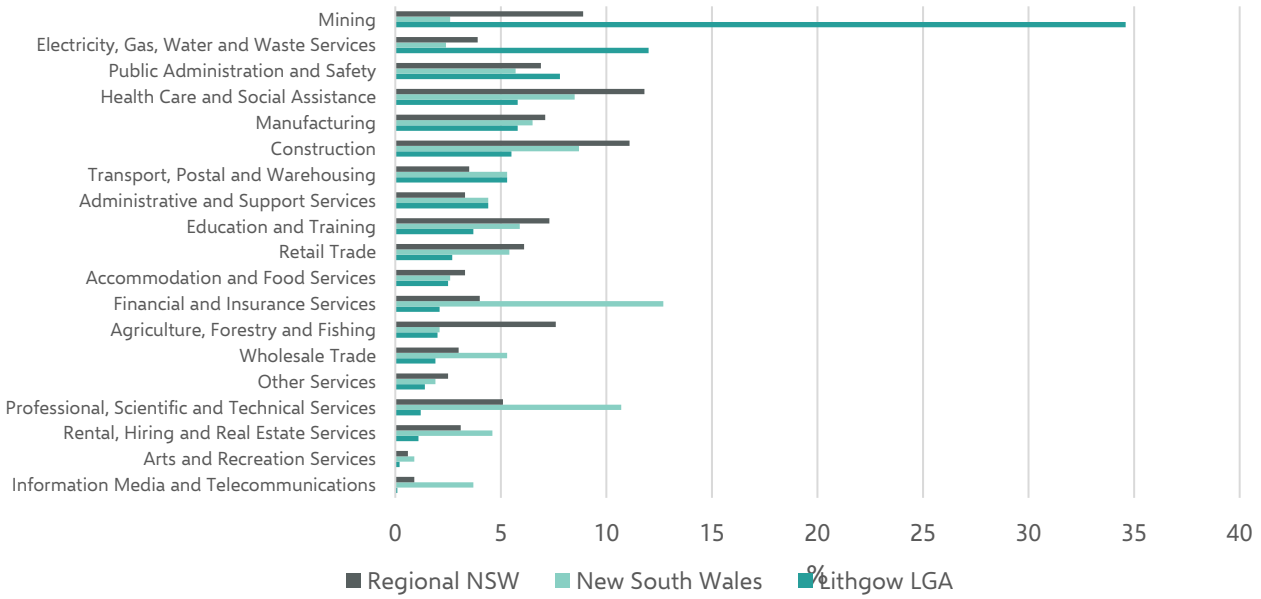

Figure 7. Value added per Industry

Source: NIEIR (2022)

What does this mean for Lithgow's transition?

Lithgow's value added is highly concentrated in Coal Mining and Electricity Supply. This suggests the economy is vulnerable to shocks to these subsectors.

Tourism

Tourism can be an important economic driver. Currently, Lithgow's tourism industry provides only 2% of total value added (which would rank it at 12th out of 20 industries). Similarly, Lithgow's tourism industry provides only 4% of total employment (again ranking 12th) (NIEIR, 2022).

The region's offerings are similar to those of the neighbouring Blue Mountains LGA. Source: NIEIR (2022)

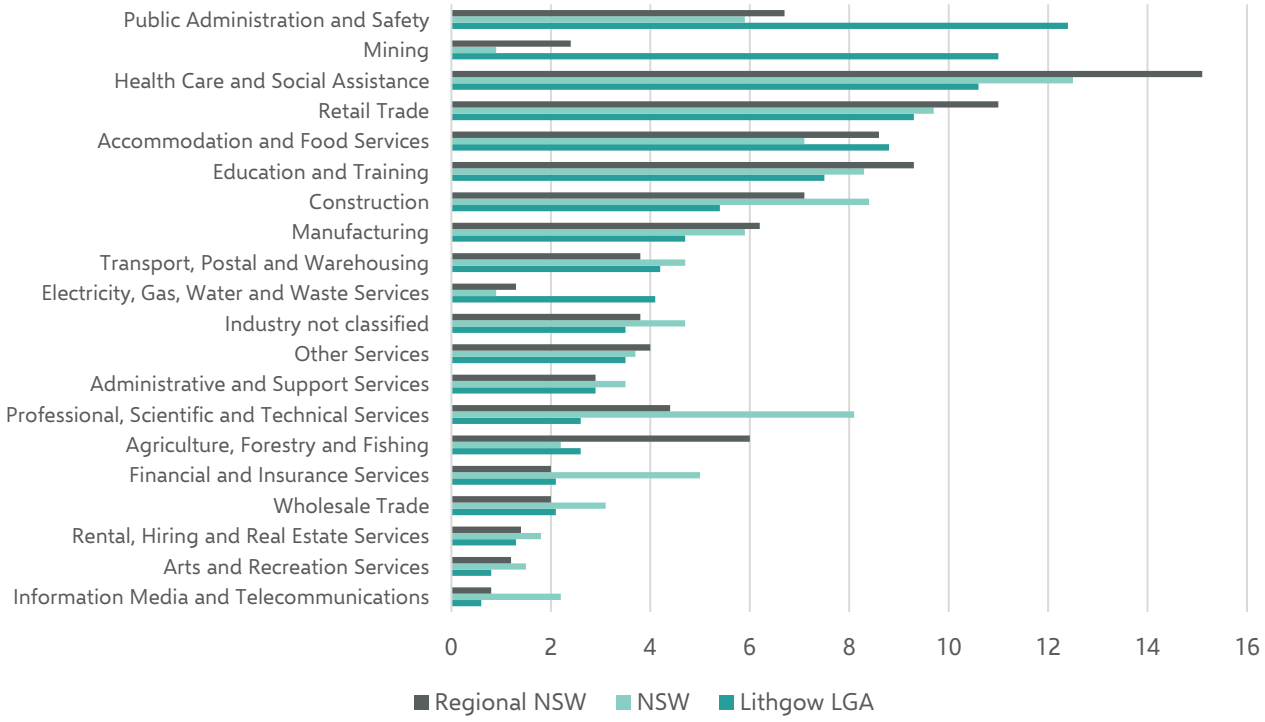

Figure 6Figure 8 below shows a breakdown of day trip tourist activity between Lithgow LGA, Blue Mountains LGA and NSW over the last 10 years.

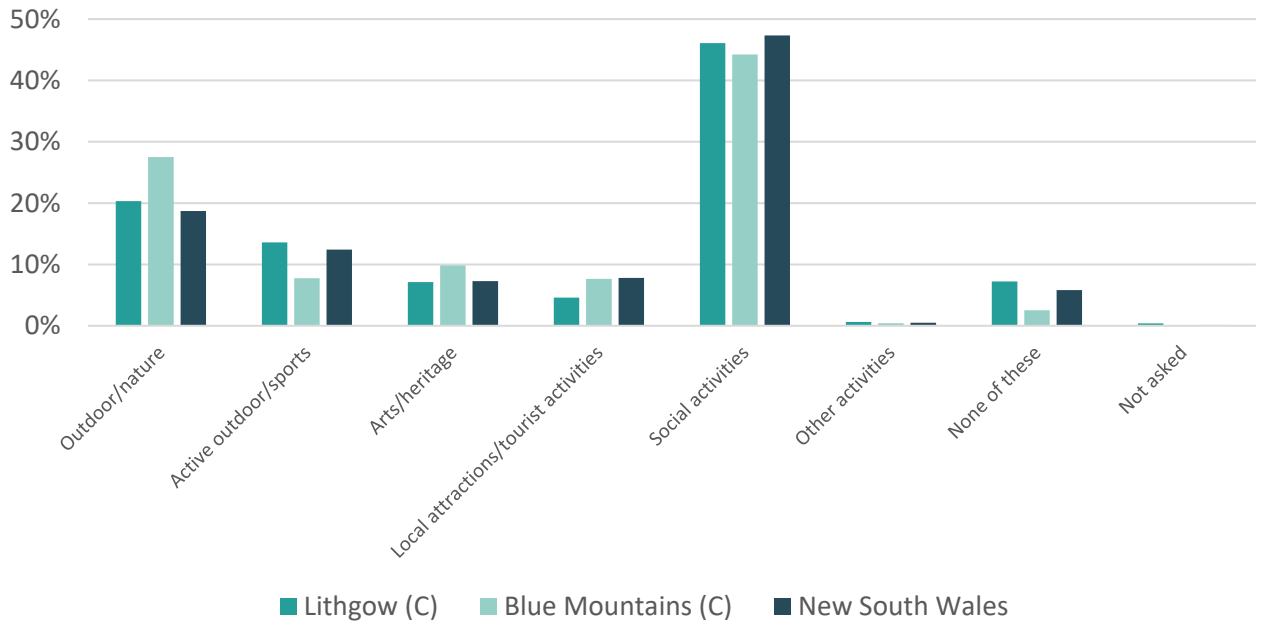

Figure 8. Tourism activity mix - Lithgow LGA, Blue Mountains LGA & NSW

Source: TRA (2020)

Table 11 below highlights some key tourism indicators between the Lithgow and Blue Mountains LGAs.

Table 11. Key tourism indicators - Lithgow LGA and Blue Mountains LGA

Indicator	Lithgow	Blue Mountains
Total tourism businesses	204	905
Total visitors (% of visitors international)	598,000 (0.8%)	3,570,000 (3.1%)
Average spend per trip	$167	$167
Average nights	3	3
Key activities (based on overnight visitors)	Social activities (46%), Outdoor/nature (20%), and Active outdoor/sports (14%)	Social activities (44%), Outdoor/nature (28%), and Active outdoor/sports (10%)

Source: TRA (2020) & TRA (2022)

Despite its current secondary relevance to the local economy, the tourism industry has potential for growth, considering that nearly two-thirds of the region is National Parks or State Forests and Lithgow's rich Aboriginal and European heritage (NSW Government, 2018). Aiming to capitalize on those resources, the NSW Government has announced a plan to invest $50 million to promote the expansion of the state conservation area around the Gardens of Stone and Wollemi National Parks and its further development as an adventure and ecotourism destination. Planning to attract 200,000 visitors a year, this project is expected to create around 200 jobs for the Lithgow area (NSW Government, 2022-c). It should be noted however, that the tourism industry tends to grow incrementally without a major catalyst. While future growth seems likely, the process to change visitors' destination choices may be a long one.

What does this mean for Lithgow's transition?

The tourism industry is not currently a major contributor; however, offerings and activity mix undertaken are similar to the Blue Mountains. There is likely to be incremental growth in this sector in the future.

Productivity per worker

Productivity, calculated as value added per employee, is a good indicator of the value each employee generates. In general, Lithgow shows high productivity compared to NSW and Regional NSW (Table 12), which is strongly driven by the Mining, Energy, Administration, and Transport sectors. This advantage makes the replacement of the Mining and Energy Industries particularly challenging for the region, as any transition or replacement attempt must balance contribution to employment and economic performance. For example, annual productivity per employee in the mining sector ($503,606/worker) is four times higher than productivity in Public Administration and Security ($118,283/worker), seven times higher than that of Health Care and Social Assistance ($66,046/worker), and nine times higher than Retail Trade ($56,134/worker). However, the last three industries together employ 2,850 people, three times more workers than Mining.

Table 12. Productivity per Industry 2020/2021

Industry	Lithgow ($)	NSW ($)	Regional NSW ($)
Mining	503,588	313,756	315,616
Electricity, Gas, Water and Waste Services	382,521	289,385	279,779
Administrative and Support Services	249,919	168,805	120,473
Transport, Postal and Warehousing	247,990	133,802	116,968
Wholesale Trade	177,430	203,110	170,020
Rental, Hiring and Real Estate Services	173,682	350,307	269,342
Financial and Insurance Services	171,237	321,100	226,077
Construction	158,478	123,340	111,932
Public Administration and Safety	118,283	118,640	114,921
Manufacturing	117,360	126,338	107,228
Professional, Scientific and Technical Services	86,286	135,764	116,896
Education and Training	82,155	86,450	81,570
Agriculture, Forestry and Fishing	79,992	126,010	127,463
Other Services	71,873	66,352	61,685
Information Media and Telecommunications	68,475	215,369	129,377
Health Care and Social Assistance	66,046	82,486	78,307
Accommodation and Food Services	60,073	51,541	45,906
Retail Trade	56,134	73,070	61,842
Arts and Recreation Services	51,771	66,204	51,660
Total worker productivity	**165,634**	**127,679**	**105,810**

Source: NIEIR (2022)

The resilience of an economy is linked to its ability to resist, avoid or recover from shocks to its economic base. It is often determined by assessing how diversified the activity is across sectors. As shown in Table 13, in terms

of employment, Lithgow's concentration ratios are moderate and relatively similar to NSW and Regional NSW when the top four (44% in Lithgow versus 42% in NSW and 46% in Regional NSW) and the top eight contributing sectors are taken into account (73% in Lithgow versus approximately 72% in NSW and Regional NSW). However, in terms of value-added, Lithgow shows a significantly higher concentration ratios of resources than the region. The top four contributing industries to value added in Lithgow account for around 60% of the total, rising to 81% when the top eight industries are considered. For reference, the concentration ratios for NSW and Regional NSW sit at around 40% for the top four industries and around 65% for the top eight industries. Lithgow's high concentration rates show its vulnerability to shocks to its economic base.

Table 13. Concentration of employment and value added 2020/2021

	Lithgow		Regional NSW		NSW	
# Top industries	**4**	**8**	**4**	**8**	**4**	**8**
Employment	44%	73%	46%	73%	42%	70%
Value added	60%	81%	39%	67%	41%	64%

Source: NCEconomics estimates based on NIEIR (2022) data

What does this mean for Lithgow's transition?

Mining and Electricity, Gas, Water and Waste Services are highly productive sectors using standard measures. This has implications both for the potential vulnerability to shocks, and potential areas for growth.

Income by industry

As shown in Figure 9, income distribution in Lithgow is highly industry-related. Mining dominates in the higher income categories ($1,500 or more per week), with 34% of jobs (406 workers) within that range and 70% of its workers (117) earning $3,000 or more. The closure of the mining industry will mean the loss of more than 540 high-paying jobs.

Although other industries in Lithgow, such as Health Care and Social Assistance, Public Administration and Security, Accommodation and Food Services, and Education and Training, also have representation in the high wage ranges (over $1,500 per week), a significantly smaller proportion of its employees are in those categories, with most of their workers' income sitting below this mark.

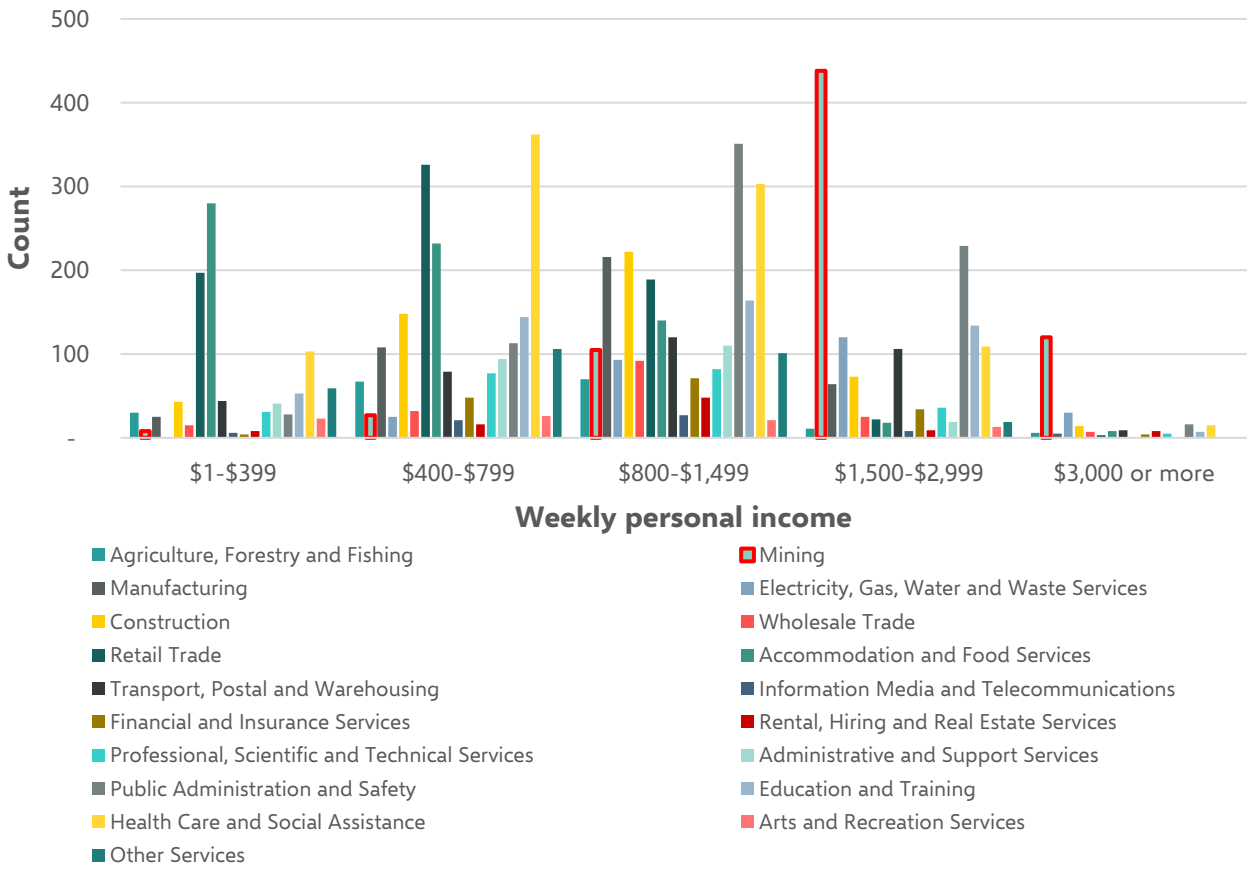

Figure 9. Weekly personal income per industry

Source: ABS (2022)

What does this mean for Lithgow's transition?

Loss of mining jobs will mean the loss of many of the regions high-paying jobs. There are other industries (e.g. Health Care and Social Assistance) that also provide a number of high paying jobs which may be candidates for future growth.

Lithgow as a Metro Satellite

Metropolitan Satellites are classified as such based on three main criteria: relatively high-density communities with higher-than-average population growth rates, location on the outskirts of large population centres, and greater economic resilience, as they are protected from changes in local industries due to its proximity to major growing cities (NSW Government, 2021). This classification assumes that workers can commute to Metro hubs, increasing their income by taking advantage of opportunities in those areas.

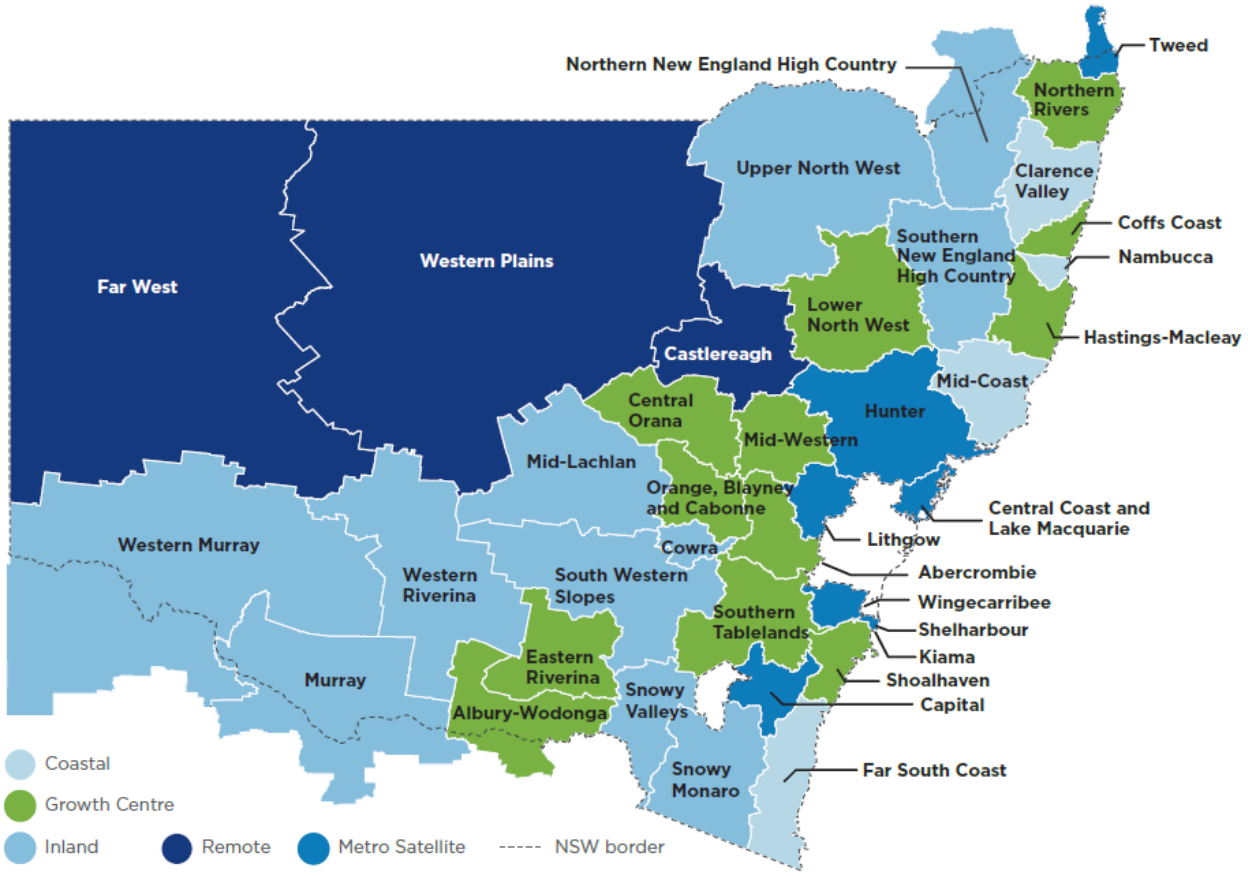

Figure 10. Functional economic regions of Regional NSW

Source: NSW Government (2021)

Despite Lithgow's proximity and relatively high connectivity to Greater Sydney, the classification of Lithgow as a Metro Satellite does not particularly fit its characteristics (Figure 10). Lithgow shows projections of possible population stagnation and a poorly diversified economy compared to the State and Regional New South Wales, with its high reliance on coal mining challenging its resilience to face shocks. Additionally, although Lithgow urban area has a relatively high density (154.9 people per square kilometre), this is not the case for the Lithgow Region SA2 (3.38 people per square kilometre) and the unpopulated Wollangambe- Wollem. This brings the population density of the LGA to 4.6 people per square kilometre and places Lithgow well below other Metro Satellite towns in NSW such as Wingecarribee (19.5), Kiana (83.2) or Shellharbour (518.1).

Additionally, Lithgow's buffer zone status is impacted by the presence of areas such as the Blue Mountains. Although the Blue Mountains are classified as part of Greater Sydney, this region absorbs some of the benefits expected for Lithgow. In terms of employment, for example, Lithgow's reliance on Greater Sydney is secondary. Compared to Lithgow, the Blue Mountains population shows high growth rates and signs of a young population taking up residence in the area (high proportion of homeowners with mortgages).

What does this mean for Lithgow's transition?

The classification of Lithgow as a Metro Satellite does not particularly fit its characteristics. This has implications for investment and growth opportunities.

2.3 Adaptive capacity

The Productivity Commission's (PC) Transitioning Regional Economies report defines relative adaptive capacity as "a summary of the complex set of factors considered to influence the capacity of regions to be resilient", but "not a guarantee of resilience to disruptive events".

The PC have constructed an index based on a range of factors (at both the individual and wider economy level), including skills and education of the regional workforce, access to infrastructure and services, availability of natural resources, availability of financial resources, and industry diversity. This is similar to the approach used by the ABS to develop the SEIFA (Socio-Economic Indexes for Areas) indices.

The index has been constructed for a range of Functional Economic Regions (FERs) in Australia and is not reported at the LGA level. The Lithgow LGA lies entirely within the Bathurst – Orange FER. Figure 11 below displays the relative adaptive capacity of FERs.

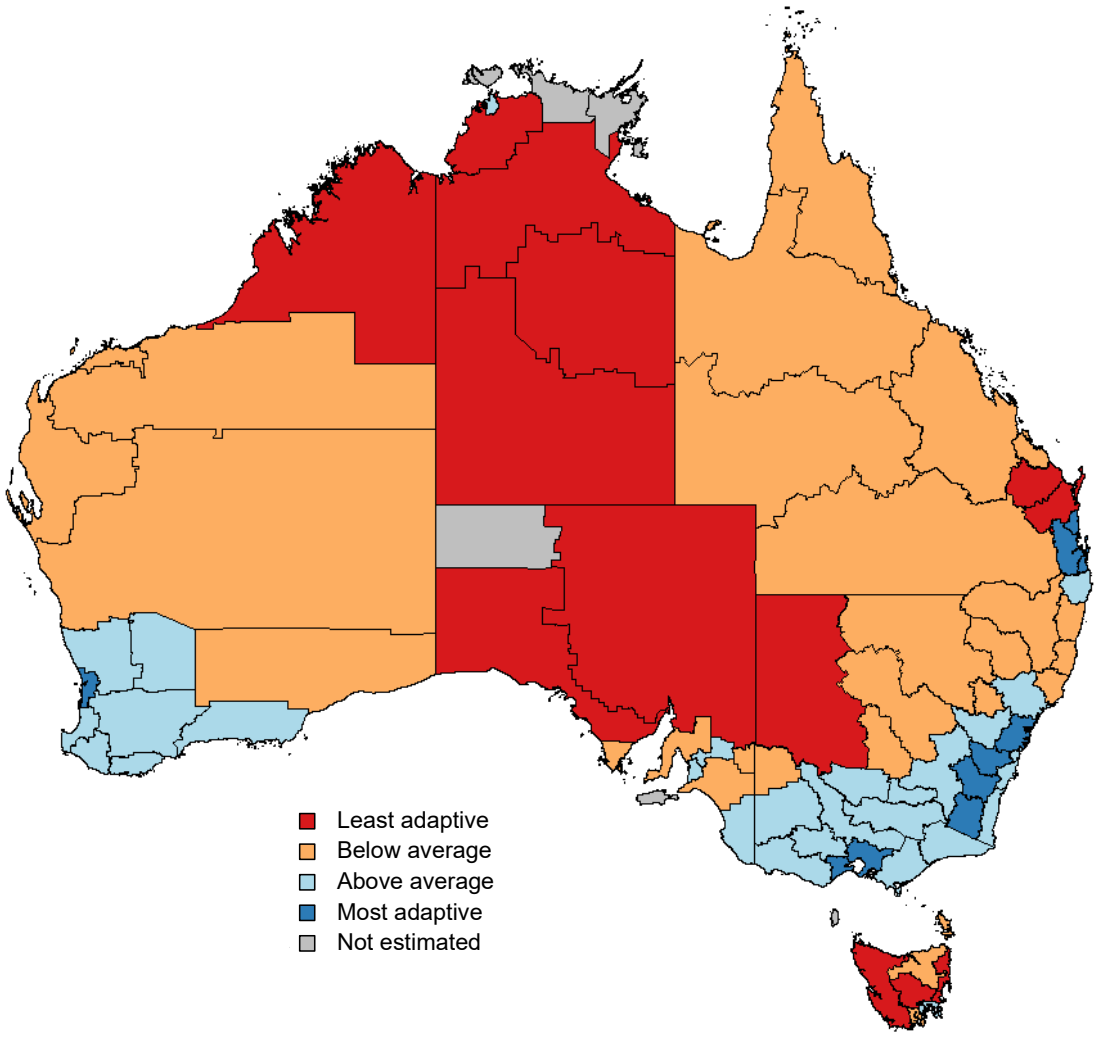

Figure 11. The relative adaptive capacity of functional economic regions

Source: Productivity Commission (2017)

Productivity Commission research indicates that the Bathurst – Orange FER has a slightly higher than average adaptive capacity. However, for some key indicators Lithgow performs considerably worse, indicating a lower level of adaptive capacity than that of the Bathurst – Orange FER. This is evidenced by Table 14 below, which

displays some key adaptive capacity indicators for LGAs situated within the Bathurst – Orange and Mudgee FERs (LGAs shaded grey are situated in the Mudgee FER).

Table 14. Key adaptive capacity indicators of Lithgow and nearby LGAs

LGA	People over 15 with year 12 or higher education (%)	Labour force employed (%)	People over 15 working or looking for work (%)	People aged 15-64 (%)	People who identify as indigenous (%)	Population change from 2016 to 2021 (%)	Mean weekly personal income ($)
Lithgow	52.2	94.5	50.4	60.1	7.8	-1.2	632
Cabonne	57.0	97.4	61.1	58.2	5.0	2.8	768
Orange	61.3	96.5	62.1	60.4	7.7	7.9	842
Blayney	57.2	95.7	61.2	59.5	5.8	3.3	765
Bathurst	61.3	96.0	60.2	62.7	7.2	5.5	796
Oberon	52.0	96.5	54.9	57.9	4.7	5.3	759
Mid-Western	56.2	96.0	57.8	59.4	6.8	6.8	703
Warrumbungle	44.8	93.9	47.2	54.4	10.7	-1.7	559

Source: ABS (2022-c)

The Lithgow LGA appears more similar to the Mudgee FER, which has an index of -0.11 and is ranked 44th out of the 77 FERs – a lower than average adaptive capacity. Figure 12 displays index values and their 90% confidence intervals for each FER, sorted from lowest to highest. The positions of the Bathurst – Orange and Mudgee FERs in Figure 12 are indicated using arrows and respective labels.Figure 12. Index values and their 90% confidence intervals for each FER, sorted from lowest to highest

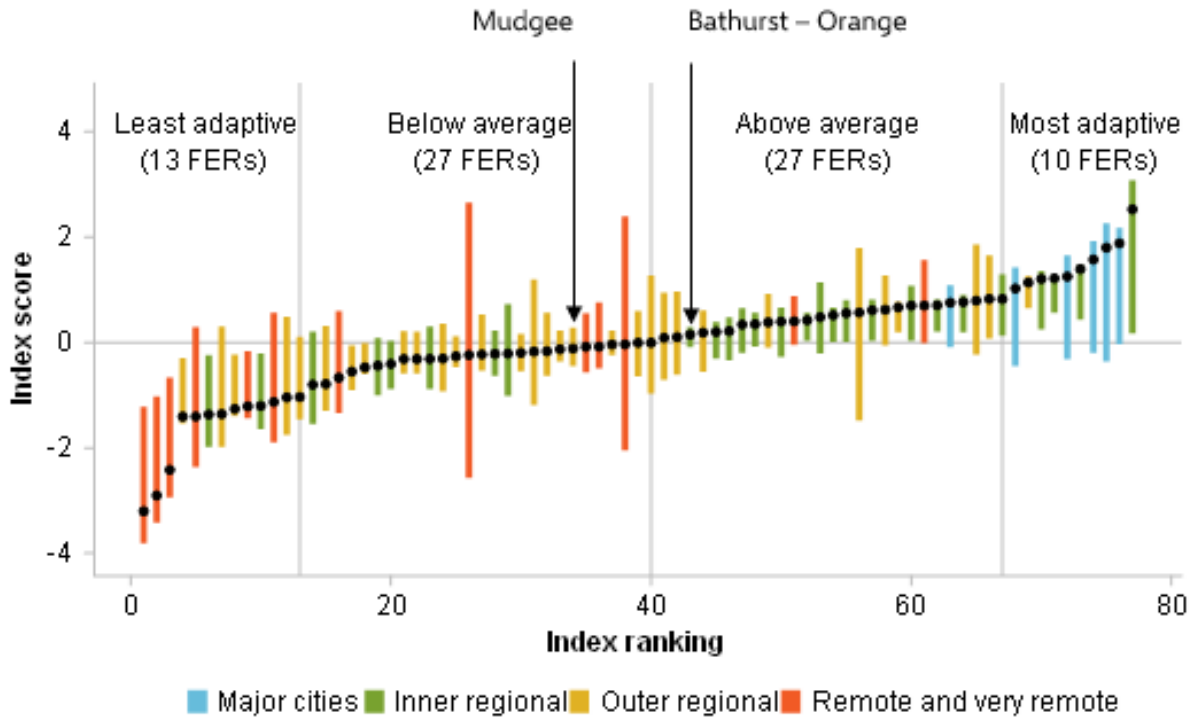

Figure 12. Index values and their 90% confidence intervals for each FER, sorted from lowest to highest

Source: Productivity Commission (2017)

What does this mean for Lithgow's transition?

Lithgow has an adaptive capacity that is slightly below average. Consequently, Lithgow will likely need assistance and interventions to transition successfully following an economic disruption.

3 Baseline projection

This section briefly outlines a credible projection of key socio-economic outcomes in the Lithgow LGA in the absence of any additional and specific transition interventions.

3.1 Economic risks: Coal mining and coal-fired power station

Coal mining accounts for 99% of mining value added in Lithgow and provides a significant number of direct, high-paid jobs and support services.

Despite an expected 6% increase in global coal demand in 2021, the coal industry is declining worldwide due to the substitution by renewable energy (IEA, 2021). In the past decade, Australia has faced the closure of several coal-fired plants (Burke et al., 2018), and in a recent report, the Australian Energy Market Operator (AEMO) has stated that Australia is likely to exit coal-fired power entirely by 2043 (AEMO, 2021). Mt Piper is the last remining coal fired power station in Lithgow, following the closure of the Wallerawang Power Station.

In the Lithgow and Mid-Western Regions, most of the coal mines are expected to close down within the next twenty years, and much of the output is used domestically for power generation. Unless market conditions change and current agreements are modified, consents for the major underground coal mines currently operating: Airly Mine, Clarence and Springvale Coal Mines, will expire in 2037, 2026 and 2028, respectively. Angus Place is currently in care and maintenance mode, but Centennial is seeking approval to extend its underground mining operations with the proposed Angus Place West Project (current consent is till 2024). The project is intended to coincide with late-stage operations at Springvale Mine, and involve the redeployment of the Springvale workforce to Angus Place.

The West Centennial Coalfields, which include Lithgow and Mid-Western Regional Operations, currently employ about 800 FTE workers plus more than 100 FTE contractor positions. Centennial's internal analysis estimates the contribution of direct jobs to the regional economy to range from $5.0 million to $7.2 million per year, supporting an estimated 1,910 to 2,468 residents in the region (AIGIS Group, 2021).

The contribution of the mining industry is further extended considering that each producing site (Airly, Clarence and Springvale) trades with an average of 73 (local), 92 (regional) and 387 (NSW) supplier companies each year. Over the last three years, the combined operations of the active mines are estimated to have contributed about $63.4 million, $69.4 million and $458.5 million on average to the local, regional and State economy, respectively .

Additionally, Centennial's western operations also contribute payments in the form of taxes and other fees to local, regional and federal governments. For example, in fiscal year 2020, the three producing mines paid a total of $3.4 million to Lithgow City Council for fees and charges, $4.7 million to the State of NSW for payroll taxes, and a total of $30.7 million to the State for royalties.

The future of the Mt Piper Power Station, operated by Energy Australia, is also closely linked to the nearby coal mines. The station has 2 generators with a combined capacity of 1,400MWh, with one of the generators having recently undergone a major refurbishment. While consultation revealed there are plans for continuity of coal supply beyond the closure of the nearest mines, it is likely that there will be an increase in cost involved in

utilising coal from other mines due to the increased transport distance and mode (road rather than conveyer belt). Importantly, the generators at Mt Piper have the ability to operate much lower than maximum capacity (unlike many other generators), which provides more flexibility for energy market participation and may serve to extend their economic life. This means the power station will be an important component of Energy Australia's strategy in the medium term, as they are seeking to establish themselves as suppliers of dispatchable energy and energy storage in the long term.

While the current expected closure date of Mt Piper is 2040, Energy Australia are legally required to provide notice of the closure at least 3.5 years in advance. The power station has a large and stable workforce (approx. 250 employees) that will be at risk upon its closure, and therefore this workforce should be considered in Lithgow's transition plan.

The importance of Coal mining for high-paying jobs can be seen in Census data on employment and income. Figure 13 presents the weekly incomes of people working in Coal mining in Lithgow by occupation.

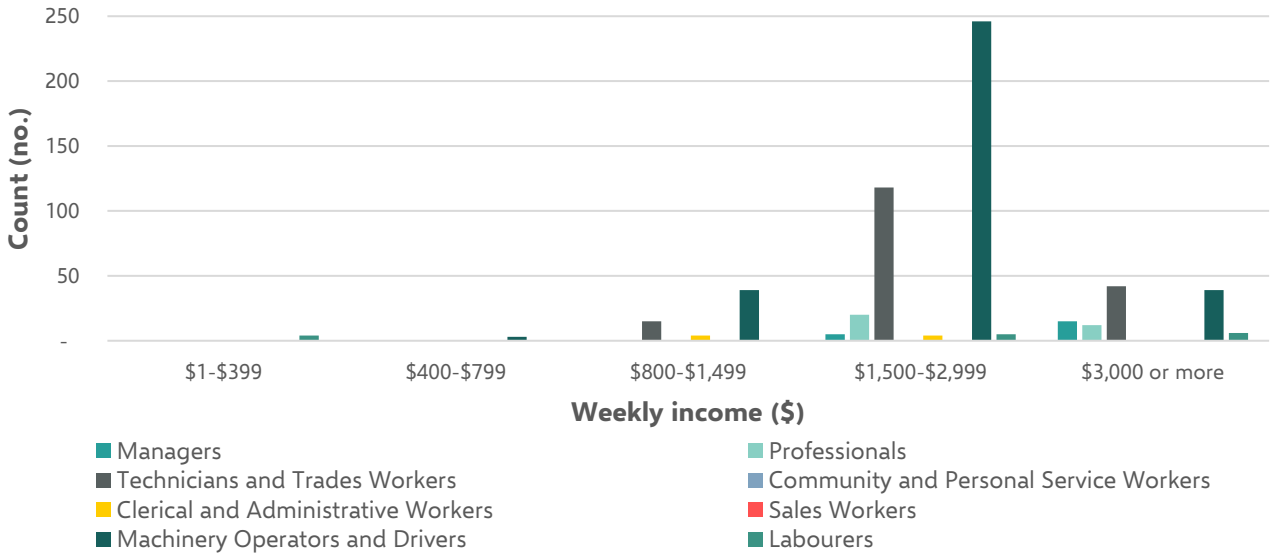

Figure 13. Weekly income by occupation in the Coal mining industry in 2016

Source: ABS (2022)

The coal mining sector concentrates not only a disproportionately high share of well-paying jobs in the region, but also an industry-specific skilled workforce represented primarily by machine operators, drivers, and technicians, and a small proportion of labourers. Figure 14 shows Mining workforce skewed towards younger workers compared to Health Care and Public Administration Sectors.

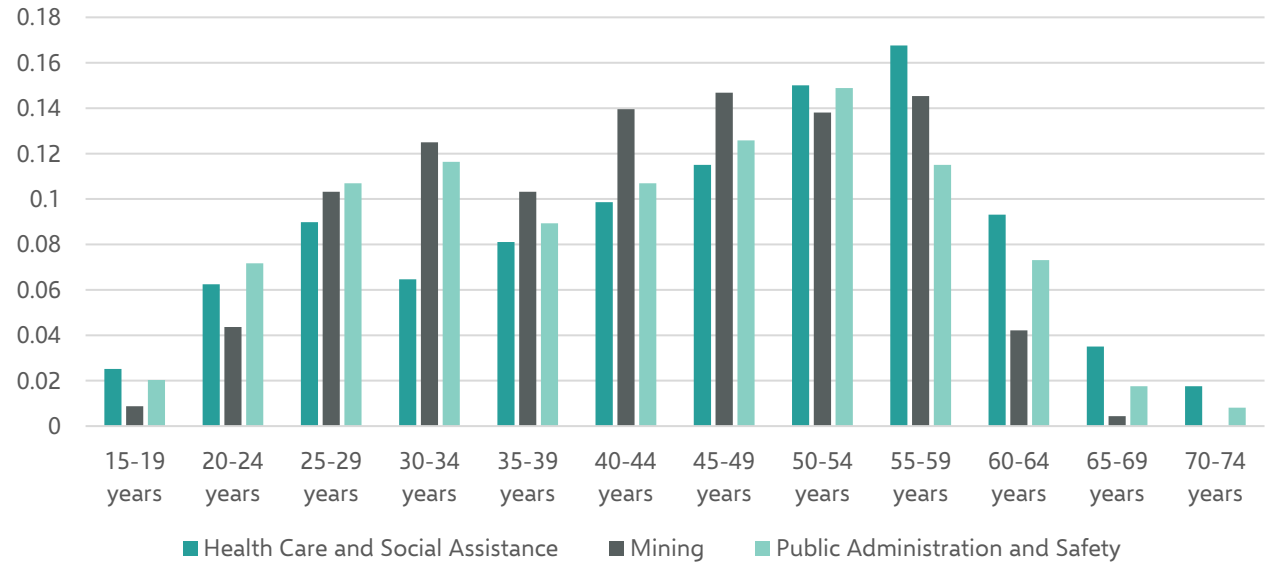

Figure 14. Age by occupation in Lithgow (2016)

Source: ABS (2022)

The undoubtedly important contribution of coal mining to Lithgow is not limited to the economy, as mining employees also play an important role in the local community (i.e. volunteer work in the fire and emergency services, support to schools, community associations) (AIGIS Group, 2021).

What does this mean for Lithgow's transition?

Coal mining and coal-fired power generation are currently cornerstones of the local economy. Shocks to these sectors are expected in the near future and should be considered for Lithgow's transition.

3.2 Projection assuming closure without transition

Regional economies are dynamic, and businesses and workers adjust to shocks including changes in turnover, changes in input prices etc. It is known with almost absolute certainty that the Mt Piper Power Station will close by 2040, but depending on market circumstances, could close earlier. This would create an immediate flow in impact on Centennial's coal operations as new markets were sought.

It is informative to attempt to understand the potential impacts of the closures on the local economy in the absence of any transition actions as this provides a broad orders of magnitude indication of the scale of the risk and the economic activity that would need to be generated elsewhere in the local economy to make up for the shortfall.

Approach and assumptions for economic modelling

To assess the economic impact of step changes in the local economy, the approach draws on a national accounting approach, scaled down to the regional level, to estimate the economic impacts of the developments on the Lithgow City Council regional economy (in terms of value added).

To estimate the economic impact of a step change in economic activity, an Input-Output (I-O) model of the Lithgow City Council regional economy was used[5]. This allows changes in economic activity in one sector to be

[5] Economy.id – Lithgow City Council Economic Impact Model

traced through to resulting economic activity in another sector. An existing model was used as the purpose of this project is not to establish a model – rather to use available information to better understand the challenges facing the Lithgow economy and community.

To understand the potential magnitude of the impact to the local economy and employment, it is important to model the potential impacts if *no transition actions are undertaken (including company plans to diversify into renewables at these sites) – a worst-case scenario.* The inputs to the I-O model are the likely job losses resulting from coal mine closures and the power station closure. This does not include an assessment of the transient workforce required for rehabilitation.

The timing of this scenario is unclear at this stage, and as such, three different timeframes for closure are considered here:

1. **Closures in the near term (2028 to 2032)** – This period broadly aligns with the 42-month minimum legal notice required for closures of power stations. This does not signal that closure will occur in 2028, but considers the impact should an announcement be made in the future to bring closure forward to this timeframe. Assuming the mines' and power station's production and employment levels were similar to current levels at the time of any closure, this would equate to a decline in sector employment of approximately 900 jobs between 2028 and 2032 (approx. 650 in Coal mining [approx. no. of employees at Clarence and Springvale mines] and 250 in Electricity supply [approx. no. of employees at Mt Piper]).
2. **Closures in the near to medium term (2032 to 2036)** – This period may represent a scenario where coal prices are sufficient to incentivise further mining with insufficient drivers for the power station and mines to remain operational for the period to 2040.
3. **Closures in the medium to long term (2036 to 2040)** – This period represents the most recent formal announcement from EnergyAustralia around the closure of Mt Piper (2040) and represents an upper bound for the remaining commercial viability in the coal mining and coal-fired energy generation industries.

The timing of any mine closures and the extent of the impacts will be determined by a number of factors for the mines *and* the Mount Piper power station including:

- The actual rate of utilisation of the remaining coal reserves, and the actual volume of commercially viable reserves available. This is also influenced by the current consent dates and the ability to amend them. It should be noted that Centennial are developing contingencies to redeploy staff to other local operations if Clarence and Springvale Coal Mines were to close (potentially including underground mining operations at Angus Place).
- The prevailing coal price, and the ability of the mines to profitably sell coal from production levels above the volume required for Mount Piper power station into the broader market.
- The future wholesale price of electricity and the ability of Mount Piper power station to generate electricity at a marginal cost below the wholesale market price. This will be further influenced by the degree to which the two units at Mount Piper continue to operate efficiently, and at levels that match market demand for their output, noting that the power station is a relatively modern facility. It is also noted that Energy Australia gave seven years' notice for closure of the Yallourn power station in Victoria.
- The dedicated sector-wide effort to manage the transition of energy generation and energy sources at minimal disruption to both consumers and producers (e.g. through the Australian Energy Market Operator 2022 Integrated System Plan).

The key point is that the I-O modelling approach requires assumptions to be made with respect to inputs, and that the point of the modelling exercise is to understand the implications of a worst-case scenario where no transition actions are undertaken.

Limitations

There are a number of limitations associated with the use of the I-O approach, which influence the interpretation of the results. These limitations are discussed by the Productivity Commission (2013) and the degree to which they apply to the current situation are summarised as:[6]

- Lack of supply-side constraints – it is assumed that extra output can be produced in one area of activity without taking away resources from other activities. Actual impacts would be dependent on the availability of appropriate labour and capital and other productive inputs.[7]
- Fixed prices – it is assumed that the effects of relative price changes play no role in the allocation of scarce resources between activities. Actual impacts would be affected by relative price changes due to constraints on the availability of labour, capital and other inputs and policy changes. This is a limitation of I-O modelling in general, particularly as the model parameters are generated using data that may not reflect current prices of inputs key sectors.
- Fixed ratios for intermediate inputs to production and outputs from production – it is assumed that changes in production technology and the use of inputs in production play no role in impact assessment. Furthermore, the structure of the I-O model does not necessarily reflect the degree to which capital is imported into a region (e.g. specialist earth moving equipment). Actual impacts could be affected by changes in production technologies such as more efficient irrigation technologies. This could result in the flow-on benefits being overestimates.
- No allowance for household purchasers' marginal responses to change – it is assumed that the real budget shares remain unchanged with changes in household income and relative prices. In practice, the level and composition of household purchases would be affected by income and relative price changes.
- Absence of budget constraints – it is assumed that changes in household or government consumption occur without reducing demand elsewhere. In practice, the level of consumption expenditure by households and government would be budget constrained.

These limitations have no influence on the estimated direct economic impacts. However, they mean that the estimates of flow-on benefits should be treated with caution as they are potentially over-estimates.

Key points

The approach to assess the economic impact of the potential job losses is based on a national accounting approach, scaled down to the regional level, to estimate the economic impacts of the job losses on the Lithgow City Council regional economy (or value added) from an eventual cessation of coal-fired electricity generation and coal mining.

Inputs to the economic impact assessment are the likely job losses resulting from coal mine closures, based on desktop research and consultation with key stakeholders.

[6] Gretton, P. (2013) On input-output tables: uses and abuses, Staff Research Note, Productivity Commission, Canberra.
[7] It is also important to consider the degree to which the unemployed labour force possesses transferable skills, which may limit the reduction of unemployment resulting from demand shocks.

Projection

Historical estimates of value added were collated and then the I-O model was used, basic trends for each sector were used to estimate short-term outcomes, then a 'shock' to the model was applied to estimate the impacts of the closure in that year (a worst-case scenario). Figure 15 presents the economic baseline in terms of the value-add of the economy by industry. The historical performance has demonstrated exposure to mining sector volatility and points to the influence that sector can have on the wider economy.

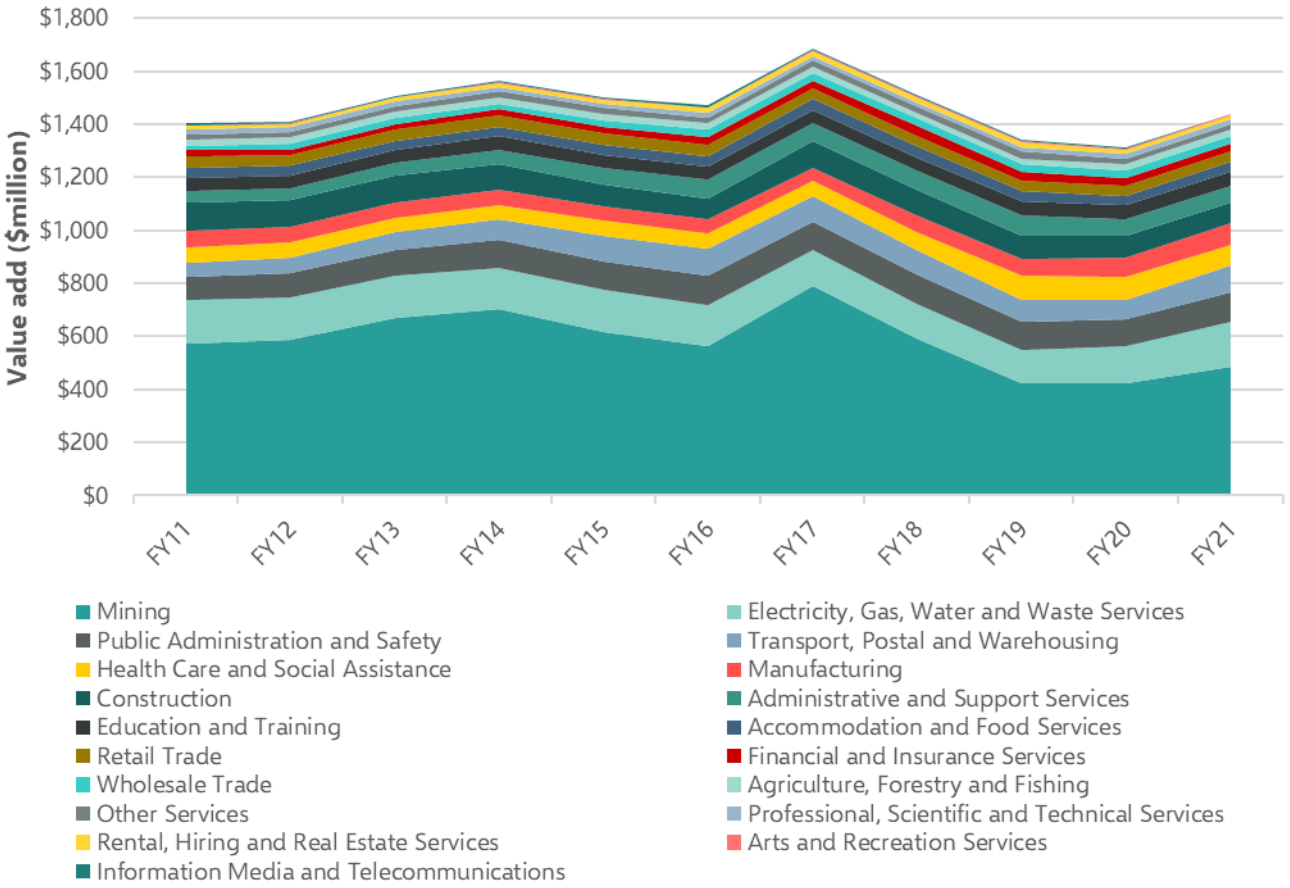

Figure 15. Economic baseline – historical economic value added ($million)

Source: NCEconomics estimates

If the closures are to occur in the near term (2028-2032), they would likely result in a 10-year CAGR of -4.2% p.a. out to 2030, as opposed to the 10-year historical CAGR of 0.9% p.a. If the closure happens at a different time period (highly possible) and no transition arrangements have been implemented, the order of magnitude of the impacts will be similar.

The modelling indicates the economic impact of a sudden closure and reinforces the need to establish a transition strategy to mitigate the impacts of closures, regardless of the expected timing.

What does this mean for Lithgow's transition?

While the timing of the closure of Mt Piper power station and coal mining in the region will be largely determined by market forces, the magnitude of the impact on the local economy in the absence of mitigation and adaptation actions will be significant. This reinforces the need to establish a transition strategy to mitigate the impacts of the shock.

Table 15 presents the baseline projection estimates by industry and shows the comparison with recent growth estimates.

Table 15. Baseline projection – with versus without step change impacts ($million, CAGRs in parentheses)

Industry	FY21 value add	Baseline FY31 value add with closure impacts	Baseline FY31 value add without step change impact
Mining	$487	$42 (-21.8%)	$414 (-1.6%)
Electricity, Gas, Water and Waste Services	$169	$25 (-17.5%)	$176 (0.4%)
Public Administration and Safety	$110	$132 (1.8%)	$134 (2.0%)
Transport, Postal and Warehousing	$99	$180 (6.1%)	$189 (6.6%)
Manufacturing	$82	$102 (2.3%)	$108 (2.8%)
Health Care and Social Assistance	$81	$110 (3.1%)	$113 (3.3%)
Construction	$77	$34 (-7.9%)	$56 (-3.1%)
Administrative and Support Services	$62	$77 (2.3%)	$88 (3.6%)
Education and Training	$52	$51 (-0.2%)	$53 (0.2%)
Accommodation and Food Services	$40	$42 (0.5%)	$42 (0.5%)
Retail Trade	$38	$25 (-4.1%)	$37 (-0.3%)
Financial and Insurance Services	$30	$17 (-5.4%)	$33 (1.3%)
Agriculture, Forestry and Fishing	$28	$32 (1.3%)	$32 (1.3%)
Wholesale Trade	$27	$32 (1.7%)	$46 (5.5%)
Other Services	$19	$14 (-2.9%)	$22 (1.3%)
Professional, Scientific and Technical Services	$18	$0 (-100.0%)	$15 (-1.8%)
Rental, Hiring and Real Estate Services	$16	$18 (1.1%)	$18 (1.4%)
Arts and Recreation Services	$3	$2 (-1.3%)	$3 (1.1%)
Information Media and Telecommunications	$1	$0 (-100.0%)	$0 (-16.9%)

Industry	FY21 value add	Baseline FY31 value add with closure impacts	Baseline FY31 value add without step change impact
Total	**$1,439**	**$936 (-4.2%)**	**$1,579 (0.9%)**

Source: NCEconomics estimates

There a number of key insights derived from the above projections that should be noted. They are as follows:

- **Economy trending upwards in the absence of future shocks.** Despite much variability in the last 10 years, the general trend in value add has been positive (CAGR of 0.9% p.a.). Without any major shocks in the future this may continue.
- **The modelled shock of mining job losses results in considerable impacts for the Lithgow economy.** The potential loss of up to 900 jobs in the coal mining industry around 2028 has large direct and flow on impacts for the local economy value add.
- **Decommissioning of mines and power station provides some temporary economic stimulus.** The decommissioning of these assets will generate employment in the construction industry for the duration of those projects; however, it is likely that a large proportion of this employment will be sourced from outside of the Lithgow LGA. Furthermore, there are unlikely to be significant ongoing benefits to offset the job losses.

Economic transition can take a long time and therefore, regardless of the exact timing of mine and power station closures, Lithgow should be working towards their transition as soon as possible to stand the greatest chance of mitigating job losses.

What does this mean for Lithgow's transition?

The baseline projection shows that there is likely to be a large economic gap to be filled following the direct and flow on economic impacts of mine and power station closures. Decommissioning works will help to smooth out these impacts to a small degree; however, will have little impact on the long-term outlook.

Lithgow needs to accelerate efforts to diversify its economy as soon as possible in order to mitigate these consequences, whether the closures happen in accordance with the publicly committed timelines or earlier.

4 Looking forward

This section briefly analyses a number of factors and information to provide insight for forward-looking transition strategies and opportunities.

4.1 Key concepts and approach

Projecting future development opportunities for Lithgow will necessarily involve the interplay of multiple factors. While on the one hand, the historical patterns observed in the local economy and the current position of Lithgow's industries relative to national/State levels could give some indications of Lithgow's strengths, designing a development strategy in preparation for the upcoming challenges the region will face will have to go hand in hand with the opportunities and limitations associated with demographics, regional endowments, and the expectations of the local stakeholders.

With this perspective as a frame of reference, a systematic approach using multiple lines of enquire and evidence was used to analyse the main fronts defining the priorities for Lithgow's future development (Figure 16). While each section represents a scenario of opportunities and challenges for the local industries, it is important to note that no section necessarily defines the future of the region on its own. Attempts to design development strategies must consider a holistic approach combining them all.

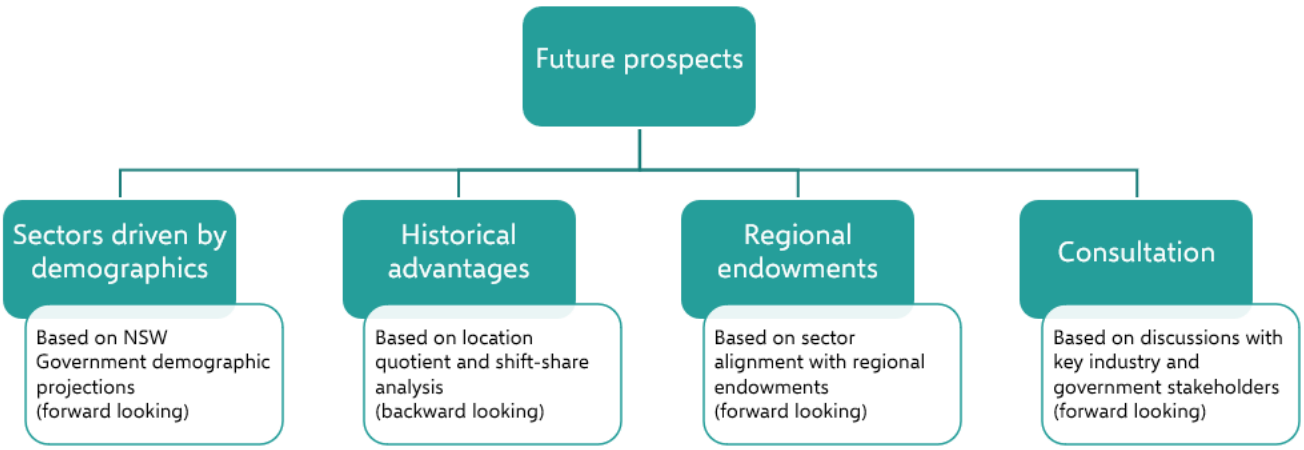

Figure 16. Future prospect identification framework

What does this mean for Lithgow's transition?

Several different factors have been considered in trying to determine which industries have the greatest advantages for future growth in Lithgow.

4.2 Sectors driven by demographics

The future prospects of some sectors will be heavily influenced by demographic change as the growth or contraction of activity in the sectors is more reliant on changes in demographic makeup in the LGA than any economic or commercial factors. Lithgow's future development opportunities are closely linked not only to its local characteristics but also to its position within the regional context. Compared to the most relevant

neighbouring LGAs (i.e., Bathurst Regional, Blue Mountains, Hawkesbury, Oberon, Orange, Mid-Western Regional, Singleton), Lithgow's population has a higher proportion of people over the age of 50, particularly notable in Singleton, Hawkesbury and Bathurst (Figure 17). This disproportionate representation of older groups explains the profile of home ownership and tenure in Figure 18. Lithgow shows a higher proportion of owners than other LGAs, likely represented by more senior residents, and a lower proportion of renters, typically characterised by the younger segment of the population. This demographic profile suggests that a higher proportion of Lithgow residents may be more inclined to remain residents than other LGAs, where people are expected to be more flexible about changing place of residence based on job availability as they have longer to go in their careers.

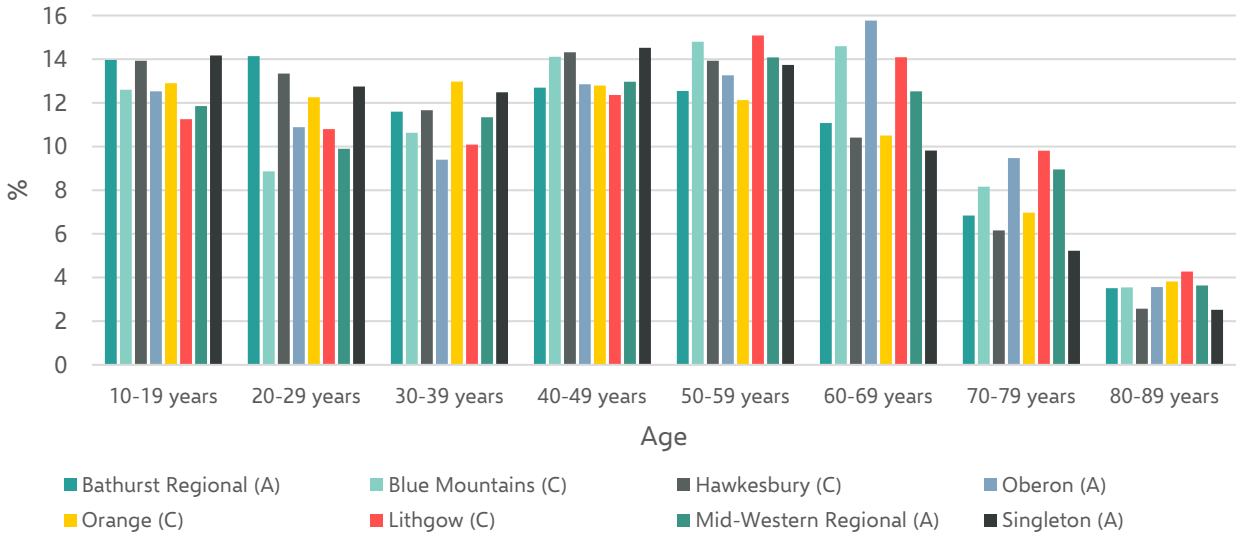

Figure 17. Age in ten-year groups by LGA in 2016

Source: ABS (2022)

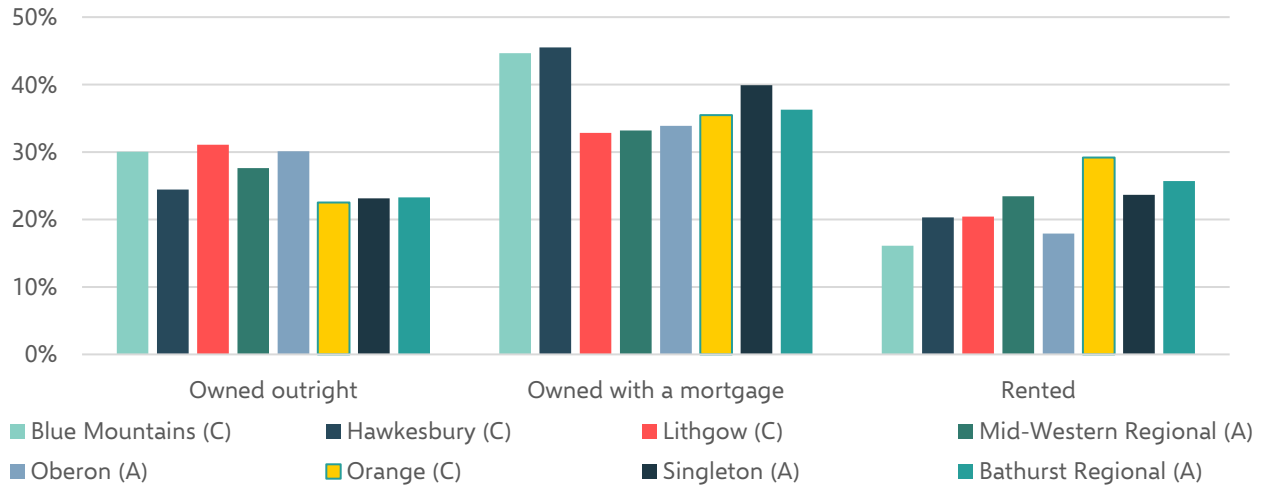

Figure 18. Tenure by LGA

Figure 19 and Figure 20 show the highest educational level achieved and the proportion of occupations by LGA, respectively. Based on its skewness toward high representation of technical and industrial occupations (i.e., mining, agriculture, manufacturing, construction), Lithgow can be grouped with Singleton, Mid-Western Regional, Oberon, and Hawkesbury. In terms of income, although some Lithgow and Mid-Western Regional residents are represented in the higher wage categories (likely senior positions in the mining industry), they make up a small proportion of the workforce, with most of its population sitting within the lower income

categories (ABS, 2022). As expected, this differs from the profile seen in the Blue Mountains, Orange, and Bathurst that shows a higher proportion of highly educated and professional residents, and wages more evenly distributed across income categories.

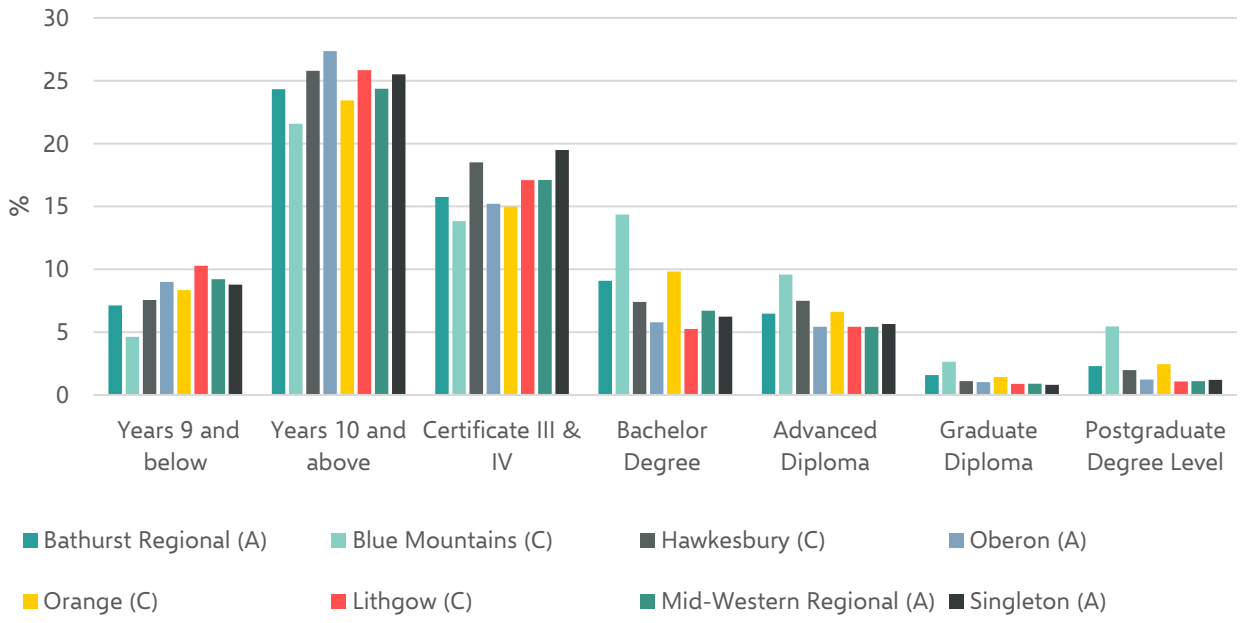

Figure 19. Level of Highest Educational Attainment in 2016

Source: ABS (2022)

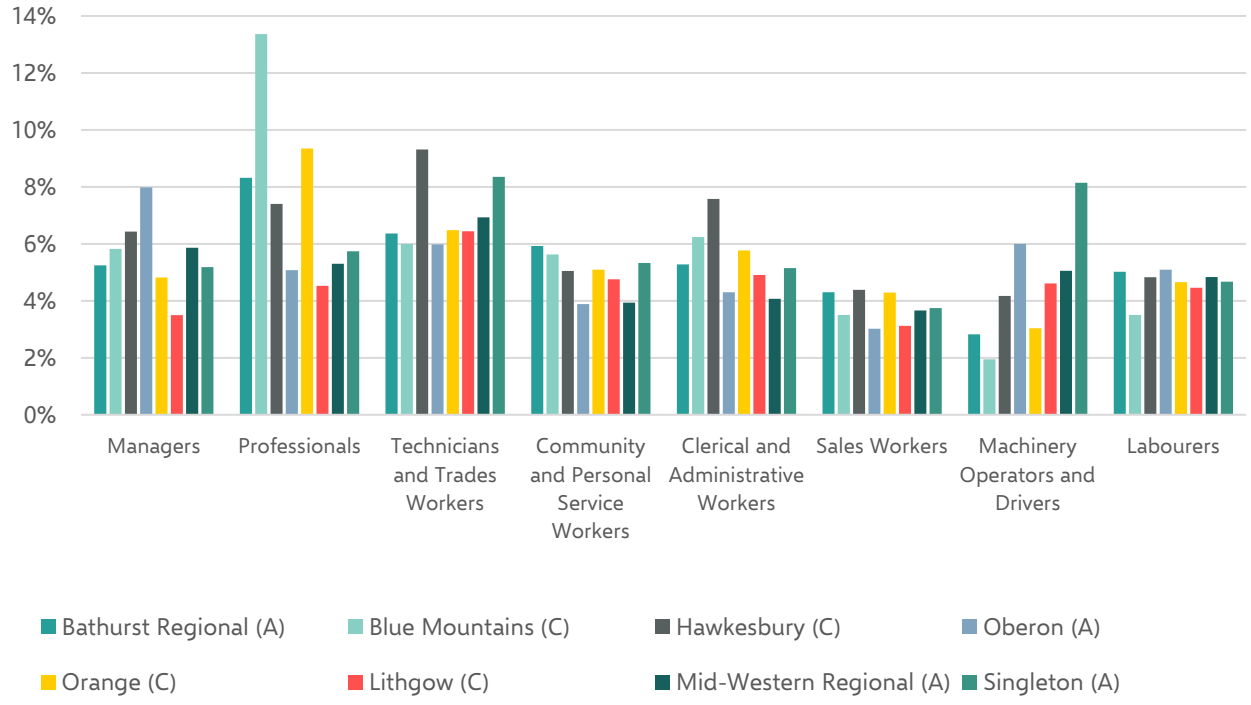

Figure 20. Employment by occupation in 2016

Source: ABS (2022)

The changing demographics of Lithgow will play a role in the future demand for services. Figure 21 presents the population projections for Lithgow, showing both total population and the population of over 65s. This shows that while Lithgow's population is not expected to grow the cohort of over 65s will make up a higher

proportion of the total by 2041. This indicates that the demand for services related to that cohort (e.g. Health Care and Social Assistance) will likely increase, and that industries that rely on aggregate population growth as a key driver may experience stagnation.

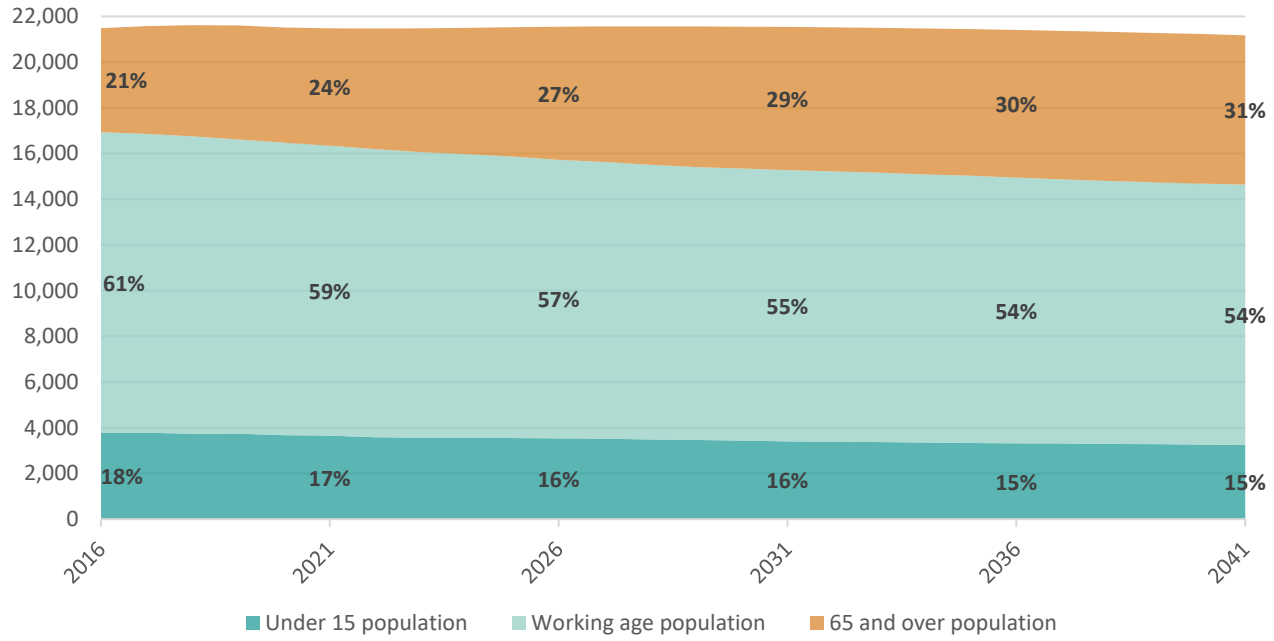

Figure 21. Lithgow LGA total and 65+ population projections (including 65+ proportion of total)*

Source: DPE (2022)
*Based on Common Planning Assumption.

The stagnation of aggregate population in the period out to 2041 can be further understood by considering the different contributing factors. Figure 22 presents Lithgow's population changes between 2022 and 2041 by the individual components.

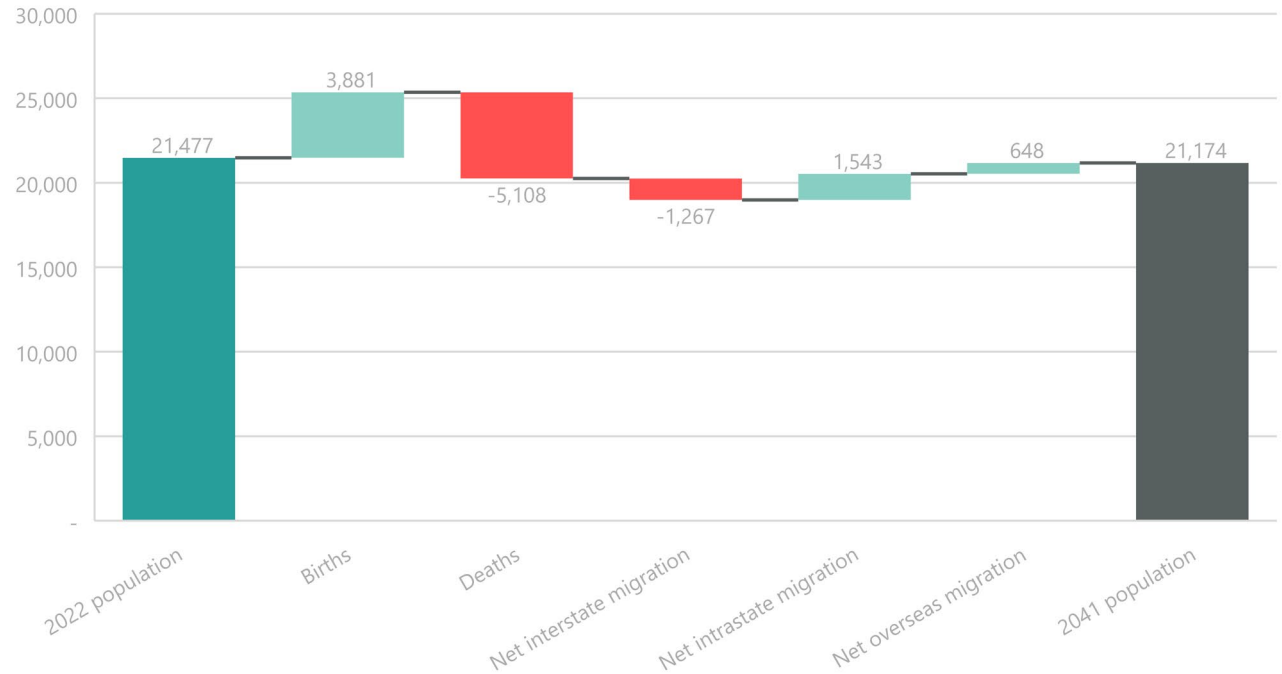

Figure 22. Population projection for Lithgow by component of change (2022 to 2041)

Source: DPE (2022)
*Based on Common Planning Assumption.

While the natural change (i.e. births minus deaths) is expected to be negative, the total net migration is expected to be positive over this period, largely coming from within the state of NSW. This is reflective of the historical data on inward migration.

Figure 23 presents the historical sources of migration to Lithgow. It shows that from the 6,155 people whose 2016 residence was outside of Lithgow, most came other LGAs in NSW, followed by overseas immigrants. The contribution from other Australian States was more secondary, with QLD being the largest contributor after NSW. The rest of the States combined made up around 2.1% of the total migration in Lithgow, with individual contributions lower than 0.7%. The Not applicable/Not stated answers represented around 14.5% (3,019) of local population and are not included in the figure.

At the intrastate level, the majority of people that moved their residence to Lithgow in the five years preceding 2021 came from nearby LGAs in NSW. This was predominantly from Blue Mountains (28.01%), followed by Blacktown (5.95%), Hawkesbury (5.27%), and Bathurst (4.23%). The individual contributions of other LGAs in NSW to migration were less than 2.5%.

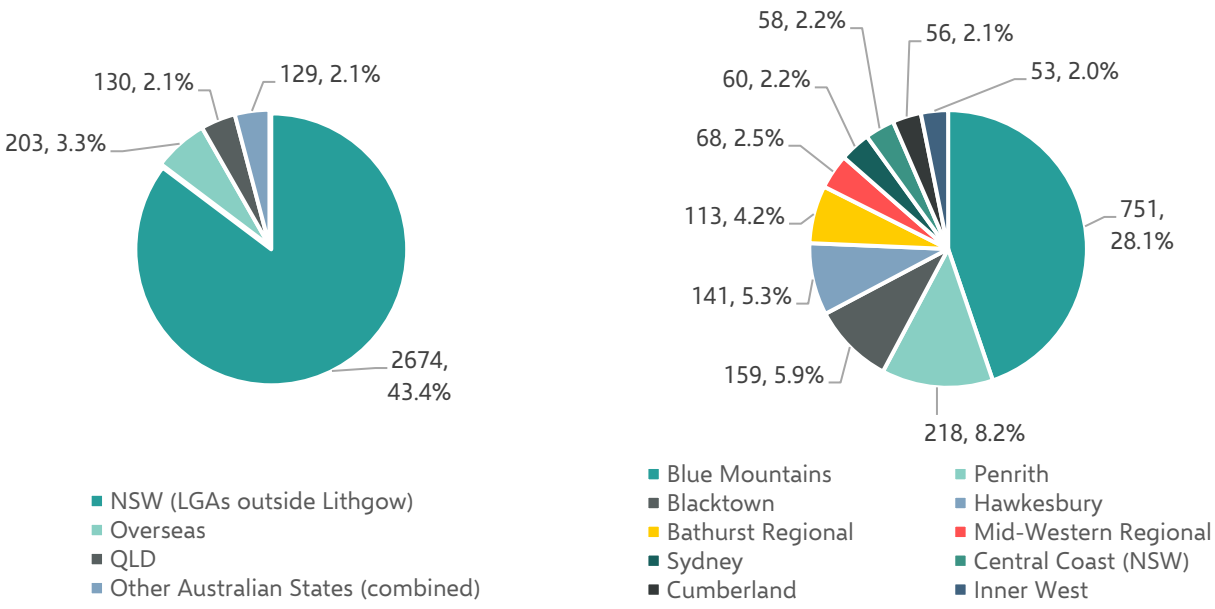

Figure 23. Sources of migration to Lithgow (2016 to 2021)

Left: Origin interstate/overseas migration; Right: Origin intrastate (NSW) migration.

Source: ABS (2022)

What does this mean for Lithgow's transition?

There are a number of socio-economic characteristics of the Lithgow region, when compared to other LGAs in the region, that indicate a workforce that is more likely to stay in the region and meets the skills needs of future developments.

In addition, the trend towards an older population is likely to reinforce growth in the Health Care and Social Assistance sector, while the lack of aggregate population growth may present a challenge for other sectors for which it is a key driver (e.g. Housing construction, Retail Trade, and Rental, Hiring and Real Estate Services).

4.3 Historical competitiveness

Lithgow's existing specialisations

Ensuring that investments align with a region's existing advantages is essential to using resources efficiently as it helps identify the regional capacity to innovate and upgrade based on existing infrastructure and social and natural capital.

One common and widely accepted approach to estimate regional specialisation is to use Location Quotients (LQ). LQs compare the concentration of an industry within a specific area to the concentration of that industry at a higher administrative level reference (e.g. at a State-scale). Using LQs to compare the share of employment by sector at the LGA level to the percentage of the same industry at the Regional or State level can be indicative of the industries in which an LGA has a greater degree of specialisation. If an LQ equals 1, then that industry has the same share of its LGA employment as it does in the comparator region. An LQ greater than 1 suggests that the industry makes up a larger share of the LGA employment total than it does for the State. Generally, an industry is considered a specialisation if it has a LQ greater than 1.2, and a major specialisation if it has a LQ greater than 2.0.

Although the LQ presented here is backwards looking and is not necessarily a predictor of future growth, this analysis provides insight into recent trends observed in the region and it also indicates a degree of local capacity, specialisation and potential competitiveness for some of the key sectors. Table 16 presents LQ ratios of Lithgow's industries compared to both Regional NSW and NSW as a whole. The instances where Lithgow is relatively specialised are highlighted in green, and commentary is also provided in the table which also considers the sub-industries within each industry.

Table 16. Lithgow's existing specialisations (Location quotients compared to Regional NSW and NSW)

Industry	Location Quotient Regional NSW*	Location Quotient New South Wales*	Comment
Accommodation and Food Services	1.01	1.18	No specific specialisation identified at the industry level. At the sub-industry level, Accommodation is a specialisation compared to Regional NSW (LQ=2.18) and NSW (LQ=1.39). Using value add to determine LQs results in similar levels of specialisation for this industry.
Administrative and Support Services	0.99	0.85	No specific specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs results in specialisation compared to Regional NSW for this industry (LQ=1.31) and the Administrative Services sub-industry (LQ=1.59)
Agriculture, Forestry and Fishing	0.64	1.90	Specialisation identified at the industry level compared to NSW (that incorporated major urban areas) but not compared to Regional NSW. At the sub-industry level there is specialisation in Agriculture (LQ=2.08), and Agriculture, Forestry and Fishing Support Services (LQ=1.26) compared to NSW but again no specialisation compared to Regional NSW. It should also be noted that when using value add to measure specialisation rather than employment, this industry and its sub industries do not appear to be specialisations for Lithgow compared to either Regional NSW or NSW (i.e. the current employment is largely in lower value agricultural sectors).
Arts and Recreation Services	0.49	0.37	No specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs also does not show any specialisations for this industry.
Construction	0.54	0.62	No specialisation identified at the industry level. At the sub-industry level Heavy and Civil Engineering Construction is a specialisation compared to NSW (LQ=1.28) but not Regional NSW. Using value add to determine LQs does not show any specialisations for this industry.
Education and Training	0.78	0.84	Whilst Lithgow hosts the presence of three universities, the data does indicate that it is currently a specialisation. It is possible that this is due to the campuses in Lithgow being satellite campuses and employees are being counted elsewhere. No specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs also does not show any specialisations for this industry.

Industry	Location Quotient Regional NSW*	Location Quotient New South Wales*	Comment
Electricity, Gas, Water and Waste Services	3.52	4.88	Considerable specialisation identified compared to both Regional NSW and NSW. This specialisation is concentrated in just one sub-industry, Electricity Supply (LQ=6.07 compared to Regional NSW and LQ=10.52 compared to NSW). Using value add to determine LQs results in similar levels of specialisation for this industry.
Financial and Insurance Services	1.07	0.39	No specialisation identified at the industry level. At the sub-industry level, Insurance and Superannuation Funds is a specialisation compared to Regional NSW only (LQ=2.41). Using value add to determine LQs also does not show any specialisations for this industry.
Health Care and Social Assistance	0.90	1.07	No specialisation identified at the industry level. At the sub-industry level, Social Assistance Services is a specialisation compared to NSW (LQ=1.24) only. Using value add to determine LQs also does not show any specialisations for this industry.
Information Media and Telecommunications	0.23	0.08	No specialisation identified at the industry level. At the sub-industry level, Publishing (except Internet and Music Publishing) is a specialisation compared to Regional NSW (LQ=1.22) only. Using value add to determine LQs also does not show any specialisations for this industry.
Manufacturing	1.15	1.22	Specialisation identified at the industry level compared to NSW but not compared to Regional NSW. At the sub-industry level there is specialisation in Textile, Leather, Clothing and Footwear Manufacturing (LQ=1.79), Pulp, Paper and Converted Paper Product Manufacturing (LQ=1.79), Printing (including the Reproduction of Recorded Media) (LQ=5.43), Polymer Product and Rubber Product Manufacturing (LQ=1.23), Non-Metallic Mineral Product Manufacturing (LQ=1.91), and Fabricated Metal Product Manufacturing (LQ=5.70) compared to Regional NSW. There is also specialisation compared to NSW in Textile, Leather, Clothing and Footwear Manufacturing (LQ=1.28), Printing (including the Reproduction of Recorded Media) (LQ=2.20), Non-Metallic Mineral Product Manufacturing (LQ=1.68), and Fabricated Metal Product Manufacturing (LQ=6.94). Using value add to determine LQs results in lower levels of specialisation for this industry, with Printing (including the Reproduction of Recorded Media), Non-Metallic Mineral Product Manufacturing, and Fabricated Metal Product Manufacturing being the only sub-industries showing specialisation at both the Regional NSW and NSW level.

Industry	Location Quotient Regional NSW*	Location Quotient New South Wales*	Comment
Mining	3.77	10.70	Considerable specialisation identified compared to both Regional NSW and NSW. This specialisation is concentrated in the Coal Mining sub-industry (LQ=6.96 compared to Regional NSW and LQ=20.47 compared to NSW), and to a lesser extent, Non-Metallic Mineral Mining and Quarrying (LQ=1.94 compared to Regional NSW and LQ=5.26 compared to NSW) and Exploration and Other Mining Support Services (LQ=1.71 compared to NSW). Using value add to determine LQs results in similar levels of specialisation for this industry.
Other Services	0.71	0.83	No specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs results in similar levels of specialisation for this industry.
Professional, Scientific and Technical Services	0.51	0.23	No specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs results in similar levels of specialisation for this industry.
Public Administration and Safety	1.70	1.76	Specialisation identified compared to both Regional NSW and NSW. This specialisation holds true across all three sub-industries: - Public Administration (LQ=1.36 compared to Regional NSW and LQ=1.39 compared to NSW). - Defence (LQ=1.38 compared to Regional NSW and LQ=2.02 compared to NSW). - Public Order, Safety and Regulatory Services (LQ=2.89 compared to Regional NSW and LQ=2.69 compared to NSW). Using value add to determine LQs results in slightly lower levels of specialisation for this industry.
Rental, Hiring and Real Estate Services	0.87	0.63	No specialisation identified at the industry level. At the sub-industry level, Rental and Hiring Services (except Real Estate) is a specialisation compared to Regional NSW (LQ=2.06) and NSW (LQ=1.81). Using value add to determine LQs results in similar levels of specialisation for this industry.
Retail Trade	0.76	0.83	No specialisation identified at the industry or sub-industry level compared to either Regional NSW or NSW. Using value add to determine LQs results in similar levels of specialisation for this industry.

Industry	Location Quotient Regional NSW*	Location Quotient New South Wales*	Comment
Transport, Postal and Warehousing	1.20	0.92	Marginal specialisation identified at the industry level compared to Regional NSW but not compared to NSW. At the sub-industry level there is specialisation in Rail Transport compared to Regional NSW (LQ=3.48) and compared to NSW (LQ=2.44). Using value add to determine LQs results in specialisation compared to both Regional NSW and NSW for the industry and both the Road Transport and Rail Transport sub-industries.
Wholesale Trade	0.94	0.52	No specialisation identified at the industry level. At the sub-industry level, Grocery, Liquor and Tobacco Product Wholesaling is a specialisation compared to Regional NSW (LQ=3.05) and NSW (LQ=1.71). Using value add to determine LQs results in similar levels of specialisation for this industry.

*Note that the LQs present here are based on Total Employment. These LQs differ when using another statistic like value add and key differences have been noted in the Comment column.

What does this mean for Lithgow's transition?

The LQs indicate that Lithgow has historically specialised in a number of key sectors identified through the data analysis and consultation. While this data is backwards looking, it provides an indication of which sectors are foundational for Lithgow's economy, and sectors which Lithgow may currently have a comparative advantage relative to other LGAs.

Lithgow's local advantages

Shift-share analysis identifies the extent to which changes (i.e., growth or decline) in an economic variable between different time periods can be attributed to national/State trends, industry trends, or regional factors. By removing the national or State trends and industry effects, shift-share analysis determine local advantages. To do this, shift share analysis decomposes the change of a regional economic variable into three components: the National/State growth effect, industrial mix effect, and regional/ local competitiveness effect.

- **National/State growth effect** – refers to the local change that is attributed to trends in a larger area that encompasses the region's economy, usually state or national. This component describes the change that would be expected due to the fact the local area is part of a dynamic national economy.
- **Industry mix effect** – refers to the local change in an industry that can be attributed to the specific industry trends at the national/state level.
- **Regional competitive effect** – describes the amount of growth or decline in a specific industry that could be attributed to a local advantage or disadvantage.

An industry will have a positive regional competitive effect if it grows above benchmark trends in that period, suggesting that changes are driven by regional advantages and not attributable to industry or State trends. Conversely, a negative value indicates regional disadvantages for that industry. Table 17 presents Lithgow's regional competitive effects for each industry using employment along with commentary around any insights at the sub-industry level, and whether these results change significantly when using value add instead of employment.

Table 17. Lithgow's advantages

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
Accommodation and Food Services	663	-38	27	-27	Positive competitive effect compared to Regional NSW only. Competitive effect for Food and Beverage sub-industry (CE=+23.5) larger than that of Accommodation (CE=+9.5). Using value add to determine regional competitive effects results in positive effects compared to NSW as well as Regional NSW.
Administrative and Support Services	245	-50	-11	-57	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for Building Cleaning, Pest Control and Other Support Services sub-industry (CE=+2.8) compared to Regional NSW only. Using value add to determine regional competitive effects results in positive effects for the industry and both sub-industries compared to Regional NSW but not NSW.
Agriculture, Forestry and Fishing	348	108	111	105	Positive competitive effect compared to both Regional NSW and NSW. At the sub-industry level, Agriculture has a positive competitive effect compared to both Regional NSW (CE=+112.9) and NSW (CE=+108.0). Note that much of the current agricultural employment in Lithgow comes under Beef or Sheep farming, as opposed to more intensive animal or crop production. Using value add to determine regional competitive effects also results in positive effects for the industry and the Agriculture sub-industry compared to NSW as well as Regional NSW.

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
Arts and Recreation Services	54	-22	-12	-30	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Heritage Activities sub-industry compared to Regional NSW (CE=+6.2) and NSW (CE=+2.0). Using value add to determine regional competitive effects results in positive effects for the industry compared to Regional NSW, and the Heritage Activities and Creative and Performing Arts Activities sub-industries compared to both Regional NSW and NSW.
Construction	486	38	-51	-25	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Building Construction sub-industry compared to NSW only (CE=+7.8). Using value add to determine regional competitive effects results in negative effects for the industry and all sub-industries.
Education and Training	636	-41	-45	-105	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Tertiary Education sub-industry compared to Regional NSW (CE=+6.9) and NSW (CE=+2.4). Using value add to determine regional competitive effects results in a positive competitive effect for the industry compared to Regional NSW and the Tertiary Education sub-industry again has positive competitive effects compared to both Regional NSW and NSW.

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
Electricity, Gas, Water and Waste Services	442	50	29	28	Positive competitive effect compared to both Regional NSW and NSW. At the sub-industry level, Electricity Supply has a positive competitive effect compared to both Regional NSW (CE=+26.4) and NSW (CE=+64.1). Using value add to determine regional competitive effects also results in positive competitive effects for the industry and the Electricity Supply sub-industry.
Financial and Insurance Services	172	1	1	-14	Very minor positive competitive effect compared to Regional NSW only. At the sub-industry level, Finance has a minor competitive effect compared to Regional NSW only (CE=+1.8). Using value add to determine regional competitive effects results in similar effects compared to Regional NSW but additionally results in positive competitive effects for the industry and Finance sub-industry compared to NSW.
Health Care and Social Assistance	1,231	309	246	200	Considerable positive competitive effect compared to both Regional NSW and NSW. There is also a positive competitive effect for three of the four sub-industries: - Hospitals (CE=+24.6 compared to Regional NSW and CE=+14.8 compared to NSW). - Medical and Other Health Care Services (CE=+125.3 compared to Regional NSW and CE=+110.6 compared to NSW).

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
					- Social Assistance Services (CE=+127.7 compared to Regional NSW and CE=+118.5 compared to NSW). Using value add to determine regional competitive effects results in positive competitive effects for the industry and the same sub-industries mentioned above.
Information Media and Telecommunications	15	-48	-42	-49	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Publishing (except Internet and Music Publishing) sub-industry compared to Regional NSW only (CE=+2.5). Using value add to determine regional competitive effects results in similar positive competitive effects.
Manufacturing	694	234	221	204	Considerable positive competitive effect compared to both Regional NSW and NSW. There is also a positive competitive effect for a number of sub-industries, the most notable of which are: - Food Product Manufacturing (CE=+35.8 compared to Regional NSW and CE=+37.9 compared to NSW). - Textile, Leather, Clothing and Footwear Manufacturing (CE=+14.9 compared to Regional NSW and CE=+14.9 compared to NSW). - Primary Metal and Metal Product Manufacturing (CE=+14.9 compared to Regional NSW and CE=+14.6 compared to NSW).

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
					- Fabricated Metal Product Manufacturing (CE=+111.4 compared to Regional NSW and CE=+88.3 compared to NSW). Using value add to determine regional competitive effects results in similar positive competitive effects, with the additional of the Non-Metallic Mineral Product Manufacturing sub-industry which had a relatively high positive competitive effect.
Mining	967	-70	-188	-187	Competitive effect is considerably negative at the industry level compared to both Regional NSW and NSW. This is largely due to negative competitive effects in Non-Metallic Mineral Mining and Quarrying and Exploration and Other Mining Support Services, while Coal Mining continues to have a positive competitive effect compared to both Regional NSW (CE=+46.6) and NSW (CE=+5.8). Using value add to determine regional competitive effects results in similar positive competitive effects.
Other Services	265	-46	-64	-62	No positive regional competitive effect at the industry or sub-industry level compared to either Regional NSW or NSW. This was also the case when using value add to determine regional competitive effects.
Professional, Scientific and Technical Services	202	-23	-33	-84	No positive regional competitive effect at the industry or sub-industry level compared to either Regional NSW or NSW. This was also the case when using value add to determine regional competitive effects.

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
Public Administration and Safety	933	-41	-44	-167	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Defence sub-industry compared to Regional NSW (CE=+6.3) and NSW (CE=+9.3). Using value add to determine regional competitive effects results in similar positive competitive effects.
Rental, Hiring and Real Estate Services	91	-7	7	-6	Minor positive competitive effect compared to Regional NSW only. At the sub-industry level, both the Rental and Hiring Services (except Real Estate) and the Property Operators and Real Estate Services sub-industries have positive competitive effects compared to Regional NSW (CE=+4.1 and CE=+3.4 respectively). Using value add to determine regional competitive effects results in only negative effects for the industry and sub-industries except for Rental and Hiring Services (except Real Estate) compared to Regional NSW which has a very slight positive effect.
Retail Trade	682	-109	-72	-145	No positive regional competitive effect at the industry or sub-industry level compared to either Regional NSW or NSW. This was also the case when using value add to determine regional competitive effects.
Transport, Postal and Warehousing	400	-72	-45	-114	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Road Transport sub-industry (CE=+26.6) compared to Regional NSW only.

Industry	FY21 Employment	5-year change in employment	Regional competitive effect vs Regional NSW*	Regional competitive effect vs NSW*	Comment
					Using value add to determine regional competitive effects results in positive competitive effects at the industry level compared to both Regional NSW and NSW, as well as similar positive effects for the Road Transport sub-industry compared to both Regional NSW and NSW.
Wholesale Trade	152	-34	-8	-44	No positive regional competitive effect identified at the industry level; however, minor positive competitive effect identified for the Grocery, Liquor and Tobacco Product Wholesaling sub-industry (CE=+10.9) compared to Regional NSW only. Using value add to determine regional competitive effects results in similar positive competitive effects.

*Note that the Regional competitive effects presented here are based on Total Employment. These differ when using another statistic like value add and key differences have been noted in the Comment column

By combining Location Quotient Analysis and Shift-share analysis on a two-dimensional diagram (Figure 24), regional industries can be grouped into four categories along specialisation (LQs) and employment/value add growing trends (shift-share analysis) axis based on their performance in comparison to the trends of the economy as a whole and the industry's growth on a national/State scale. The categories represent the following:

- **Quadrant I** groups above-trend growing industries that are either existing specialisations or may become in the future due to their growth.
- **Quadrant II** includes industries where the region shows comparative advantage but are not growing above trends.
- **Quadrant III** groups industries that show neither specialisation nor above-trends growth.
- **Quadrant IV** includes the industries where the region shows comparative advantage (specialisation), but their lack of growth may imply that will not be specialisations in the future.

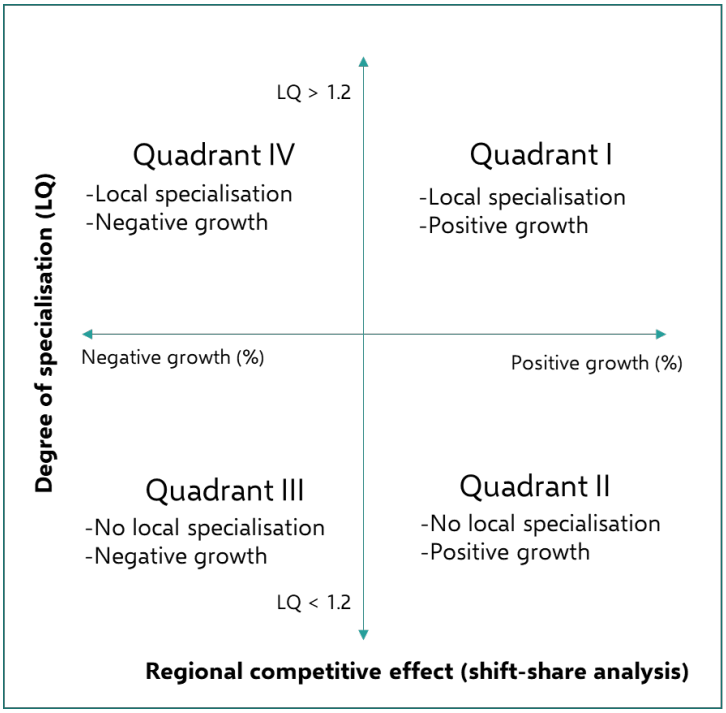

Figure 24. Two-dimensional diagram combining results from Shift-share analysis and Location Quotients

Although LQ and Shift-share analysis two-dimension charts help reveal past and existing growing trends and frame local strengths, predicting future trends needs to be carefully assessed. Factors such as industry size, industry designation into ABS categories, and reliance on data and economic models' accuracy can limit its validity. For example, having small industries with solid growth over State levels fitting within Quadrant I, do not necessarily represent a strength for the region, especially if their contribution to economic indicators is minor. Similarly, for industries like Tourism that are not included as such in the ABS categories but disaggregated into several categories (i.e., Accommodation and food services, Arts and recreation Services, etc.), this analysis could not reflect their actual comparative advantage of local resources, capital or labour suitable for future growth.

By using employment and value add between the periods 2015/2016 and 2020/2021 as the economic indicators and NSW as reference, LQs and Shift-share analysis were combined to assess potential historical comparative advantages and the position of local industries in the state context.

The two-dimension diagrams (Figure 25 and Figure 26) include the main industries where Lithgow displays levels of specialization (LQ>1.2) and/or a positive growth compared to NSW, with the size of the bubbles representing the number of workers (employment) or dollars in millions (value add) (i.e. industries within Quadrant III have been excluded from the figures for simplicity). The implications for key sectors are outlined below.

Mining and Public Administration and Safety

Both the Mining and Public Administration and Safety sectors fall in Quadrant IV due to their position as historical specialisations and recent negative local competitive effects. These sectors remain in Quadrant IV regardless of whether employment or value add is used as the basis of the comparison. This indicates that they are potential risks for the Lithgow economy and their potential future decline will need to be managed for or offset by generating growth in the sectors.

Electricity, Gas, Water and Waste Services

This sector falls in Quadrant I due to the existing specialisation and the positive local competitive effects that are shown when using either employment or value add. This means that this sector effectively represents a 'no regrets' option for targeting future growth. It is also worth noting that the specialisation and positive competitive effects are concentrated in the Electricity Supply sub-sector.

Manufacturing and Agriculture, Forestry and Fishing

These sectors fall in Quadrant I when using employment and Quadrant II when using value add. The sectors have some degree of specialisation and have experienced a positive local competitive effect. This indicates that the sectors are currently somewhere between emerging and established sectors and may be good candidates for targeting future growth.

It is also worth noting that the specialisation for the Agriculture, Forestry and Fishing industry does not remain when comparing to Regional NSW rather than NSW as a whole, indicating that it is more of an emerging sector, growing from a relatively small base.

Manufacturing on the other hand, has a number of sub-sectors which are specialisations whether using value add or employment, or whether comparing to Regional NSW or NSW. These include Printing (including the Reproduction of Recorded Media), Non-Metallic Mineral Product Manufacturing, and Fabricated Metal Product Manufacturing, all of which also have positive local competitive effects across all measures. This indicates that Manufacturing is more of an established sector and that targeting further growth in these sub-sectors may represent the greatest opportunities. This is particularly the case for Fabricated Metal Product Manufacturing, which performed the best across all measures.

Health Care and Social Assistance

This sector falls in Quadrant II for both value add and employment. This indicates that it is an emerging sector that has the potential to become a future specialisation due to significant positive local competitive effects. It is also important to consider that while this analysis identifies it as an emerging sector, Health Care and Social Assistance is currently Lithgow's largest employer; however, this proportion of employment is similar to Regional NSW and NSW levels. The local competitive effects are particularly strong for the Medical and Other Health Care Services and Social Assistance Services sub-sectors, indicating that they could be priorities for future growth activities.

Accommodation and Food Services, Financial and Insurance Services, and Transport, Postal and Warehousing

These sectors fall in Quadrant III using employment but move to Quadrant II when using value add. This indicates that while they aren't current specialisations, there may be some positive local competitive effects to build upon in the future.

Other industries

The remaining sectors all fall in Quadrant III when using both employment and value add. This indicates that they may not be best positioned for future growth.

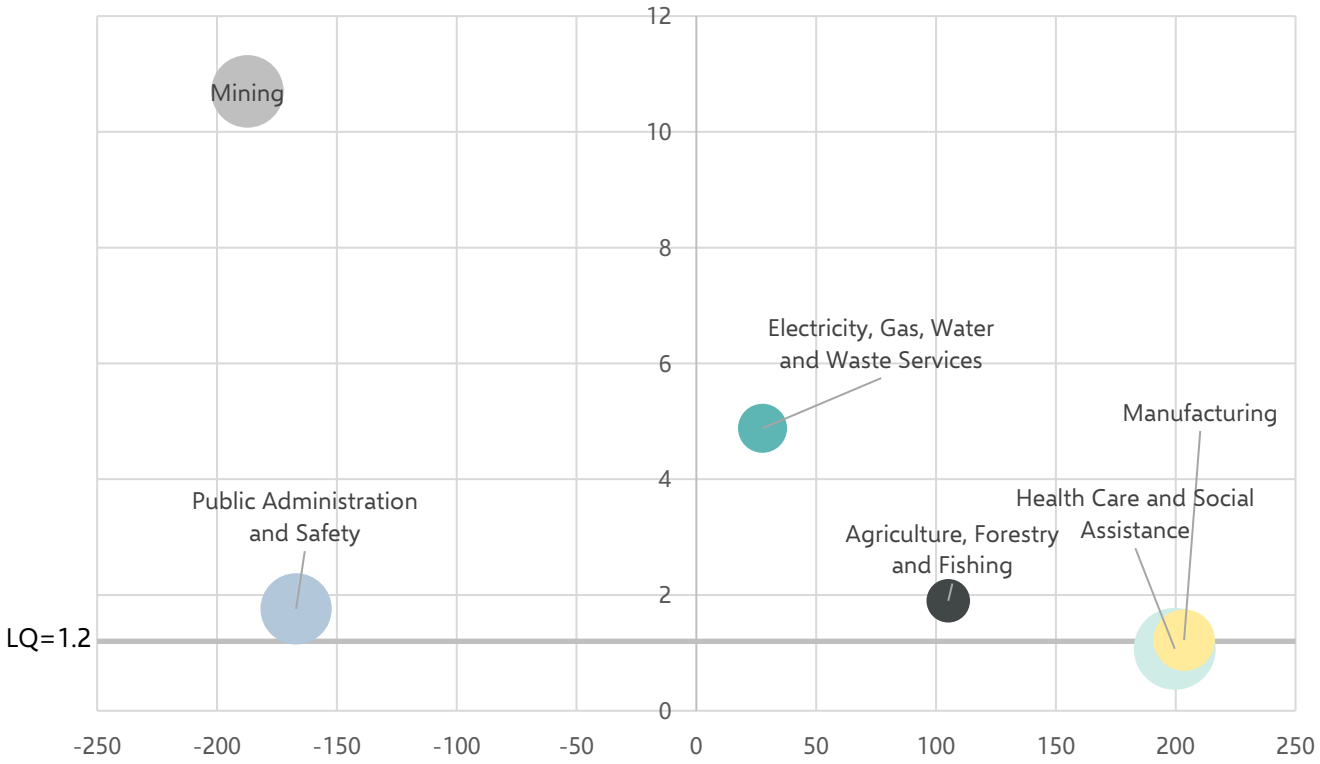

Figure 25. Location Quotient and Shift-share analysis visualisation (Employment)

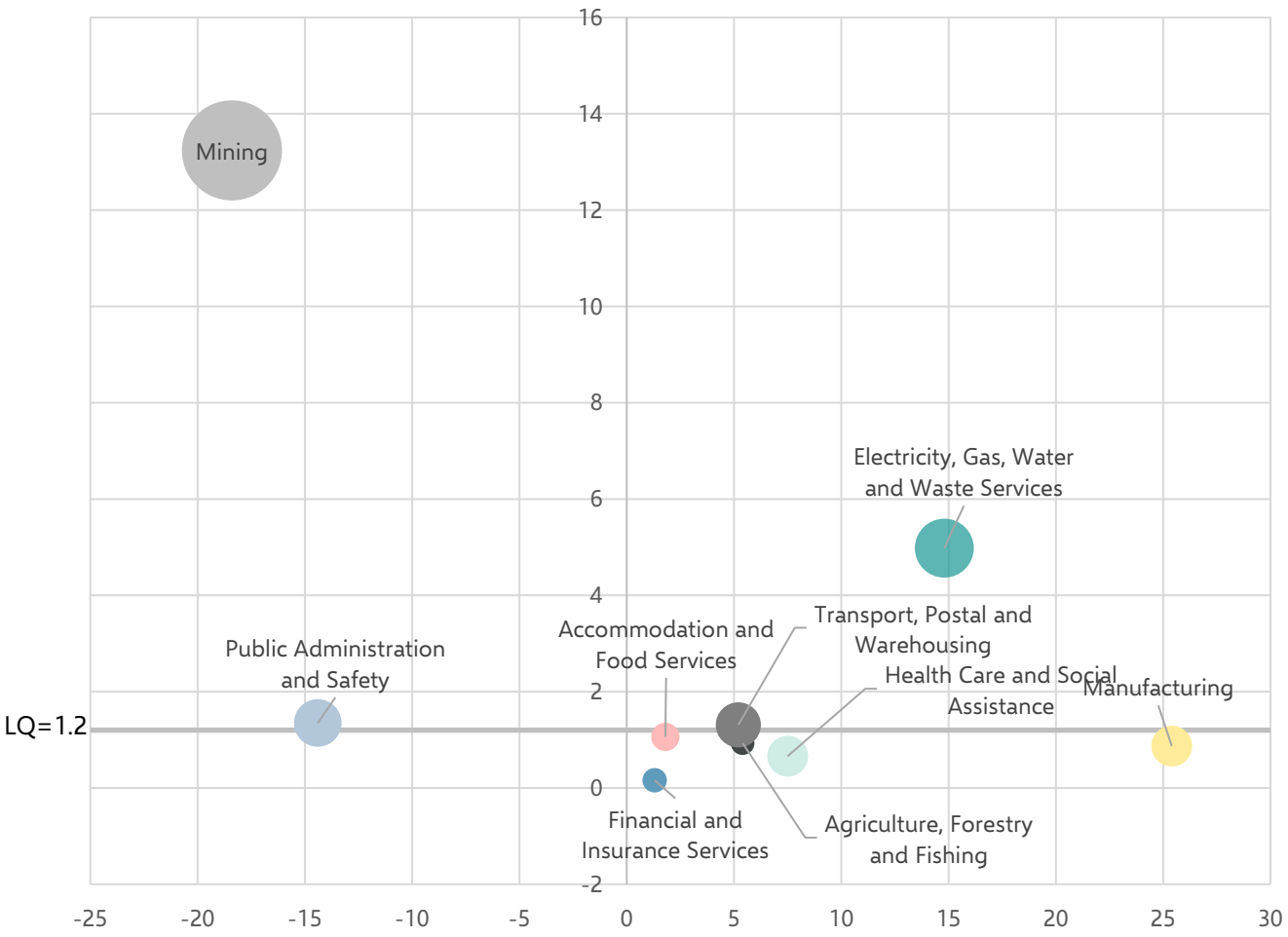

Figure 26. Location Quotient and Shift-share analysis visualisation (Value add)

4.4 Regional endowments

Endowments are a region's strengths, which drive comparative advantage and can be capitalised on for economic development. Lithgow's geographical location, natural resources, population, as well as its industrial and mining history provide it with a variety of natural, human, infrastructural, and institutional endowments that will play a crucial role in shaping its economic strategy. A complete understanding of Lithgow's specialisations and core competencies will allow future economic plans to focus on factors that enable the development of endowment-based industries and on building local capacity, leadership, and governance to capitalise on the opportunities they offer.

Human capital

Education

Lithgow residents were found to have lower levels of university education than the wider State of NSW. In the 2016 census, 28.2% of residents of the Lithgow LGA stated that they had completed year 12 or equivalent, compared to 52.1% for NSW (ABS, 2022-a). Those who hold a Bachelor's degree or above in the Lithgow LGA were recorded to be 17.2%, significantly below that of the NSW average of 38.2% (ABS, 2016). However, Lithgow has a significantly higher proportion of trade and TAFE qualified workers, reflecting the nature of the current economic needs in the region. This provides a significant opportunity for business development in manufacturing, construction, alternative energy and other sectors that rely heavily on trade-qualified workers. Figure 27 below compares the highest qualification achieved between residents of the Lithgow LGA and NSW.

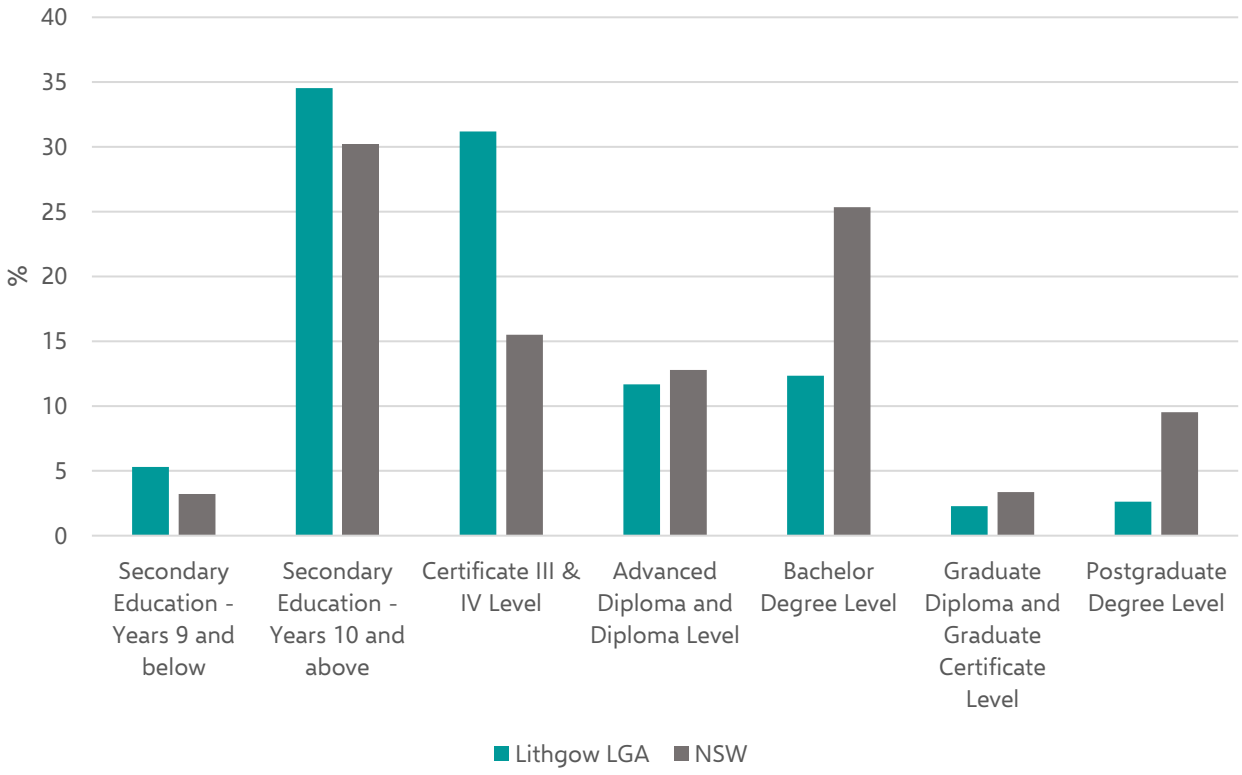

Figure 27. Highest qualification achieved 2016

Source: ABS (2016)

Figure 28 below shows the employment occupations by category for Lithgow LGA compared to NSW. The underrepresentation of highly skilled (i.e. professional) residents within the Lithgow LGA is demonstrated by employees distribution across various occupation categories. Compared to NSW, Lithgow LGA focuses heavily on low-skilled professions, such as Labourers, Machine Operators and Drivers, Technicians, Sales Workers, and Community and Personal Service Workers (ABS, 2016).

When education levels for the Lithgow LGA are combined with occupation data, it becomes clear that the Lithgow LGA's skills base is geared towards industrial-like work, an expectable profile considering Lithgow's high reliance on the Mining and Energy Industries.

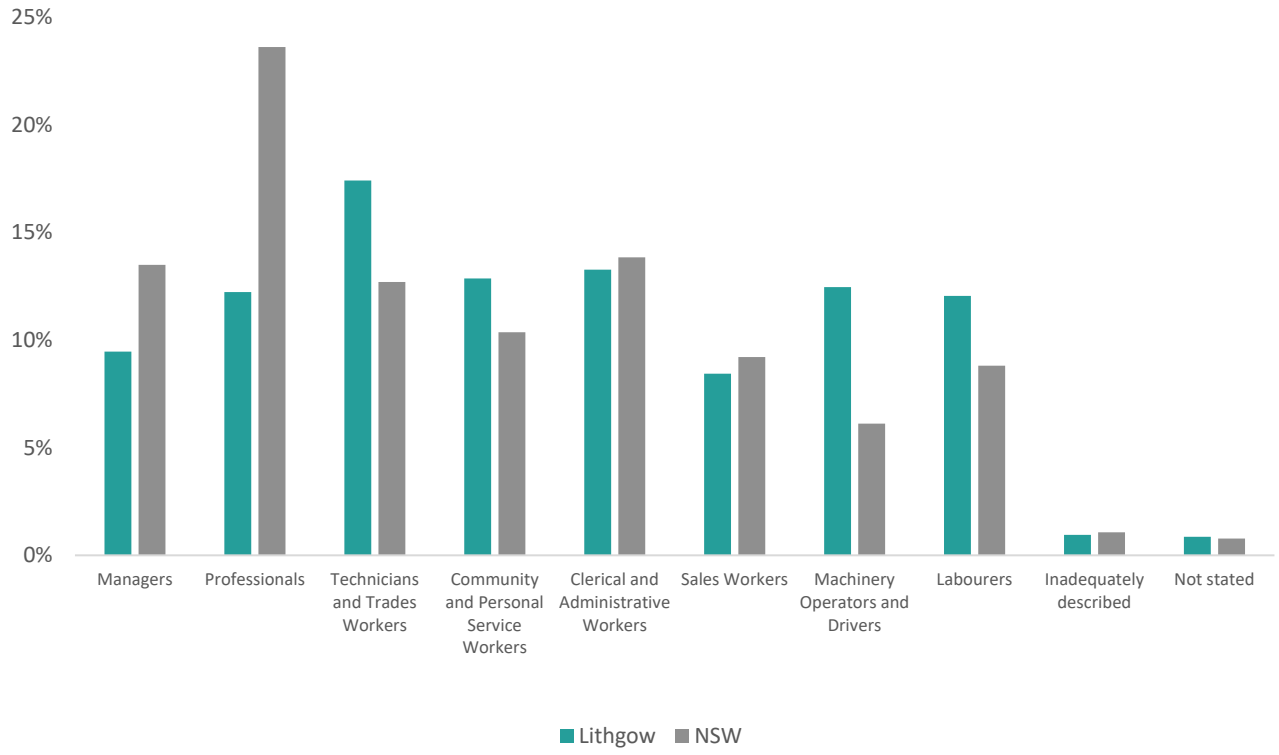

Figure 28. Occupation category - Lithgow LGA and NSW 2016

Source: ABS (2016)

The existing human capital is an intangible asset that will play an essential role in Lithgow's comparative advantage and will be a determining factor for the growth of key sectors, including but not limited to:

- **Alternative energy:** Given the overlapping technical and trade skills between alternative energy and the existing coal mining and energy production sectors, it is expected that the current workforce with technical training (i.e., Certificates and Diplomas) will have the ability to develop new skills and adapt existing ones to new technologies. Incentives should focus on retraining and reskilling labour to smooth the transition between economic activities.
- **Manufacturing:** The development of the manufacturing sector will require filling positions of various skill levels. Given the highly skilled professionals in the mining industry and the broad section of workers whose technical skills are not specific to mining, it seems reasonable to assume skills are relatively transferrable to the manufacturing sector.
- **Health Care and Social Services:** The existing workforce has a high proportion of community and personal service workers. To sustain future growth, Lithgow will need to attract and retain qualified and trained medical practitioners (e.g., specialists, nurses, aged care workers, clinical management) and administration staff, as well as find alternative educational pathways for workers to earn technical and undergraduate degrees.

- **Tourism:** High enrolments in tourism and hospitality certificates among Lithgow high school students suggest local capacity and willingness to fill new positions in an increasing tourism scenario. Cultural and Nature tourism development provides opportunities for Aboriginal operators and retirees from the mining industry. There is also a significant number of clerical, administrative, and retail-trade workers, whose skills could be transferable to the tourism industry. However, there is a need to focus on retaining qualified professionals (e.g., bilingual staff, managers) and reskilling/upskilling the existing workforce to expand the current offer to a more diversified type of visitors (e.g., luxury tourism, corporate events, museums).
- **Public administration:** Current profile of employers is already generating a workforce with suitable skills for public administration and safety. The attraction of further government services would position Lithgow as desirable location for people to pursue a public service career, enabling mobility between agencies while retaining their skills within the community.
- **Agriculture:** The skills of the current stock of labourers and machine operators could be easily transferred to the agricultural industry. However, given some trends showing a slow shift in the local agricultural force towards increasingly relying on off-farm income (LCC, 2020), it seems unlikely that this sector will attract a substantial number of workers in the absence of any major new investments.

What does this mean for Lithgow's transition?

Lithgow has considerable human capital with the right skills base to support a transition away from coal. The skills base is well suited to other industrial-type work across sectors including manufacturing, construction, alternative energy and other sectors requiring trade-qualified workers.

Key infrastructure

Lithgow LGA hosts and is connected to some key infrastructure, with some existing transport infrastructure and assets likely to play a crucial role in helping the transition away from reliance on coal mining. Lithgow LGA is well positioned in terms of its distance from major population centres, being just 140km and 280km from the major industrial precincts of Sydney and Canberra respectively. Both the Castlereagh Highway and the Great Western Highway serve to connect the Lithgow LGA with Sydney and Canberra, as well as other population centres and industrial precincts. The Lithgow LGA is also directly connected to Sydney by train via the Main Western railway line. Port of Sydney is approximately 140km and Port Kembla is approximately 210km.

Other key infrastructure in the Lithgow LGA include the Mount Piper Power Station; a coal powered power station with a generating capacity of 1,400 MW of electricity, and the Wallerawang Power Station (although this power station was decommissioned in 2013). Critical when considering this report, is how legacy infrastructure from coal mining and coal-powered energy generation provides a starting point for potential future growth in renewable energy generation within the Lithgow LGA. For example, the region has numerous rail assets (i.e. rail lines built around coal, oil shale mines, passenger transport, etc), networks and structures that can be redeployed and reused to lower the cost of any potential transitions the Lithgow LGA may make towards renewable energy generation. Figure 29 displays the various transmission lines emanating from the Lithgow LGA.

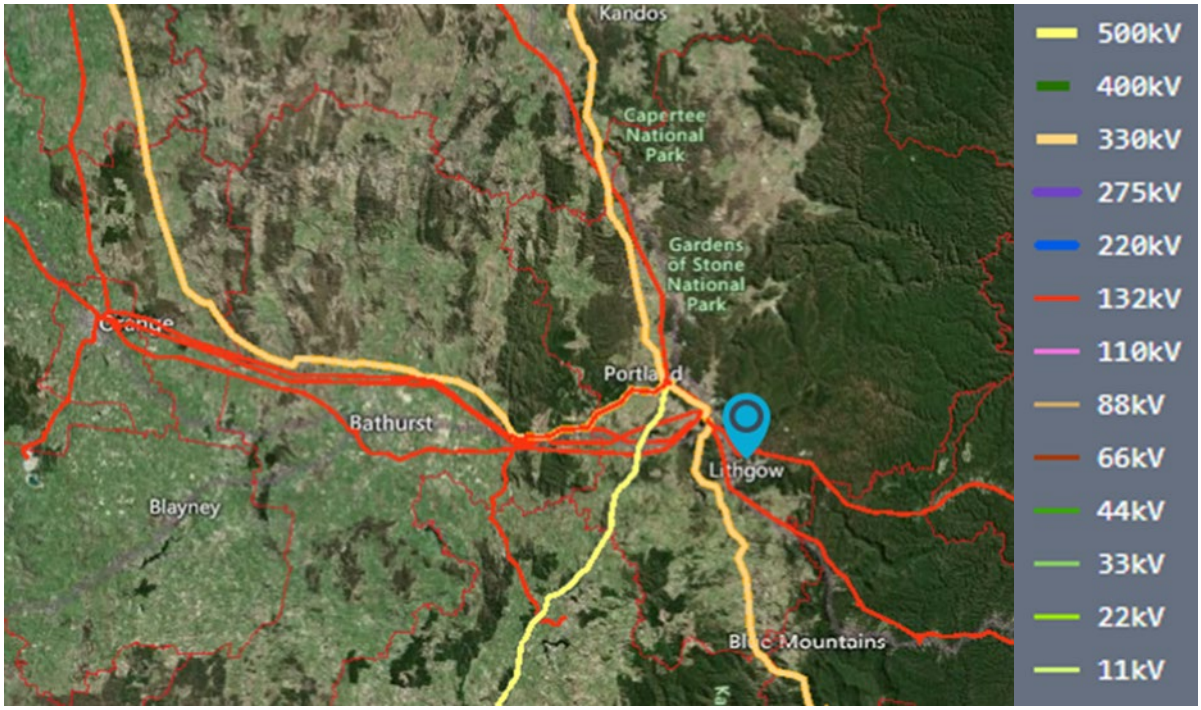

Figure 29. Lithgow transmission lines

When the Lithgow LGA transmission lines below in Figure 30 are viewed within the broader context of NSW, it becomes clear that due to its history as a major coal-fired power generator, the Lithgow LGA serves as a hub for transmission for electrical connection activity.

The key point to note is that this legacy infrastructure is a 'sunk cost' for any future regional development initiatives that require extensive transport and energy distribution connectivity. This reduces the investment cost in supply and value chains within Lithgow when compared to regions that do not have this legacy infrastructure and creates a potential comparative advantage for future investment.

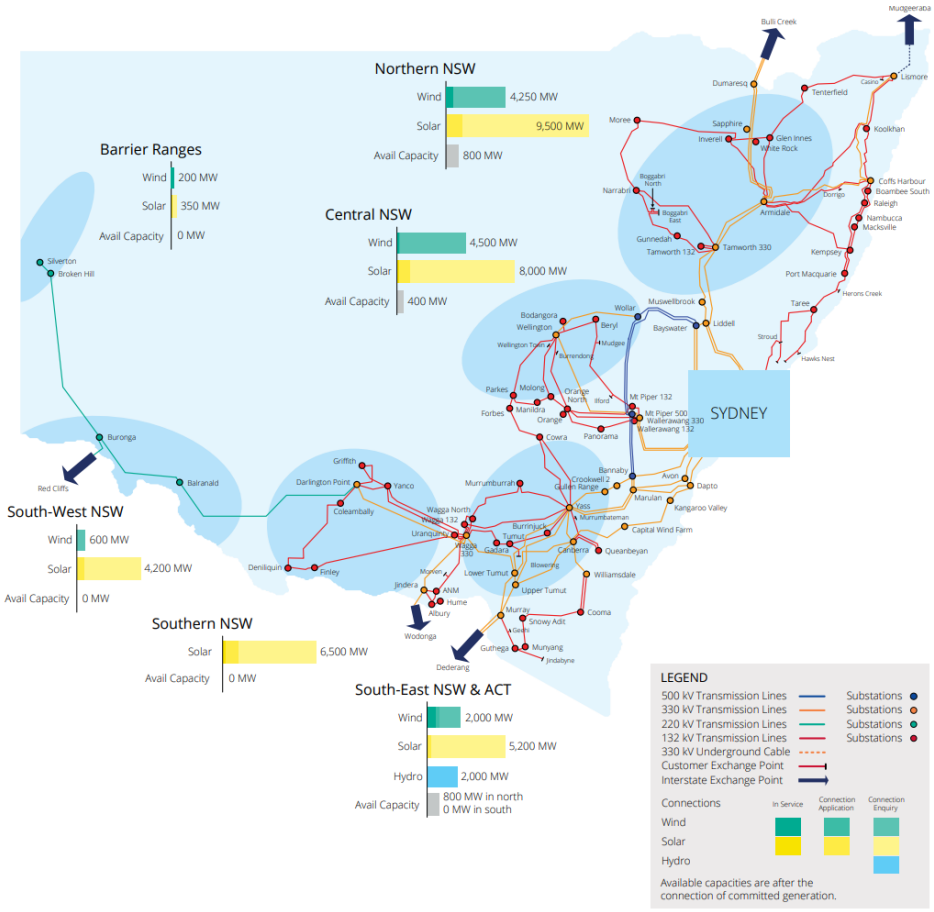

Figure 30. NSW transmission connection activity 2016-2019

Source: TransGrid, 2019

What does this mean for Lithgow's transition?

The legacy transport and energy distribution infrastructure from coal mining and coal-powered energy generation provides a significant basis for future growth.

What does this mean for Lithgow's economic sectors?

The built infrastructure is an existing asset which provides a comparative advantage for growth in several key sectors, including but not limited to:

- **Alternative energy**: Lithgow possesses an extensive existing transmission network that is the result of the area's history in coal mining and coal-powered energy generation. The alternative energy sector is likely to benefit from this existing electricity transmission infrastructure, which reduces the cost for new alternative energy developments. This existing transmission network also allows for a smooth and economically optimal transition from traditional energy sources to alternative sources. As coal mining and coal-powered energy generation declines alternative energies can gradually be introduced, and the distribution capacity of the transmission network can be utilised to its full extent.
- **Manufacturing**: Lithgow has an extensive transportation network, as well as a robust existing electricity transmission network that is geographically extensive. The manufacturing industry is likely to benefit from the existing electricity transmission infrastructure as the sector expands into new geographical areas. Furthermore, Lithgow's transportation network will enable manufactured outputs and products to get to market efficiently and economically.

- **Health care and social services:** Lithgow possesses existing transport, water, energy, and telecommunications services infrastructure that are extensive and robust. This infrastructure is likely to be beneficial towards a growing health care and social services sector in Lithgow, which depends on an array of infrastructure to function successfully.
- **Tourism:** Lithgow possesses existing transport, energy, and telecommunications services infrastructure that are extensive and robust. This infrastructure is likely to be beneficial towards a growing tourism sector in Lithgow, which depends on an array of infrastructure to function successfully. This is particularly the case with the existing transportation infrastructure, and particularly Lithgow's roads, which provide a high level of accessibility for current tourism and can likely continue to do so for an increasing number of tourists.
- **Public admin**: Lithgow possesses existing transport, energy, and telecommunications services infrastructure that are extensive and robust. This infrastructure is likely to be beneficial towards a growing public administration sector in Lithgow, which depends on an array of infrastructure to function successfully. This is particularly the case with the existing telecommunications infrastructure, with a high quality and extensive telecommunications network being crucial to this industry's operations where virtual forms of communication are commonplace.
- **Agriculture:** Lithgow is home to an extensive transportation network that includes a multitude of roadways. This agricultural sector is likely to benefit and be able to grow as a result of this extensive transportation network as the sector relies on prompt, efficient and economical means of transportation for its outputs.

Natural resources

In reviewing the current status of the Lithgow LGA, it is important to consider the natural resources located within the region and how they may represent potential opportunities for future economic growth.

Solar exposure

Lithgow LGA recorded an average of 15.4 MJ/ m^2 per day of solar exposure in 2021 (BoM, 2022)[8]. As mentioned previously, legacy coal-fired power generation infrastructure could provide a starting point for potential future growth in renewable solar power generation within the Lithgow LGA. Figure 31 below displays levels (MJ/m2) of solar exposure in NSW.

The solar resources, in conjunction with energy transmission infrastructure, creates significant opportunities for further development of solar projects in the region, with the ability to provide dispatchable energy into the grid.

[8] Solar exposure represents the total solar energy for a day falling on a horizontal surface. It is measured from midnight to midnight. The values are usually highest in clear sun conditions during the summer and lowest during winter or very cloudy days.

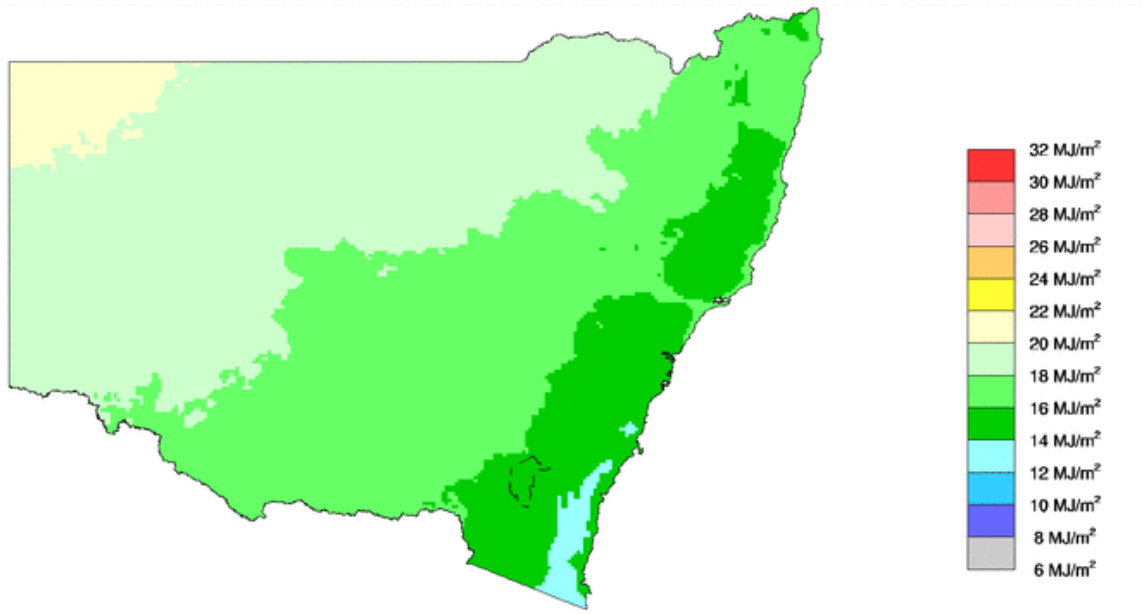

Figure 31. Solar exposure NSW/ACT (1 April 2021 to 31 March 2022)

Source: BOM (2022)

What does this mean for Lithgow's transition?

Lithgow is a very suitable location for solar energy generation with pre-existing transmission infrastructure.

Land use

Land use within the Lithgow LGA consists primarily of low intensity uses, such as nature conservation (51.07% of total area), grazing native vegetation (17.1%), grazing of modified pastures (14.1%), production of native forests (12.6%), and around 8% of land is considered to be minimally used. 'Intensive Uses' as classified by the Department of Agriculture, Fisheries and Forestry (2022), which include land uses such as 'mining and waste', 'rural residential and farm infrastructure', and 'urban intensive uses', account for only 2.54% of land use within the Lithgow LGA. The proportion of low intensity land uses within the Lithgow LGA indicate that there are opportunities for the intensification of land use if such uses are deemed to be commercially viable. Figure 32 below displays broad land usage within the Lithgow LGA by percentage.

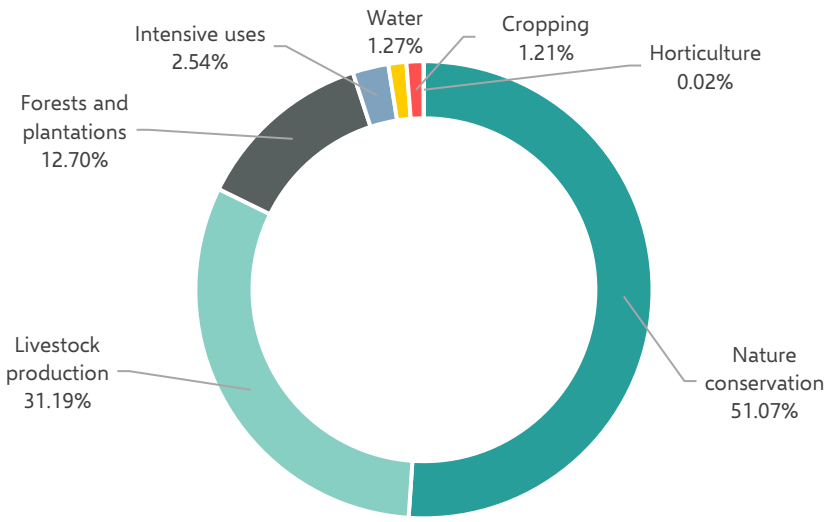

Figure 32. Broad land use within the Lithgow LGA

Source: DAFF, 2022

What does this mean for Lithgow's transition?

Lithgow has large areas of low intensity land uses that provide opportunities for intensification if commercially viable.

Water resources

Water resources are another form of the Lithgow LGA's natural resources that are worthy of analysis. Rainfall patterns and water infrastructure have the ability to create economic opportunities in the form of irrigation for agriculture or the development of power generation industries such as Green Hydrogen Electrolysis or Pumped Hydro. If the Lithgow LGA is to move towards more intensive and profitable uses of land such as various forms of agriculture, reliable water supply and management is essential to a sustainable and productive agricultural sector.

Lithgow has a relatively high level of water security compared to the lower valleys thanks to its location in the upper part of the catchment, offering opportunities for the development of new industries or the growth of existing ones that rely on abundant and reliable water supplies. Most of the water in Lithgow is drawn from rivers in the Murray-Darling Basin, specifically the Macquarie-Castlereagh catchment (DPI Water, 2018). This catchment is part of Regional Water Strategies which include planning and infrastructure solutions to ensure ongoing water security across Regional NSW. This program plays a central role in the Snowy Hydro Legacy Fund, a $4.2 billion government-led initiative (NSW Government, 2022-b).

The Lithgow LGA already presents significant rainfall levels (Table 18) and possesses various major water storage facilities. Such infrastructure includes Farmers Creek Dam No.2, of which the Clarence water transfer scheme is used to supplement Farmers Creek Dam No.2 when natural flows are inefficient. The Fish River water supply scheme is another water source for the Lithgow LGA. It supplies water to Wallerawang and Mount Piper Power Stations, to Oberon and Lithgow for domestic and industrial use, and to about 230 properties along its route. The scheme draws water from Oberon Dam and Duckmaloi Weir and includes 236 kilometres of pipelines and a tunnel under the Great Dividing Range (Water NSW, n.d).

Table 18. Rainfall Lithgow LGA

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean (mm)	85.2	81.4	77.8	56.9	51	72.1	60.3	57.9	55.7	61.9	64.5	79.1	785.8
Lowest (mm)	0	1.3	0.8	1.8	0	0	0	1.5	0	3.2	3.1	0.5	466.2
Median (mm)	76.7	62.2	60.3	47.4	37.3	57.2	46.3	48.6	48.6	58.5	51.9	67.3	777.5
Highest (mm)	250.8	323.1	411.1	197.9	244.3	324.2	319	255	255	167.8	195	257.8	1206.3

Source: Bureau of Meteorology

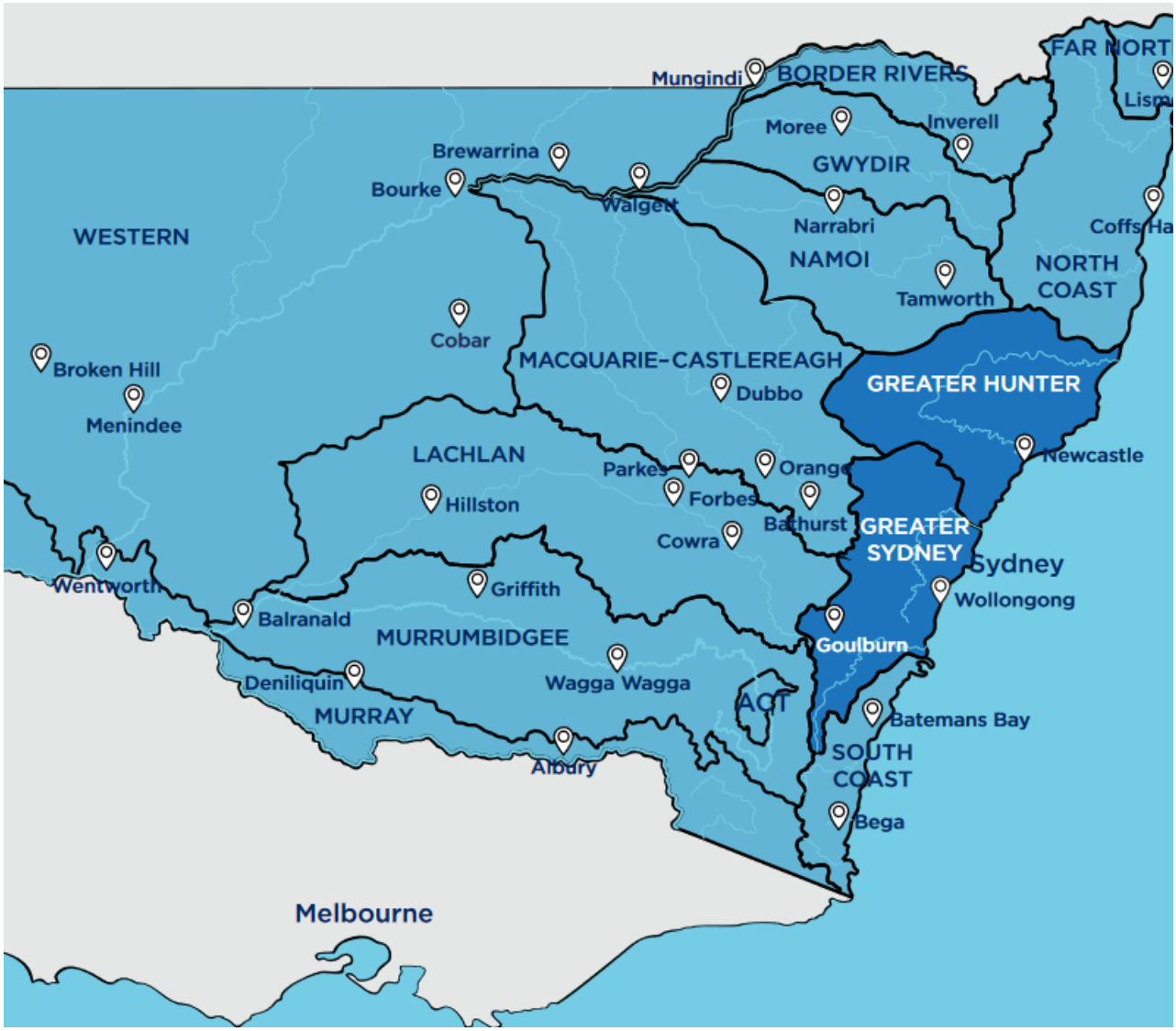

Figure 33. NSW regional water strategy regions

Source: NSW Government (2020)

Figure 34 presents the location of Lithgow's main water sources in areas of high precipitation and low evaporation within the Macquarie-Castlereagh catchment, which suggests a high reliability of water for the development of industries such as agriculture in the region (DPI Water, 2018).

Figure 34. Average rainfall and annual evaporation across the Macquarie-Castlereagh catchment.

Source: DPI Water (2018)

Additional to current water sources, the closure of Mt Piper Power Station in 2037 is expected to release the volume of water currently used for cooling purposes, which at full operation amounts to 50ML/day (Energy Australia, 2022). This water is sourced from Lake Lyell, Thompsons Creek Reservoir, and Fish River Water Scheme. In addition, Energy Australia retained the water rights in Lake Wallace after the Wallerawang power station closure. The access to these large volumes of water (approx. 31,200ML [9]), which use is restricted to energy production, offers suitable conditions for alternative energy technologies such as pumped hydro or energy production from hydrogen. Energy Australia is currently investigating a pumped hydro project that proposes to use Lake Lyell as a lower reservoir with a new upper reservoir being built at Mt Walker. This project, which seeks to use existing infrastructure, water and transmission lines, will produce up to 335 megawatts (MW) of electricity, bringing renewable energy and economic benefits to the region (Energy Australia, 2022).

What does this mean for Lithgow's transition?

Lithgow has sufficient water resources to support the development of renewable energy generation assets (pumped hydro) and other commercial uses including irrigated agriculture.

What does this mean for Lithgow's economic sectors?

Lithgow's natural resources are assets that provide a comparative advantage for growth in several key sectors including but not limited to:

- **Alternative energy:** Lithgow's solar exposure is relatively high. Lithgow also possesses many lakes, rivers, and a large amount of land is either undeveloped or its current usage is categorised as low intensity. The alternative energy sector is likely to benefit from these natural assets, as a large factor in the success of solar energy generation is the solar exposure in which the solar infrastructure is located. Furthermore, pumped hydro projects are dependent on rivers and lakes in order to function. Both solar and pumped hydro alternative energy sources can benefit from Lithgow's spare land capacity as they both require land to situate infrastructure on, this is particularly the case with solar energy where solar farms generally

[9] GHD (2016). Springvale Water Treatment Project. Report for EnergyAustralia. Retrieved: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-7592%2120190227T234217.337%20GMT

require approximately two to three hectares of land per one megawatt of power generation (Queensland Government, 2018).

- **Manufacturing:** Lithgow possesses a large amount of land that is either undeveloped or its current usage is categorised as low intensity. The manufacturing sector is likely to benefit from Lithgow's spare land capacity as growth in this sector will require land to situate additional manufacturing buildings and facilities.
- **Tourism:** Lithgow is home to an abundance and variety of natural resources that also provide high levels of natural beauty. The tourism sector can benefit further from Lithgow's natural beauty if it can be exposed to a greater number of people both domestically and internationally. Lithgow's abundant water resources can likely supply and facilitate any potential growth in the tourism sector.
- **Public admin:** Lithgow possesses a large amount of land that is either undeveloped or its current usage is categorised as low intensity. The public administration sector is likely to benefit from Lithgow's spare land capacity as growth in this sector will require land to situate additional buildings and facilities, which would primarily act as a workplace for additional workers.
- **Agriculture:** Lithgow possesses a large amount of land that is either undeveloped or its current usage is categorised as low intensity. Lithgow's water supply is also strong with water security levels relatively high. The agriculture sector is likely to benefit from Lithgow's spare land capacity, as additional farms (or more profitable and intensive farms replacing the lower intensive and less profitable farms) will require available land on which to operate. Lithgow's abundant water resources can likely supply and facilitate any potential growth in the agriculture sector and/or a transition from less intensive agriculture to more intense agriculture.

4.5 Summary of Lithgow's advantages and key sectors

Based on Lithgow's regional endowments, historical specialisations, and a need to focus investment for maximum impact, a number of important sectors for the future of Lithgow are identified here. The approach to scoring the sectors across the various factors is described in Table 19 below.

Table 19. Scoring approach

Category	✓	✓✓	✓✓✓
Demographic trends	Sector has a strong dependency on aggregate population growth for its own growth.	Sector does not rely on population growth for its own growth.	Sector is likely to have increased demand due to changes in demographics.
Existing specialisations	Sector has no or limited specialisation in terms of employment or value add.	Sector shows specialisation compared to either Regional NSW or NSW but not necessarily both. Some sub-sectors may show specialisation, but they are in the minority or do not bear out in both the employment and value add datasets.	Sector has considerable specialisation compared to both Regional NSW and NSW at the sector level and for key sub-sector/s.
Regional advantages	Sector has no or limited local competitive effects in terms or employment or value add.	Sector shows local competitive effects compared to either Regional NSW or NSW but not necessarily both. Some sub-sectors may show competitive effects, but they are in the minority or do not bear out in both the employment and value add datasets.	Sector has considerable local competitive effects compared to both Regional NSW and NSW at the sector level and for key sub-sector/s.
Human capital endowment	No notable human capital advantage identified. Taking note of the presence of labour versus presence of sector-specific skills.	Moderate levels of relevant human capital exist within the LGA, or there is an emerging workforce identified in education and training trends.	Considerable human capital available to be transferred to growing industries or be built upon with migration and training.

Category	✓	✓✓	✓✓✓
Infrastructure endowment	No unique and relevant infrastructure advantages identified.	Sector may benefit from the existing infrastructure unique to the LGA.	Sector stands to benefit considerably from the existing infrastructure, and that infrastructure advantage is unique to the LGA.
Natural resource endowment	No unique and relevant natural resource endowments identified.	Sector may benefit from the natural resource endowments of the LGA; however, these sectors may have similar advantages in nearby areas.	Sector stands to benefit considerably from one or more natural resource endowments.

Table 20 presents the assessment of the degree to which each sector is likely to benefit from Lithgow's demographic trends, historical advantages, and endowments (human capital, infrastructure, and natural resources).

Table 20. Sector alignment with Lithgow's demographic trends, historical advantages, and endowments

		Historical advantages		Endowments			
Sector	**Demographic trends**	**Existing specialisations**	**Regional advantages**	**Human capital endowment**	**Infrastructure endowment**	**Natural resource endowment**	**Rationale**
Accommodation and Food Services and Retail Trade (Tourism)	✓	✓	✓✓	✓✓	✓	✓✓✓	The tourism sector has the ingredients necessary to grow because of enrolments in tourism and hospitality certificates (i.e. potential for an emerging workforce), and an abundance of natural beauty and a secure water supply that can enable growth in the sector. Upcoming improvements to the Great Western Highway will improve access to Lithgow; however, investments in

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
							roads, accommodation, telecommunications connectivity, and retail throughout the Seven Valleys will be required.
Administrative and Support Services	✓	✓	✓	✓	✓	✓	The Administrative and Support Services sector is not an existing specialisation for Lithgow and is largely population driven. Lithgow's endowments do not present any unique advantages for this sector.
Agriculture, Forestry and Fishing	✓ ✓	✓	✓ ✓ ✓	✓	✓	✓ ✓	It is not presently a key sector for Lithgow. While the agriculture sector may grow incrementally, there were no major or specific advantages identified beyond available land and water resources, and a suitable transport network. and current agricultural trends. Furthermore, there is only a limited role for government to facilitate growth in this sector.

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
Arts and Recreation Services	✓	✓	✓ ✓	✓	✓	✓ ✓	Lithgow has a vibrant arts community which has potential to contribute to and complement placemaking and the development of the tourism industry.
Construction	✓	✓	✓	✓	✓	✓	The Construction sector is not an existing specialisation for Lithgow. Furthermore, the economic activity is transient and largely driven by population growth (i.e. demand for housing). Lithgow's endowments do not present any unique advantages for this sector.
Education and Training	✓	✓	✓ ✓	✓	✓	✓	Education and Training is an important sector for Lithgow and while some marginal growth may occur through transition demands. Lithgow's endowments do not present any unique advantages for this sector.

Sector	Demographic trends	Historical advantages: Existing specialisations	Historical advantages: Regional advantages	Endowments: Human capital endowment	Endowments: Infrastructure endowment	Endowments: Natural resource endowment	Rationale
Electricity, Gas, Water and Waste Services (Alternative energy)	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	The alternative energy sector is likely to thrive because of the existence of an appropriate workforce, largescale energy infrastructure (which is likely to be underutilised in the future), and an abundance of natural resources (high solar exposure levels and an abundance of rivers, lakes and suitable land).
Financial and Insurance Services	✓	✓	✓	✓	✓	✓	The Financial and Insurance Services sector is not an existing specialisation for Lithgow and is largely population driven, and is increasingly moving to an on-line sector where geography is even less relevant. Lithgow's endowments do not present any unique advantages for this sector.
Health Care and Social Services	✓ ✓ ✓	✓	✓ ✓ ✓	✓ ✓	✓	✓	While Lithgow doesn't provide any major advantages for the health care and social services sector, some further growth is likely to be driven by

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
							demographic trends (i.e. an aging population), particularly as no major disadvantages were identified. Furthermore, due to its current importance for the local economy and relatively high potential for government influence it, would be sensible to consider this sector in the action plan, in order to mitigate further risks to the economy.
Information Media and Telecommunications	✓	✓	✓	✓	✓	✓	The Information Media and Telecommunications sector is not an existing specialisation. Growth in Lithgow as a metro satellite may generate opportunities in this sector. Lithgow's endowments do not present any unique advantages for this sector.
Manufacturing	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓	✓ ✓	The manufacturing sector is likely to thrive because of the existence of an appropriate workforce, extensive and robust electricity and transportation

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
							networks, and an abundance of suitable land where manufacturing building and facilities can be situated. This provides a robust base for further expansion.
Other Services	✓	✓	✓	✓	✓	✓	The Other Services sector is not an existing specialisation for Lithgow and is largely population driven. Lithgow's endowments do not present any unique advantages for this sector.
Professional, Scientific and Technical Services	✓	✓	✓	✓	✓	✓	The Professional, Scientific and Technical Services sector is not an existing specialisation for Lithgow and tends to be centralised in more urban areas (e.g. Sydney). Lithgow's endowments do not present any unique advantages for this sector.

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
Public Administration and Safety	✓	✓ ✓	✓	✓ ✓ ✓	✓	✓	While Lithgow doesn't provide any major advantages for the public administration sector, no major disadvantages were identified. Furthermore, due to its current importance for the local economy and relatively high potential for government influence it, would be sensible to consider this sector in the action plan, in order to mitigate further risks to the economy. Further, information technology could make Lithgow an attractive location for 'back office' services.
Rental, Hiring and Real Estate Services	✓	✓	✓	✓	✓	✓	The Rental, Hiring and Real Estate Services sector is not an existing specialisation for Lithgow and is largely population driven. Lithgow's endowments do not present any unique advantages for this sector.

Sector	Demographic trends	Historical advantages		Endowments			Rationale
		Existing specialisations	Regional advantages	Human capital endowment	Infrastructure endowment	Natural resource endowment	
Transport, Postal and Warehousing	✓	✓ ✓	✓ ✓	✓	✓	✓	Lithgow has only slight specialisation in the Transport, Postal and Warehousing sector relative to nearby LGAs, and this slight specialisation does not remain when comparing to state-wide averages. Regional competitors include the Parkes Special Activation Precinct. Lithgow is well positioned to serve as the regional interchange between Sydney Metro and regional train services.
Wholesale Trade	✓ ✓	✓	✓	✓	✓	✓	The Wholesale Trade sector is not an existing specialisation for Lithgow and is largely driven by demand from other sectors (e.g. manufacturing). Lithgow's endowments do not present any unique advantages for this sector.

What does this mean for Lithgow's transition?

Lithgow has a number of sectors with a solid endowment of human, infrastructure and natural resources to underpin future opportunities. These endowments do not mean success is assured. However, they do provide a solid basis for initiatives to build on. Furthermore, some of these sectors may also benefit from, or avoid being negatively impacted by, demographic trends.

The six sectors which score the highest across all categories are Electricity, Gas, Water and Waste Services (Alternative energy), Manufacturing, Health Care and Social Services, Accommodation and Food Services and Retail Trade (Tourism), Agriculture, Forestry and Fishing, and Public Administration and Safety.

4.6 Sectors for focus in action plan

Important sectors for the future Lithgow economy

Lithgow faces an uncertain future, and the action plan should concentrate on a selection of key sectors in order to focus efforts and best facilitate a transition. The alternative energy, manufacturing and tourism sectors stand to benefit from the human, infrastructure, and natural endowments of the region and could be well positioned for exceptional growth due to these comparative advantages. The health care and social services and public administration sectors are currently foundational sectors for the regional economy; however, no major advantages were identified in these sectors for future growth. They should be considered in the action plan due to the higher level of government control over these sectors, providing opportunities to mitigate risks and take advantage of demographic trends (e.g. aging population). The prospects for the agriculture sector are less clear, as while there is land and water available there are a number of other competing constraints and trends for the industry in Lithgow. These factors are discussed in the following section. The remaining sectors were not assessed to have any obvious major advantages in Lithgow and may not represent areas of focus for future efforts. However, it should be noted that their exclusion does not mean investment is unlikely to occur, rather they may be a lower priority for government efforts and are likely to continue with business-as-usual growth.

What does this mean for Lithgow's transition?

Alternative energy, manufacturing, tourism, health care and social services, and public administration are important sectors for the future Lithgow economy and should be higher priorities for active government efforts to underpin and accelerate transition.

4.7 The case for positive action on agriculture

Summary

While the Agriculture, Forestry and Fishing industry was one of the high performing sectors in the scoring outlined above (driven by the Agriculture sub-sector specifically), the are a number of other considerations that should be mentioned. Table 21 presents some of the advantages or positives for growth in the agricultural industry, as well as some impediments to growth.

Table 21. Pros and cons for agricultural growth

Pros	Cons
• Lithgow's reliable water resources • Positive local competitive effect (identified through shift share analysis) • Potential lower urban-agriculture land use conflicts due to lower population growth • Proximity to markets (i.e. Sydney)	• Fragmented farmland limiting large-scale and cost-competitive developments, along with *existing* impediments in the local environmental and development control plans • Lack of *existing* critical mass to create freight efficiency for distribution to key markets

In addition to the pros and cons outlined above, cost of real estate will also be a consideration for future investment, and the cool climate of Lithgow may provide pros or cons for intensive agriculture development, however this is product specific.

As the analysis on the Agriculture sector is inconclusive and the recent growth has come from a low base, it may be useful for Lithgow to undertake further work in this area in the future. This could include consultation with key players in the intensive animal production and intensive horticulture industries to determine what they are considering in their decisions around locating their future developments.

Underpinning analysis

The agricultural sector in Lithgow, mainly represented by grazing and livestock production, currently represents a minor contribution to the current local economy (i.e., value added and employment). This trend is also reflected in the shift observed in the local agricultural workforce that is increasingly relying on off-farm income (LCC, 2020). These changes in the sector have been linked to the growing prevalence of small land holdings, product of land fragmentation.

The farmland fragmentation observed in Lithgow largely originates in the growing demand for housing, driven by the development growth in the Sydney basin and the interest in adopting a rural lifestyle in the region. This has increased the demand for dwelling entitlements on rural lands and raised the land price to levels above regional and national averages, creating an incentive for landowners to subdivide holdings down to the minimum lot size (currently 40ha in most rural zones) in rural land with agricultural potential. Direct consequences of this fragmentation are the reduced available land for farming and increased land use conflicts that further limit agricultural development possibilities. Additional to local conditions, some external factors, such as tightening regulation and planning regimes for intensive animal production, have enhanced the competitiveness of other locations (e.g., Toowoomba in QLD) and restricted Lithgow's agriculture industry's ability to reverse the current downward trends.

Land use data for Lithgow show that 46,289 ha correspond to agriculture, principally represented by low intensity uses such as Grazing native vegetation (52.9%) and Grazing modified pastures (43.5%), followed by Dryland cropping (3.7 %) (DAFF, 2022).

Lithgow's current agricultural production is mainly focused on cattle grazing. Although this industry is not a particularly high-value sector, it offers an opportunity if Lithgow moves towards more intensive and profitable uses such as intensive animal production, which viability will largely depend on factors such as regulations, local competitiveness, and water reliability.

Due to the adverse impacts that intensive animal production could cause on amenities and residences in the vicinity of the site, surface and groundwater pollution, and potential soil degradation, this industry is generally highly regulated. For example, the Lithgow Local Environmental Plan 2014 (NSW Government, 2023) restricts any intensive livestock development:

- in an environmentally sensitive area, or
- within 100 metres of a natural watercourse, or
- in a drinking water catchment, or
- within 500 metres of any dwelling that is not associated with the development, or a residential zone.

In addition to the distance any intensive animal development must have from residences and water sources, the Lithgow Local Environmental Plan 2014 restricts the distance between livestock facilities and nearby similar developments. For example, the minimum distance between two poultry farms is between 1 and 5km, depending on whether they are farms used for breeding poultry. In the case of pig farms, the minimum distance between farms is 3km.

After applying the current regulations on the distance to residences and water sources as constraints to land use data (Figure 35), the area for Grazing and Cropping activities (14,126 ha) gets reduced to a total of 13,516 ha (blue areas in map), where intensive animal production could effectively be developed. Although this area is significant, it is fragmented and distributed across the west side of the LGA. Most contiguous areas are between 25ha to 300ha, and only two are larger than 800ha (Table 22). Considering the additional restrictions on the minimum distance between intensive animal facilities, future development will be limited to a selection of key locations.

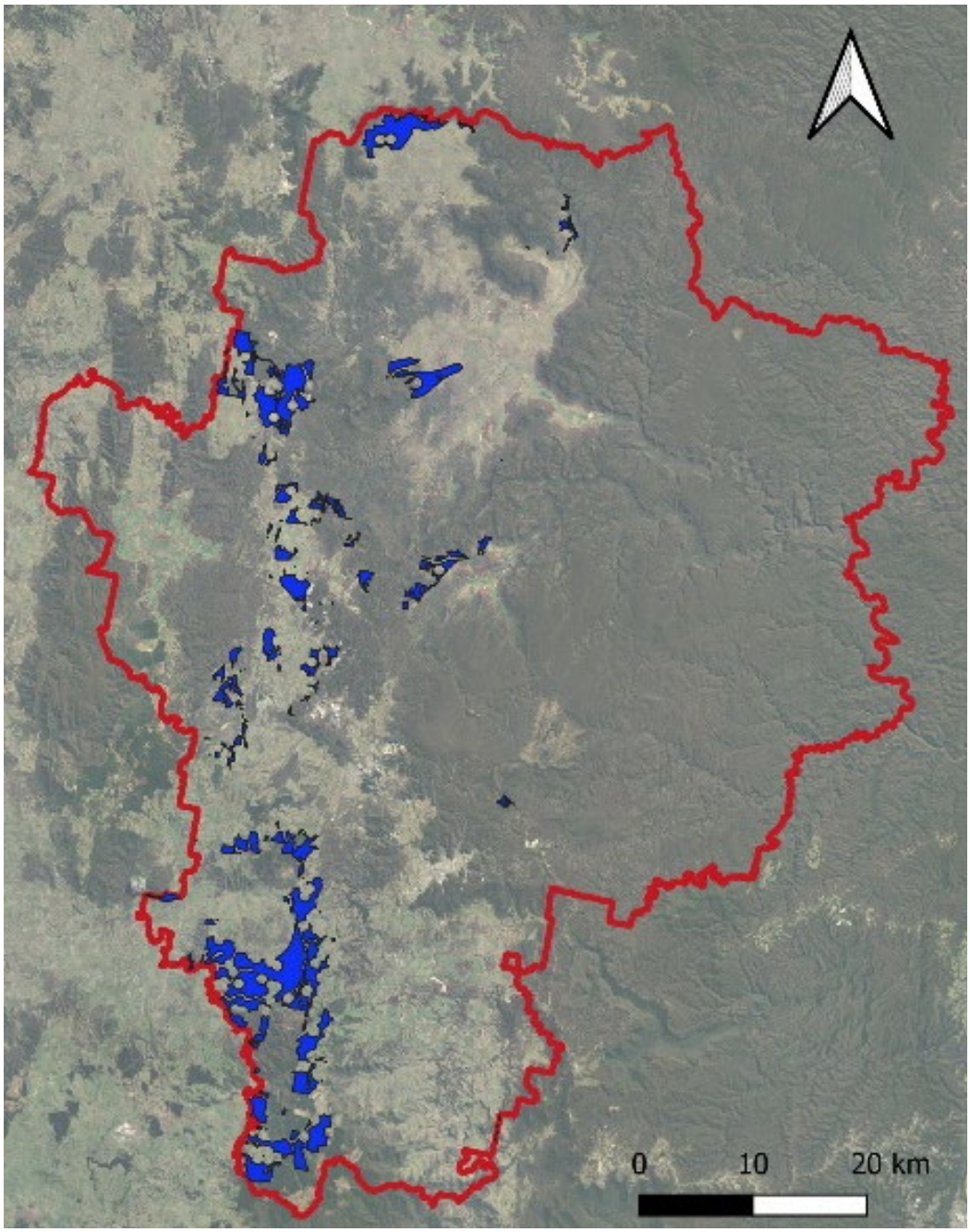

Figure 35. Area available for the development of intensive animal production in Lithgow LGA

Table 22. Area available for the development of intensive animal production in Lithgow LGA

Area range (ha)	Number	Total Area by range (ha)
25 to 300	48	4,626
300 to 600	12	4,781
600 to 900	1	843
More than 900	1	1,766

Additionally, the land cost in Lithgow is expected to play a critical role in determining its regional competitiveness. The median price per hectare for farmland in Lithgow is almost triple the value of the wider Central NSW Region and double the value of NSW (Table 23). Its significant growth over the last decade could be partly attributable to the local incentives to allocate land to rural residences over agriculture described above. The table also includes the farmland prices from neighbouring LGAs, and other LGAs where there is currently significant presence of piggeries, poultry, or undercover horticulture. Note that there are a number of LGAs for which there isn't data. Additionally, for context, the most expensive median land values in NSW are found in Ballina, with a median value of $26,177 per hectare.

Table 23. Farmland price and compound annual growth rate by municipality in Central NSW

Municipality/region	2021 median land value ($/ha)	5yr CAGR	10yr CAGR
Bathurst	$5,974	8.5%	4.5%
Central Coast (NSW)	n/a	n/a	n/a
Hawkesbury	n/a	n/a	n/a
Lithgow	$14,373	14.4%	7.3%
Liverpool	n/a	n/a	n/a
Mid-Coast	$11,348	10.8%	5.7%
Mid-Western	$5,332	9.5%	7.0%
Muswellbrook	$13,545	11.1%	5.6%
Oberon	$10,921	16.5%	9.8%
Orange	$16,324	5.6%	4.0%

Municipality/region	2021 median land value ($/ha)	5yr CAGR	10yr CAGR
Penrith	n/a	n/a	n/a
Singleton	$12,790	11.1%	5.0%
Central NSW region	$5,893	11.2%	9.0%
Armidale Regional	$7,081	17.4%	10.2%
Tamworth Regional	$3,918	2.5%	3.8%
Northern region	$6,094	8.2%	7.5%
Carrathool	$2,858	29.9%	15.4%
Edward River	$5,434	15.3%	13.1%
Federation	$9,019	20.10%	15.1%
Hilltops	$10,229	19.4%	12.8%
Murray River	$3,461	20.1%	10.8%
Narrandera	$4,855	16.00%	12.4%
Temora	$9,982	28.9%	13.1%
Southern region	$6,425	19.3%	11.3%
NSW	$6,339	11.8%	9.0%

Source: Rural Bank (2022). Australian Farmland Values 2022.

In horticulture, the current trend in the region is towards developing large greenhouses to produce high-value crops, mainly for export. To offset the high cost of transportation to distant markets, these initiatives require large-scale operations and are very capital-intensive (Hadley, 2017). Attracting investment to Lithgow may face challenges, considering its low average minimum temperatures (i.e., higher glasshouse heating costs, noting that this will be product specific), high land value, and lack of existing critical mass to create freight efficiency for distribution to key markets. In NSW, these enterprises have been dominated by large corporate entities (e.g., Costa Group) that have concentrated their investments in zones that present advantages in terms of climate and proximity to distribution routes, such as the region around the Sydney Metropolitan Area (nursery and cut flower growers) and Guyra, that hosts one of the most advanced tomato glasshouse facilities in Australia.

Finally, it is important to note that council are likely to have limited influence over the agriculture sector, with the key action being to ensure council planning does not provide additional constraints for the sector (e.g. further fragmentation and land use conflicts). For this reason, and the others outlined above, the prospects for agriculture in Lithgow are potentially less than those of the other important sectors considered here.

What does this mean for Lithgow's transition?

While there could be incremental growth in the agriculture sector, it is unlikely to experience outsized growth and has not been considered further in the action plan. This is particularly the case for agricultural intensification that require larger parcels of land, or where land use conflict with adjacent land uses is more likely.

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Appendix D: Planning and land use

Appendix D: Planning and land use

This document includes the following components:

- A desktop review of key local and State government strategic planning documents and recommendations and actions underway to accelerate the transition.
- A desktop assessment of possible future land use requirements for each priority sector.
- High-level recommendations for land use planning to enable future change.

State Government Strategic Planning

An integrated approach to policy and planning at all levels of government has the potential to support an economic transformation and diversification of the energy mix from the traditional coal mining and coal-fired power generation in the City of Lithgow. This document looks at the Central West and Orana Regional Plan 2041 as a key State Government strategic planning document and the directions included in the plan that could support Lithgow and its potential future economy.

Central West and Orana Regional Plan 2041

The Central West and Orana Regional Plan is a 20-year land use plan that sets out the strategic framework for the region, to ensure the region's ongoing prosperity.

Key planning related directions identified are:

- Renewable energy projects to be, where possible, integrated with rural production or on sites where industrial projects such as power stations or mining operations are operating or have ceased operation. For example, work is underway to repurpose the former coal-fired Wallerawang power station at Lithgow, which closed in 2014, into a renewable energy (battery, biomass and solar) industrial and intensive agriculture zone.
- The greatest population growth and housing demand is expected to occur in Lithgow and the region's centres will require a mixture of housing that meets the population's changing needs and reflects the unique local character and needs of each community.
- Lithgow is positioned to capitalise on proximity to Sydney, including Western Sydney Parkland City. The region will also benefit from improved links into the Central West and other regional centres.
- High street activation projects in Bathurst, Coonabarabran, Gilgandra and Lithgow through the Streets as Shared Spaces program have tested ideas for improvements to local streets, paths and public spaces.
- The upgrade of the Great Western Highway between Katoomba and Lithgow will capitalise on growth in Western Sydney, including the Western Sydney International Airport and Aerotropolis. Improved connections to Newcastle, Canberra and Port Kembla will provide additional access opportunities to markets and export gateways.
- Greater connectivity through fast rail has the potential to sustain communities such as Lithgow, currently projected to see a population decline by 2041.
- Precinct-based planning approaches to be investigated around tertiary education and major secondary education institutions in Bathurst, Dubbo, Orange and Lithgow to create mixed use precincts. These could feature local workforce training, or research and industry business development collaboration, and bring activity to local centres and campuses.

Lithgow City Council's Submission on the Draft Central West and Orana Regional Plan 2041 (Officer Level)

The Council submission on the Draft Central West and Orana Regional Plan 2041 included several points that would support the economic change in relation to planning and land use requirements.

- Council requested that the Regional Plan recognise the importance of the Marrangaroo Urban Release Area and the GreenSpot initiative on the Wallerawang site to contribute to the provision of the region's future housing and employment needs.

- Council's key priority to address future housing needs is to implement the Marrangaroo Masterplan within the Marrangaroo Urban Release Area. The Lithgow LGA has limited greenfield land options to provide for future housing opportunities of suitable topography, environmental capacity and within servicing limits of existing infrastructure.
- The Marrangaroo Urban Release Area has been master-planned to provide 1584 residential lots of varying typologies supported by 1 ha village centre and 16 ha of business and productivity support land. The site is also adjacent to 49 ha of industrial employment lands. The site is strategically located within 60 mins of Bathurst Regional Centre and 90 mins to Western Sydney Parkland City with good transport links to the west and north-east of the region.
- There is a strong market trend within the region to provide for large single dwellings on larger residential allotments despite local plans providing the framework for more diverse and affordable housing typologies.
- Council's Local Strategic Planning Statement identifies two significant employment land precincts located at Marrangaroo and Wallerawang. These areas provide zoned land to support a range of industrial, business and support activities, renewable energy projects, innovative agricultural and circular economy businesses. Both precincts are strategically located with strong transport connectivity located close to the convergence of two major highways. The Wallerawang precinct also has access to the Great Western Rail Line.

LEEP Summary considerations for land use planning and possible future economy

The directions and priorities of the Central West and Orana Regional Plan 2041, along with Lithgow City Council's submission, provide the following considerations for Lithgow in terms of land use and planning policy:

- Precinct-based planning to support emerging and new sectors and co-locating similar uses.
- Identification of strategic locations that harness existing and proposed transport connections and appropriately zoned land for priority locations for emerging sectors.
- Reuse and repurposing of existing power stations and mining land.
- Due diligence for siting of emerging sectors aligned with specific land use requirements and appropriate in the context of the region and local towns to still maintain local character.
- Supporting the needs of the population in terms of housing and placemaking initiatives will be important.
- A regional approach to provision of housing and employment needs within the context of environmental protection and infrastructure servicing constraints.

Local Government Planning

Local government policy and planning has the potential to progress the possible future economy for Lithgow. To assist, the local strategic directions will need to provide support and present opportunities, and this will need to be reflected in statutory policy and planning instruments to be effective.

Lithgow 2040 - Local Strategic Planning Statement

Lithgow 2040 Local Strategic Planning Statement (LSPS) outlines the vision for land use planning over the next 20 years along with a set of key planning priorities and actions to guide future land use decisions. The Lithgow 2040 vision is '***the Lithgow region is an ideally located strategic centre with an evolving economy and a resilient and connected community which embraces its proud heritage and world class natural environment'***.

Council's planning priorities outlined in the LSPS to attract investment and grow local jobs include the following:

- Protect and enhance our main streets by ensuring orderly development.
- Plan for employment lands to build upon effective buffering controls, and access to essential infrastructure and services.
- Manage zoning to facilitate appropriate levels of development to reflect characteristic values of our areas.
- Protect and enhance historical land use and businesses.
- Investigate new release areas where demand and servicing is appropriate.
- Protect the agricultural values of our regional lands while allowing for supplementary land uses that value adds to our agricultural industry.
- Encourage niche and innovative industries that complement their local area and/or adaptively reuse existing buildings.

Relevant Local Strategic Planning Statement actions include:

- Review the Lithgow LEP to facilitate the activation and redevelopment of the former Wallerawang Power Station Site and the Foundations Portland Site.
- Actively engage and partner with owners of zoned employment lands to facilitate the availability of shovel ready land to the market.
- Audit and review employment lands to unlock redevelopment or infill opportunities.
- Review the LEP and DCP to facilitate growth of agribusinesses/Agri industries to capitalise on new technologies and proximity to existing and emerging markets
- Review the LEP to create opportunities for creative industries such as artisan food and drink premises and to facilitate the paddock to plate strategy.
- Review the land use zoning over the Thales Site to facilitate redevelopment opportunities.

It is evident from the LSPS that Council is focused on creating redevelopment opportunities as well as infill and new employment lands where they are supported by appropriate infrastructure, and while still protecting the environmental, agricultural, and heritage aspects of the area.

Lithgow Land Use Strategy 2010-2030

The Lithgow Land Use Strategy 2010-2030 explores the issues that currently face the LGA and recommends a new planning approach to address these issues. It also sets directions for the LGA's settlement and land use management for the 20-year period.

The strategy acknowledges the need to diversify the employment base as a result of a reduction in mining employment and that this will require the identification of land to cater for modern industrial land use in areas that enable clustering of like uses.

The strategy identified a number of issues that would need to be addressed for enhanced employment and industry opportunities:

- The lack of suitable and serviced industrial land in a clustered estate format inhibits industry and business investment and diversification of the employment base of the LGA.
- Many of the existing precincts are located amongst and adjoining residential development. This restricts the ability of the lands to accommodate general industrial land use and does not provide ample areas for expansion.
- The likelihood of land use conflict to severely impact upon the operational environment of industrial businesses is high and is a deterrent to large scale investment in these lands.
- Tourism development if not appropriately located and planned may result in the loss of amenity and character of some areas.

Lithgow City Council's priorities for the LGA are:

- Lithgow's main street and CBD
- transport and freight connections that capitalise on Lithgow's proximity to Sydney
- opportunities from the LGA's location and rural character, such as tourism
- the right housing in local areas
- items and places of heritage significance
- creating a sense of place in public spaces.

LEEP Summary considerations for land use planning and possible future economy

The actions / opportunities and priorities outlined above are generally consistent with the findings of the LEEP.

- The recommendations to move into the LEEP Action Plan are those that relate to a combination of diversification of the economy and some degree of regional industry specialisation where Lithgow has a competitive advantage: Consider appropriate densification of housing in the Lithgow town centre
- Plan for improved serviceability of employment lands for market-ready approaches
- Adopt precinct-based planning to support emerging and new sectors and co-locating similar uses.
- Identify strategic locations that harness existing and proposed transport connections and appropriately zoned land for priority locations for emerging sectors.
- Reuse and repurposing of existing power stations and mining land.
- Complete the due diligence for siting of emerging sectors aligned with specific land use requirements and appropriate in the context of the region and local towns to still maintain local character.
- Support community involvement in the economic futures with respect to housing needs and placemaking initiatives
- Take a regional approach to the provision of housing and employment needs within the context of environmental protection and infrastructure servicing constraints.
- Create redevelopment opportunities as well as infill and new employment lands where they are supported by appropriate infrastructure, while protecting the environmental, agricultural, and heritage
- Review the LEP and DCP to:
  - support diversification and specialisation in specific sectors and reuse of industrial / employment lands such as agribusiness, renewables, tourism
  - support a buffer zone between residential and industrial lands

Land use in Lithgow

Land use context

Lithgow LGA encompasses a total land area of 4,551 square kilometres. The LGA includes the township of Lithgow, the smaller towns of Portland and Wallerawang, numerous villages, and nearly two-thirds of the area is National Parks and State Forests.

The townships are characterised by local centres with adjoining general residential and mixed-use land. Outside of the centres there is low-density residential land with pockets of industry. Beyond this, land becomes large lot residential, rural landscape, environmental living, and primary production. National parks and environmental management land surround the townships.

Land use analysis

Broadly there are two aspects to consider in relation to land use planning for Lithgow:

1. Land and planning policy as enablers for possible sectors
2. Available land from the cessation of mining and coal-based activities.

The major industrial and commercial localities in Lithgow LGA are in Lithgow town centre, Portland, Marrangaroo, and Wallerawang (Figure 1). Land use maps for each area are provided as an attachment.

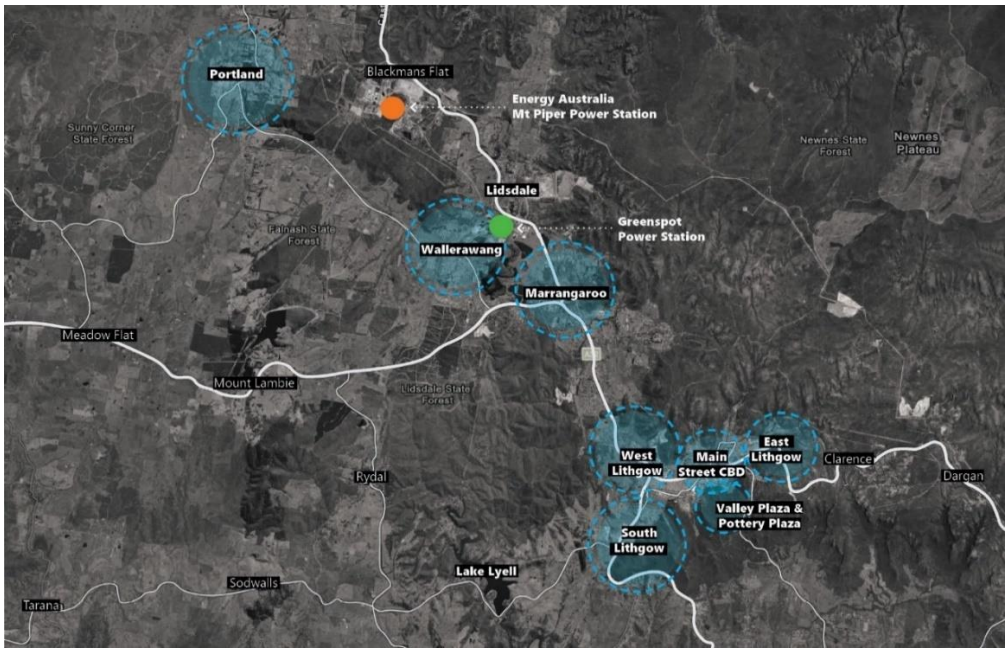


Figure 1 Major employment lands in Lithgow

An audit of industrial and commercial lands across Lithgow LGA (May 2022) indicated that there is a total of 137.72 hectares of commercial land (B1, B2, B4, B6, B7) and 325.82 hectares of industrial zoned land (IN1, IN2, IN3). Table 1 outlines the zones and the current uses of the land (i.e. industrial use, residential use or vacant)[1].

Table 1. Lithgow industrial zones and current land uses

Zone	Total area (ha)	Current area of use (ha)			Comments
		Industrial	other purpose (i.e. residential)	Vacant	
IN1 – General Industrial	141.7	55.28	53.97	26.20	All vacant IN1 zoned land is in Wallerawang. Land in Marrangaroo has been identified by Council as a future industrial precinct.
IN2 – Light Industrial	81.17	48.72	2.69	17.77	The majority of the vacant IN2 zoned land is in Wallerawang
IN3 – Heavy Industrial	103.48	12.39	-	90.64	All IN3 zoned land has been localised to south of the former Wallerawang Power Station. There is no IN3 zoned land in Lithgow or Portland.
B4 – Mixed use	53.39	22.10	4.88	5.69	B4 zoned land is found in Lithgow and Portland with the majority of the vacant sites to be found in Lithgow. Some new B4 zoned land is anticipated in the Portland area that has not been included in this assessment.
B6 – Enterprise Corridor	41.24	8.01	23.08	9.20	All the B6 zoned land is in the Lithgow area in Marrangaroo Urban Release Area, the total of B6 zoned land will reduce to 18.24ha on completion of the Marrangaroo URA.
B7 – Business Park	10.28	10.28	-	-	All the B7 land is in Lithgow around the Thales site

One of the key challenges for the growth of the use of available industrial and commercial land is ensuring that land is appropriately serviced by supporting infrastructure. Collocating industrial and commercial land in precincts reduces the potential for land use conflicts, reduced amenity issues, enables better use of shared infrastructure, and attracts investment.

Land use requirements

The following sectors have been investigated with respect to Lithgow's possible future economy. They fall into broad land use categories:

- Industrial zones
- Business / commercial zones
- Special uses and rural zones

[1] LEEP Industrial Lands Enquiry, LCC (2022)

Table 2 focusses on some likely future sectors for Lithgow and identifies the infrastructure and land use needs for each sector, the land use zones most appropriate for catering to the requirements of each sector, and high-level land use and planning recommendations to support each sector.

Table 2 Emerging sectors in Lithgow and relevant land use zones

Sector	Identified infrastructure and land use needs	Possible Land use zones	Planning and land use recommendations
Electricity, Gas, Water and Waste Services	Quite specific infrastructure and land use needs identified for each scenario, focused around maximising the repurposing of transmission lines, water supply (particularly Lake Lyell, Thompsons Creek Dam, and Lake Wallace) and land owned by EnergyAustralia (including Mt Piper and Lake Lyell surrounds), Greenspot (Wallerawang) and Centennial Coal. Road and rail transport connections are also critical enablers.	IN1, IN2, IN3, SP2, B6, B7, RU1	• The Council and State Government to work together with industry to provide business case, due diligence and planning support to industry for reuse of the existing, electricity generation and mining land, and infrastructure for new emerging industries (inc. Batteries, Pumped Hydro, Green Hydrogen production, Heavy industry, EfW) • Identify suitable locations for operation of emerging renewable energy and associated technologies, particularly where reuse and repurposing of existing infrastructure is available. Review the LEP (including most appropriate zones) for enabling renewables and look at the potential to identify suitable land in Council mapping.
Manufacturing	While Lithgow has a number of assets that would enable manufacturing, including good access to energy, water and transport routes, access to available and ready industrial land is an issue. Key challenges for the growth of the industrial and manufacturing sector come from the access to land that is appropriately zoned. Lithgow has three core areas where lands are zoned for industry and economic activity: 1. Lithgow East, Lithgow West and Marrangaroo. 2. Wallerawang is located to the north of the Lithgow and Marrangaroo economic areas. This area has some significant vacant land lots. 3. Portland lies to the north of the Lithgow and Wallerawang economic areas and has some significant vacant industrial zoned lands. While there is some significant land available for industrial and economic development there are still some barriers to realising the potential of these sites across all three areas. Emerging challenges for current owners and potential investors include the lack of awareness of what is available and where, and the enabling factors such as transport access and constraints such as due diligence for compliance with zoning and environmental considerations.	IN1, IN2, IN3, SP2, B6, B7, RU1	• Undertake precinct planning for manufacturing and industrial uses, including a Defence and Innovation Precinct plan and Clean Manufacturing Precinct plan. • Look at the potential to include available land for industrial development in Council mapping. • Develop the business case for improved road and rail infrastructure to support the manufacturing sector in developing a local comparative advantage and supply chain connectivity into the Central West, as well as into Sydney, and to export points of sea and air ports.
Healthcare and social assistance	Healthcare and social assistance is the largest employer in the Lithgow LGA. It is not expected that major new public health infrastructure will be a significant feature of future growth. . Any expansion of services or associated staff accommodation would require land rezoning and potential acquisition. In residential aged care, there are a number of current expansion plans in progress. Further expansion would require large tranches of land, with consideration for integration into greenfield development sites, including Marangaroo and Portland.	SP2	• Develop a Lithgow Health, Ageing and Innovation Precinct Masterplan including a supporting infrastructure plan to investigate, support and foster growth in the health and ageing sector. • Engage with hospital and health care services to further understand demand and potential land use requirements.
Tourism	Tourism can co-exist with a variety of land uses and include tourism activities, accommodation and transport.	Broad potential zoning: business, residential, rural,	• Develop the case and funding options for improved road and rail to boost tourism and liveability.

Sector	Identified infrastructure and land use needs	Possible Land use zones	Planning and land use recommendations
	Promoting Lithgow as a tourist destination must go hand in hand with investment to ensure adequate facilities and infrastructure. Some areas to focus include: • Improve and expand the extension of trails, signage, mapping, bike paths, parklands, and parking at access points. • Improve regional public services, such as water supply and Internet access in remote areas. • Increase the offering of 4-5 stars accommodation, targeting high-income and international tourists. • Upgrade roads to key attractions to ensure safe and efficient access to sites • Increase the range of transport options, extend Sydney Metro line to Lithgow • Guarantee suitable land use planning that avoids conflicts.	environmental living zones with consent	• Explore opportunities for promotion and enhancement of walking and cycling infrastructure both at a local and regional scale. • Consider the implementation of a tourism zone in the LEP. • Evaluate the feasibility of improved utility services across the region, such as improved water supplies and internet access. Such improvements enhance liveability and in so doing attract people to the region's city, towns and villages. • Incorporate tourism and recreation opportunities in master planning. • Explore how planning for township main streets incorporates tourism supporting uses such as dining and combined with street revitalisation initiatives. • Ensure the LEP and zones appropriately support a diverse accommodation offering across the LGA.
Public Administration	Subject to the type of public administration and safety offering, it may be possible to house the service in existing, but vacant or underutilised buildings, or store frontage on the main street. Information security will likely be critical. The State Office Block, opened in 2004, currently houses PoliceLink and the State Debt Recovery Centre. Lithgow's potential role as a future multi-modal transport hub would also support the mobility and engagement of workers between public administration hubs in the city, the region and in Sydney.	B2, B4, SP2	• Investigate opportunities to integrate Lithgow into government regional service planning to identify opportunities for service growth in the city. • Conduct an audit of available vacant and underutilised buildings in each local centre.

Planning and land use actions for LEEP

Council can take an active role in facilitating land use and infrastructure requirements to support the priority sectors. The recommended actions in Table 3 will support land use planning for Lithgow's possible economic futures.

The major actions for Lithgow for land use planning are to

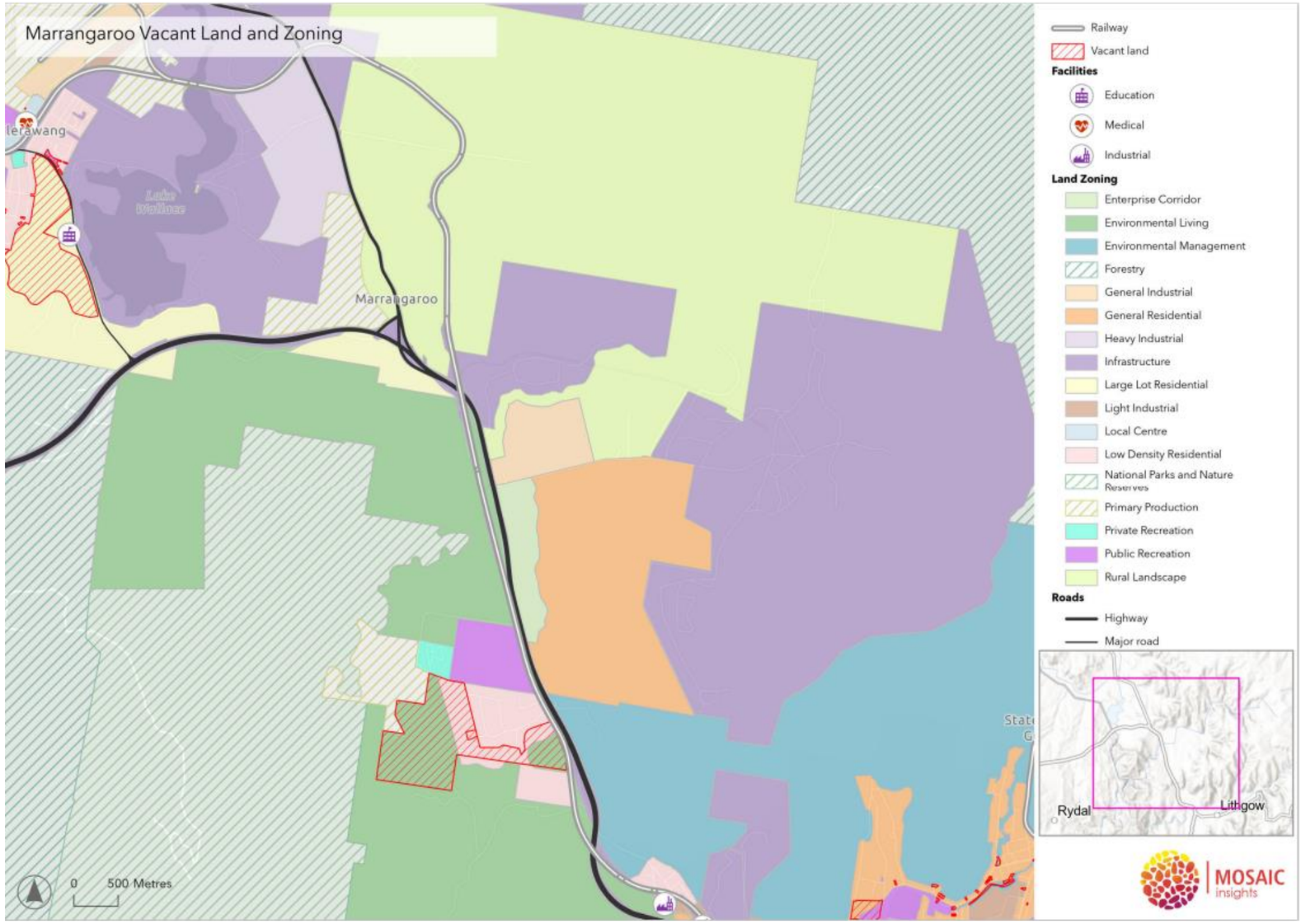
1. **Take a regional approach for local benefit** – work collaboratively with the NSW Government and understand housing and employment land needs at the regional scale and implement actions to support new communities and sectors in Lithgow and continue to engage with mining operations on site rehabilitation and reuse / repurposing
2. **Update the planning instruments** - to support diversification and the emerging sectors, protect residential areas, the environment and social health and wellbeing; and explore a precinct planning approach for emerging sectors / sites focussing on priority precincts that offer more immediate economic activity; look at supported staged release of employment lands
3. **Focus on Lithgow's local community and competitive advantages** - complete an audit of lands that are supported by infrastructure and vacant buildings in centres that are suitable for reuse and repurposing to support industry, renewable energy generation, commercial, healthy, public sector administration, and tourism operations; improve the serviceability of current industrial and employment lands; improve placemaking and engage the community in the change process; identify available sustainable water resources (stormwater waste water) for urban greening and placemaking in preparation for a changing climate and need for liveable resilient places

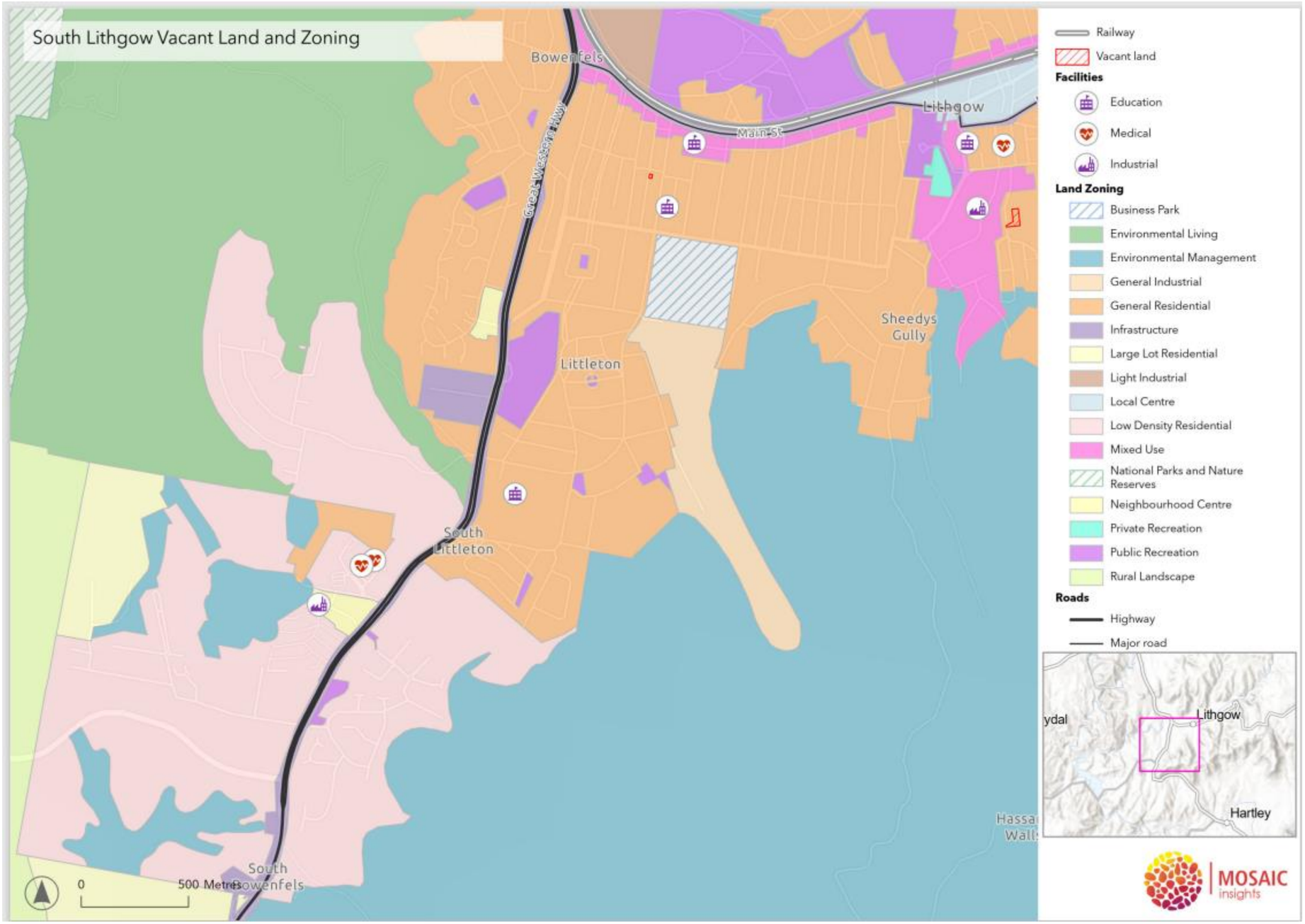
Table 3 Planning and land use actions for the next steps of the LEEP.

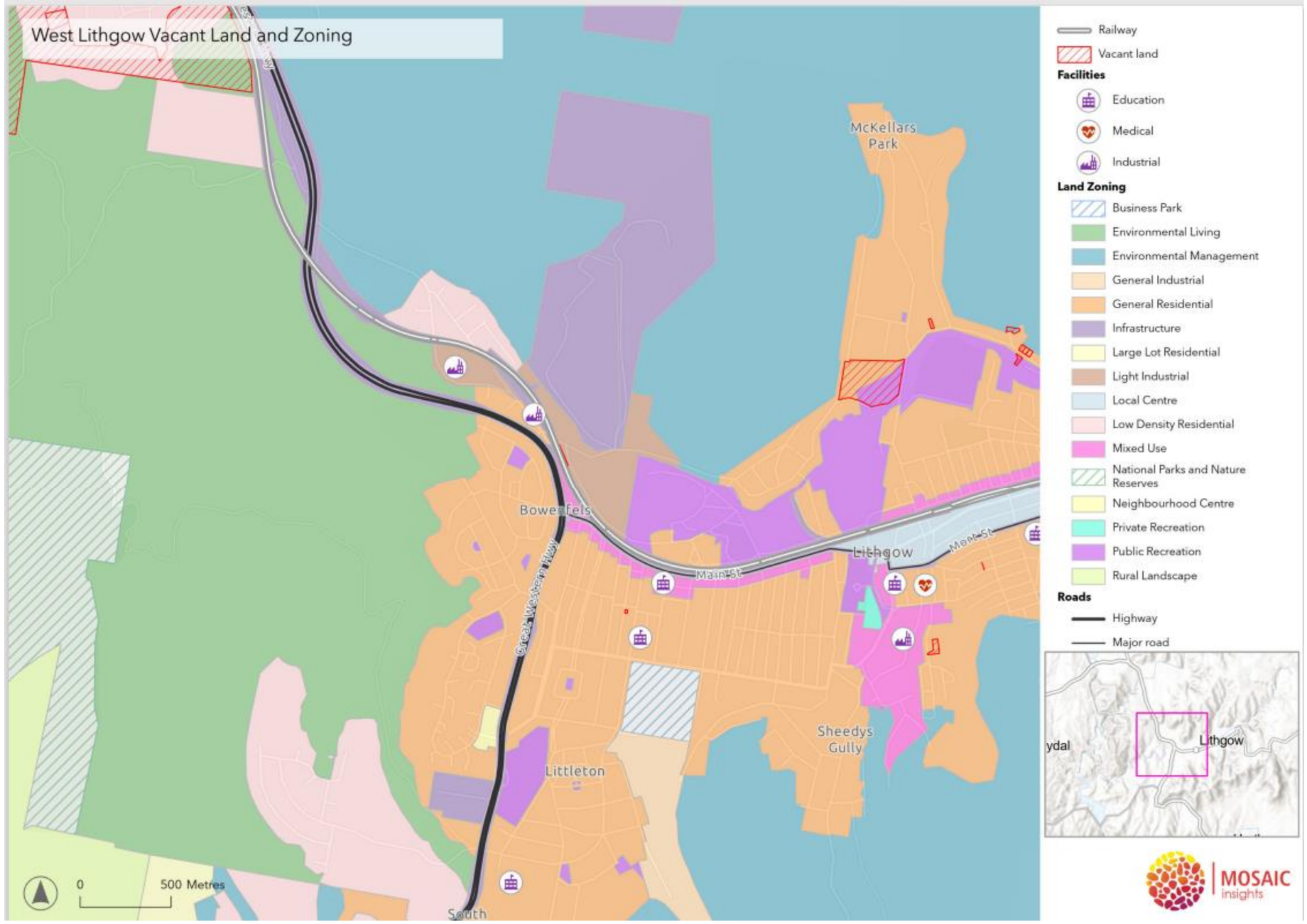
Action	Completion timeframe
1. Review existing employment land zonings and potential candidate sites to ensure suitability of supply having regard, amongst other things, to likely demand, serviceability, infrastructure re-use, co-location and supply chain value capture, environmental and community factors and constraints.	18 months
2. Review existing residential land zonings and potential candidate sites to ensure suitability of supply having regard, amongst other things, to likely demand, serviceability, environmental and community factors and constraints.	18 months
3. Review (or, where applicable, draft and adopt) Part 7 infrastructure contribution agreements or plans for proposed residential and employment land release areas identifying key infrastructure step issues and infrastructure barriers to development.	2 – 3 years
4. Develop and adopt an infrastructure staging and funding plan to support the actions of the Lithgow Floodplain Risk Management Strategy, facilitating greater urban residential densification.	12 months
5. Review planning instruments, particularly Council's development control plans, which seek to manage the impact of utility scale renewable energy projects.	18 months
6. Undertake precinct planning for the repurposing of the Region's redundant mining and coal-based energy land and built infrastructure to grow regional capabilities in renewable energy, circular economy processing and manufacturing.	2 – 3 years

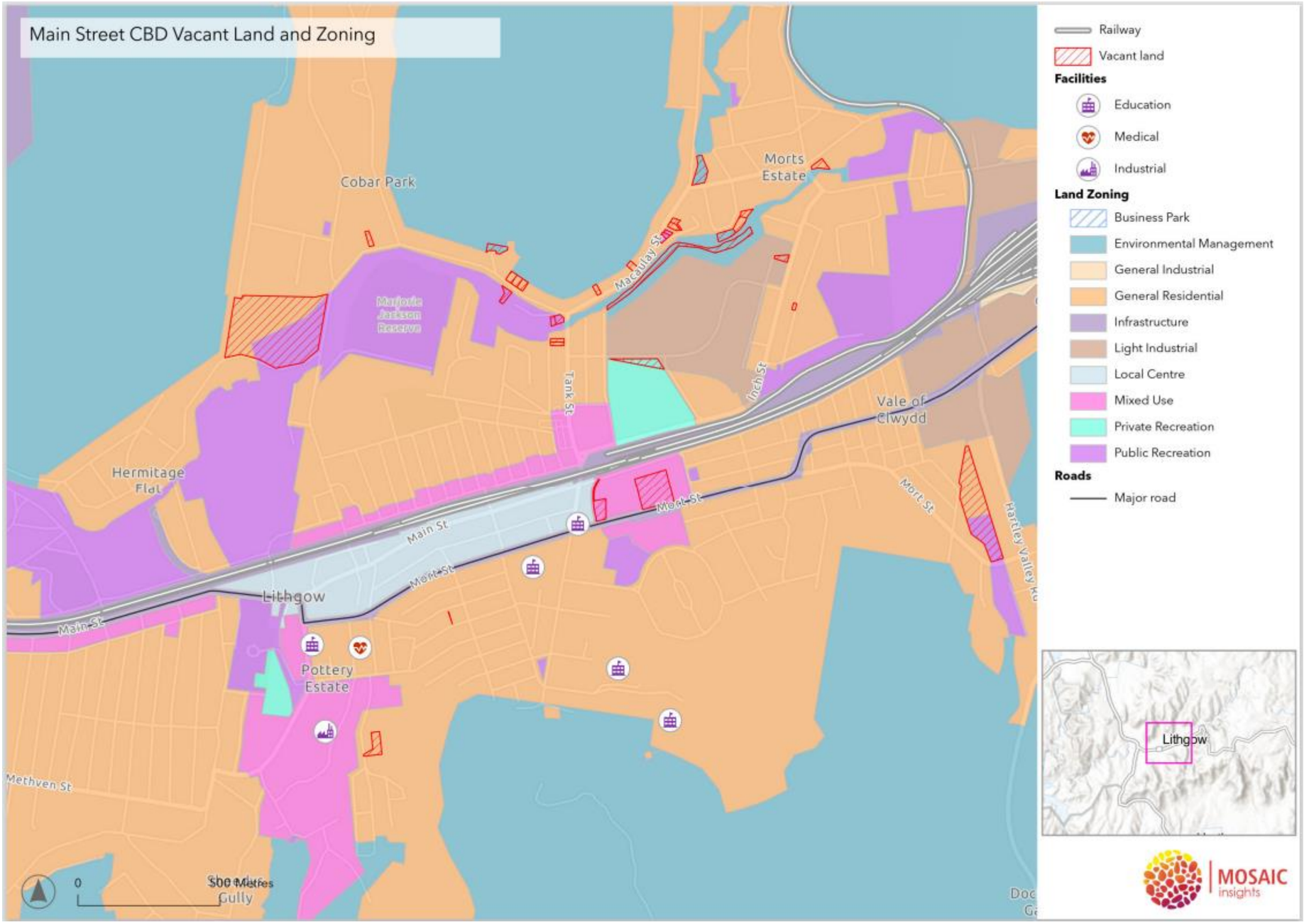
Attachment 1: Vacant land and land use maps

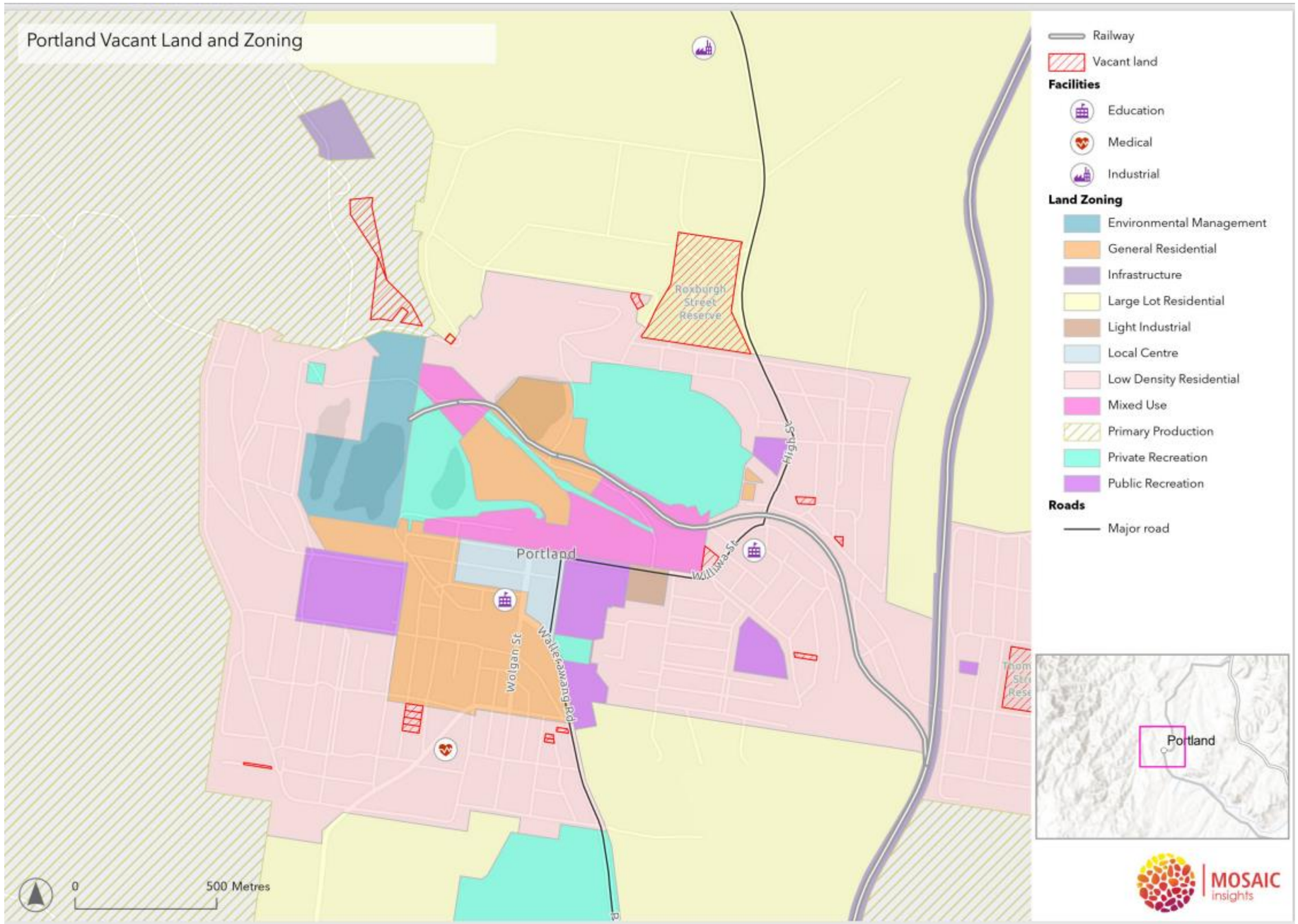
The following land use maps are provided as a reference. They identify the current zooming for each of the major employment land areas in Lithgow LGA as well as the vacant lands. These can form the basis of future precincts for more detailed planning and auditing.

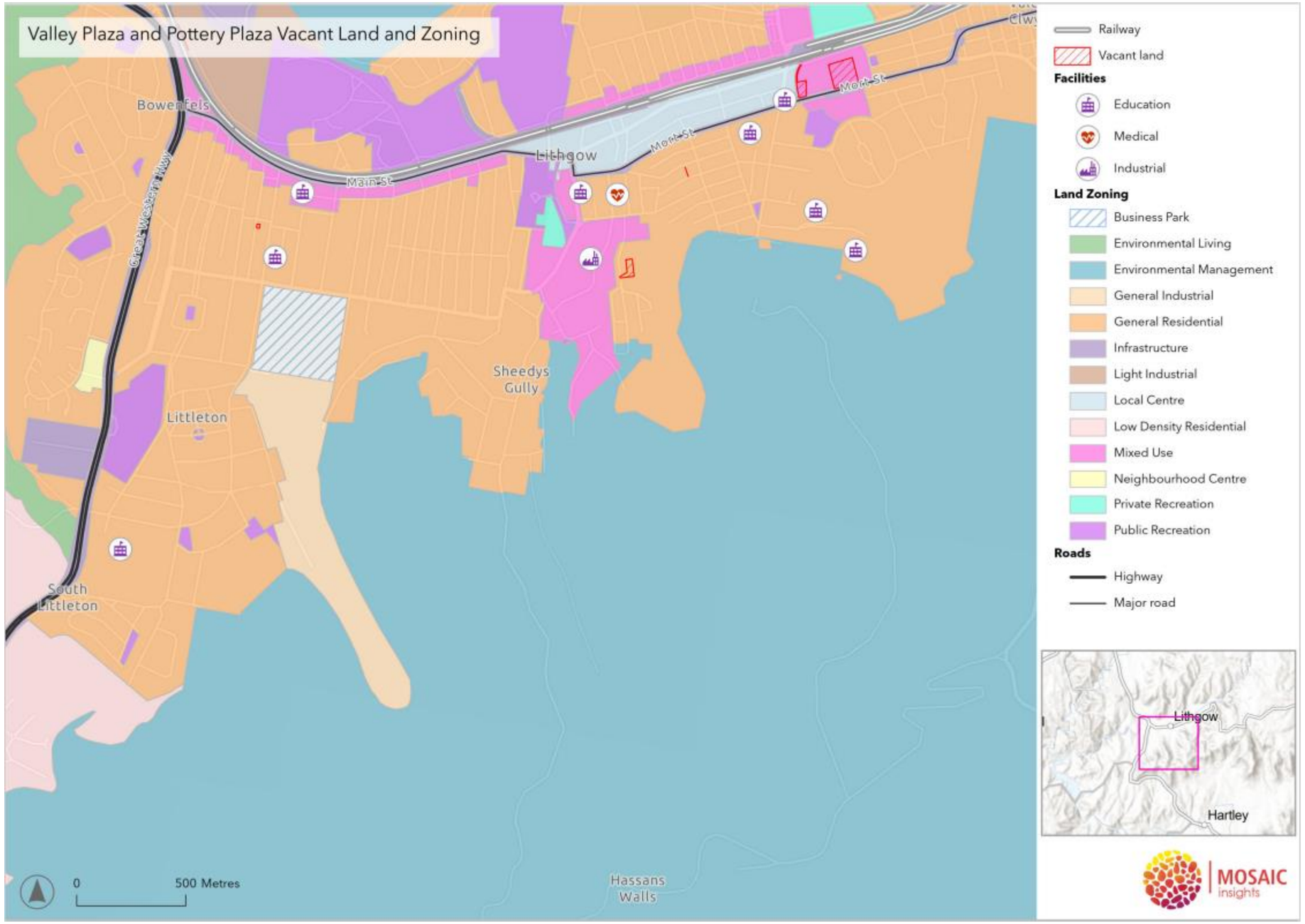


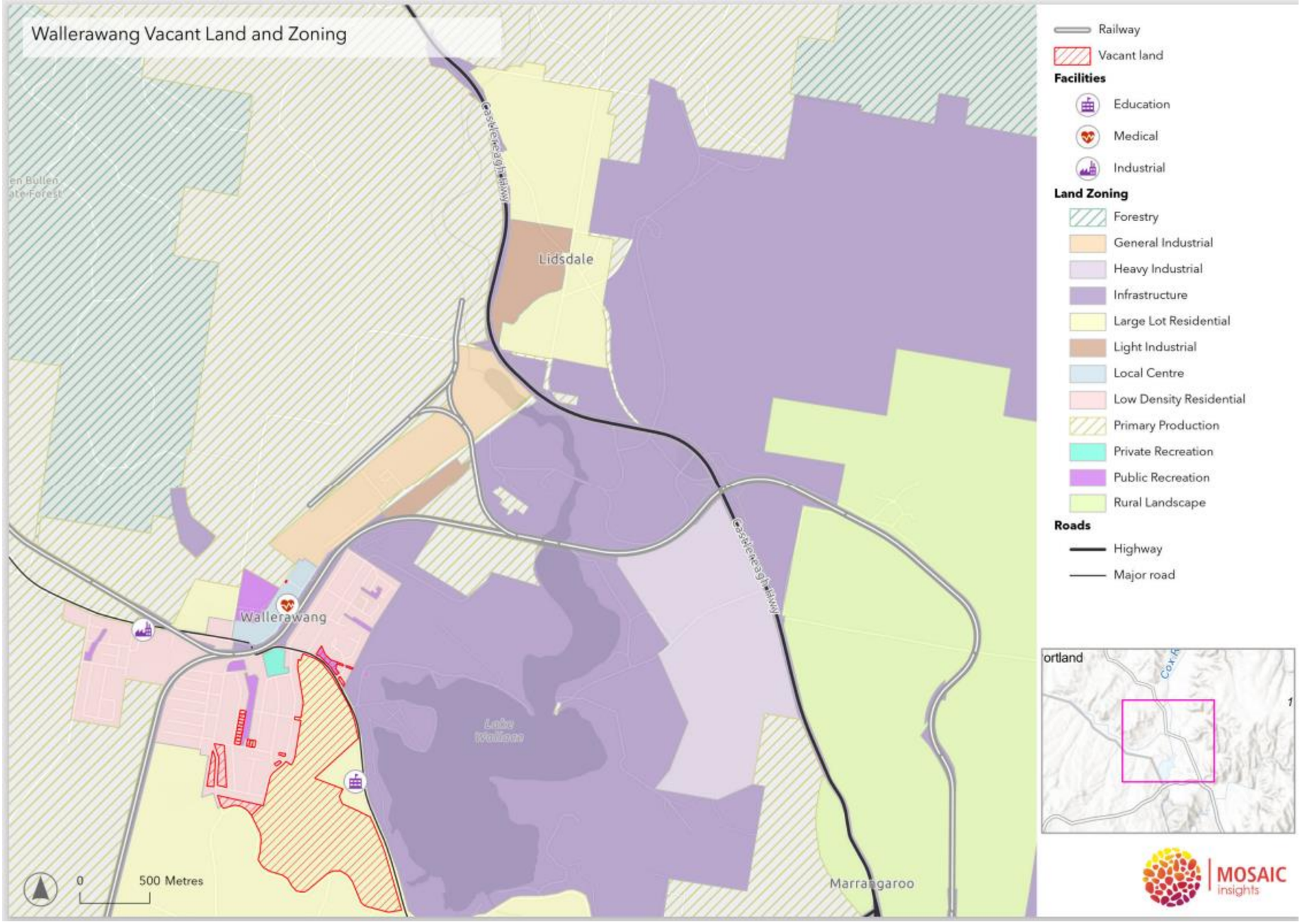

South Lithgow Vacant Land and Zoning
Bowenfels
Great Western Hwy
Main St
Lithgow
Sheedys Gully
Littleton
South Littleton
South Bowenfels
Hassa
Wall
0
500 Metres
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Business Park
Environmental Living
Environmental Management
General Industrial
General Residential
Infrastructure
Large Lot Residential
Light Industrial
Local Centre
Low Density Residential
Mixed Use
National Parks and Nature Reserves
Neighbourhood Centre
Private Recreation
Public Recreation
Rural Landscape
Roads
Highway
Major road
ydal
Lithgow
Hartley
MOSAIC insights

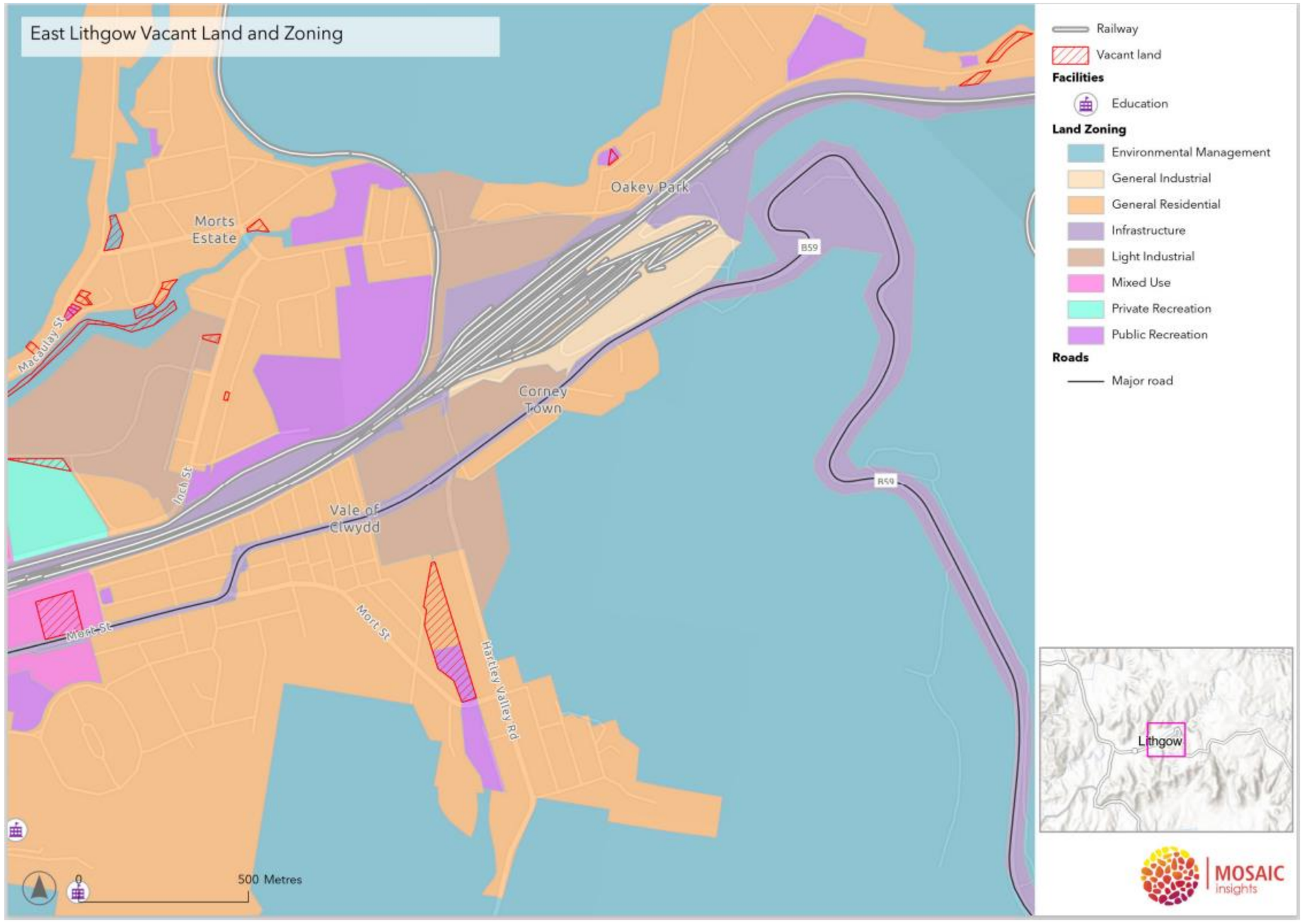

West Lithgow Vacant Land and Zoning
McKellars Park
Bowenfels
Lithgow
Main St
Littleton
Sheedys Gully
South
0
500 Metres
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Business Park
Environmental Living
Environmental Management
General Industrial
General Residential
Infrastructure
Large Lot Residential
Light Industrial
Local Centre
Low Density Residential
Mixed Use
National Parks and Nature Reserves
Neighbourhood Centre
Private Recreation
Public Recreation
Rural Landscape
Roads
Highway
Major road
ydal
Lithgow
MOSAIC insights


Main Street CBD Vacant Land and Zoning
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Business Park
Environmental Management
General Industrial
General Residential
Infrastructure
Light Industrial
Local Centre
Mixed Use
Private Recreation
Public Recreation
Roads
Major road
Cobar Park
Morts Estate
Macaulay St
Majestic Jackson Reserve
Tank St
Inch St
Vale of Clwydd
Hermitage Flat
Main St
Mort St
Hartley Valley Rd
Lithgow
Pottery Estate
Methven St
Gully
0
500 Metres
Lithgow
MOSAIC insights


Portland Vacant Land and Zoning
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Environmental Management
General Residential
Infrastructure
Large Lot Residential
Light Industrial
Local Centre
Low Density Residential
Mixed Use
Primary Production
Private Recreation
Public Recreation
Roads
Major road
Roxburgh Street Reserve
High St
Portland
William St
Wolgan St
Wallerawang Rd
0
500 Metres
Portland
MOSAIC insights


Valley Plaza and Pottery Plaza Vacant Land and Zoning
Bowenfels
Great Western Hwy
Main St
Lithgow
Main St
Sheedys Gully
Littleton
South Littleton
Hassans Walls
0
500 Metres
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Business Park
Environmental Living
Environmental Management
General Industrial
General Residential
Infrastructure
Light Industrial
Local Centre
Low Density Residential
Mixed Use
Neighbourhood Centre
Private Recreation
Public Recreation
Roads
Highway
Major road
Lithgow
Hartley
MOSAIC insights


Wallerawang Vacant Land and Zoning
Lidsdale
Wallerawang
Marrangaroo
0
500 Metres
Railway
Vacant land
Facilities
Education
Medical
Industrial
Land Zoning
Forestry
General Industrial
Heavy Industrial
Infrastructure
Large Lot Residential
Light Industrial
Local Centre
Low Density Residential
Primary Production
Private Recreation
Public Recreation
Rural Landscape
Roads
Highway
Major road
MOSAIC
insights


East Lithgow Vacant Land and Zoning
Railway
Vacant land
Facilities
Education
Land Zoning
Environmental Management
General Industrial
General Residential
Infrastructure
Light Industrial
Mixed Use
Private Recreation
Public Recreation
Roads
Major road
Oakey Park
Morts Estate
Macaulay St
Corney Town
B59
R59
Inch St
Vale of Clwydd
Mort St
Hartley Valley Rd
0
500 Metres
Lithgow
MOSAIC insights

Attachment 2: Commercial and industrial land totals

Commercial lands – total: 137.72ha	
B1	• Total: 4.22ha • Lithgow: 4.22ha • Wallerawang: - • Portland: -
B2	• Total: 28.59ha • Lithgow: 15.14ha • Wallerawang: 8.56ha • Portland: 4.88ha
B4	• Total: 53.39ha • Lithgow: 39.26ha • Wallerawang: - • Portland: 14.12ha
B6	• Total: 41.24ha • Lithgow: 41.24ha • Wallerawang: - • Portland: -
B7	• Total: 10.28ha • Lithgow: 10.28ha • Wallerawang: - • Portland: -

Industrial lands – total: 325.82ha	
IN1	• Total: 141.17HA • Lithgow: 90.11ha • Wallerawang: 51.01ha • Portland: -
IN2	• Total: 81.17ha • Lithgow: 54.87ha • Wallerawang: 25.1ha • Portland: 1.21ha
IN3	• Total: 103.48ha • Lithgow: - • Wallerawang: 103.48ha • Portland: -

Attachment 3: Land use zones – Commercial and Industrial

State Environment Planning Policy Amendment (Land Use Zones) 2022

It is noted that the current business and industrial zones are transitioning to new employment zones in line with the State Environment Planning Policy Amendment (Land Use Zones) 2022 which will come into force on 26 April 2023. The employment zones that correspond with the current business and industrial zones are outlined in the table below.

Current Business and Industrial Zones	Employment Zones
B1 Neighbourhood Centre B2 Local Centre	E1 Local Centre
B4 Mixed Use	MU1 Mixed Use
B6 Enterprise Corridor B7 Business Park	E3 Productivity Support
IN1 General Industrial IN2 Light Industrial	E4 General Industrial
IN3 Heavy Industrial	E5 Heavy Industrial

Land use zones	Context from DCP	(1) Objectives of zone	(2) Permitted without consent	(3) Permitted with consent	Prohibited
IN1 General Industrial	This zone seeks to provide the greatest flexibility for a range of industrial uses and impacts. There are currently Zone IN1 areas to the north of Marrangaroo (North), Lidsdale/ Wallerawang, and Littleton and Corney Town (Lithgow). Generally, these areas have some buffers from sensitive uses so they can operate will less restrictions than Zone IN2.	• To provide a wide range of industrial and warehouse land uses. • To encourage employment opportunities. • To minimise any adverse effect of industry on other land uses. • To support and protect industrial land for industrial uses. • To maintain or improve the water quality of receiving water catchments.	Roads	Biosolids treatment facilities; Boat building and repair facilities; Car parks; Community facilities; Crematoria; Depots; Environmental protection works; Flood mitigation works; Freight transport facilities; Garden centres; General industries; Hardware and building supplies; Helipads; Highway service centres; Industrial retail outlets; Industrial training facilities; Landscaping material supplies; Light industries; Mortuaries; Neighbourhood shops; Oyster aquaculture; Passenger transport facilities; Places of public worship; Recreation areas; Research stations; Rural supplies; Rural industries; Service stations; Storage premises; Take away food and drink premises; Tank-based aquaculture; Timber yards; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Vehicle sales or hire premises; Veterinary hospitals; Warehouse or distribution centres; Water supply systems; Wholesale supplies	Pond-based aquaculture; Any other development not specified in item 2 or 3
IN2 Light Industrial	This zone seeks to provide land for a wide range of light industrial, warehouse and related uses that generally have a lower impact that is expected to be managed within each Site or industrial precinct so this zone can integrate into urban areas.	• To provide a wide range of light industrial, warehouse and related land uses. • To encourage employment opportunities and to support the viability of centres. • To minimise any adverse effect of industry on other land uses. • To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.	Roads	Boat building and repair facilities; Car parks; Community facilities; Depots; Environmental protection works; Flood mitigation works; Freight transport facilities; Funeral homes; Garden centres; Hardware and building supplies; Industrial retail outlets; Industrial training facilities; Landscaping material supplies; Light industries; Mortuaries; Neighbourhood shops; Oyster aquaculture; Passenger transport facilities; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (indoor); Research stations; Rural supplies; Service stations; Signage; Storage premises; Take away food and drink premises; Tank-based aquaculture; Timber yards; Transport	Pond-based aquaculture; Any other development not specified in item 2 or 3

Land use zones	Context from DCP	(1) Objectives of zone	(2) Permitted without consent	(3) Permitted with consent	Prohibited
		• To support and protect industrial land for industrial uses. • To maintain or improve the water quality of receiving water catchments.		depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Vehicle sales or hire premises; Veterinary hospitals; Warehouse or distribution centres; Water recycling facilities; Water reticulation systems; Wholesale supplies	
IN3 Heavy Industrial	This is a zone for the highest impact industrial uses. There is only one (1) zoned area near Lidsdale/Wallerawang. It is well separated from other urban/ sensitive land uses.		Roads	Car parks; Depots; Environmental protection works; Flood mitigation works; Freight transport facilities; General industries; Hardware and building supplies; Hazardous storage establishments; Heavy industrial storage establishments; Heavy industries; Helipads; Industrial training facilities; Kiosks; Landscaping material supplies; Offensive storage establishments; Oyster aquaculture; Research stations; Rural supplies; Signage; Take away food and drink premises; Tank-based aquaculture; Transport depots; Truck depots; Warehouse or distribution centres; Water reticulation systems; Water storage facilities	Pond-based aquaculture; Any other development not specified in item 2 or 3
SP2 Infrastructure	This zone has specific uses nominated for each Zone SP2 area that may include electricity generating works, defense, waste or resource management facility, rail infrastructure facility etc. Development is limited to the permitted use and any ancillary activities. Some of these are 'industrial' in their nature but are likely to be addressed under SEPP (Infrastructure) 2008.	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure. • To maintain or improve the water quality of receiving water catchments.	Nil	Aquaculture; Recreation areas; Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose	Any development not specified in item 2 or 3
B2 Local Centre	This zone applies to the 'Central Business District' (CBD) of Lithgow, Portland and Wallerawang. These areas are the focus for compact and walkable retail, office and business areas and supporting services. It is important to ensure other business zoned areas do not impact significantly on the viability of the town centre, particularly retail services. These areas often have historic/heritage character and subdivision patterns that is considered as part of any development and may limit larger floor-plate proposals	• To provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area. • To encourage employment opportunities in accessible locations. • To maximise public transport patronage and encourage walking and cycling. • To maintain the built integrity of the area by enabling development that is sympathetic to the heritage character and significance of the area and surrounding streetscapes and features. • To maintain or improve the water quality of receiving water catchments	Roads	Boarding houses; Centre-based child care facilities; Commercial premises; Community facilities; Educational establishments; Entertainment facilities; Function centres; Information and education facilities; Medical centres; Oyster aquaculture; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Residential flat buildings; Respite day care centres; Restricted premises; Service stations; Shop top housing; Tank-based aquaculture; Tourist and visitor accommodation; Water recycling facilities; Water reticulation systems; Any other development not specified in item 2 or 4	Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Places of public worship; Pond-based aquaculture Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Research stations; Residential accommodation; Resource recovery facilities; Rural industries; Sewage treatment plants; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Warehouse or distribution centres; Waste disposal facilities; Water recreation structures; Water storage facilities; Water treatment facilities; Wharf or boating facilities; Wholesale supplies

Land use zones	Context from DCP	(1) Objectives of zone	(2) Permitted without consent	(3) Permitted with consent	Prohibited
B4 Mixed Use	This zone is generally used for mixed-use precincts outside the CBD or in 'satellite' large format retail areas that are intended to supplement key town centres (e.g., Portland/ Lithgow - Main St (west) & Lithgow Valley & Pottery Plaza retail developments). Council encourages future development of these areas for larger-format/footprint retail and commercial uses that do not undermine the Zone B2 CBD or main street area(s) and would not otherwise fit within historic town centre areas as well as a mix of appropriate well-designed medium density residential development.	• To provide a mixture of compatible land uses. • To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling. • To promote development that does not detract from the role of the town centre core commercial precincts. • To promote the retention and reuse of heritage items as well as the retention of established buildings that contribute positively to the heritage and cultural values of lands at Portland. • To maintain or improve the water quality of receiving water catchments.	Roads	Boarding houses; Centre-based child care facilities; Commercial premises; Community facilities; Educational establishments; Entertainment facilities; Function centres; Hotel or motel accommodation; Information and education facilities; Medical centres; Oyster aquaculture; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Respite day care centres; Restricted premises; Seniors housing; Shop top housing; Tank-based aquaculture; Water recycling facilities; Water reticulation systems; Any other development not specified in item 2 or 4	Advertising structures; Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Crematoria; Depots; Dual occupancies; Dwelling houses; Eco-tourist facilities; Electricity generating works; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Farm stay accommodation; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Highway service centres; Hostels; Industrial retail outlets; Industrial training facilities; Jetties; Marinas; Mooring pens; Moorings; Multi dwelling housing; Open cut mining; Pond-based aquaculture Recreation facilities (major); Recreation facilities (outdoor); Resource recovery facilities; Rural industries; Rural workers' dwellings; Secondary dwellings; Sewage treatment plants; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Waste disposal facilities; Water recreation structures; Water storage facilities; Water treatment facilities; Wharf or boating facilities
B1 Neighbourhood Centre	This zone is generally used in Lithgow for retail, community & highway services along the Great Western Highway. These areas service the local needs of the surrounding residential areas and provide highway related services at a scale that would not significantly impact on town centre retail areas.	• To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood. • To ensure development within the area is of a scale consistent with the needs of the local community and will not detract from the role of the Lithgow core business areas as the primary centre. • To maintain or improve the water quality of receiving water catchments.	Roads	Boarding houses; Business premises; Centre-based child care facilities; Community facilities; Environmental protection works; Flood mitigation works; Hotel or motel accommodation; Medical centres; Neighbourhood shops; Neighbourhood supermarkets; Office premises; Oyster aquaculture; Places of public worship; Public administration buildings; Recreation facilities (indoor); Respite day care centres; Restaurants or cafes; Shop top housing; Signage; Take away food and drink premises; Tank-based aquaculture; Water recycling facilities; Water reticulation systems	Pond-based aquaculture; Any other development not specified in item 2 or 3
B6 Enterprise Corridor	This zone is generally used for business development along the eastern side of the Great Western Highway in Marrangaroo, though this area is transitioning as a new urban release area. Zone B7 Business Park is used in Lithgow for the historic industrial area including the Lithgow Arms Factory and other businesses along Martini Parade to Methven St. The aim is to encourage a range of light industrial, larger footprint buildings that do not compete with town centres and adaptively re-uses heritage items and buildings.	• To promote businesses along main roads and to encourage a mix of compatible uses. • To provide a range of employment uses (including business, office, retail and light industrial uses). • To maintain the economic strength of centres by limiting retailing activity. • To maintain or improve the water quality of receiving water catchments.	Roads	Building identification signs; Business identification signs; Business premises; Car parks; Community facilities; Environmental protection works; Flood mitigation works; Garden centres; Hardware and building supplies; Highway service centres; Hotel or motel accommodation; Industrial retail outlets; Information and education facilities; Landscaping material supplies; Light industries; Neighbourhood shops; Office premises; Oyster aquaculture; Passenger transport facilities; Plant nurseries; Recreation facilities (indoor); Research stations; Restaurants or cafes; Service stations; Sewage treatment plants; Specialised retail premises; Take away food and drink premises; Tank-based aquaculture; Vehicle sales or hire premises; Warehouse or distribution centres; Waste or resource transfer stations; Water recycling facilities; Water reticulation systems; Water treatment facilities; Wholesale supplies	

Land use zones	Context from DCP	(1) Objectives of zone	(2) Permitted without consent	(3) Permitted with consent	Prohibited
B7 Business Park	This zone is used in Lithgow for the historic industrial area including the Lithgow Arms Factory and other businesses along Martini Parade to Methven St. The aim is to encourage a range of light industrial, larger footprint buildings that do not compete with town centres and adaptively re-uses heritage items and buildings.	• To provide a range of office and light industrial uses. • To encourage employment opportunities. • To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area. • To promote the retention and re-use of heritage items as well as the retention of established buildings that contribute positively to heritage and cultural values. • To enable development that is compatible with the surrounding residential land use and that does not detract from the role of the Lithgow core business areas. • To maintain or improve the water quality of receiving water catchments.	Roads	Backpackers' accommodation; Car parks; Centre-based child care facilities; Community facilities; Environmental protection works; Flood mitigation works; Function centres; Garden centres; Hardware and building supplies; Hotel or motel accommodation; Information and education facilities; Light industries; Neighbourhood shops; Office premises; Oyster aquaculture; Passenger transport facilities; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Research stations; Respite day care centres; Restaurants or cafes; Serviced apartments; Signage; Take away food and drink premises; Tank-based aquaculture; Warehouse or distribution centres; Water recycling facilities; Water reticulation systems; Wholesale supplies	Pond-based aquaculture; Any other development not specified in item 2 or 3
RU1 Primary Production		• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To encourage diversity in primary industry enterprises and systems appropriate for the area. • To minimise the fragmentation and alienation of resource lands. • To minimise conflict between land uses within this zone and land uses within adjoining zones. • To minimise the environmental and visual impact of development on the rural landscape. • To provide for recreational and tourist development and activities of an appropriate type and scale that do not detract from the economic resource, environmental or conservation value of the land. • To maintain or improve the water quality of receiving water catchments.	Extensive agriculture; Home occupations; Roads	Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat building and repair facilities; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Charter and tourism boating facilities; Community facilities; Crematoria; Dual occupancies; Dwelling houses; Eco-tourist facilities; Educational establishments; Environmental facilities; Environmental protection works; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home-based child care; Home businesses; Home industries; Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping material supplies; Markets; Open cut mining; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Secondary dwellings; Service stations; Transport depots; Truck depots; Veterinary hospitals; Water recreation structures; Water supply systems	Any development not specified in item 2 or 3

Attachment 4: Conditions of consent for renewables

Mining affected land can be rehabilitated to a variety of land uses including cropping and agriculture, native ecosystems, forestry, industry, heritage sites, residential developments and mixed land uses.[2]

Solar farm

The EP&A Act and relevant environmental planning instruments (EPIs), including local environmental plans (LEPs) and state environmental planning policies (SEPPs), determine where large-scale solar energy development is permitted.

In general, large-scale solar energy development is permissible with consent on any land zoned for rural (RU1, RU2, RU3, RU4), industrial (IN1, IN2, IN3, IN4), or special purpose (SP1, SP2) uses in the relevant LEP.

Where large-scale solar energy development is permitted with consent, the applicant can lodge a DA for determination by the relevant consent authority if it has the consent of the owner of the land.

A solar energy project is SSD1 if it requires development consent and has:

- a capital investment value of more than $30 million, or
- a capital investment value of more than $10 million and is in an environmentally sensitive area of state significance.[3]

For large-scale solar energy development to be approved near certain regional cities, the consent authority will need to be satisfied that any urban land conflicts, impacts on urban growth potential and important scenic values are not significant.

There are many technical and commercial factors that need to be considered when selecting a site for large-scale solar energy development.

These include:

- proximity to the existing transmission infrastructure
- available connection capacity level of solar radiation
- distance to major towns, cities or other major energy users
- proximity to major roads and transport infrastructure
- size and shape of land parcels
- development restrictions including land use zoning and proximity to regional cities.

These considerations limit the areas that are suitable for large-scale solar development. Applicants must also consider other environmental issues and land use conflicts when selecting a site, such as the agricultural productivity of the land, visibility and topography of the site and biodiversity values. Variations in topography can reduce the usability of land and minimise the efficiency of energy production (by increasing the potential for panels to overshadow each other). Higher gradients will

[2] https://www.resourcesregulator.nsw.gov.au/rehabilitation/compliance/new-standard-rehabilitation-conditions-on-mining-leases
[3] https://shared-drupal-s3fs.s3.ap-southeast-2.amazonaws.com/master-test/fapub_pdf/Lisa+Drupal+Documents/16007_DPIE+Large+Scale+Solar+Energy+Guidelines_26-9-22.pdf

also increase construction costs, create access challenges and increase the potential for erosion and sedimentation unless substantial controls are implemented.

Pumped hydro

There are no set of regulations or conditions for consent for pumped hydro developments in NSW. Although, *NSW Pumped Hydro Roadmap* sets out few conditions were set to ensure the identified reservoir pairs would be suitable for large transmission-scale pumped hydro developments.[4]

The minimum requirements were:

- A minimum head between the upper and lower reservoirs of 300m
- A maximum slope 1:15 (height-to-penstock ratio)
- A minimum reservoir size of 1GL
- Exclusion of Biophysical Strategic / Agricultural Land
- Exclusion of National Parks
- Exclusion of World Heritage Sites
- Exclusion of reservoirs within 50m of rail infrastructure, motorways and primary roads, and residential areas
- Exclusion of reservoirs which overlay with Named Waterbodies

Intensive agriculture

The Standard Instrument LEP provides considerable flexibility by allowing councils to:

- identify if development consent is required for various forms of intensive plant agriculture and in what zone
- specify different minimum lot sizes (for a dwelling) in specific locations and/or zones
- to zone land suitable for smaller scale intensive plant agriculture as a Rural Small Holdings Zone (RU4).

Some forms of intensive plant agriculture may require development consent, depending on the Local Environmental Plan or the land use zone, for example:

- Broadacre irrigated crops such as cotton or lucerne are also usually considered to be extensive agriculture and do not require consent. However, a LEP may prescribe that irrigated agriculture, or developments that involve aerial spraying may require consent.
- Horticulture or viticulture might require consent in an Environmental zone, but not in a rural zone. All forms of intensive agriculture may be prohibited in a Rural Residential zone.[5]

[4] https://www.energy.nsw.gov.au/sites/default/files/2022-08/NSW%20Pumped%20Hydro%20Roadmap.pdf
[5] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/422982/Preparing-intensive-plant-agriculture-development-applications.pdf