ACIL ALLEN

April 2024

Report to Port Hedland Industries Council

The Economic Significance of Port of Port Hedland

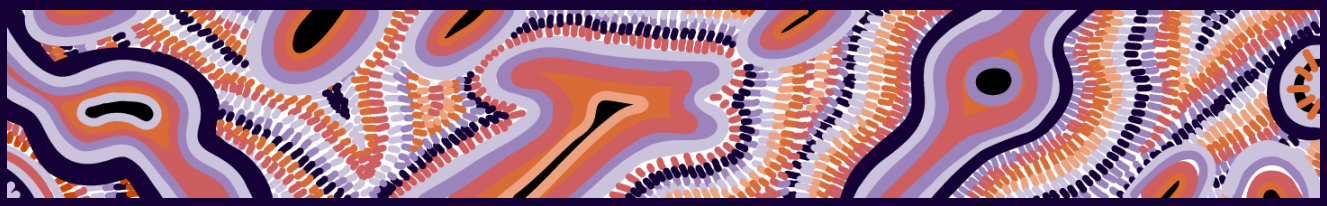
About ACIL Allen

ACIL Allen is a leading independent economics, policy and strategy advisory firm, dedicated to helping clients solve complex issues.

Our purpose is to help clients make informed decisions about complex economic and public policy issues.

Our vision is to be Australia's most trusted economics, policy and strategy advisory firm. We are committed and passionate about providing rigorous independent advice that contributes to a better world.

ACIL Allen acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land and its waters. We pay our respects to Elders, past and present, and to the youth, for the future. We extend this to all Aboriginal and Torres Strait Islander peoples reading this report.



Goomup, by Jarni McGuire

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Source: BHP

Report Overview and Context

Introduction

ACIL Allen was commissioned by the Port Hedland Industries Council (PHIC) to undertake an assessment of the economic significance of the Port of Port Hedland. This is the third report commissioned by PHIC to ACIL Allen on the economic significance of the Port of Port Hedland, following previous reports commissioned in 2017 and 2020.

Trade through the Port has continued to expand since the completion of the 2020 study, which has led to calls to further expand the capacity of the Port in order to facilitate exports of high value commodities such as lithium, and to facilitate the importation of machinery and equipment to support the significant renewable energy projects that are being planned in the region. It has also resulted in Pilbara Ports progressing plans to develop a general cargo facility and logistics hub at Lumsden Point, with funding commitments recently provided by the Commonwealth and Western Australian Governments to progress this development.

In order to estimate the economic significance of the Port of Port Hedland, ACIL Allen adopted a similar methodology as was used for the 2020 study and collected up-to-date data from a broader range of companies.

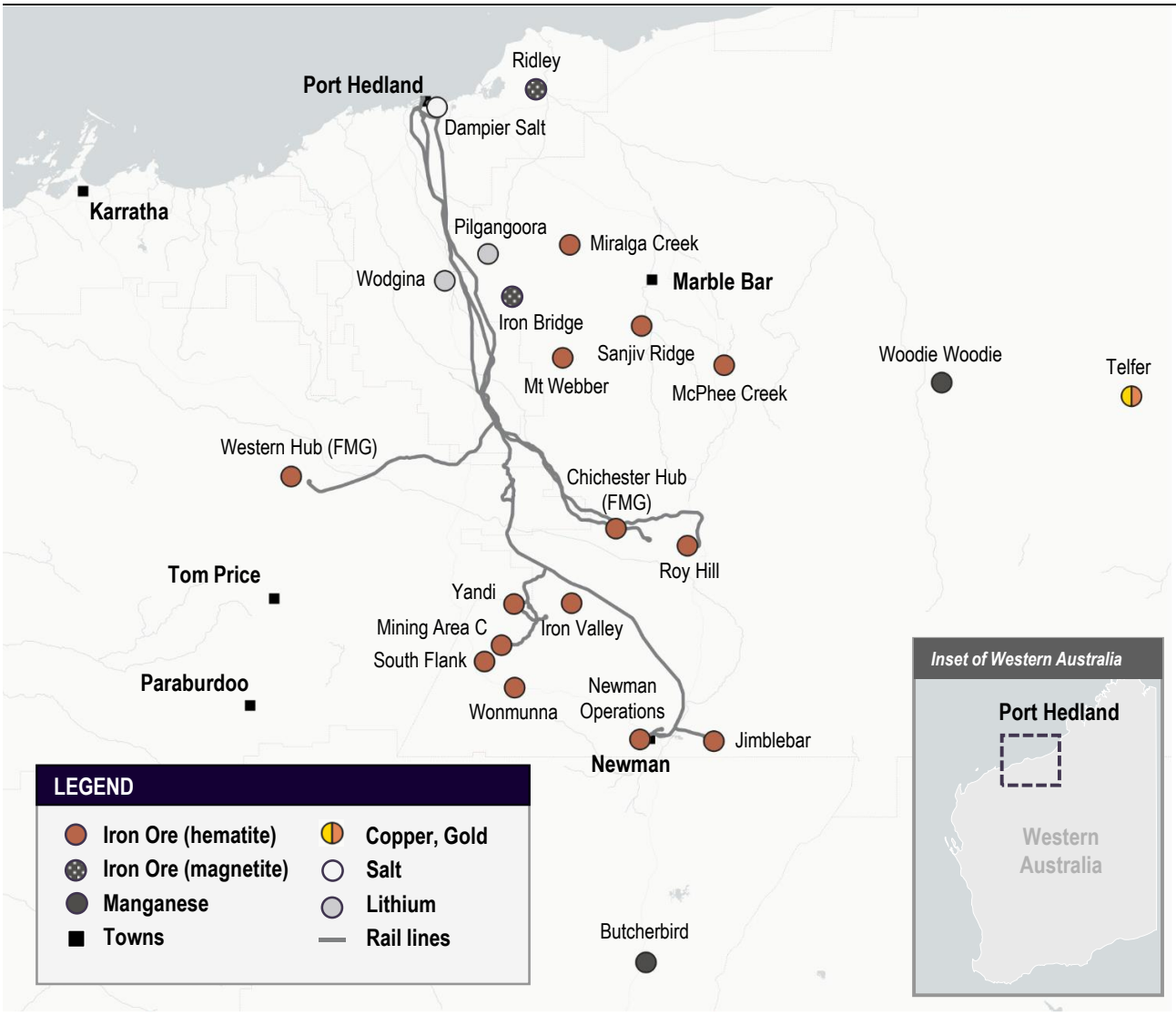
Using ACIL Allen's Input-Output models of the Town of Port Hedland, the Pilbara Region, Western Australia, and Australia, the economic contribution of the Port Hedland Port Supply Chain in 2022-23 was determined in each region on the basis of its contribution to output (Gross Domestic Product, Gross State Product, Gross Regional Product), income (wages and salaries earned), employment (Full Time Equivalent (FTE) basis) and taxation and royalty payments.

In order to develop projections for future economic activity through the Port, ACIL Allen has used forward guidance from participating companies to estimate the economic impact of the Port Hedland Port Supply Chain over the ten-year period between 2023-24 and 2032-33 using ACIL Allen's in-house computable general equilibrium *Tasman Global*. For the purposes of this study, the Port Hedland Port Supply Chain consists of the economic activity generated by ten companies, and Pilbara Ports which operates as a Government Trading Enterprise.

As part of the future assessment, ACIL Allen has also modelled the economic impact of the Lumsden Point General Cargo Facility, which is a new multi-user marine infrastructure development within the Port of Port Hedland which will catalyse and support a diverse range of projects across the Pilbara region. This has been presented as a separate scenario in this report.

A visual representation of all the mining operations and supporting major infrastructure links that make up the Port Hedland Port Supply Chain are presented below in **Figure ES 1**.

Figure ES 1 Port Hedland Port Supply Chain



Source: ACIL Allen

Methodology

ACIL Allen has undertaken an economic contribution assessment for the 2022-23 financial year and economic impact assessment for the subsequent ten-year period from 2023-24 to 2032-33 based on the financial results of the most recent financial year and forward guidance provided by companies participating in the study.

The aggregation of the data inputs collected by ACIL Allen enables the development of a forward outlook for financial and economic indicators relating to the Port Hedland Port Supply Chain, including the projected value of production, operating expenditure, capital expenditure and operational employment for the period through to 2032-33.

ACIL Allen has estimated that the total value of production for the Port Hedland Port Supply Chain in 2022-23 was approximately $87.1 billion (**Figure ES 2**). The value of production is projected to increase marginally to reach a peak of $89.2 billion in 2023-24, before steadily declining to reach approximately $64.2 billion in 2027-28. The projected value of production stabilises at this level over the remainder of the modelling period. The decline in the projected value of production from

the peak recorded at the beginning of the modelling period is mostly due to conservative unit price assumptions for both iron ore and lithium (spodumene concentrate) compared to current levels.

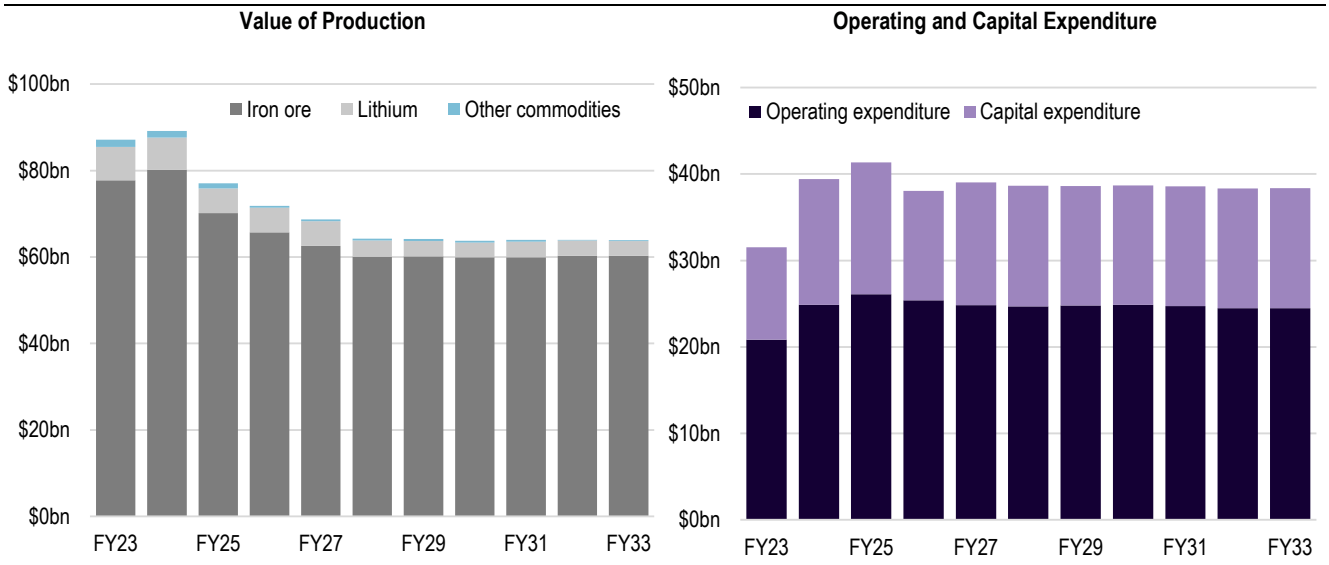
The conservative unit price assumptions for iron ore provided by companies in their forward guidance are comparable to the iron ore price assumptions adopted by Treasury in the WA State Budget whereby the iron price is typically set at levels within the range of $US60-70 per tonne over the outyears.

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that total iron ore production is forecast to steadily increase over the first half of the modelling period from approximately 544.8Mt in 2022-23 to approximately 589.4Mt in 2027-28, before stabilising at this level over the second half of the modelling period.

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that projected annual operating expenditure is anticipated to increase from approximately $20.8 billion in 2022-23 to a peak of approximately $26.1 billion in 2024-25, before steadily declining to approximately $24.5 billion by the end of modelling period.

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that projected annual capital expenditure is anticipated to increase from approximately $10.7 billion in 2022-23 to a peak of approximately $15.3 billion in 2024-25. Over the remainder of the modelling period, annual capital expenditure is expected to average approximately $13.8 billion. Forward guidance on capital expenditure includes both sustaining capital expenditure towards existing operations, and growth capital expenditure which is associate with the development of new operations.

Figure ES 2 Port Hedland Port Supply Chain – Financial and Operations Outlook



Source: ACIL Allen

Regional Context

Port Hedland is going through a period of transition driven by the shift of the main residential community from the historic town centre in the West End to South Hedland. While this transition has gradually been taking place for almost a decade, it has been expedited in more recent times by the State Government's voluntary buyback program (Hedland Maritime Initiative). As of October 2023, the Hedland Maritime Initiative had acquired 60% of homes located in the West End. The

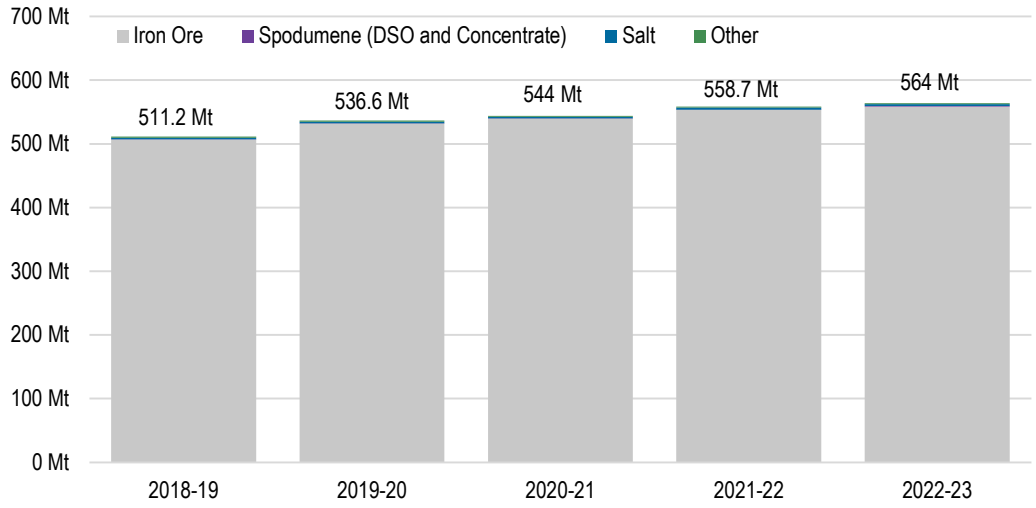
shift of the residential population away from the West End is anticipated to result in the area becoming more of a focal point for tourism, retail, heritage and cultural activities.

The population of the Town of Port Hedland increased by 6.7% between 2012-13 and 2021-22, which made it the only LGA within the Pilbara region to record an increase in population over this period. A growing proportion of the population is associated with age bands which have the highest demand for social infrastructure. This trend, in conjunction with limited growth in the size of the local labour force and low availability of affordable rental housing, is placing strain on the delivery of core services and heightening the need for investment in social infrastructure to support the attraction and retention of residents in Port Hedland.

The Port of Port Hedland is the largest bulk export port in the world, and supports the trade activities of a number of the largest and most prominent resource companies in the world. In more recent times, the port has supported the trade activities of a number of emerging resource companies of global significance in battery and critical minerals.

Between 2018-19 and 2022-23, total export volumes from the Port of Port Hedland increased by 10.3%, with iron ore exports from the Port also increasing by 10.3% over the same period (**Figure ES 3**). The greatest recent shift in the composition of export trade from the Port of Port Hedland can attributed to the lithium market, with export volumes for spodumene increasing by 265% between 2019-20 and 2022-23.

Figure ES 3 Port of Port Hedland – Total Export Trade Volumes

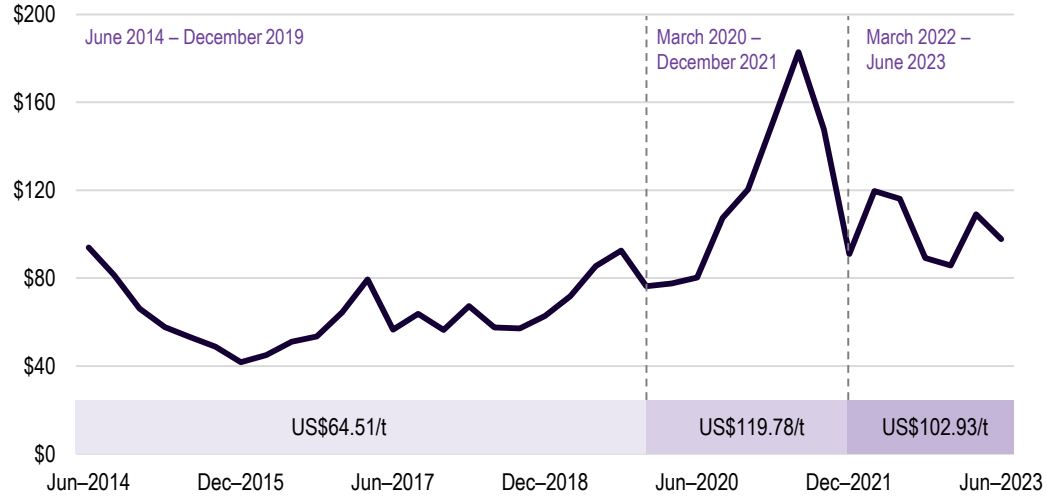


Note: Other includes copper concentrates, manganese ore, primary produce, chemical compound, containers and general products.
Source: Pilbara Ports

China is the largest destination market for iron ore exports from the Port of Port Hedland, at a share of 83.4% in 2022-23. Import trade volumes from the Port of Port Hedland displayed limited variability between 2018-19 and 2022-23, albeit an uplift is anticipated in the short to medium term as a result of the commencement of operations at the Lumsden Point General Cargo Facility.

Iron ore prices have experienced volatility over the past 2-3 years due to significant fluctuations in demand from China due primarily to restrictions imposed in response to the COVID-19 pandemic hindering industrial activity. Despite the higher volatility, iron ore prices over this period have remained significantly higher than prices over the five-year period preceding the COVID-19 pandemic (**Figure ES 4**).

Figure ES 4 Iron ore price (US$/t, 62% iron content)



Source: Department of Industry, Science and Resources: Resources and Energy Quarterly – September 2023

Spodumene and lithium hydroxide prices peaked in the December 2022 quarter, and declined over the subsequent period through to the June 2023 quarter. In the later stages of 2023 and early 2024 lithium prices declined significantly towards the five year average due to a slow down in demand growth and the outlook for new supply. Prices remain elevated versus the long run average and support the continued operations of existing producers. It is expected current market conditions will revert towards a more positive price outlook in the years ahead as supply and demand rebalance.

As of December 2023, there is approximately $44 billion of investment in the pipeline for major mining projects, with linkages to the Port Hedland Port Supply Chain. As the dominant resource in the Pilbara region, iron ore accounts for 88.8% of the total value of major projects in the investment pipeline, while battery minerals accounts for a share of 7.1%, reflecting the growing diversification of the commodity base.

Beyond mining projects, there are also a large number of renewable energy and infrastructure projects in the investment pipeline. The significant uplift in investment activity associated with renewable energy projects in the Pilbara region has been driven to a large extent by the efforts of major resource companies in the Port Hedland Port Supply Chain to decarbonise and replace the share of power generation attributed to the use of gas and diesel with a range of renewable energy sources such as wind and solar.

Public and private sector investment in port, rail and road infrastructure will play an important role in supporting companies within the Port Hedland Port Supply Chain to achieve decarbonisation targets. Infrastructure investment, along with an increase in the availability of industrial land, will also help to facilitate growth in the overall scale of economic activity by enabling existing resources companies in the region to expand their operations, as well as attracting new resources companies to the region and mining service companies to establish a local presence. The Lumsden Point General Cargo Facility will play a central role in facilitating this.

Summary Findings

*ACIL Allen has undertaken an **economic contribution assessment** for the 2022-23 financial year and **economic impact assessment** for the subsequent ten-year period from 2023-24 to 2032-33 based on the financial results of the most recent financial year and forward guidance provided by companies participating in the study.*

Economic Contribution of Port of Port Hedland, 2022-23

The economic contribution of the Port of Port Hedland reflects the economy-wide (ie direct and indirect) economic value supported by the production, expenditure, employment and taxation paid by participants in the supply chain. The results are presented by region below.

Port Hedland

ACIL Allen estimates the total economic contribution of the Port Hedland Port Supply Chain within the Town of Port Hedland was approximately $2.01 billion in 2022-23, reflecting $678 million of direct contribution and $1.33 billion of indirect contribution.

Figure ES 5 Economic Contribution of the Port of Port Hedland Supply Chain to the Town of Port Hedland, 2022-23

Source: ACIL Allen

The economic multiplier of local expenditure by the Port Hedland Port Supply Chain is estimated to be 2.97, meaning every dollar of expenditure made in the area generated flow on expenditure of $1.97.

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 2,019 FTE jobs in the Town of Port Hedland, and a further 6,139 FTE jobs were indirectly created, with an implied employment multiplier of 4.04. Overall, the Port Hedland Port Supply supported 8,158 direct and indirect FTE jobs in the Town of Port Hedland in 2022-23, accounting for 74% of total employment in the Town of Port Hedland in 2022-23.

Pilbara Region

ACIL Allen estimates the Port Hedland Port Supply Chain accounted for $60.57 billion in direct economic output in the Pilbara Region in 2022-23, with an additional $2.71 billion of indirect output supported throughout the Region. The total economic contribution of the Port Hedland Port Supply Chain within the Pilbara Region was approximately $63.28 billion in 2022-23, accounting almost three quarters of the Region's economy in 2022-23.

Figure ES 6 Economic Contribution of the Port of Port Hedland Supply Chain to the Pilbara Region, 2022-23

Source: ACIL Allen

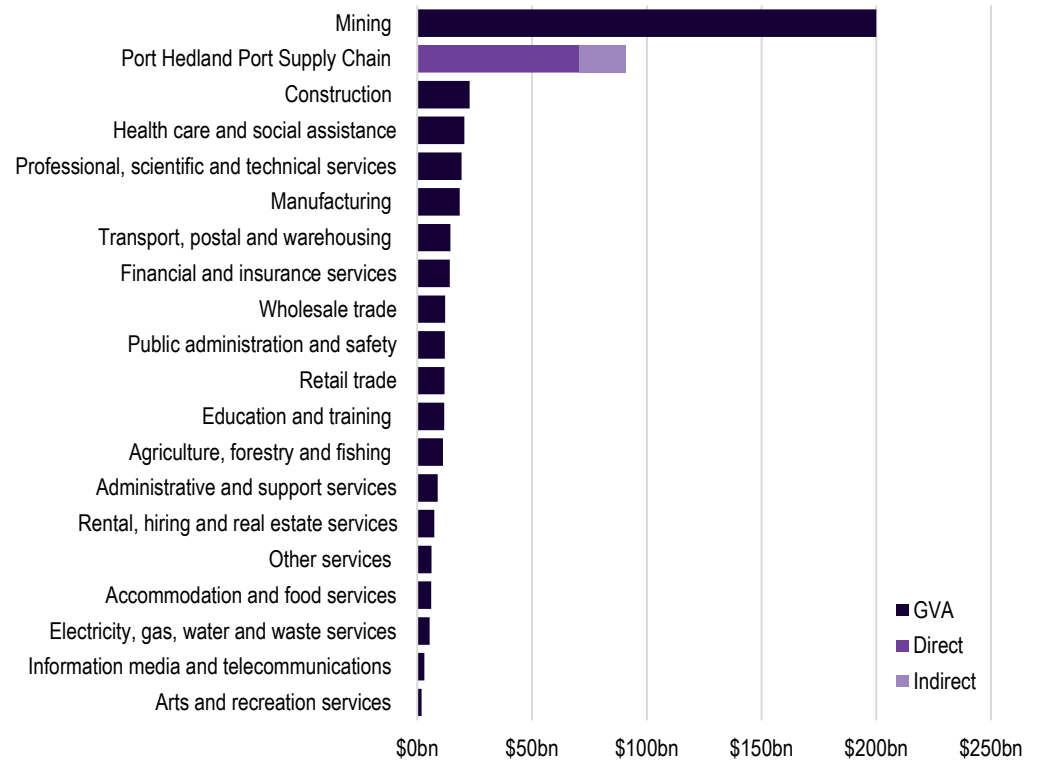
The Port Hedland Port Supply Chain supported 22,487 direct and indirect FTE jobs in the Pilbara region in 2022-23, which equated to approximately 38% of total employment in the Region. ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 10,890 FTE jobs in 2022-23, and a further 11,596 FTE jobs were indirectly created as a result of this activity, with an implied employment multiplier of 2.06.

Western Australia

ACIL Allen estimates, the total economic contribution of the Port Hedland Port Supply Chain in the WA economy was approximately $90.68 billion in 2022-23. Some $70.48 billion of this was direct economic output, with the balance ($20.21 billion) contributed on an indirect basis. Significantly, the results suggest the Port Hedland Port Supply Chain accounted for over one fifth of all activity in the Western Australian economy in 2022-23.

The Port Hedland Port Supply Chain generated significantly higher levels of output than any other WA industry, aside from mining. The overall direct and indirect contribution of the Port Hedland Port Supply Chain equated to approximately four times the Gross Value Added (GVA) of the Construction industry and more than eight times the GVA of the Agriculture, Forestry and Fishing industry.

Figure ES 7 Gross Value Added by Industry in Western Australia – Comparisons to the Port Hedland Port Supply Chain, 2022-23



Source: ABS Australian National Accounts – State Accounts – Industry Components of Gross State Product (Current prices)

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 34,424 FTE jobs in Western Australia, and a further 91,656 FTE jobs were indirectly created. Overall, ACIL Allen estimates the Port Hedland Port Supply Chain supported 126,080 direct and indirect FTE jobs in Western Australia in 2022-23, equating to approximately 11.7% of Western Australia's average full-time workforce in 2022-23. As a result, it is estimated that approximately one in every nine full-time jobs in Western Australia in 2022-23 were either directly or indirectly supported by the Port of Port Hedland and the trade that is facilitated through the Port.

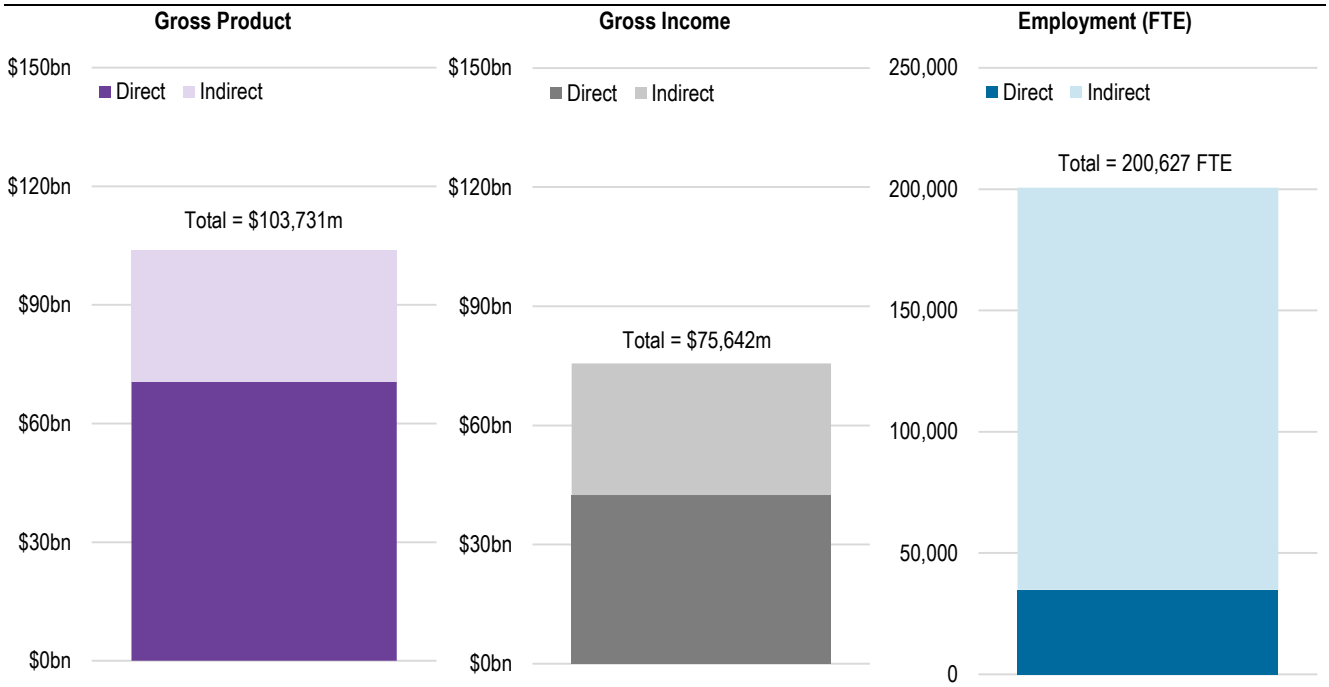
Figure ES 8 Economic Contribution of the Port of Port Hedland Supply Chain in Western Australia, 2022-23

Source: ACIL Allen

Australia

The Port Hedland Port Supply Chain contributed $70.58 billion in direct economic output to the national economy in 2022-23. The activities of the Port Hedland Port Supply Chain in Australia generated $33.15 billion of indirect economic output.

Figure ES 9 Economic Contribution of the Port of Port Hedland Supply Chain in Australia, 2022-23



Source: ACIL Allen

Together, the total economic contribution of the Port Hedland Port Supply Chain within Australia was approximately $103.73 billion in 2022-23. As a result, economic activity either directly or indirectly supported by the Port of Port Hedland and the trade that is facilitated through the Port equated to approximately 4% of the national economy.

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 34,793 FTE jobs in Australia, and a further 165,835 FTE jobs were indirectly created. Overall, the Port Hedland Port Supply Chain supported 200,627 direct and indirect jobs in Western Australia in 2022-23.

Taxation and Royalties

Companies in the Port Hedland Port Supply Chain pay a range of taxes and royalties to the Commonwealth Government, WA Government and local governments in the Pilbara region.[1]

In the context of this study, ACIL Allen has estimated the following taxes and royalties that are directly and indirectly paid by the Port Hedland Port Supply Chain:

- Company income tax
- Personal income tax
- Fringe benefits tax
- Payroll tax
- State Government Royalties
- Local Government fees, charges and rates

In total, ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $6 billion in taxation payments to the WA Government in 2022-23. Resource royalties account for the majority of these payments to the WA Government at a share of 92.8% ($5.56 billion), with payroll tax paid by companies in the Port Hedland Port Supply Chain ($329 million), as well as other payments which includes dividend and tax equivalent payments made by Pilbara Ports ($102 million), making up a smaller proportion.

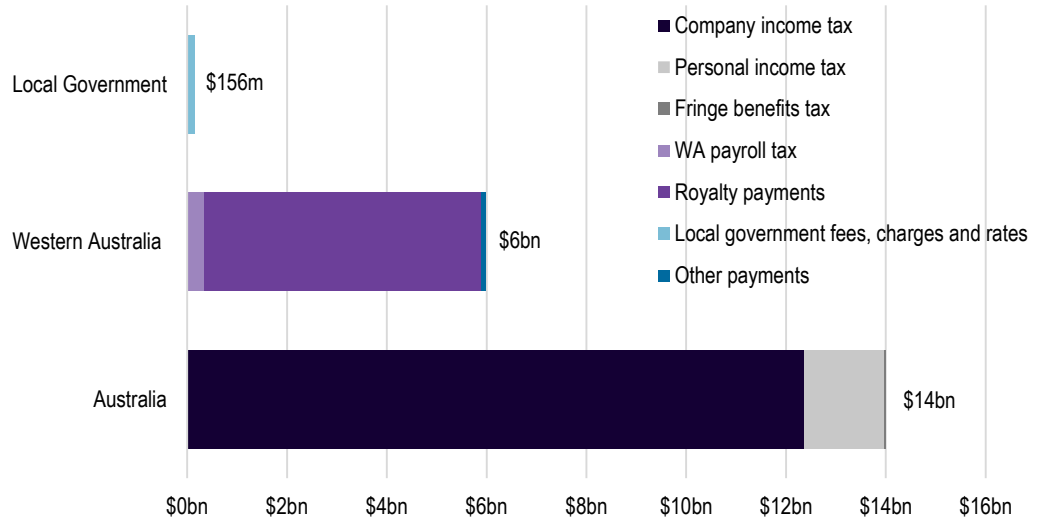
The estimated taxation payments made by the Port Hedland Port Supply Chain to the WA Government in 2022-23 is equivalent to approximately 13.9% of the General Government sector revenue.

In total, ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $14 billion in taxation payments to the Commonwealth Government in 2022-23. Company income tax accounted for the majority of taxation payments to the Commonwealth Government at a share of 88.3% ($12.36 billion), with personal income taxation as a result of the direct employment on projects ($1.61 billion), as well as fringe benefits tax ($25 million), making up a smaller proportion.

In total, ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $156 million in fees, charges and rates to the local government sector in WA in 2022-23.

[1] The economic contribution study does not take into account indirect company or personal income taxation receipts associated with the supplies and services used by the Port Hedland Port Supply Chain due to the modelling technique applied.

Figure ES 10 Taxation Payments to Commonwealth Government, WA Government and Local Government, 2022-23



Source: ACIL Allen

Economic Impact of Port of Port Hedland, 2023-24 to 2032-33

The economic impact of the Port Hedland Port Supply Chain over the ten years to 2032-33 has been estimated using ACIL Allen's in-house Computable General Equilibrium (CGE) model, *Tasman Global*. The results are predominately based on the information made available regarding the existing operations of the participants in the study, plus conservative treatment of future price outcomes for major commodities. This means the study has delivered a conservative assessment of the future economic contribution of the Port to the region, State and national economies.

The conservative commodity price outlook has a material impact on the overall economic impact of the Port Hedland Port Supply Chain over the outlook period. If current prices were to be maintained over this period, the overall impacts would be significantly larger, reflecting the projected increase in volumes through the Port through to 2027-28.

Gross product

The total economic contribution of the Port Hedland Port Supply Chain to gross product is estimated to decline over the modelling period from $105.2 billion in 2023-24 to $77.2 billion by the end of the modelling period in 2032-33. ACIL Allen estimates the Port Hedland Port Supply Chain will contribute a total of $828.8 billion in gross product to the Australian economy between 2023-24 and 2032-33.

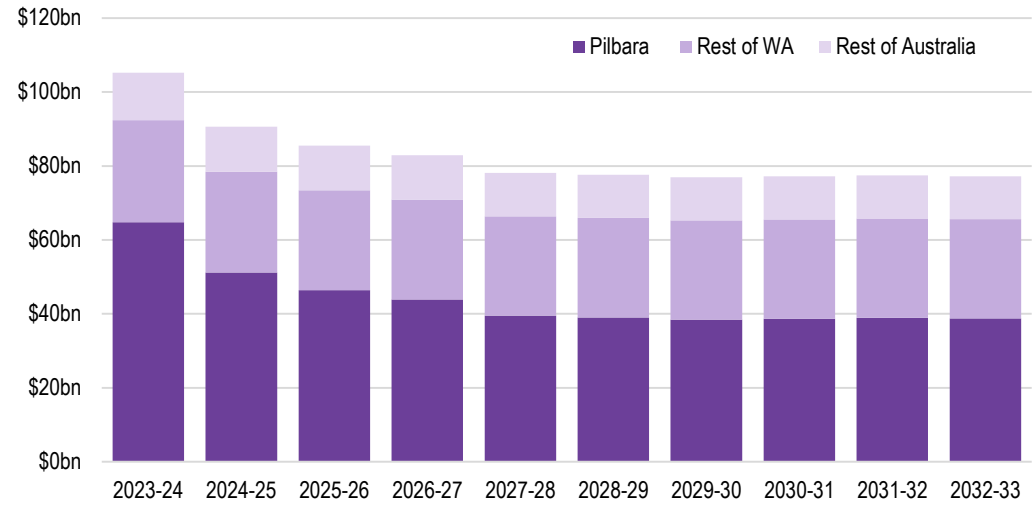
The normalisation of the economic contribution of the Port Hedland Port Supply Chain primarily occurs in the first half of the modelling period through to 2027-28 on the basis of forecast declines in commodity prices relative to the average prices recorded over the 2022-23 financial year. In addition to the conservative basis of the price forecasts that underpin the economic modelling are the pipeline of investment projects that have not been modelled but will significantly add to the economic potential of the Port Hedland Port Supply Chain and the Pilbara Region more broadly.

The projected contribution to gross product over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to gross product in 2028-29 was

estimated at $66.3 billion in the previous study, below the equivalent projected contribution of $77.6 billion in 2028-29 for this study.

The projected total economic contribution of the Port Hedland Port Supply Chain to gross product is expected to be concentrated primarily in the Pilbara region at an average share of approximately 53% over the modelling period.

Figure ES 11 Real Output Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33

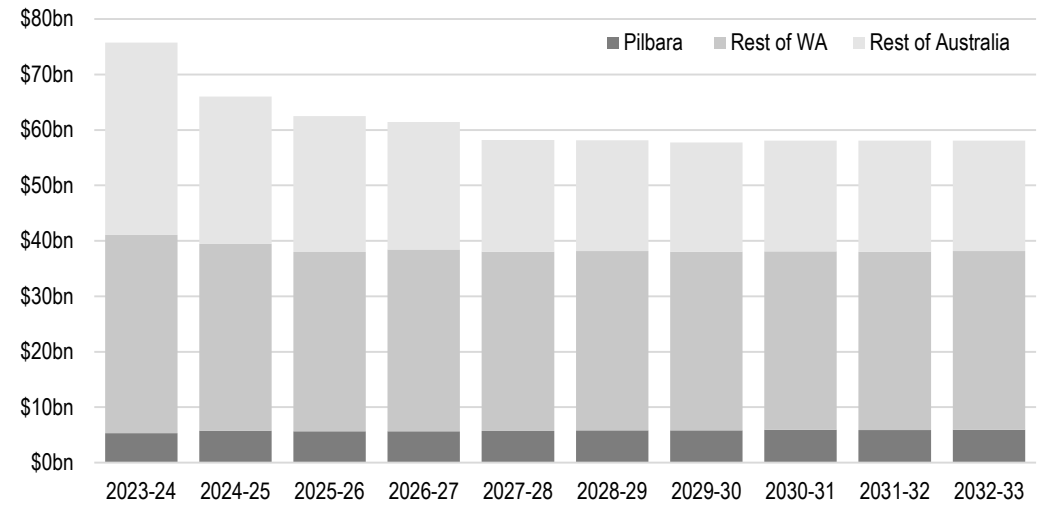


Source: ACIL Allen

Real income

The total economic contribution of the Port Hedland Port Supply Chain to income is estimated to decline over the modelling period from $75.8 billion in 2023-24 to $58.1 billion by the end of the modelling period in 2032-33.

Figure ES 12 Real Income Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33



Source: ACIL Allen

The large majority of the decline is projected to occur over the first four years of the modelling period, with the total economic contribution to income estimated to subsequently remain relatively

stable over the period between 2027-28 and 2032-33. ACIL Allen estimates the Port Hedland Port Supply Chain will contribute a total of $614 billion in income to the Australian economy between 2023-24 and 2032-33.

The projected total economic contribution of the Port Hedland Port Supply Chain to income is expected to be concentrated primarily in areas of Western Australia outside of the Pilbara region (i.e. rest of Western Australia), at an average share of approximately 53.6% over the modelling period.

Employment

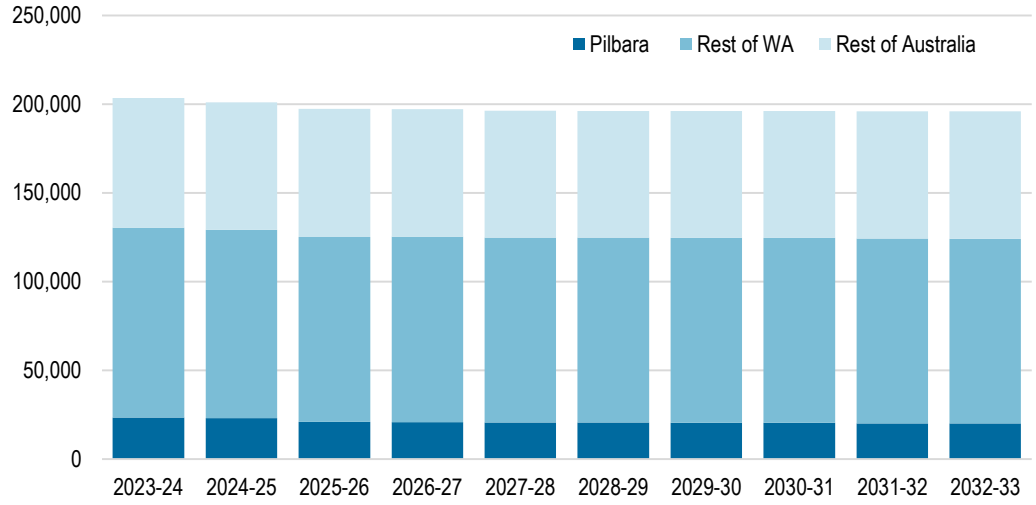
The total economic contribution of the Port Hedland Port Supply Chain to employment is estimated to remain relatively stable over the modelling period with only a marginal decline projected to be recorded from 203,497 FTE in 2023-24 to 195,976 FTE by the end of the modelling period in 2032-33. ACIL Allen estimates the Port Hedland Port Supply Chain will contribute on average 197,603 FTE jobs to the Australian economy over the ten-year period between 2023-24 and 2032-33.

The pipeline of investment projects that have not been modelled will significantly add to the economic potential of the Port Hedland Port Supply Chain and the Pilbara Region more broadly, in the form of additional job creation.

The projected contribution to employment over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to employment in 2028-29 was estimated at approximately 137,000 FTE in the previous study, below the equivalent projected contribution of approximately 196,200 FTE in 2028-29 for this study.

Over the modelling period the majority of jobs directly and indirectly stimulated by the Port Hedland Port Supply Chain are expected to be located in the rest of Western Australia, at an average share of 53% over the modelling period, followed by the rest of Australia which accounts for an average share of 36.4% over the modelling period.

Figure ES 13 Employment Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33 (FTE)



Source: ACIL Allen

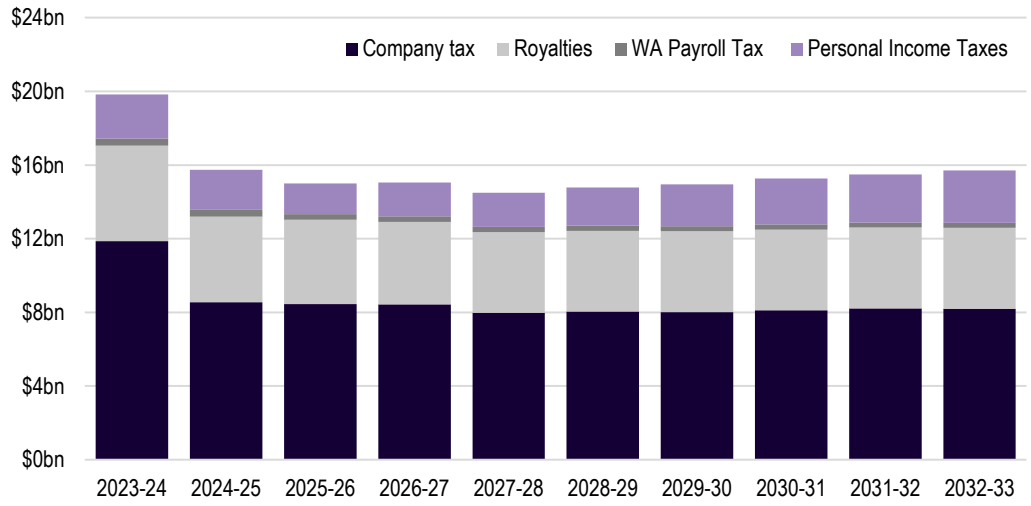
Taxation and Royalties

The total economic contribution of the Port Hedland Port Supply Chain to Commonwealth Government and WA Government taxation is estimated to decline over the modelling period from $19.8 billion in 2023-24 to $15.7 billion by the end of the modelling period in 2032-33. In total, it is estimated the Port Hedland Port Supply Chain will contribute $156.3 billion in taxation and royalty payments between 2023-24 and 2032-33.

Company tax is the primary driver of the normalisation of taxation payments from the Port Hedland Port Supply Chain. Company tax payments are projected to decline from $11.9 billion in 2023-24 to $8.2 billion by the end of the modelling period in 2032-33.

The projected total contribution to taxation over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to taxation in 2028-29 was estimated at approximately $5.75 billion in the previous study, below the equivalent projected contribution of approximately $14.8 billion in 2028-29 for this study.

Figure ES 14 Real Taxation Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33



Note: Local government fees, charges and rates, and other taxation payments, have been excluded from this analysis.
Source: ACIL Allen

Scenario Analysis: Future Impact of Lumsden Point

The Lumsden Point General Cargo Facility is expected to catalyse and support a diverse range of projects across the Pilbara region, which are currently constrained in their access to international markets. It is therefore considered appropriate the outlook for the emerging value chains which flow through Lumsden Point are considered alongside the existing, predominately bulk mineral export value chains which access the port today. To provide this perspective, ACIL Allen was permitted by PHIC member Pilbara Ports to use a range of inputs and assumptions developed during the economic and commercial assessment of Lumsden Point between 2020 and 2023 to build a scenario which demonstrates the future economic value of the emerging Lumsden Point value chains.

The assessment was limited to the economic value associated with new project value chains, to align the basis of the assessment with the broader Port Hedland Port Supply Chain analysis. The overall assessment of Lumsden Point completed by ACIL Allen included the quantification of

impacts associated with changes to product import supply chains, and efficiencies in the operations of general cargo trade at the Port of Port Hedland more broadly.

ACIL Allen estimates the Lumsden Point project will contribute an additional $22.56 billion in gross product to the Australian economy between 2023-24 and 2032-33, averaging $3.22 billion per annum once operational. In addition, ACIL Allen estimates the Lumsden Point project will boost national income by $31.42 billion and generate an additional 6,204 FTE jobs per annum once operational. Governments will also benefit considerably from this expansion to the Port of Port Hedland, with the Lumsden Point project expected to boost Commonwealth and State tax collections on average by $2.33 billion over the study period.

Figure ES 15 Scenario Analysis: Future Economic Impact of Port Hedland Port Supply Chain and Lumsden Point project to the Australian economy

Source: ACIL Allen

When combined, ACIL Allen estimates the expanded Port Hedland Port Supply Chain and Lumsden Point project will collectively contribute:

— a total of **$851.4 billion in gross product to the Australian economy** between 2023-24 and 2032-33, at an average of $85.1 billion per annum

- a total of **$645.5 billion in income to the Australian economy** between 2023-24 and 2032-33, at an average of $64.5 billion per annum
- on average **201,976 FTE jobs to the Australian economy** over the ten-year period between 2023-24 and 2032-33
- a total of **$172.7 billion in taxation and royalty payments** between 2023-24 and 2032-33, at an average of $17.3 billion per annum.

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Main Report

Source: Fortescue

1 Introduction

This section provides an overview of the objectives of the study and the approach to quantifying the economic significance of the Port of Port Hedland and the trade that the port facilitates.

1.1 About this Engagement

ACIL Allen was commissioned by the Port Hedland Industries Council (PHIC) to undertake an assessment of the economic significance of the Port of Port Hedland. This is the third report commissioned by PHIC to ACIL Allen on the economic significance of the Port of Port Hedland, following previous reports commissioned in 2017 and 2020.

Trade through the Port has continued to expand since the completion of the 2020 study, which has led to calls to further expand the capacity of the Port in order to facilitate exports of high value commodities such as lithium, and to facilitate the importation of machinery and equipment to support the significant renewable energy projects that are being planned in the region. It has also resulted in Pilbara Ports progressing plans to develop a general cargo facility and logistics hub at Lumsden Point, with funding commitments recently provided by the Commonwealth and Western Australian Governments to progress this development.

The economic modelling for this study takes into consideration the projected expenditure on renewable energy infrastructure in the Pilbara region by companies in the Port Hedland Port Supply Chain over the forward outlook period. It is expected there will be additional investment in renewable energy infrastructure in the Pilbara region over the forward outlook period by the State and Commonwealth Government, as well as companies who for the purposes of this study were not included in the Port Hedland Port Supply Chain. This investment is not accounted for in the economic modelling undertaken for this study.

1.2 Overview of Approach

In order to estimate the economic significance of the Port of Port Hedland, ACIL Allen adopted a similar methodology as was used for the 2020 study and collected up-to-date data from a broader range of companies.

Using ACIL Allen's Input-Output models of the Town of Port Hedland, the Pilbara Region, Western Australia, and Australia, the economic contribution of the Port Hedland Port Supply Chain in 2022-23 was determined in each region on the basis of its contribution to output (Gross Domestic Product, Gross State Product, Gross Regional Product), income (wages and salaries earned), employment (Full Time Equivalent (FTE) basis) and taxation and royalty payments.

In order to develop projections for future economic activity through the Port, ACIL Allen has used forward guidance from participating companies to estimate the economic impact of the Port Hedland Port Supply Chain over the ten-year period between 2023-24 and 2032-33 using ACIL Allen's in-house computable general equilibrium *Tasman Global*.

1.2.1 Port Hedland Port Supply Chain

For the purposes of this study, the Port Hedland Port Supply Chain consists of the economic activity generated by ten companies, and Pilbara Ports which operates as a Government Trading Enterprise.[2]. A brief description of each entity and their operations in the Pilbara Region is provided in **Table 1.1**, with a visual representation of all the mining operations and supporting major infrastructure links that make up the Port Hedland Port Supply Chain presented in **Figure 1.1**.

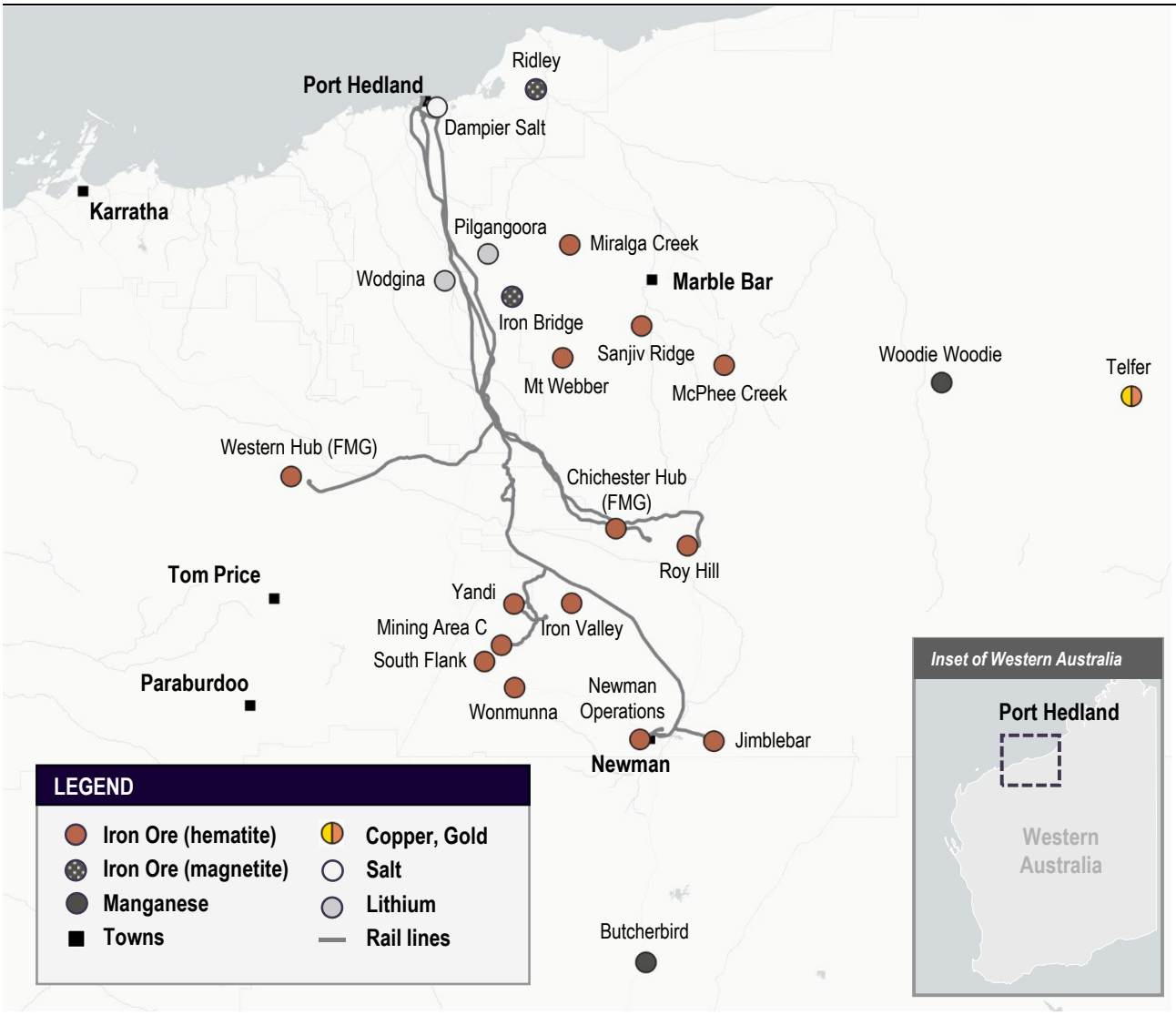
Table 1.1 Companies in the Port Hedland Port Supply Chain

Company	Description
	Pilbara Ports Pilbara Ports operates as a Western Australian Government Trading Enterprise, and was established in July 2014 as a result of the *Ports Legislation Amendment Act 2014* consolidating seven of WA's eight port authorities into four new regional port authorities. Pilbara Ports was formed by the amalgamation of the former port authorities of Dampier and Port Hedland. As such, Pilbara Ports encompasses the Port of Ashburton, Port of Dampier, Port of Port Hedland and Port of Varanus Island.
	BHP BHP's operations in the Pilbara are organised around an integrated system of iron ore mine sites (South Flank, Jimblebar, Yandi, Mining Area C, Newman Operations), connected by more than 1,000 kilometres of rail infrastructure and port facilities – collectively referred to as Western Australia Iron Ore (WAIO).
	Fortescue Fortescue's operations in the Pilbara consist of the Chichester and Western Hubs, as well as magnetite project Iron Bridge. The Chichester Hub comprises of the Cloudbreak and Christmas Creek mines, and the Western Hub comprises of the Firetail, Kings Valley and Queens Valley mines. The Western Hub also includes Fortescue's newest mine at Eliwana, which commenced operations in December 2020. Iron Bridge is Fortescue's first magnetite operation and signifies the company's entry into the high grade segment of the iron ore market. Fortescue's operations in the Pilbara also consist of five-berth port operations at Port Hedland, towage infrastructure, heavy haul railway infrastructure, tug fleet and ore carriers.
	Roy Hill Roy Hill is majority owned by Hancock Prospecting (70% equity interest), with the remaining equity interest held through a consortium comprising Marubeni Corporation (15%), POSCO (12.5%) and China Steel Corporation (2.5%). The Roy Hill mine commenced operations in 2014, and currently delivers 60 million tonnes per annum of iron ore to international markets, with approval to increase production to 70 million tonnes. The mine is supported by a 344km single line heavy haul railway and a two-berth iron ore port facility at Port Hedland.
	Dampier Salt Dampier Salt Limited (DSL) is a joint venture between Rio Tinto (68% ownership), Marubeni Corporation (22%) and Sojitz (10%), and comprises three solar salt operations located at Dampier, Port Hedland and Lake MacLeod. The three operations have the capacity to produce approximately 10.3 million tonnes of salt every year. Salt produced at the Port Hedland site is exported out of the Port of Port Hedland.

[2] Sandfire Resources were not included in the study as mining and processing activities at the DeGrussa mine ceased in October 2022.

Company	Description
	**Mineral Resources** Mineral Resources is a diversified resources company, with operations in lithium, iron ore, energy, and mining services across Western Australia. Operations in the Pilbara are focused on iron ore and lithium. The Pilbara Hub comprises the Wonmunna and Iron Valley iron ore mines, with product from both sites transported by road to Port Hedland for export. The Wodgina lithium operation operates under the MARBL Lithium Joint Venture – an unincorporated joint venture between Mineral Resources (50%) and Albemarle Corporation (50%). Spodumene produced at Wodgina is exported from the Port of Port Hedland for conversion to battery-grade lithium products and supply to global markets.
	**Pilbara Minerals** Pilbara Minerals operate the 100% owned Pilgangoora Project, located about 120km from Port Hedland. The Pilgangoora ore body is one of the largest hard rock lithium deposits in the world. Operations consist of two processing plants located on site, which provides Pilbara Minerals with the opportunity rapidly increase production to satisfy rising lithium market demand and flexibility by being able to blend products to meet customer needs. For the project, Pilbara Minerals have a group of experienced offtake partners including Ganfeng Lithium, General Lithium, Yibin Tianyi, and POSCO.
	**Consolidated Minerals** Consolidated Minerals is a privately owned company with mining operations in Australia and Ghana. It is one of the four largest manganese producers in the world by volume. The company's key asset in Western Australia is the Woodie Woodie mine, located about 380km south-east of Port Hedland. Manganese ore has been mined at Woodie Woodie since the early 1950s and was the first bulk commodity exported from Port Hedland. Material is crushed, screened and beneficated on site at a central processing plant and trucked by road trains to Port Hedland for shipment.
	**Atlas Iron** Atlas Iron was first listed as a public company in 2004. In 2018, Atlas Iron was acquired by Hancock Prospecting. Atlas Iron has three operating iron ore projects located in the Pilbara Region (Mt Webber, Sanjiv Ridge, Miralga Creek). In addition, Atlas Iron have two projects in the planning phase: McPhee Creek (iron ore) and Ridley (magnetite). Production from all operating and proposed projects is or is expected to be exported from the Port of Port Hedland.
	**Newmont Corporation** In November 2023, Newcrest Mining was acquired by Newmont Corporation. In the Pilbara Region of Western Australia, Newmont operate the Telfer gold and copper mine which is located approximately 400km from Port Hedland. Gold-copper concentrates produced at the Telfer mine are trucked to Port Hedland and exported to various smelters, primarily in the Eastern Asia region.
	**Element 25** Element 25 (E25) produces manganese concentrate from its 100% owned Butcherbird Project located in the Pilbara Region, with ore transported from site to Port Hedland for shipment. Butcherbird is Australia's largest onshore manganese resource. E25 commenced mining and concentrate production at Butcherbird in mid-2021.

Figure 1.1 Port Hedland Port Supply Chain



Source: ACIL Allen

1.3 Report Structure

This report has been structured into five sections and an **Executive Summary**:

- **Section 1: Introduction** – provides an overview of the objectives of the study and the approach to quantifying the economic significance of the Port of Port Hedland and the trade that the port facilitates.
- **Section 2: Port of Port Hedland and the Pilbara Region –** provides a profile of the Port Hedland economy, an investment outlook for major projects with linkages to the Port of Port Hedland, an overview of recent trade trends for the Port of Port Hedland, and analysis on the primary commodities exported from the port.
- **Section 3: Modelling Methodology and Assumptions** – provides an overview of the modelling methodology and data that has been collated from participating companies to estimate the economic significance of the Port of Port Hedland.
- **Section 4: Economic Contribution of Port of Port Hedland, 2022-23** – presents the economic contribution that the Port of Port Hedland and the trade through the Port made to

the Town of Port Hedland, the Pilbara Region, Western Australia and Australia in 2022-23, using ACIL Allen's Input Output model.

— **Section 5: Economic Impact of Port of Port Hedland, 2023-24 to 2032-33** – presents the economic impact of the Port of Port Hedland and the trade through the Port to the Town of Port Hedland, the Pilbara Region, Western Australia and Australia over the ten-year period between 2023-24 and 2032-33, using ACIL Allen's CGE Model *Tasman Global*. The results are measured in terms of the direct and indirect impact to output (Gross Product), incomes (wages and salaries earned by individuals and profits generated by businesses), employment (FTE basis) and taxation and royalty payments to key heads of taxation.

1.4 Glossary of terms and abbreviations

The following terms and acronyms are used in this report.

Table 1.2 Summary of Terms Used

Term used	Meaning
Compensation of employees	The total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the employee during the accounting period. It is further classified into two sub-components: wages and salaries; and employers' social contributions. Compensation of employees is not payable in respect of unpaid work undertaken voluntarily, including the work done by members of a household within an unincorporated enterprise owned by the same household. Compensation of employees excludes any taxes payable by the employer on the wage and salary bill (e.g. payroll tax).
Economic footprint	A measure of the total economic activity in the production of new goods and services. Economic footprint is a broader measure of the economy in that it includes the final value of goods and services produced (GDP/GSP/GRP), as well as the value of the intermediate consumption within the region to produce the goods and services, and imports from outside the region.
Employment	The number of full time equivalent job years created as a result of a project or expenditure in the economy, which includes direct and indirect (flow-on) employment.
Exchange rate	The exchange rate is expressed as the AUD/USD exchange rate unless otherwise stated and is denoted as $ or A$ throughout the document.
Gross Operating Surplus	Gross Operating Surplus (GOS) is an economic measure of the income earned by the capital employed by a project or economy. It is typically calculated as a residual factor of total income earned by a project less expenditure on intermediate inputs and wages paid. It is different to accounting profit as it includes a number of the deductions and other outflows a company would typically remove from the measure of its profitability; it also includes all taxes payable to governments
Gross product or real economic output	Gross product is a measure of the output generated by an economy over a period of time (typically a year). It represents the total dollar value of all finalised goods and services produced over a specific time period and is considered as a measure of the size of the economy. At a national level, it is referred to as Gross Domestic Product (GDP); at the state level, Gross State Product (GSP); while at a regional level, Gross Regional Product (GRP).

Term used	Meaning
Input-Output Tables	Input-Output (I-O) tables capture the direct and indirect effects of expenditure by capturing, for each industry, the industries it purchases inputs from and also the industries it sells its outputs to. For example, the I-O model for Western Australia captures purchases from and sales to industries located in Western Australia, as well as imports from outside of Western Australia.
Job years	Real employment is measured in job years. A job year is employment of one full time equivalent (FTE) person for one year. Alternatively in can be expressed as one 0.5 FTE person for two years.
Net present value (NPV)	The value of a future stream of income (or expenses) converted into current terms by an assumed annual discount rate. The underlying premise is that receiving, say, $100 in 10 years is not 'worth' the same (i.e. is less desirable) than receiving $100 today. For the purposes of this study, NPV calculations have been made based on a discount rate of 4% and 7%.
Port Hedland Port Supply Chain	For the purposes of this study, ACIL Allen has combined the income, expenditure and employment of the Port Hedland Port and associated entities that utilise the Port for trade into a single group we have called the Port Hedland Port Supply Chain. This allows us to present the results of this study as a single contribution/impact, and protects the confidentiality of information provided by the Port and its users.
Purchasing Power Parity (PPP)	Purchasing Power Parity (PPP) represents the theoretical value of a nation state's economic output adjusted for currency effects and the purchasing power of a standard unit of exchange. It ultimately reflects the underlying competitiveness of a country's economy.
Real and nominal dollars	Nominal dollars are dollars that are expressed in the actual dollars that are spent or earned in each year, including inflation effects. Real dollars have been adjusted to exclude any inflationary effects and therefore allow better comparison of economic impacts in different years. Over time, price inflation erodes the purchasing power of a dollar thereby making the comparison of a dollar of income in 2063 with a dollar of income in 2016 invalid. Adjusting nominal dollars into real dollars overcomes this problem.
Real income	A measure of the welfare of residents in an economy through their ability to purchase goods and services and to accumulate wealth. Although changes in real economic output are useful measures for estimating how much the output of the economy may change due to a change in policy, changes in real income are also important as they provide an indication of the change in economic welfare of the residents of a region through their ability to purchase goods and services. Real income measures the income available for final consumption and saving after adjusting for inflation. An increase in real income means that there has been a rise in the capacity for consumption as well as a rise in the ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in the economic welfare of residents within an economy.
State Final Demand / domestic economy	A measure of the value of goods and services in an economy. The aggregate obtained by summing government final consumption expenditure, household final consumption expenditure, private gross fixed capital formation and the gross fixed capital formation of public corporations and general government. It is conceptually equivalent to the Australia level aggregate domestic final demand.

Term used	Meaning
Working age population	All usual residents of Australia aged 15 years and over except members of the permanent defence forces, certain diplomatic personnel of overseas governments customarily excluded from census and estimated population counts, overseas residents in Australia, and members of non-Australian defence forces (and their dependants) stationed in Australia.

Table 1.3 Summary of Acronyms

Acronym	Meaning
ABS	Australian Bureau of Statistics
AUD / A$ or $	Australian dollars (default unless otherwise specified)
CAPEX	Capital expenditure
CGE	Computable General Equilibrium (model)
CO2	Carbon dioxide
CPI	Consumer Price Index
FIFO	Fly in-fly out work practice
FOB	Free on Board
FTE	Full Time Equivalent
FY	Financial year
GDP	Gross Domestic Product
GRP	Gross Regional Product
GSP	Gross State Product
GST	Goods and Services Tax
GVA	Gross Value Added
LGA	Local Government Area
MT	Million tonnes
MTPA	Million tonnes per annum
NPV	Net Present Value
OPEX	Operational expenditure
PAYE	Pay as you earn income tax
PPP	Purchasing Power Parity
USD or US$	United States dollars
WPI	Wage Price Index

Port of Port Hedland and the Pilbara Region

2

This section provides a profile of the Port Hedland economy, an investment outlook for major projects with linkages to the Port of Port Hedland, an overview of recent trade trends for the Port of Port Hedland, and analysis on the primary commodities exported from the port.

2.1 Overview and Recent Trends

Port Hedland is currently going through a period of transition driven by the shift of the main residential community from the historic town centre in the West End to South Hedland.

While this transition has gradually been taking place for almost a decade, it has been expediated in more recent times by the Port Hedland Voluntary Buy-Back Scheme (PHVBS). As of October 2023, the Hedland Maritime Initiative (HMI) which is administering the PHVBS, had acquired 60% of homes located in the West End. The shift of the residential population away from the West End is anticipated to result in the area becoming more of a focal point for tourism, retail, heritage and cultural activities. The separation of industry and the residential community will also bring the Port in line with established best-practice dust management guidelines.

Population growth is critical to regional towns across Western Australia from both an economic and social perspective. From an economic perspective, population growth supports the long-term viability of local businesses, in particular small to medium size businesses, through both growing the size of the local labour force as well as the overall level of household consumption expenditure flowing through the economy. Within the Town of Port Hedland, there are an estimated 775 local businesses.[3]

From a social perspective, population growth supports demand for social and human services (such as health and education) and helps to grow the resourcing (often in a voluntary capacity) for the delivery of local community services. Importantly, evidence of sustained population growth in a regional economy helps to support the case for an uplift in investment from the State and Commonwealth Government towards critical social and human services.

As of June 2022, the Town of Port Hedland had an estimated resident population of 17,015 people, with the *Strategic Workforce Plan 2020-24* developed by the Town of Port Hedland presenting an aspirational population growth forecast scenario which results in the population reaching 27,085 people by 2041.

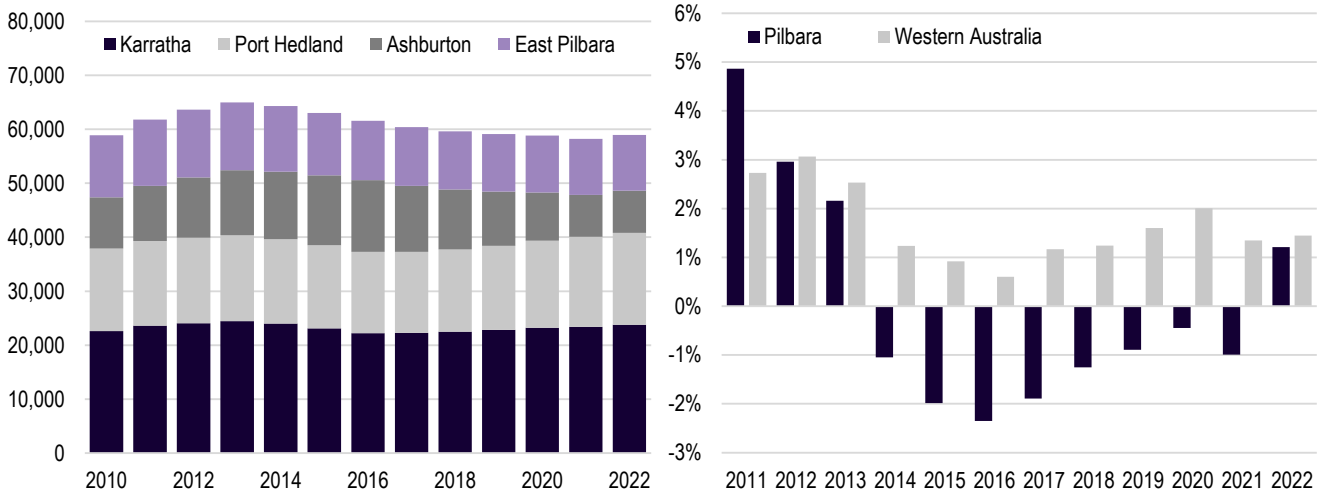
In 2021-22, the Pilbara region had a total population of 58,940 people, accounting for just 2.1% of the State's population (**Figure 2.1**). In the same year, the Pilbara region recorded its first year of positive annual population growth (1.2%), since 2012-13. Over the period since 2010-11, the average annual population growth rate for the Pilbara region was 0.03%, compared to 1.7% at a statewide level. The population of the Pilbara region peaked in 2012-13 at 64,978 people. Since

[3] Town of Port Hedland: Strategic Workforce Plan (updated May 2023)

this peak, the population of all LGAs in the Pilbara region declined (through to 2021-22), aside from the Town of Port Hedland which increased by 6.7% over this period.

The Pilbara region was the only region in Western Australia to record a decline in population over both the last 10 years and last 5 years. Goldfields-Esperance recorded a decline in population of 7.6% over the last 10 years, however over the last five years the population within the region grew by 1%. While the population of the Pilbara region declined by 9.3% over the last ten years, the population increased by 48.7% over the preceding ten-year period between 2001 and 2010.

Figure 2.1 Population Trends



Source: ABS Regional Population

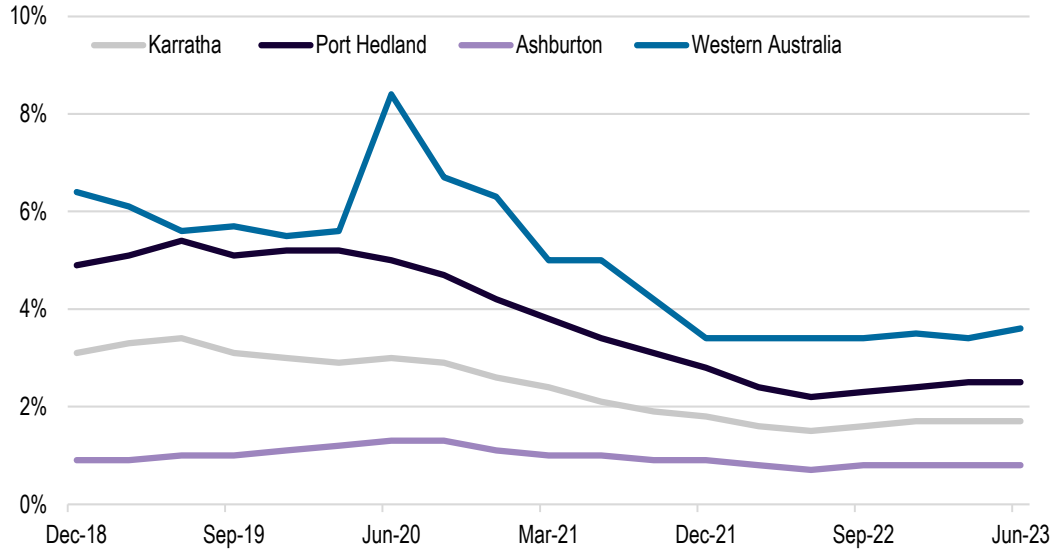
Over the period since 2011, the Town of Port Hedland has recorded an increase in the share of the total population sitting within the 0-19 age band and 60-79 age band. An increasing share of the total population in these age bands indicatives that demographic trends have the potential to place growing strain on social infrastructure, on the basis that both age bands are directly linked to being the primary source of demand for particular forms of social infrastructure, such as child care, education and recreation facilities for the 0-19 age band, and community services, health care and aged care for the 60-79 age band.

By contrast, there has been a decline in the share of the population sitting within the 20-39 age band and 40-59 age band. An ongoing, sustained decline of the population in these age bands has the potential to impact on the medium to long-term population growth of the Town of Port Hedland as it may be indicative of a decline in young families or families with children in primary and/or secondary school, residing in the community.

Employment opportunities are the critical prerequisite to sustaining and growing the population in regional economies. The unemployment rate for LGAs in the Pilbara region has been consistently below the statewide unemployment rate over the past five years (**Figure 2.2**). As of June 2023, the unemployment rate in the Town of Port Hedland was 2.5%, only marginally higher than the low of 2.2% recorded in June 2022. Over the period since December 2018, the unemployment rate for the Town of Port Hedland peaked at 5.4% in June 2019, only marginally below the statewide unemployment rate at the same time of 5.6%.

The low unemployment rate in the Town of Port Hedland is driven in part by the limited growth in the size of the local labour force over the past five years which increased by only 0.9% between June 2018 and June 2023 from 10,411 people to 10,509 people.

Figure 2.2 Unemployment Rate



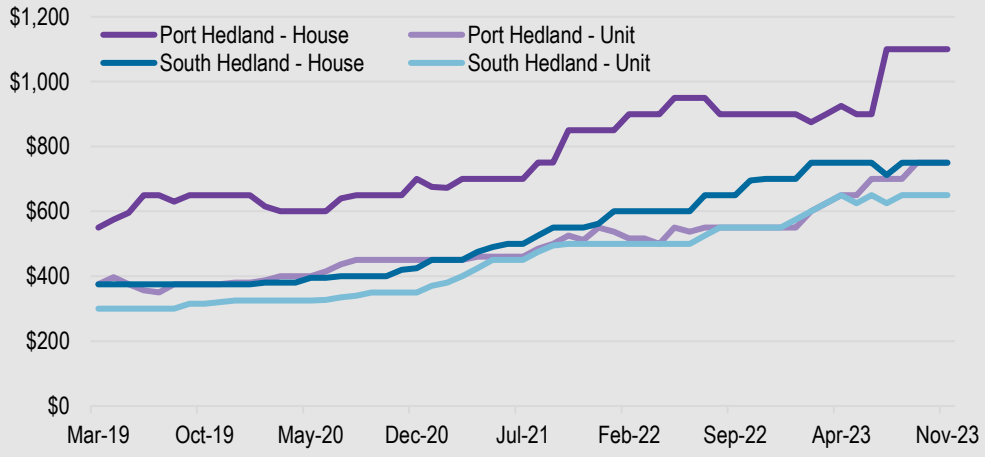
Source: ABS Labour Force, Jobs and Skills Australia – Small Area Labour Markets

A lack of affordable housing can result in a higher proportion of work being contracted to businesses outside of the Pilbara region, as well as a larger FIFO workforce, as local businesses don't have the labour resourcing to deliver on the requirements of contract opportunities (**Box 2.1**).

Box 2.1 Housing Affordability

Despite the high median personal weekly income in the Pilbara region (approximately 1.9 times the median personal weekly income for Western Australia), a growing issue is limited availability of affordable rental housing for people working in key service industries such as education, tourism, childcare, retail and hospitality. This is currently a major challenge in Port Hedland, as well as other towns across the Pilbara region such as Karratha and Tom Price. The Town of Port Hedland has stated there is a current deficit of 1,031 service workers in Port Hedland, and without intervention this is expected to increase to 1,444 workers by 2031.

The chart below presents the median annual rental prices (per week) for houses and units in Port Hedland and South Hedland over the period since March 2019. Over this period, the rental price for houses and units in Port Hedland, as well as house in South Hedland has doubled. In South Hedland, rental prices for units have more than doubled, recording an increase of 117%.



Source (Chart): realestate.com.au

Alongside challenges relating to housing affordability and supply, a growing population will place further demands on social infrastructure in Port Hedland, in particularly in areas including aged care and child care. Investment in social infrastructure supports the attraction and retention of residents in Port Hedland across all age bands, and in turn the efforts of a vast range of community sport, recreation and cultural groups which serve a critical function in enriching and connecting the local community. Investment in social infrastructure is of particular importance for young families and elderly residents within the Port Hedland community.

Social infrastructure projects in Port Hedland in the development pipeline include the South Hedland Integrated Sports Hub, a major placemaking redevelopment for the town square, a civic and community hub, and Spoilbank Marina which is due to open in late 2024. A number of these projects sit within the Town of Port Hedland's Long-Term Financial Plan which outlines approximately $800 million of capital works projects to support the growth of the community.

Key Finding 1 Economic Profile

The population of the Town of Port Hedland increased by 6.7% between 2012-13 and 2021-22, which made it the only LGA within the Pilbara region to record an increase in population over this period. A growing proportion of the population is associated with age bands which have the highest demand for social infrastructure. This trend, in conjunction with limited growth in the size of the local labour force and low availability of affordable rental housing, is placing strain on the delivery of core services and heightening the need for investment in social infrastructure to support the attraction and retention of residents in Port Hedland.

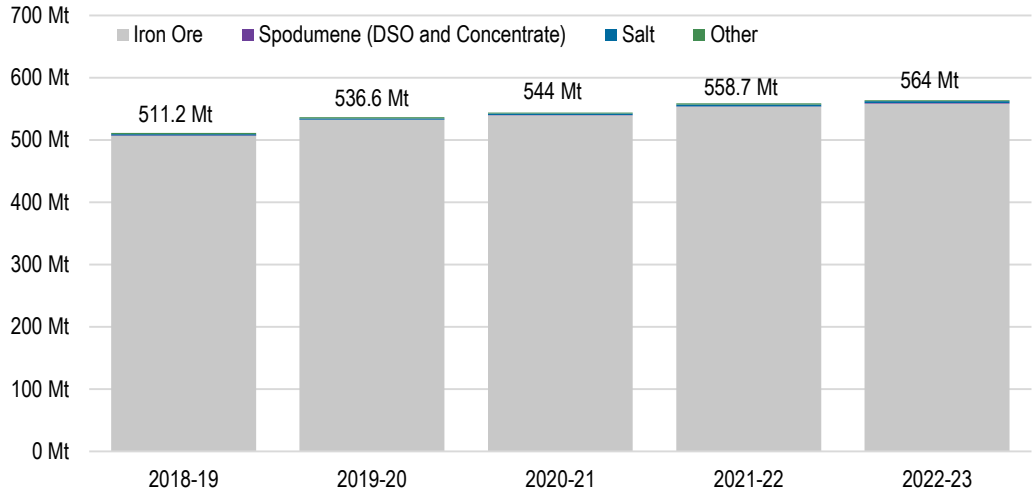
2.2 Port of Port Hedland Trade Overview

The Port of Port Hedland is the largest bulk export port in the world, and supports the trade activities of a number of the largest and most prominent resource companies in the world. In more recent times, the port has supported the trade activities of a number of emerging resource companies of global significance in battery and critical minerals.

In 2022-23, the Port of Port Hedland recorded total throughput of 566.5Mt, of which 98.7% was attributed to iron ore, followed by salt (0.9%), fuel (0.5%) and other (0.5%). In 2022-23, the Port of Port Hedland had 6,786 vessel movements, equating to a rate of approximately 565 vessel movements per month.

Figure 2.3 presents a breakdown of total annual export trade volumes from the Port of Port Hedland over the five-year period between 2018-19 and 2022-23. Over this period, total annual export trade volumes have increased by 10.3%, with the largest year-on-year increase over this period recorded between 2018-19 and 2019-20 when total annual export trade volumes increased by 5%.

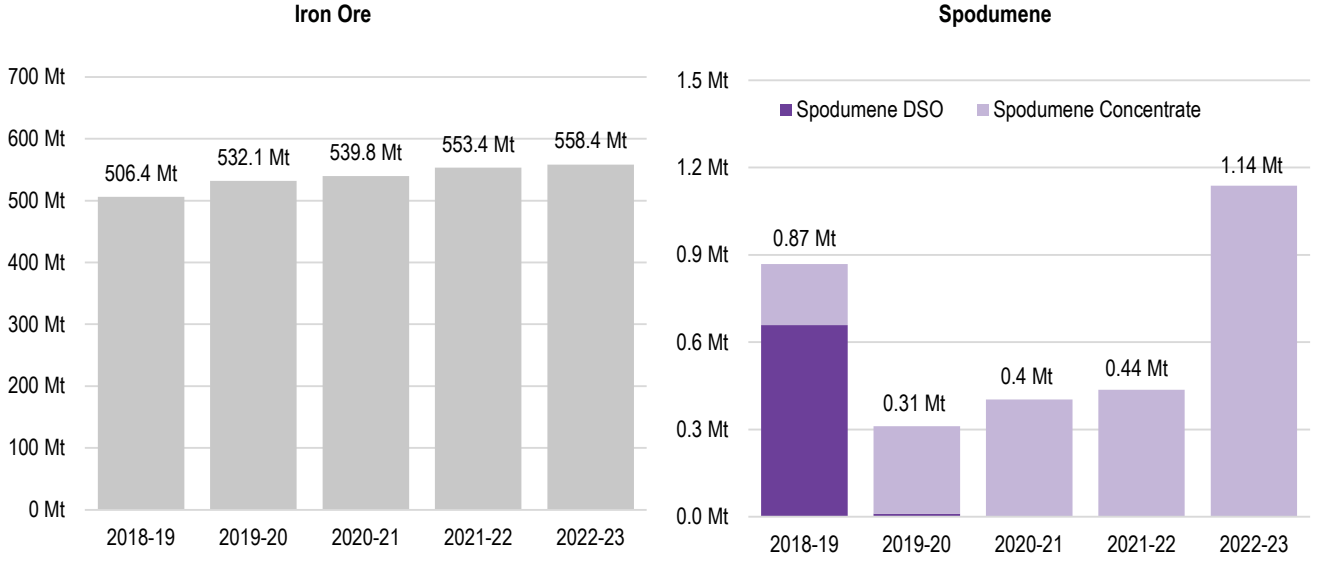
Figure 2.3 Port of Port Hedland – Total Export Trade Volumes



Note: Other includes copper concentrates, manganese ore, primary produce, chemical compound, containers and general.
Source: Pilbara Ports

Figure 2.4 presents a profile of the export trade volumes for iron ore and spodumene (DS0 and concentrate) from the Port of Port Hedland over the five-year period between 2018-19 and 2022-23. Over this period, total annual export trade volumes for iron ore have steadily increased by 10.3% from 506.4 Mt in 2018-19 to 558.4 Mt in 2022-23. In turn, over the four-year period between 2019-20 and 2022-23, total annual export trade volumes for spodumene increased by 265%. A sharp decline in export trade volumes for spodumene was recorded between 2018-19 and 2019-20 as a result of the depressed unit price for spodumene over this period.

Figure 2.4 Port of Port Hedland – Export Trade Volumes by Commodity

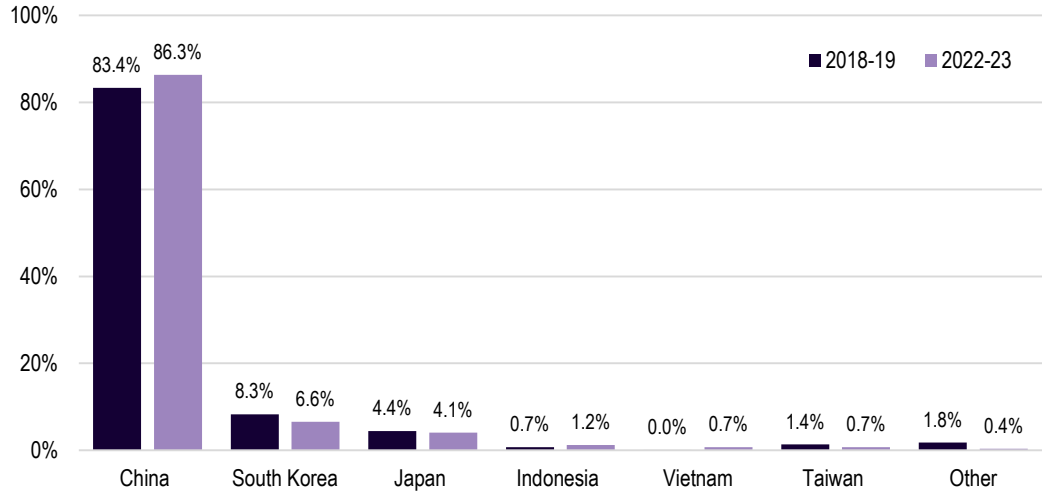


Source: Pilbara Ports

Figure 2.5 presents a breakdown of the destination country for iron ore exports from the Port of Port Hedland in 2018-19 and 2022-23. Iron ore exports to China accounted for a large majority of iron ore exports at a share of 86.3% in 2022-23, with the next largest being South Korea (6.6%) and Japan (4.1%). Similarly, in 2022-23, China accounted for the largest share of spodumene concentrate exports from the Port of Port Hedland at a share of 99.6%.

Compared to 2018-19, the share of iron ore exports to China increased from 83.4% to 86.3%, while the share of iron ore exports declined for South Korea (8.3% to 6.6%), Japan (4.4% to 4.1%) and Taiwan (1.4% to 0.7%).

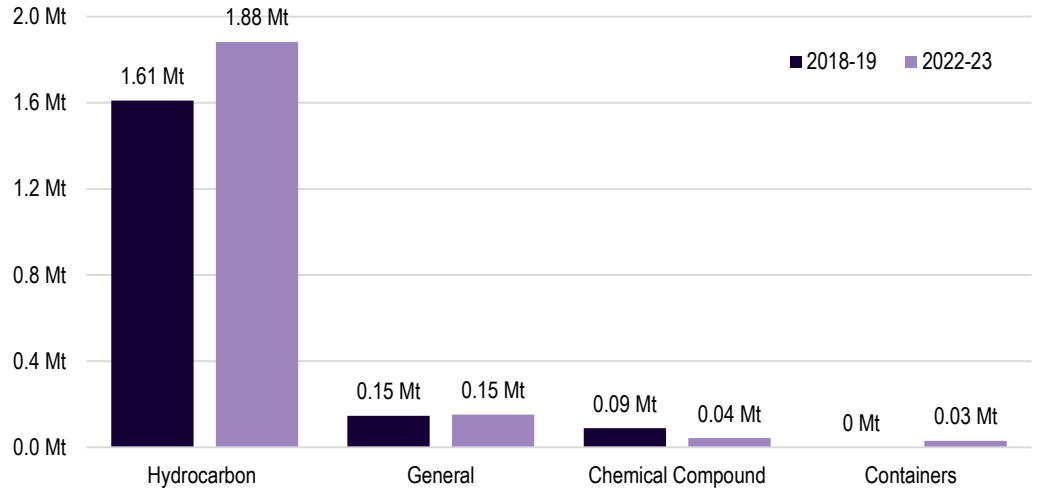
Figure 2.5 Port of Port Hedland – Destination Country for Iron Ore Exports



Source: Pilbara Ports

Figure 2.6 presents a breakdown of import trade volumes through the Port of Port Hedland in 2018-19 and 2022-23. In 2022-23, overall import trade volumes were recorded at approximately 2.1Mt, a 14.2% increase compared to five years prior in 2018-19. The increase in overall import trade volumes was driven primarily by fuel (hydrocarbon) imports which increased by 17% between 2018-19 and 2022-23. Over the same period, chemical compound imports declined by 52%.

Figure 2.6 Port of Port Hedland – Import Trade Volumes by Commodity



Source: Pilbara Ports

Key Finding 2 Port of Port Hedland Trade Overview

Between 2018-19 and 2022-23, total export volumes from the Port of Port Hedland increased by 10.3%, with iron ore exports from the Port also increasing by 10.3% over the same period. The greatest recent shift in the composition of export trade from the Port of Port Hedland can attributed to the lithium market, with export volumes for spodumene increasing by 265% between 2019-20 and 2022-23. China accounts for the significant majority of iron ore exports from the Port of Port Hedland at a share of 83.4% in 2022-23. Import trade volumes from the Port of Port Hedland displayed limited variability between 2018-19 and 2022-23, having an uplift is anticipated in the short to medium term as a result of the commencement of operations at the Lumsden Point General Cargo Facility.

2.3 Commodities Outlook

This section provides an overview of the demand and supply outlook for the major commodities exported from the Port of Port Hedland. Western Australia's track record and experience in mining, low sovereign risk, high environmental and social standards, and tried-and-tested regulatory framework are all factors that differentiate Western Australian producers as suppliers of choice in a competitive global market.

2.3.1 Iron ore

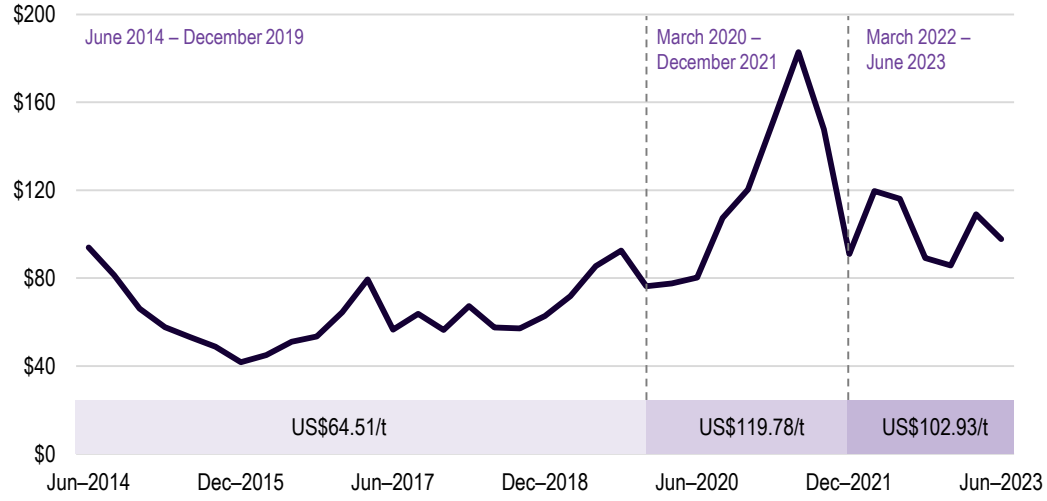
While the Pilbara region has a rich diversity of metals and minerals, which has become more profoundly evident over the past five years, iron ore remains by far the most dominant resource within the region in terms of business activity and export value.

Iron ore prices have displayed higher volatility over the past 2-3 years due to significant fluctuations in demand from China due primarily to restrictions imposed in response to the COVID-19 pandemic hindering industrial activity. More broadly, steel production across the rest of the world has been impacted by high energy prices due to the ongoing effects of the war in Ukraine. On the supply front, shipments from Brazil which is the world's second largest iron ore producer behind Australia have been impacted by adverse weather conditions and environmental concerns.

As presented in **Figure 2.7**, the iron ore price increased sharply in the 2020-21 financial year, peaking at US$182.85/t in the June 2021 quarter. The iron ore price subsequently declined over the first half of the 2021-22 financial year to reach US$90.95/t in the December 2021. Since this point, the iron ore price has displayed less volatility and has sat within a range of around US$90/t to US$120/t.

Despite the decline recorded since the peak in June 2021, the average iron price over the period between March 2022 quarter and June 2023 quarter of US$102.93/t is significantly greater than the average iron ore price over the period between June 2014 quarter and December 2019 quarter of US$64.51/t. The WA State Budget 2023-24 forecasts an iron ore price of US$74.1/t in 2023-24, declining to US$66/t in 2024-25, 2025-26 and 2026-27 – noting this is typically a conservative forecast due to the sensitivity of the assumption on the State's royalty revenue outlook.

Figure 2.7 Iron ore price (US$/t, 62% iron content)

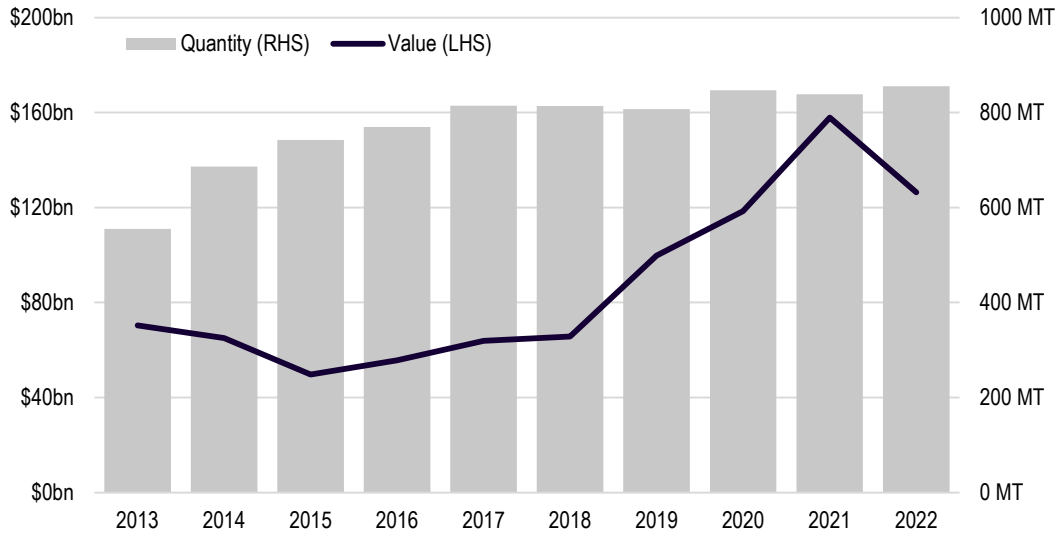


Source: Department of Industry, Science and Resources: Resources and Energy Quarterly – September 2023

Figure 2.8 presents total iron ore production in Western Australia over the ten-year period between 2013 and 2022, in terms of both quantity and value of production. In 2022, total iron ore production increased by 2% to 855 MT, marginally above the previous peak in total iron ore production of 847 MT recorded in 2020. Between 2013 and 2022, total iron ore production increased by 54.1%. Value of production peaked at $157.9 billion in 2021, which was followed by a decline of 20% in 2022 to $126.4 billion. Between 2013 and 2022, the value of iron ore production increased by 79.5%.

The WA State Budget 2023-24 forecasts total iron ore production in Western Australia to reach 890 million tonnes by 2026-27, driven primarily by production ramping up at Gudai-Darri (Rio Tinto), Eliwana (Fortescue), South Flank (BHP), Iron Bridge (Fortescue) and Onslow (Mineral Resources), as well as accounting for the depletion of some iron ore mines in the Pilbara region.

Figure 2.8 Iron ore production in Western Australia – Quantity and Value by Calendar Year



Source: WA Department of Mines, Industry Regulation and Safety

Globally, contractionary monetary policy and elevated energy prices across most major economies has impacted on private sector spending and residential investment, which in turn has adversely impacted steel demand. China accounts for approximately 60% of global iron ore demand, which in

turn provides the steel that feeds its domestic property sector (which accounts for approximately 25% of the country's steel demand).

Going forward, the Chinese economy is set to confront a number of structural challenges that are likely to result in a decline in annual economic growth rates below historic levels. These structural challenges include a decline in the working age population and a rebalancing in the country's production structure from industry to services. This is anticipated to result in a shift in the country's expenditure drivers from investment and exports towards consumption.

The 14th *Five-Year Plan of the People's Republic of China* forecasts a 4.7% compound annual growth rate (CAGR) for real GDP out to 2035. BHP's in-house economics unit believe it unlikely that China will achieve annual growth rates as high as 4.7% in the middle of the 2030s, and have developed mid case point estimates (rounded) for growth in 2025, 2030, 2035 and 2050 of 5%, 4.75%, 3.5% and 1.75% respectively.[4]

The extent to which India and other emerging countries in South-East Asia (such as Vietnam, Philippines, and Malaysia) become larger export markets for iron ore, and in turn offset fluctuations in demand from China, is becoming a growing area of focus for major iron ore producers operating in the Pilbara region. In the 2022 calendar year, steel production from India increased by 6% to 125 Mt[5], driven by strong demand from the manufacturing and construction sectors.

The Indian Government have a target to double national steel production capacity to 300 million tonnes by 2030-31, which is expected to result in more than 60 million tonnes of new steel production capacity being added over the next few years.[6]

Demand in India will be supported by the $1.5 trillion National Infrastructure Pipeline which is expected to support growth in India's residential and commercial sectors to 2025, as well as a ramp up in infrastructure spending. In addition, sustained growth in private consumption is expected to drive healthy growth in automotive and consumer durables.

However unlike China, India has access to relatively high grade domestic iron ore deposits, and has sought to build its own domestic industry through State-directed investment and export controls. As a result, India has increased its domestic iron ore production to over 280 million tonnes per annum in recent years. This has led the Indian Government to progressively remove export controls on iron ore, with the country exporting around 20% of its output in 2023. As a result, the Indian market is unlikely to present as a "China-like" partner for Western Australia's iron ore industry in the years and decades ahead.

In the long term, iron ore producers in the Pilbara region are expected to be impacted by a shift in the mix of iron ore products demanded by the steel producers, as customers seek higher grade and lower emissions ores to meet decarbonisation targets. The early stages of efforts by iron ore producers in the Pilbara region to meet this longer term shift in the market is demonstrated by projects such as Fortescue's Iron Bridge Magnetite Project and Atlas Iron's Ridley Magnetite Project (under consideration). These products are more energy intensive to produce domestically in Western Australia, but result in lower emissions during the steelmaking part of the value chain. Further insights on this can be seen in ACIL Allen (and GHD's) work with the Minerals Research Institute of Western Australia.

[4] BHP Economic and Commodity Outlook: Financial Year 2023 (p.12)

[5] BHP Economic and Commodity Outlook: Financial Year 2023 (p.14)

[6] Department of Industry, Science and Resources – Resources and Energy Quarterly – September 2023 (p.37)

Key Finding 3 Commodity Analysis – Iron Ore

Iron ore prices have displayed higher volatility over the past 2-3 years due to significant fluctuations in demand from China due primarily to restrictions imposed in response to the COVID-19 pandemic hindering industrial activity. Despite the higher volatility, iron ore prices over this period have remained significantly higher than prices over the five-year period preceding the COVID-19 pandemic. Going forward, the Chinese economy is set to confront a number of structural challenges that are likely to result in a decline in annual economic growth rates below historic levels, raising the focus on India and other emerging countries in South-East Asia as growing iron ore export markets to offset fluctuations in demand from China.

2.3.2 Lithium

Lithium projects support trade and investment opportunities for Western Australia across a range of existing and emerging global supply chains, including automotive manufacturing, advanced manufacturing, renewable energy, defence and aerospace.

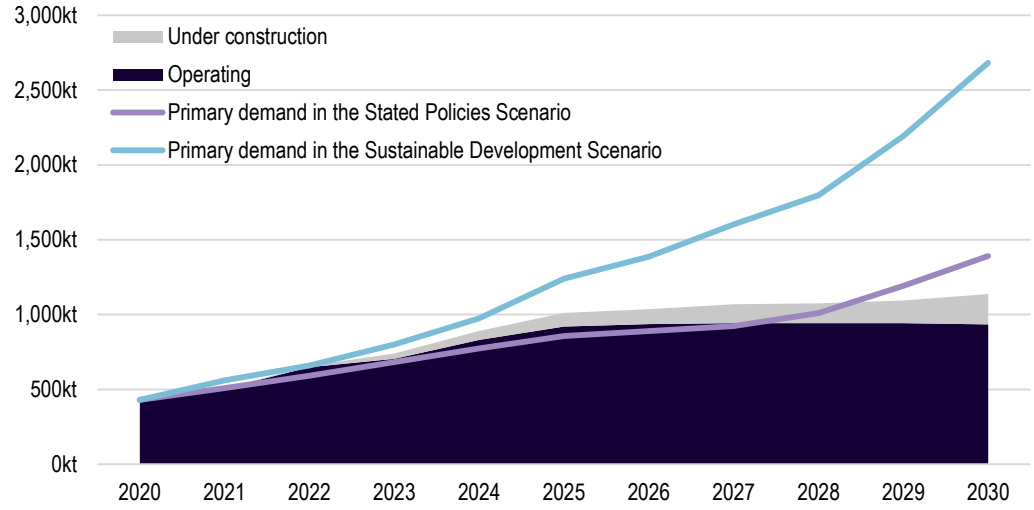
In 2022, approximately 60% of global lithium consumption was linked to electric vehicles for which demand continues to be supported by high levels of policy support, as well as shifting consumer preferences. Growth in the scale of the electric vehicle industry has been driven by China, which is now the world's largest automobile exporter, surpassing Japan and Germany.

Across the world, support for the electric vehicle industry has come both in the form of incentivising electric vehicle uptake (in alignment with emissions reduction targets), as well as the development of domestic electric vehicle supply chains. The feasibility of greenfield lithium projects, as well as expansions to existing lithium projects across Western Australia, continues to be supported by major global manufacturers in the automotive industry securing supply through offtake agreements. At the same time as the supply of battery minerals such as lithium is increasing, there are rapid developments taking place in battery chemistry, with driving ranges rising and "refuelling" times falling towards levels comparable with internal combustion engines.

Rising demand for lithium is also linked to increasing levels of investment in utility-scale energy storage systems, electrification of tools and products (such as electric scooters), growth in portable electronics, and industrial demand (including ceramics and greases).

Figure 2.9 presents the committed mine production and primary demand for lithium for the ten-year outlook period between 2020 and 2030, based on projections formulated by the International Energy Agency (IEA). By 2030, primary demand for lithium under both the IEA's Stated Policies Scenario and Sustainable Development Scenario is expected to exceed total mine production, accounting for both operating mines and those under construction.

Figure 2.9 Committed mine production and primary demand for lithium, 2020-30



Source: International Energy Agency analysis based on S&P Global

In 2022, approximately 96% of global lithium refining was undertaken in China, Chile and Argentina. It is projected this share will steadily decline in the short to medium term as countries such as Australia and the United States increase lithium refining capacity.

In Western Australia, there are currently three lithium hydroxide refineries either operating or under development. Two of the refineries are located in the Kwinana Industrial Area and one is located in the Kemerton Strategic Industrial Area. In the Pilbara region, Pilbara Minerals and Calix Limited have announced a final investment decision on construction of a lithium phosphate refinery at Pilgangoora.

The WA Government's focus on the development of the state as a downstream minerals processing hub for lithium (as well as other critical minerals such as nickel) is driven by the vision outlined in the *Future Battery and Critical Minerals Strategy*. The national significance of battery minerals such as lithium is further demonstrated by the release of the *Critical Minerals Strategy* and the ongoing development of a *National Battery Strategy* by the Commonwealth Government.

Over the period since the December 2020 quarter, the spodumene (concentrated ore) and lithium hydroxide price sharply increased, with both peaking in the December 2022 quarter at US$5,971 and US$77,984 respectively (**Figure 2.10**). While prices have declined over the subsequent period through to the June 2023 quarter, prices remain significantly higher than average prices recorded over the period between the June 2017 quarter and December 2020 quarter of US$663/t for spodumene and US$15,829/t for lithium hydroxide. The decline in prices over 2019 and 2020 resulted in a number of companies in the Pilbara region involved in the development of lithium projects facing financial and operational difficulties.

The Department of Industry, Science and Resources forecasts a spodumene price of US$2,497/t in 2024 (calendar), declining to US$1,993/t in 2025, and a lithium hydroxide price of US$41,140/t in 2024, declining to 35,530/t in 2025.

The Department of Industry, Science and Resources anticipate that despite recent price falls, lithium mines in Western Australia are expected to remain highly profitable, with long-term prices projected to settle well above reported production costs.[7] For the 2022-23 financial year, Greenbushes (Talison Lithium), Mt Cattlin (Allkem), Mt Marion (Mineral Resources), Pilgangoora

[7] Department of Industry, Science and Resources – Resources and Energy Quarterly (September 2023) – p.149

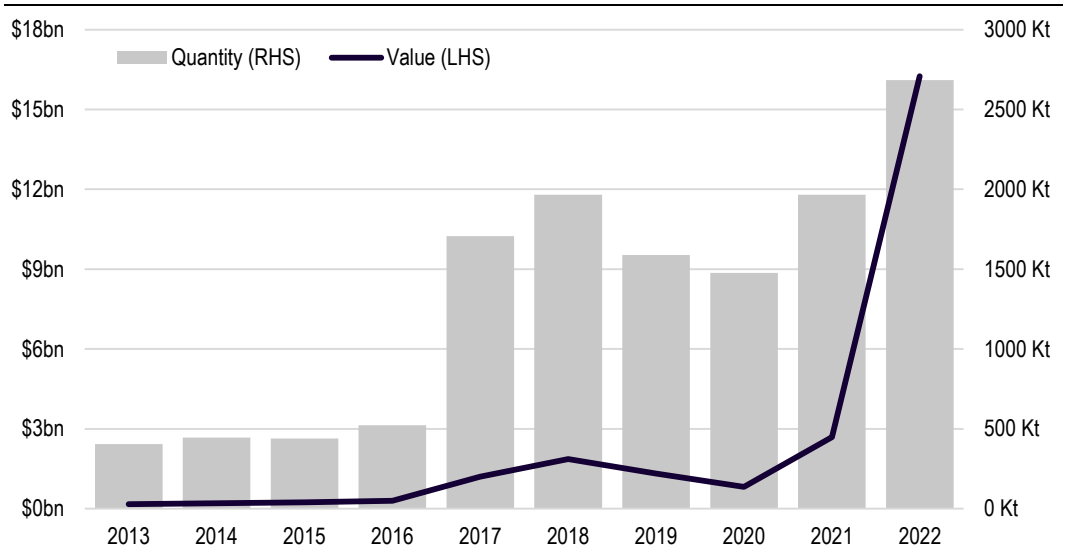
(Pilbara Minerals) and Wodgina (Mineral Resources) reported unit cash costs as a share of prices received at 9.5%, 19%, 37%, 25% and 19% respectively. While on this basis the unit cash costs as a share of prices received is in a healthy position for lithium producers in Western Australia, a challenge going forward will be the cost competitiveness of the state as a destination for the further development of major capital projects in downstream lithium processing, relative to countries such as China and South Korea.

Figure 2.10 Lithium prices (US$/t)

Source: Department of Industry, Science and Resources: Resources and Energy Quarterly – September 2023

Figure 2.11 presents total spodumene concentrate production in Western Australia over the ten-year period between 2013 and 2022, in terms of both quantity and value of production. In 2022, total spodumene concentrate production increased by 36.5% to a peak level of 2,684 Kt. Between 2013 and 2022, total spodumene concentrate production increased by 562%, representing a greater than five-fold increase. In 2022, the value of spodumene concentrate production increased by 505% to a peak level of $16.3 billion.

Figure 2.11 Spodumene concentrate production in Western Australia – Quantity and Value by Calendar Year



Source: WA Department of Mines, Industry Regulation and Safety

The ongoing growth of the lithium industry in Western Australia will benefit from the low sovereign risk associated with investment in new projects, relative to other major producers of lithium such as Chile. In April 2023, it was announced that Chile would seek to nationalise its lithium industry to boost its economy and protect its environment. Under these policy settings, future lithium contracts would only be issues as public-private partnerships with state control. The government in Chile would not terminate current contracts, but is seeking to encourage companies to be open to state participation before they expire. Contracts for major producers SQM and Albemarle are set to expire in 2030 and 2043 respectively.[8]

In more recent times, global lithium prices have fallen significantly on the back of demand uncertainty and anticipated short term growth in supply. This has resulted in the lithium spodumene price falling below US$1,000 / tonne much faster than the market anticipated. Operators in the Port of Port Hedland Supply Chain remain viable at these prices, however some other projects in Western Australia have slowed capital expenditure, deferred the development of new capacity, and eased back mining activities.

It is expected current market conditions will revert towards a more positive price outlook in the years ahead as supply and demand rebalance.

Key Finding 4 Commodity Analysis – Lithium

Spodumene and lithium hydroxide prices peaked in the December 2022 quarter, and declined over the subsequent period through to the June 2023 quarter. In the later stages of 2023 and early 2024 lithium prices declined significantly towards the five year average due to a slow down in demand growth and the outlook for new supply. Prices remain elevated versus the long run average and support the continued operations of existing producers. It is expected current market conditions will revert towards a more positive price outlook in the years ahead as supply and demand rebalance.

2.3.3 Salt

Global production of salt reached a record level of approximately 330 million tonnes in 2019, following annual average increases of 1% over the period from 2010 to 2019. The COVID-19 pandemic impacted on global salt production and consumption in 2020 and 2021. In 2022, Australia equated for approximately 4.5% of global salt production which was recorded at approximately 290 million tonnes.[9] Western Australia accounts for the majority of Australia's salt production.

Dampier Salt's operations in Western Australia (comprising of Dampier, Port Hedland and Lake MacLeod) are the world's largest exporter of seaborne salt[10]. The final destination for the majority of salt exports is Asia and the Middle East.

The chemical industry is the primary end user for the salt produced by Dampier Salt, where it is used towards the production of materials such as glass, paper, plastics, textiles, soaps and detergents. To a lesser extent, it is also used to process foods and de-ice roads. There are no economic substitutes or alternatives for salt in most of these applications. Calcium chloride and

[8] Reuters: "Chile plans to nationalize its vast lithium industry" (21 April 2023)

[9] United States Geological Survey – Salt Annual Publication (2023)

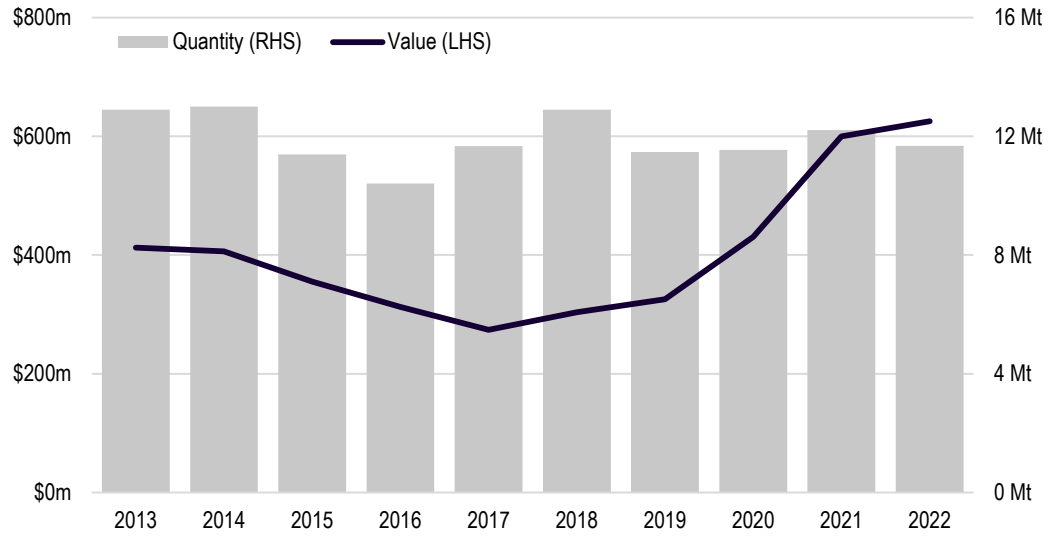
[10] Seaborne salt is salt that is produced from evaporating seawater, as opposed to being mined as a solid mineral.

calcium magnesium acetate, hydrochloric acid, and potassium chloride can be substituted for salt in de-icing, certain chemical processes, and food flavouring, but at a higher cost.[11]

A key growth driver for salt is expected to be increasing demand from the chemical industry in Asia. Future production of salt is likely to be impacted by climate change, particularly through increased variability of climatic conditions, however economic and subeconomic deposits of salt are substantial in principal salt-producing countries.

Figure 2.12 presents total salt production in Western Australia over the ten-year period between 2013 and 2022, in terms of both quantity and value of production. In 2022, total salt production declined by 4.4% to a level of 11.7 Mt. Over the period between 2013 and 2022, total salt production has displayed limited variability and has been recorded within a tight range of 10.4 Mt and 12.9 Mt. In 2022, the value of salt production increased by 4.3% to a peak level of $625.5 million. Between 2013 and 2022, the value of salt production increased by 51.7% from $412.4 million, and dropped to as low as $274 million in 2017.

Figure 2.12 Salt production in Western Australia – Quantity and Value by Calendar Year



Source: WA Department of Mines, Industry Regulation and Safety

Key Finding 5 Commodity Analysis – Salt

Over the past ten years, salt production in Western Australia has displayed limited variability, and has benefited from consistently steady growth in global demand, primarily from the chemical industry. Going forward, increasing levels of demand from the chemical industry, in particular in Asia, is expected to support salt production from Western Australia

2.4 Investment Outlook

This section is focused on the investment outlook associated with major projects with linkages to the Port Hedland Port Supply Chain, split by major projects in the mining industry and major projects in renewable energy.

[11] United States Geological Survey – Salt Annual Publication (2023)

The determination of whether a major project has linkages to the Port Hedland Port Supply Chain has been considered based on a range of factors including proximity to the Port, whether the project is likely to trade through the Port and the extent to which the project interacts with companies who are existing users of the Port.

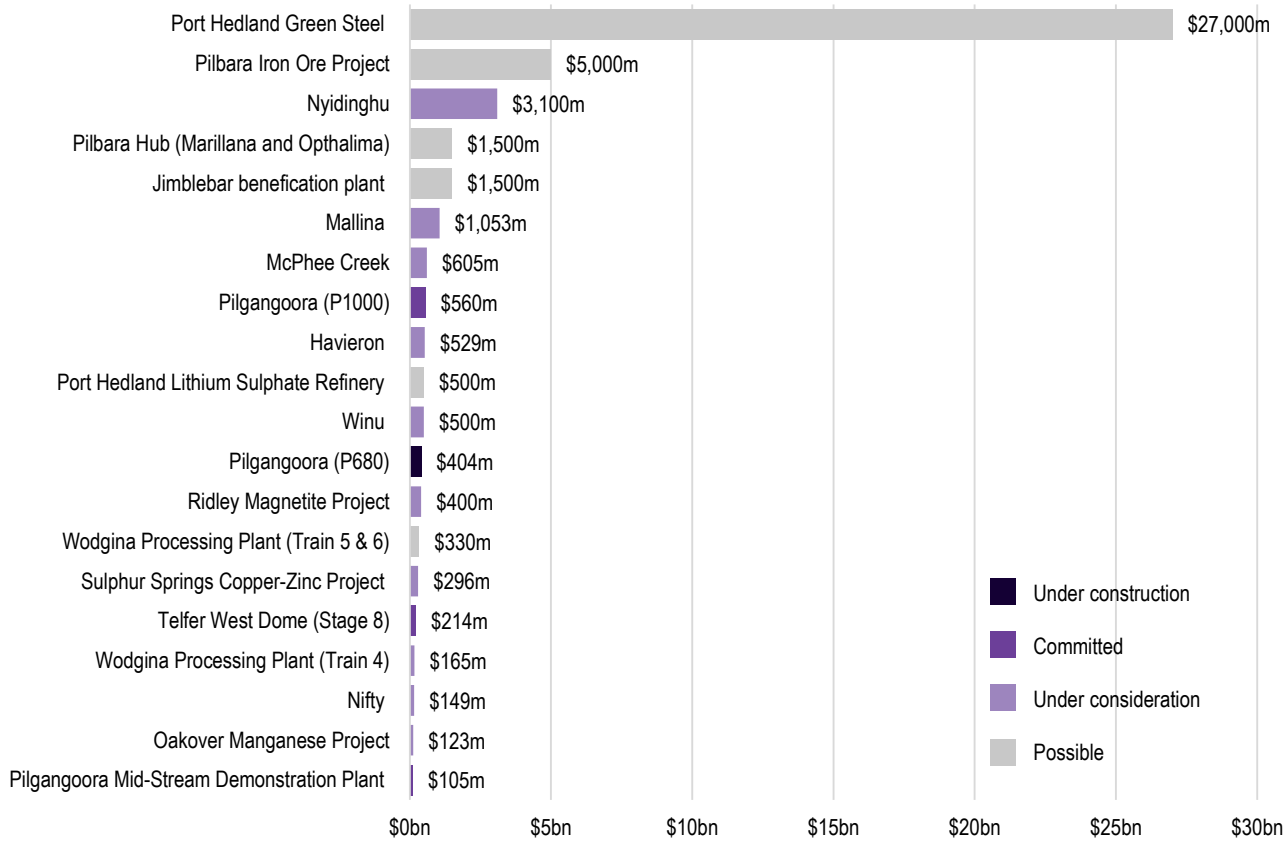
2.4.1 Mining

The target commodities associated with major mining projects in the Pilbara region are more diversified than at any other point in history, due in part to the strong global demand for battery and critical minerals and the growing focus from the WA Government on stimulating private investment towards downstream mineral processing.

As of December 2023, there is approximately **$44 billion** of investment in the pipeline for major mining projects in the Pilbara region, with linkages to the Port Hedland Port Supply Chain (**Figure 2.13**). The majority of these major projects are categorised as 'under consideration' or 'possible', accounting for a collective value of $42.7 billion, or 97.1% of the total value of major projects in the investment pipeline. A number of the major projects classified as 'under consideration' are subject to gaining final regulatory approvals from environmental bodies, as well as meeting heritage protection requirements.

The growing diversification of the commodity base associated with mining projects in the Pilbara region is reflected in 7.1% (approximately $3.1 billion) of the total value of major projects in the investment pipeline being accounted for by battery minerals, such as lithium and copper. The share accounted for by battery minerals projects increases to 18.4% when the Port Hedland Green Steel project is excluded from the total value of the investment pipeline.

Figure 2.13 Investment Outlook – Major Mining Projects with linkages to the Port Hedland Port Supply Chain



Source: Department of Industry, Science and Resources – Resources and Energy Major Projects (2022) – List reviewed and project values revised by ACIL Allen

Despite the growing diversification of the commodity base in the Pilbara region, the position of iron ore as the dominant resource is reflected by the commodity accounting for 88.8% (approximately $39.1 billion) of the total value of major projects in the investment pipeline.

Key Finding 6 Investment Outlook – Mining

As of December 2023, there is approximately $44 billion of investment in the pipeline for major mining projects, with linkages to the Port Hedland Port Supply Chain. As the dominant resource in the Pilbara region, iron ore accounts for 88.8% of the total value of major projects in the investment pipeline, while battery minerals accounts for a share of 7.1%, reflecting the growing diversification of the commodity base.

2.4.2 Renewable Energy

Investment in electricity infrastructure in the Pilbara region has increased as a result of major companies in the Port Hedland Port Supply Chain seeking to decarbonise and incrementally replace gas and diesel as the dominant power sources for mining, rail and port operations.

Investment in renewable energy is being delivered in the Pilbara region directly by both major mining companies in the Port Hedland Port Supply Chain, as well as third parties (such as the Australian Renewable Energy Hub) that are likely to end up supplying renewable power to companies in the Port Hedland Port Supply Chain. This is well demonstrated by Fortescue who as of November 2023 are close to finishing work on a 100-megawatt solar farm near to the Iron Bridge magnetite mine, while also relying on Alinta's solar farm for 60 megawatts of offtake at its Christmas Creek operations. **Table 2.1** presents an overview of a selection of renewable energy projects at various phases of development located in the region, and with linkages to the Port Hedland Port Supply Chain.

Table 2.1 Investment Outlook – Major Renewable Energy Projects with linkages to the Port Hedland Port Supply Chain

Project	Cost Estimate	Description
BP: Australian Renewable Energy Hub (AREH)	$54 billion	The AREH is situated on a 6,500 square kilometre site in the Pilbara region of Western Australia. The AREH will be developed in multiple phases up to 26 GW of combined solar and wind power generating capacity. At full scale, AREH is expected to produce around 1.6 million tonnes of green hydrogen or 9 million tonnes of green ammonia per annum for the domestic Australian market and export to major international users. The project will also supply renewable power to local customers. From 1 July 2022, BP took a 40.5% stake and operatorship of the AREH project, and is working with joint venture partners InterContinental Energy (26.4%), CWP Global (17.8%) and Macquarie (15.3%).
Fortescue: Pilbara Energy Connect	$700 million	The project is intended to enhance Fortescue's existing power generation capacity through the inclusion of 150MW of gas fired reciprocating engine-based power generation, together with 150MW of solar photovoltaic (PV) generation and 50MW of battery storage. Pilbara Energy Connect complements the Pilbara Transmission Project, which consists of 275km of high voltage transmission lines connecting Fortescue's existing mine sites.
Alinta Energy: Port Hedland Solar Battery Hybrid Project	$180 million	The project will consist of around 100,000 panels over an approximate 100 hectare land parcel. The solar array will be located about 500 metres east of the Port Hedland Power Station, with the battery located at the existing power station. Once the project is completed, it's expected that 100% of the forecasted average daytime energy requirements for BHP's port facilities will be powered by solar generation, with the remaining power requirements to be met via the battery and Alinta Energy's existing gas-fired power station.

Source: ACIL Allen

Key Finding 7 Investment Outlook – Renewable Energy

The significant uplift in investment activity associated with renewable energy projects in the Pilbara region has been driven to a large extent by the efforts of major resource companies in the Port Hedland Port Supply Chain to decarbonise and replace the share of power generation attributed to the use of gas and diesel with a range of renewable energy sources such as wind and solar.

2.4.3 Infrastructure

Ongoing investment towards port, rail and road infrastructure, as well as increasing the supply of industrial land, by the Commonwealth Government, State Government, local government and private sector has supported both an increase in the operating activities of existing companies and the entry of new companies to the Pilbara region. Investment in infrastructure also has direct and indirect linkages to the decarbonisation efforts of companies in the Port Hedland Port Supply Chain.

Port Infrastructure

Pilbara Ports are progressing the development of a new multi-user facility and logistics hub at Lumsden Point. It is anticipated the Lumsden Point development will help to facilitate the export of battery metals such as lithium and copper concentrates, import of renewable energy infrastructure (such as wind turbines and blades, and solar panels), and support the growth of direct shipping services to the Pilbara, from countries such as Singapore.

In 2022-23, Pilbara Ports reported there was an average of one vessel arrival per week associated with direct shipping services, with imported cargoes including products such as tyres, cement, mill balls, clink and steel. Direct shipping services facilitate faster and lower cost delivery of materials to the Pilbara region for mining companies, and support decarbonisation efforts by reducing greenhouse gas emissions associated with the traditional delivery mode of transporting products to mine sites by truck from Fremantle Port.

The project has received financial support from the Commonwealth Government, WA Government and industry. The Commonwealth Government is investing $565 million to support common user port upgrades in the Pilbara, part of which is allocated to the Lumsden Point project, while the WA Government has committed $129.1 million to the project. The total cost of the Lumsden Point development is estimated at approximately $633 million.

HanRoy are leading the study of a new berth and ship loading solution for iron ore exports at Stanley Point at the Port of Port Hedland on behalf of a joint venture with Mineral Resources (HanMin JV). The Stanley Point Berth 3 project sits adjacent to Roy Hill's two existing berths. The project consists of a new berth able to support Cape sized vessels, a 40 Mtpa capacity ship loader and a new overland conveyor. On landside, the project consists of a new rail loop, additional car dumper and a capacity increase to the Roy Hill stockyard. As of October 2023, ACIL Allen understands engineering design and approvals for this project are well advanced. The total cost of the project is estimated at in excess of $1 billion.

BHP's Port Debottenecking Project 1, which includes a yard extension and rate increases on shiploader routes, is on track for completion in the 2024 calendar year. This investment is intended to support throughput of more than 300 Mtpa from BHP in the medium to long term.

Rail Infrastructure

BHP, Fortescue and Roy Hill continue to make ongoing investments towards their privately operated heavy haulage rail networks that transport iron ore to the Port of Port Hedland, often in the form of extensions to connect new mine sites to the existing rail network.

Rail infrastructure is also set to play an important role going forward in the efforts of companies in the Port Hedland Port Supply Chain reducing their operational emissions. For example, in 2022, BHP purchased four battery-electric locomotives to conduct trials on its WAIO rail network. BHP has announced a full-transition to battery-electric locomotives would reduce BHP's WA iron ore diesel-related carbon emissions by approximately 30% annually. Fortescue and Roy Hill are also pursuing the adoption of battery-electric locomotives on their respective rail networks.

Road Infrastructure

Road infrastructure connecting to the Port of Port Hedland plays an important role in the supply chain of companies who don't have their operations connected to a rail network, such as Mineral Resources and Pilbara Minerals.

Road infrastructure is expected to play an increasingly important role in supporting the transport of large components (e.g. blades for wind farms) necessary for renewable energy projects located at mine sites across the Pilbara region, which can't be transported to site by any other means. The importance of road infrastructure to supporting the decarbonisation efforts of major companies in the Port Hedland Port Supply Chain is demonstrated by the Federal and State Government committing $36 million for road upgrades at Lumsden Point.

Industrial Land

The availability of industrial land in Port Hedland is critical to supporting small to medium size businesses who provide services to companies in the Port Hedland Port Supply Chain. It also enables businesses based in Perth or interstate undertaking work for companies in the Port Hedland Port Supply Chain, the opportunity to establish a presence within the Pilbara region.

Recent examples of mining service companies establishing a presence in Port Hedland include Weir Minerals building a new service centre in Port Hedland after winning a major contract with Fortescue to provide aftermarket components and service to the Iron Bridge Magnetite Project, and Civmec opening a new maintenance workshop at Wedgefield Industrial Estate. Mining service companies deciding to establish a local presence in the Pilbara region has also been a recent trend experienced in the industrial areas surrounding the Karratha and Dampier townsites.

Mining service companies with a local presence are anticipated to play an important role in going forward in providing training opportunities, and increasing the resident population of local towns such as Port Hedland. They can also play an important role in the decarbonisation efforts of local mining companies by reducing the amount of truck journeys from Perth.

The Boodarie Strategic Industrial Area (Boodarie SIA), located approximately 12km south of Port Hedland, has been positioned to accommodate downstream resource processing industries related to the iron ore and gas resources of the region, leveraging off its proximity and service corridor connections to the Port of Port Hedland. Alinta Energy's 210MW gas fired power station currently operates within the Boodarie SIA. The State Government's Industrial Lands Panel has now approved land allocations at Boodarie SIA to POSCO, Fortescue, Alinta Energy, Tees Valley Lithium and BP.

Key Finding 8 Investment Outlook – Infrastructure

Public and private sector investment in port, rail and road infrastructure will play an important role in supporting companies within the Port Hedland Port Supply Chain to achieve decarbonisation targets. Infrastructure investment, along with an increase in the availability of industrial land, will also help to facilitate growth in the overall scale of economic activity by enabling existing resources companies in the region to expand their operations, as well as attracting new resources companies to the region and mining service companies to establish a local presence.

Modelling Methodology and Assumptions 3

This section provides an overview of the modelling methodology and data that has been collated from participating companies to estimate the economic significance of the Port of Port Hedland.

3.1 Methodology

ACIL Allen has undertaken an **economic contribution assessment** for the 2022-23 financial year and **economic impact assessment** for the subsequent ten-year period from 2023-24 to 2032-33 based on the financial results of the most recent financial year and forward guidance provided by companies participating in the study.

3.1.1 Modelling Framework

Economic Contribution Modelling

The economic contribution of the Port Hedland Port Supply Chain is examined using ACIL Allen's Input-Output (IO) modelling framework, with results produced in the form of the direct and indirect contribution of the Port Hedland Port Supply Chain to the Australian and Western Australian economies, at a regional level in the Pilbara and at a sub-regional level for the Town of Port Hedland in terms of the contribution to:

- economic output (Gross Domestic Product, Gross State Product, Gross Regional Product);
- gross income;
- employment (Full Time Equivalent (FTE) jobs); and
- direct taxation payments made to the Commonwealth, WA Government and Town of Port Hedland.

Further information on ACIL Allen's IO modelling framework is provided in **Appendix A**.

An economic contribution study takes the financial and employment data of the Port Hedland Port Supply Chain entities for the 2022-23 financial year to determine the overall size and scope, and "footprint" of the economy. The economic contribution is calculated on the basis of the Port Hedland Port Supply Chain's direct activities (such as profits generated, expenditure incurred, wages paid to employees) and indirect activities (such as flow on impacts from payments made to suppliers, goods and services purchased from employees) to determine the full extent of the flow-on economic contribution.

Economic Impact Modelling

The economic impact of the Port Hedland Port Supply Chain over the ten years to 2032-33 has been estimated using ACIL Allen's in-house Computable General Equilibrium (CGE) model, *Tasman Global*.

Tasman Global is a powerful tool for undertaking economic impact analysis at the regional, state, national and global levels. *Tasman Global* is designed to account for all sectors within an economy and all economies across the world. ACIL Allen uses this modelling platform to undertake industry, project, scenario and policy analyses. The model is able to analyse issues at the industry, global, national, state and regional levels and to determine the impacts of various economic changes on production, consumption and trade at the macroeconomic and industry levels.

Further information on ACIL Allen's Tasman Global CGE model is provided in **Appendix B**.

ACIL Allen has estimated the economic impact of the Port Hedland Port Supply Chain's future operations using the following indicators:

— **Real output** (Gross Domestic Product (GDP), Gross State Product (GSP) and Gross Regional Product (GRP)): Real output represents the total dollar value of all finalised goods and services produced over a specific time period and is considered as a measure of the size of the economy.
— **Real income** (Gross Real Income): Real income measures the income available for final consumption and saving after adjusting for inflation. An increase in real income means that there has been a rise in the capacity for consumption as well as a rise in the ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in the economic welfare of residents within an economy.
— **Employment**: Labour market impacts are typically produced on an annual FTE basis.
— **Real taxation**: Taxation results are completed by major heads of taxation. This typically includes royalties, payroll tax and GST at a State level, and company tax, personal income tax, and other Commonwealth taxes like excise.

The results for each indicator are presented in terms of the direct impacts (for example, the workforce directly employed across the Port Hedland Port Supply Chain, or the direct taxation payments made) and the indirect impacts (highlighting the flow-on impacts of the Port Hedland Port Supply Chain operations across the economy).

The expected decline in the top line value of output from the Port Hedland Port Supply Chain means the economic impact assessment results under a standard presentation framework (a deviation from zero) suggest the supply chain will have a negative economic impact in the years ahead. To address this, ACIL Allen has made use of the 2022-23 contribution study results as the "base" for the assessment, with outlook values presented as a deviation from this.

3.1.2 Key Assumptions

To support the IO and CGE modelling frameworks, ACIL Allen has established a set of key assumptions for this study. These assumptions include:

— Modelling of the 2022-23 financial year completed using actual realised prices provided by participating companies.
— Constant flat real prices, set at 2022-23 levels, over the forecast period to isolate the impact of changed activity levels as opposed to fluctuations in inflation and exchange rates.
— Annual modelling results are presented in financial years.

3.1.3 Data Inputs

The input data used for the economic contribution and economic impact modelling was provided directly to ACIL Allen by companies participating in the study. To protect confidentiality, ACIL Allen has aggregated all datasets provided by companies participating in the study. Where a data request was not returned to ACIL Allen by a company in the Port Hedland Port Supply Chain, the

data was collected through publicly available information, and where possible with reference back to projections provided previously to support the 2020 study.

The data categories included in the data request workbook distributed by ACIL Allen are outlined below in **Table 3.1**.

Table 3.1 Key Data Inputs

Data category	Description	Why is it needed?
Ownership structure	The percentage breakdown of the ownership structure of a company's mine/asset (pre-filled categories of Port Hedland, Rest of Pilbara, Rest of WA, Rest of Australia and Rest of World).	To attribute income flows to geographic areas, in particular accounting for the share of foreign ownership of some companies in the Pilbara region.
Macro	Actual and projected community unit price, exchange rate, Australian inflation and US inflation.	To build up robust estimates of the real prices for each commodity over the study period.
Production	Actual and projected commodity production.	Key input that is used to project revenue flows over the study period.
Operational Expenditure	Actual and projected operating expenditure itemised to a level determined by the company.	Breakdown of operating expenditure is coded to individual industries to understand how the economic activity flows through the economy over the study period.
Capital Expenditure	Actual and projected capital expenditure itemised to a level determined by the company.	Breakdown of capital expenditure is coded to individual industries to understand how the economic activity flows through the economy over the study period.
Fiscal	Actual and projected company income taxation payments, personal income taxation payments, fringe benefits taxation payments, WA payroll taxation payments, royalty payments, local government rates, other taxation payments, average operational FTE salary and average construction FTE salary.	Provides estimates of the direct taxation payments made by the Port Hedland Port Supply Chain over the study period. Indirect taxation payments are estimated using ACIL Allen's CGE Model, *Tasman Global*.
Operational Employment	Actual and projected FTE numbers for managers, professionals, technicians and trade workers, community and personal service workers, clerical and administrative workers, sales workers, machinery operators, and drivers and labourers.	Provides estimates of the operating workforce directly employed by the companies across the Port Hedland Port Supply Chain by broad occupation classification. Indirect employment created as a result of the activities from the Port Hedland Port Supply Chain are estimated using ACIL Allen's CGE Mode, *Tasman Global.*
Capital Employment	Actual and projected FTE numbers for managers, professionals, technicians and trade workers, community and personal service workers, clerical and administrative workers, sales workers, machinery operators, and drivers and labourers.	Provides estimates of the workforce directly employed when capital investment is undertaken by the companies across the Port Hedland Port Supply Chain by broad occupation classification. Indirect employment created as a result of the activities from the Port Hedland Port Supply Chain are estimated using ACIL Allen's CGE Model, *Tasman Global*.
Social investment and community infrastructure investment	The level of social investment or community infrastructure investment in 2022-23 that provided a benefit to community members in the Town of Port Hedland catchment area.	To understand the scale of the collective social contribution of the Port Hedland Port Supply Chain.

Source: ACIL Allen

It is important to note the inputs and assumptions collected by ACIL Allen reflect the outlook for existing producers at predominately existing operations. As a result, there is likely to be upside to the economic contribution of the supply chain and broader region in the future which is not captured in the framework.

3.2 Port Hedland Port Supply Chain – Financial and Operations Outlook

This section presents the projected value of production, operating expenditure, capital expenditure and operational employment for the Port Hedland Port Supply Chain over the period to 2032-33.

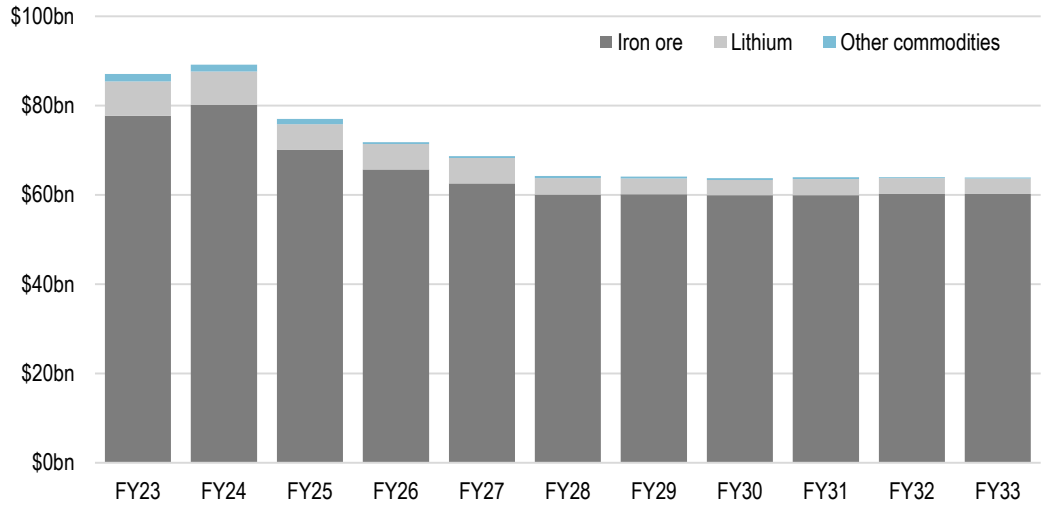
3.2.1 Value of Production

The projected value of production associated with companies in the Port Hedland Port Supply Chain has been calculated by ACIL Allen based on the forward guidance provided by companies in relation to projected production levels and the projected unit price of the commodities relevant to each company.

On this basis, ACIL Allen has estimated that the total value of production for the Port Hedland Port Supply Chain in 2022-23 was approximately $87.1 billion (**Figure 3.1**). The value of production is projected to increase marginally to reach a peak of $89.2 billion in 2023-24, before steadily declining to reach approximately $64.2 billion in 2027-28. The projected value of production stabilises at this level over the remainder of the modelling period. The decline in the projected value of production from the peak recorded at the beginning of the modelling period is due in part to conservative unit price assumptions for both iron ore and lithium (spodumene concentrate).

The conservative unit price assumptions for iron ore provided by companies in their forward guidance are comparable to the iron ore price assumptions adopted by Treasury in the WA State Budget whereby the iron price is typically set at levels within the range of $US60-70 per tonne over the outyears.

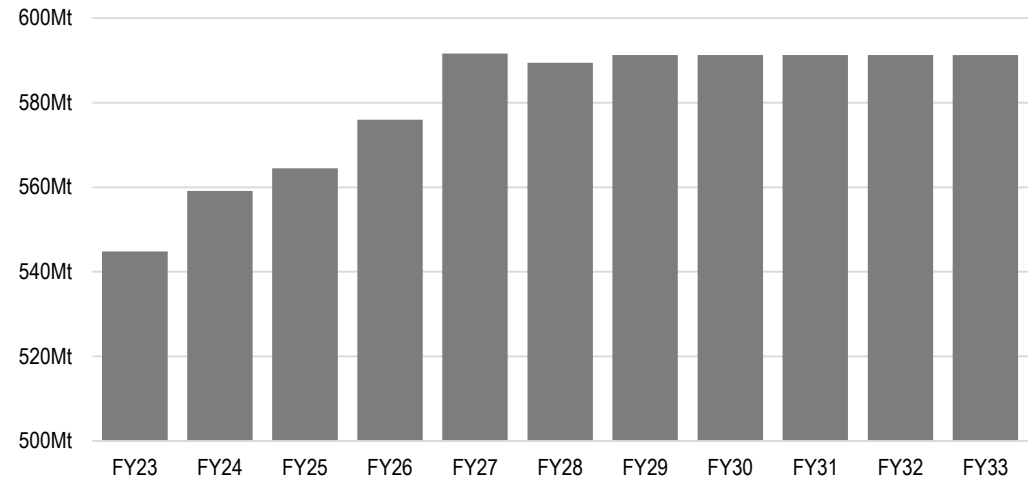
Figure 3.1 Port Hedland Port Supply Chain - Projected value of production



Source: ACIL Allen

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that total iron ore production is forecast to steadily increase over the first half of the modelling period from approximately 544.8Mt in 2022-23 to approximately 589.4Mt in 2027-28, before stabilising at this level over the second half of the modelling period (**Figure 3.2**).

Figure 3.2 Port Hedland Port Supply Chain – Projected iron ore production



Source: ACIL Allen

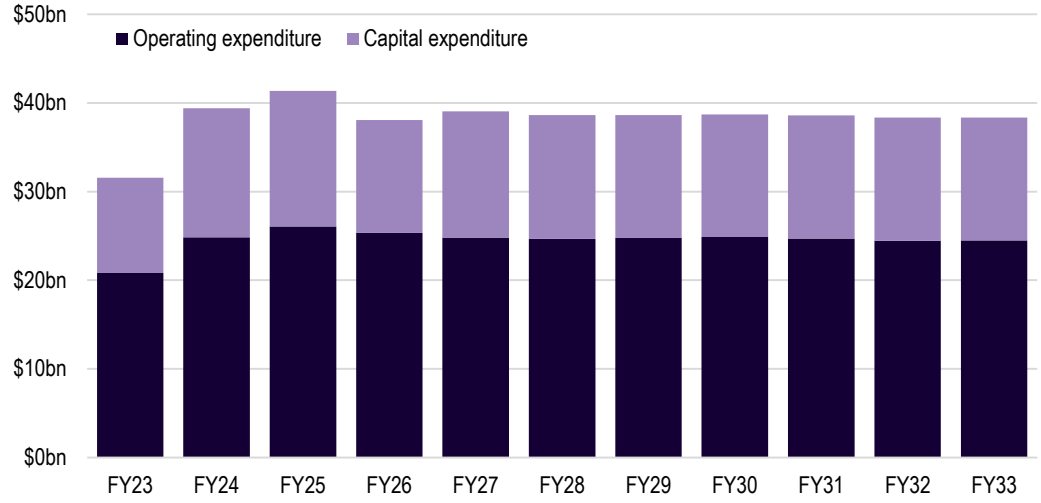
3.2.2 Operating and Capital Expenditure

Figure 3.3 presents the projected annual operating and capital expenditure for companies in the Port Hedland Port Supply Chain for the period to 2032-33.

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that projected annual operating expenditure is anticipated to increase from approximately $20.8 billion in 2022-23 to a peak of approximately $26.1 billion in 2024-25, before steadily declining to approximately $24.5 billion by the end of modelling period.

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that projected annual capital expenditure is anticipated to increase from approximately $10.7 billion in 2022-23 to a peak of approximately $15.3 billion in 2024-25. Over the remainder of the modelling period, annual capital expenditure is expected to average approximately $13.8 billion. Forward guidance on capital expenditure includes both sustaining capital expenditure towards existing operations, and growth capital expenditure which is associate with the development of new operations.

Figure 3.3 Port Hedland Port Supply Chain – Projected operating and capital expenditure



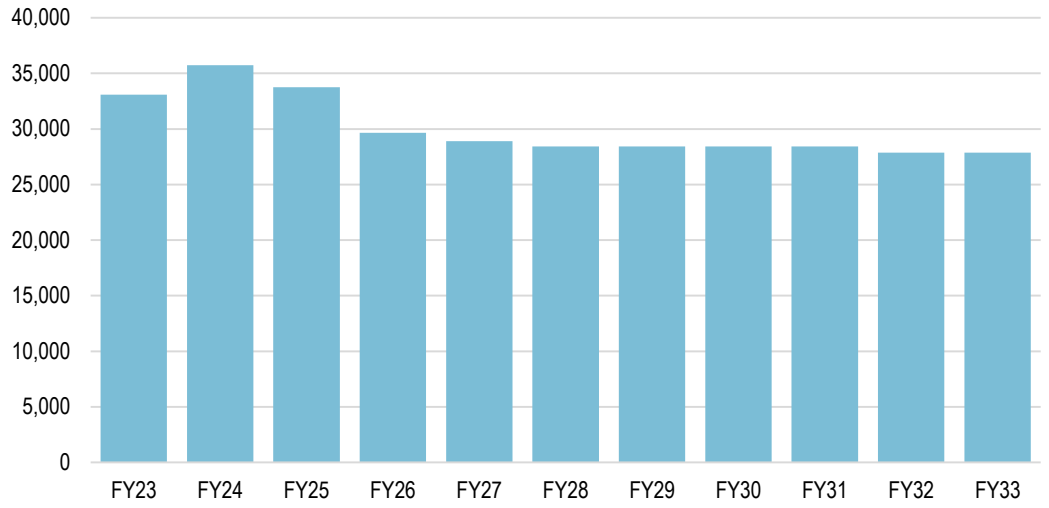
Source: ACIL Allen

3.2.3 Operational Employment

The forward guidance provided by companies in the Port Hedland Port Supply Chain indicates that total operational employment is anticipated to increase from 33,075 FTE in 2022-23 to a peak of 35,719 FTE in 2023-24, before declining to 29,653 FTE in 2025-26 (**Figure 3.4**). Over the remainder of the modelling period, total operational employment is expected to average 28,341 FTE.

The scale and composition of the workforce associated with the Port Hedland Port Supply Chain has and will continue to be impacted by the adoption of remote operations by companies at mine sites across the Pilbara region, such as through the adoption of driverless technology for big haul trucks, water carts and drill rigs, and trains.

Figure 3.4 Port Hedland Port Supply Chain - Projected operational employment (FTE)



Source: ACIL Allen

Economic Contribution of Port of Port Hedland, 2022-23

4

This section presents the economic contribution that the Port of Port Hedland and the trade through the Port made to the Town of Port Hedland, the Pilbara Region, Western Australia and Australia in 2022-23, using ACIL Allen's Input Output model.

4.1 Port Hedland

The Port Hedland Port Supply Chain accounted for $678 million in direct economic output in the Town of Port Hedland in 2022-23. The activities of the Port Hedland Port Supply Chain in the Town of Port Hedland generated $1.33 billion of indirect economic output. Together, the **total economic contribution of the Port Hedland Port Supply Chain within the Town of Port Hedland was approximately $2.01 billion in 2022-23** (**Figure 4.1**).

Figure 4.1 Economic Contribution of the Port of Port Hedland Supply Chain to the Town of Port Hedland, 2022-23

Source: ACIL Allen

The economic multiplier of local expenditure by the Port Hedland Port Supply Chain is estimated to be 2.97, meaning every dollar of expenditure made in the area generated flow on expenditure of $1.97.

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 2,019 FTE jobs in the Town of Port Hedland, and a further 6,139 FTE jobs were indirectly created, with an implied

employment multiplier of 4.04. Overall, **the Port Hedland Port Supply Chain supported 8,158 direct and indirect FTE jobs in the Town of Port Hedland in 2022-23**, **accounting for 74% of total employment in the Town of Port Hedland in 2022-23**.

From an income perspective, ACIL Allen estimates the Port Hedland Port Supply Chain directly generated $332.3 million in gross income in the Town of Port Hedland in 2022-23, with a further $691.8 million in gross income indirectly generated as a result of the activities across the supply chain. Overall, the Port Hedland Port Supply Chain helped generate approximately $1.02 billion in gross income in the Town of Port Hedland in 2022-23.

4.2 Pilbara Region

The Port Hedland Port Supply Chain accounted for $60.57 billion in direct economic output in the Pilbara Region in 2022-23. The activities of the Port Hedland Port Supply Chain generated an additional $2.71 billion of indirect economic output throughout the Region. ACIL Allen estimates that **total economic contribution of the Port Hedland Port Supply Chain within the Pilbara Region was approximately $63.28 billion in 2022-23, accounting almost three quarters of the Region's economy in 2022-23** (**Figure 4.2**).

Figure 4.2 Economic Contribution of the Port of Port Hedland Supply Chain to the Pilbara Region, 2022-23

Source: ACIL Allen

The **Port Hedland Port Supply Chain supported 22,487 direct and indirect FTE jobs in the Pilbara region in 2022-23, which equated to approximately 38% of total employment in the Region**. ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 10,890 FTE jobs in 2022-23, and a further 11,596 FTE jobs were indirectly created as a result of this activity, with an implied employment multiplier of 2.06.

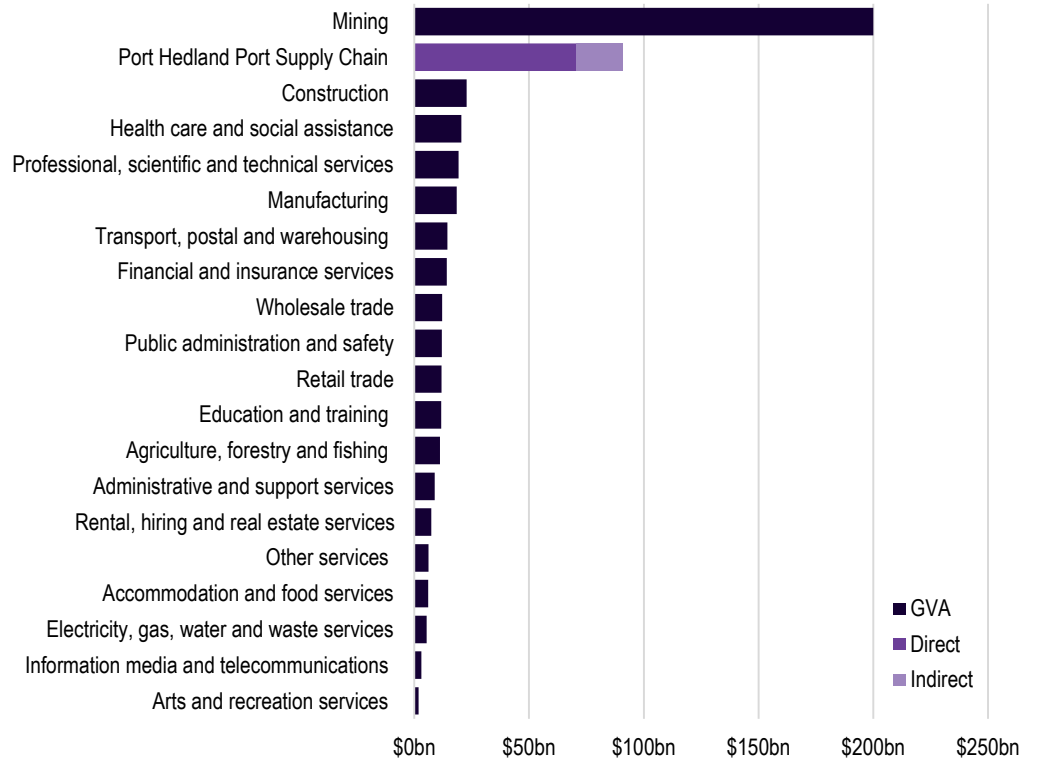
From an income perspective, ACIL Allen estimates the Port Hedland Port Supply Chain directly generated $2.14 billion in gross income in the Pilbara Region in 2022-23, with a further $2.71 billion in gross income indirectly generated as a result of the activities across the supply chain. Overall, the Port Hedland Port Supply Chain helped generate approximately $4.85 billion in gross income in the Pilbara Region in 2022-23.

4.3 Western Australia

The Port Hedland Port Supply Chain contributed **$70.48 billion in direct economic output to the WA economy in 2022-23**. The activities of the Port Hedland Port Supply Chain in the WA economy generated approximately $20.21 billion of indirect economic output. Together, the **total economic contribution of the Port Hedland Port Supply Chain in the WA economy was approximately $90.68 billion in 2022-23, accounting for over one fifth of all activity in the Western Australian economy.**

As presented in **Figure 4.3**, the Port Hedland Port Supply Chain generated significantly higher levels of output than any other WA industry, aside from mining. The overall direct and indirect contribution of the Port Hedland Port Supply Chain equated to approximately four times the Gross Value Added (GVA) of the Construction industry and more than eight times the GVA of the Agriculture, Forestry and Fishing industry.

Figure 4.3 Gross Value Added by Industry in Western Australia – Comparisons to the Port Hedland Port Supply Chain, 2022-23



Source: ABS Australian National Accounts – State Accounts – Industry Components of Gross State Product (Current prices)

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 34,424 FTE jobs in Western Australia, and a further 91,656 FTE jobs were indirectly created (**Figure 4.4**). Overall, **ACIL Allen estimates the Port Hedland Port Supply Chain supported 126,080 direct and indirect FTE jobs in Western Australia in 2022-23**, equating to approximately 11.7% of Western Australia's average full-time workforce in 2022-23. As a result, it is estimated that approximately **one in every nine full-time jobs in Western Australia in 2022-23 were either directly or indirectly supported by the Port of Port Hedland and the trade that is facilitated through the Port**.

From an income perspective, ACIL Allen estimates the Port Hedland Port Supply Chain directly generated $18.75 billion in gross income in Western Australia in 2022-23, with a further $20.21 billion in gross income indirectly generated as a result of the activities across the supply

chain. Overall, the Port Hedland Port Supply Chain helped generate approximately $38.96 billion in gross income in Western Australia in 2022-23.

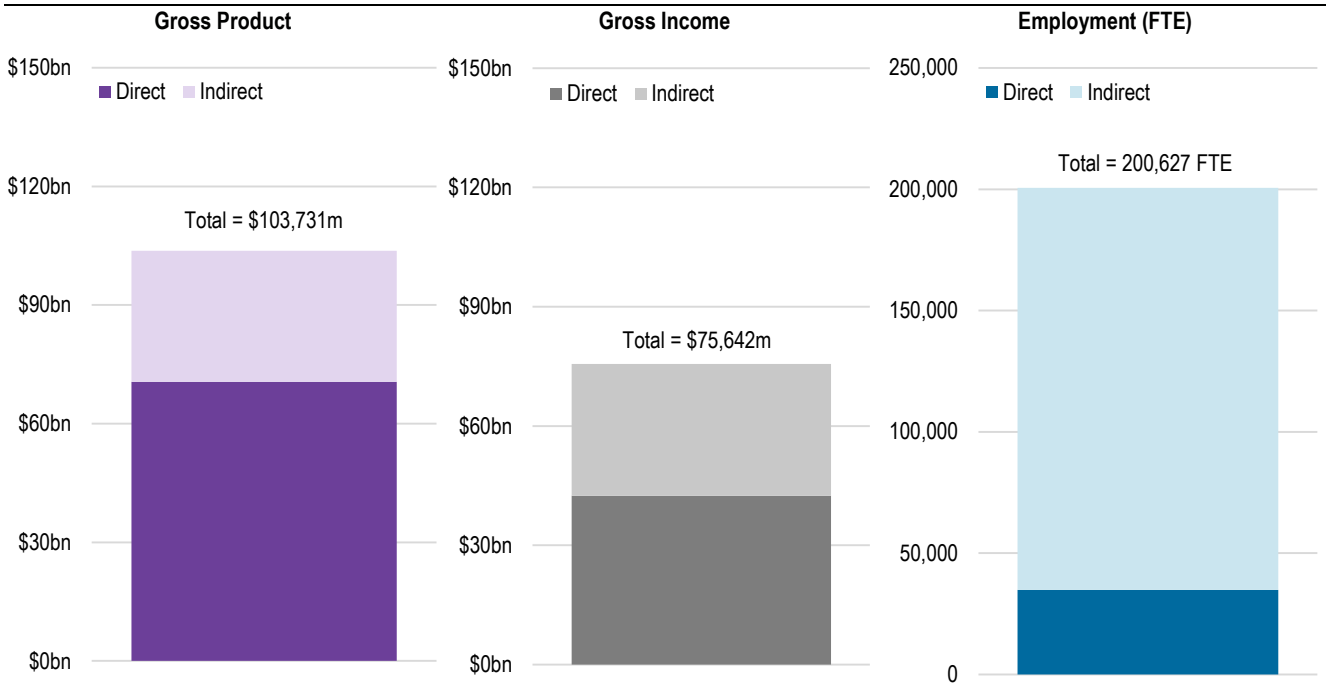
Figure 4.4 Economic Contribution of the Port of Port Hedland Supply Chain in Western Australia, 2022-23

Source: ACIL Allen

4.4 Australia

The Port Hedland Port Supply Chain contributed $70.58 billion in direct economic output to the national economy in 2022-23. The activities of the Port Hedland Port Supply Chain in Australia generated $33.15 billion of indirect economic output. Together, the total economic contribution of the Port Hedland Port Supply Chain within Australia was approximately $103.73 billion in 2022-23 (**Figure 4.5**). As a result, **economic activity either directly or indirectly supported by the Port of Port Hedland and the trade that is facilitated through the Port equated to approximately 4% of the national economy**.

Figure 4.5 Economic Contribution of the Port of Port Hedland Supply Chain in Australia, 2022-23



Source: ACIL Allen

ACIL Allen estimates that the Port Hedland Port Supply Chain directly employed 34,793 FTE jobs in Australia, and a further 165,835 FTE jobs were indirectly created. Overall, the Port Hedland Port Supply Chain supported 200,627 direct and indirect jobs in Western Australia in 2022-23.

ACIL Allen also estimates the Port Hedland Port Supply Chain directly generated $42.49 billion in gross income in Australia in 2022-23, with a further $33.15 billion in gross income indirectly generated as a result of activities across the supply chain. Overall, the Port Hedland Port Supply Chain helped generate approximately $75.64 billion in gross income in Australia in 2022-23.

4.5 Taxation and Royalties

Companies in the Port Hedland Port Supply Chain pay a range of taxes and royalties to the Commonwealth Government, WA Government and local governments in the Pilbara region.[12]

In the context of this study, ACIL Allen has estimated the following taxes and royalties that are directly and indirectly paid by the Port Hedland Port Supply Chain:

- Company income tax
- Personal income tax
- Fringe benefits tax
- Payroll tax
- State Government Royalties
- Local Government fees, charges and rates

In total, **ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $6 billion in taxation payments to the WA Government in 2022-23**. Resource

[12] The economic contribution study does not take into account indirect company or personal income taxation receipts associated with the supplies and services used by the Port Hedland Port Supply Chain due to the modelling technique applied.

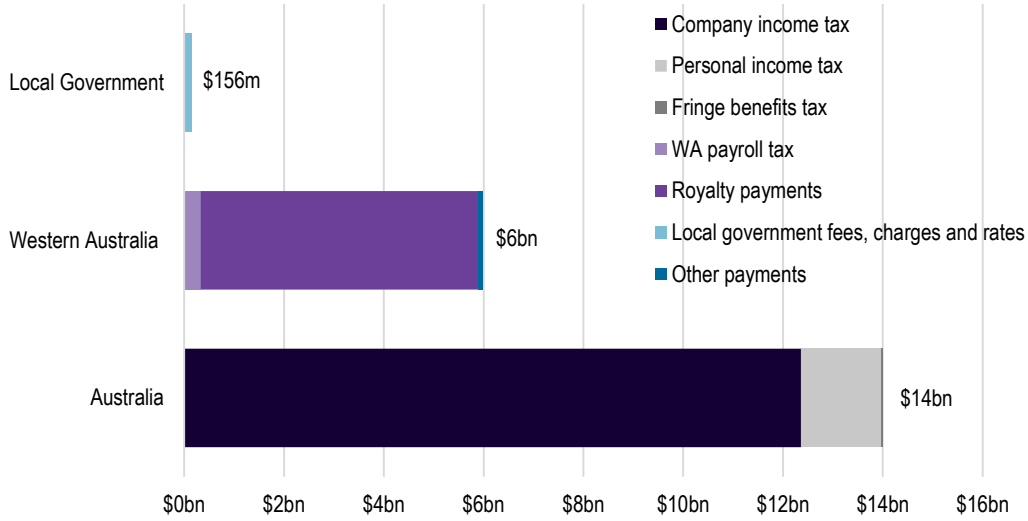
royalties account for the majority of these payments to the WA Government at a share of 92.8% ($5.56 billion), with payroll tax paid by companies in the Port Hedland Port Supply Chain ($329 million), as well as other payments which includes dividend and tax equivalent payments made by Pilbara Ports ($102 million), making up a smaller proportion.

The estimated taxation payments made by the Port Hedland Port Supply Chain to the WA Government in 2022-23 **is equivalent to approximately 13.9% of the General Government sector revenue.**

In total, ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $14 billion in taxation payments to the Commonwealth Government in 2022-23. Company income tax accounted for the majority of taxation payments to the Commonwealth Government at a share of 88.3% ($12.36 billion), with personal income taxation as a result of the direct employment on projects ($1.61 billion), as well as fringe benefits tax ($25 million), making up a smaller proportion.

In total, **ACIL Allen estimates that the Port Hedland Port Supply Chain directly paid approximately $156 million in fees, charges and rates to the local government sector in WA in 2022-23**.

Figure 4.6 Taxation Payments to Commonwealth Government, WA Government and Local Government, 2022-23



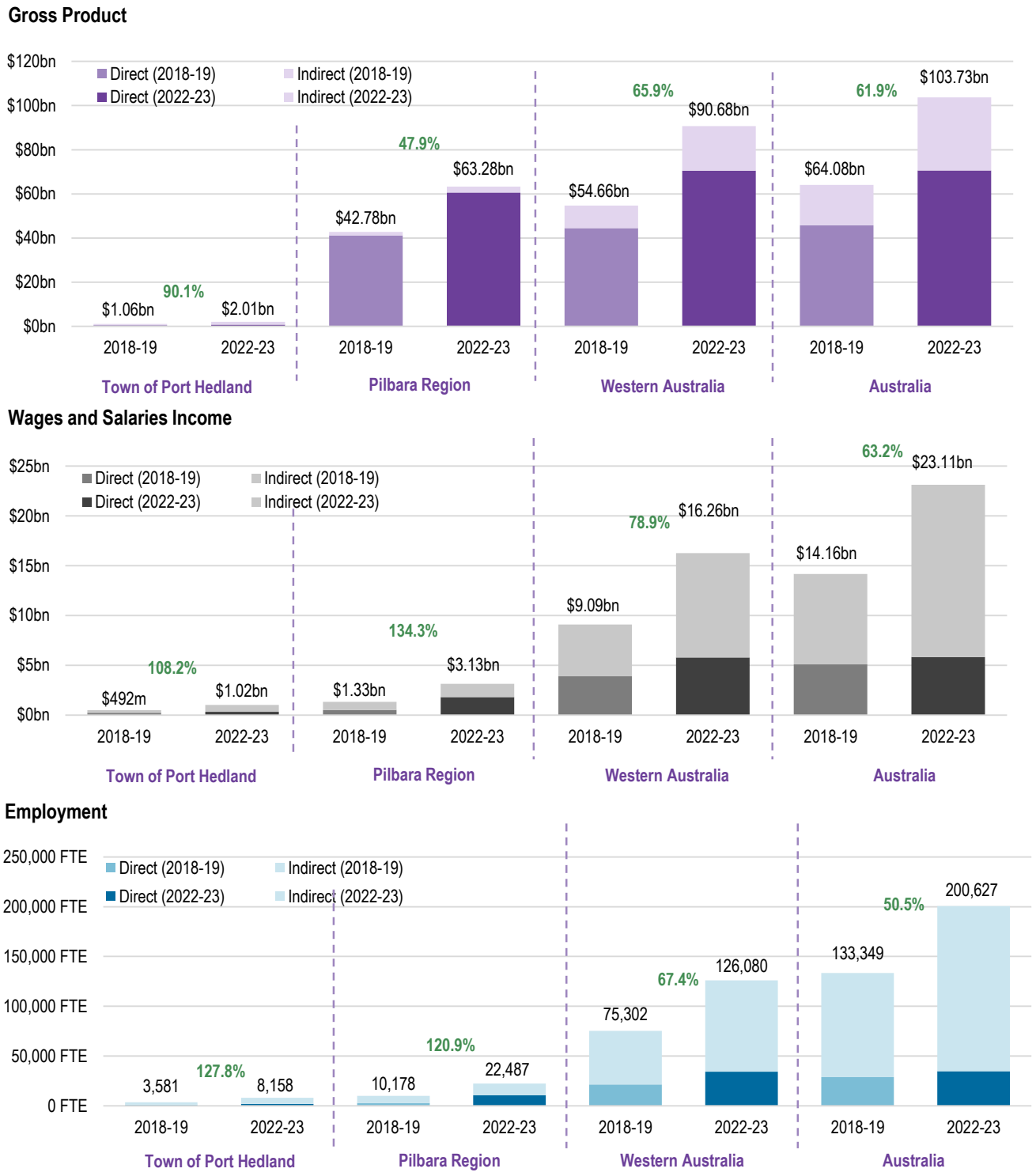
Source: ACIL Allen

4.6 Study Comparison

In this section, ACIL Allen has provided a comparison between the economic contribution of the Port Hedland Port Supply Chain in the 2022-23 financial year to the 2018-19 financial year, estimated by ACIL Allen's report for the Port Hedland Industries Council released in 2020 (**Figure 4.7**).

Across gross product, wages and salaries income and employment, the economic contribution of the Port Hedland Port Supply Chain in 2022-23 was significantly greater compared to 2018-19, reflecting increased levels of production across the supply chain more broadly, and more specifically higher iron ore prices in 2022-23. On a percentage basis, between 2018-19 and 2022-23, the greatest increase was recorded in the total number of jobs supported in the Town of Port Hedland (127.8%) and the total number of jobs supported in the Pilbara Region (120.9%).

Figure 4.7 Study Comparison



Source: ACIL Allen

4.7 Summary – Economic Contribution

Table 4.1 provides a summary of the results of the economic contribution assessment of the Port Hedland Port Supply Chain for the Town of Port Hedland, Pilbara Region, Western Australia and Australia in 2022-23.

Table 4.1 Summary of Economic Contribution Results

	Gross Product	Gross Income	Employment (FTE)
Port Hedland			
Direct	$678.0m	$332.3m	2,019
Indirect	$1,333.4m	$691.8m	6,139
Total	$2,011.4m	$1,024.1m	8,158
Pilbara Region			
Direct	$60,571.4m	$2,140.9m	10,890
Indirect	$2,713.5m	$2,713.5m	11,596
Total	$63,285.0m	$4,854.4m	22,487
Western Australia			
Direct	$70,475.2m	$18,747.5m	34,424
Indirect	$20,208.2m	$20,208.2m	91,656
Total	$90,683.4m	$38,955.7m	126,080
Australia			
Direct	$70,579.0m	$42,490.2m	34,793
Indirect	$33,152.0m	$33,152.0m	165,835
Total	$103,731.0m	$75,642.2m	200,627

Source: ACIL Allen

Economic Impact of Port of Port Hedland, 2023-24 to 2032-33

5

This section presents the economic impact of the Port of Port Hedland and the trade through the Port to the Town of Port Hedland, the Pilbara Region, Western Australia and Australia over the ten-year period between 2023-24 and 2032-33, using ACIL Allen's CGE Model Tasman Global. The results are measured in terms of the direct and indirect impact to output (Gross Product), incomes (wages and salaries earned by individuals and profits generated by businesses), employment (FTE basis) and taxation and royalty payments to key heads of taxation.

The modelled impacts of the Port of Port Hedland Supply Chain are significantly influenced by the conservative price forecasts adopted for this study. Importantly, if current prices were to be maintained over the outlook period, the overall impacts in relation to output, income, employment and taxation would be significantly larger, reflecting the projected increase in volumes through the Port through to 2027-28.

5.1 Gross product

The total economic contribution of the Port Hedland Port Supply Chain to gross product is estimated to decline over the modelling period from $105.2 billion in 2023-24 to $77.2 billion by the end of the modelling period in 2032-33 (**Figure 5.1**). ACIL Allen estimates the **Port Hedland Port Supply Chain will contribute a total of $828.8 billion in gross product to the Australian economy between 2023-24 and 2032-33.**

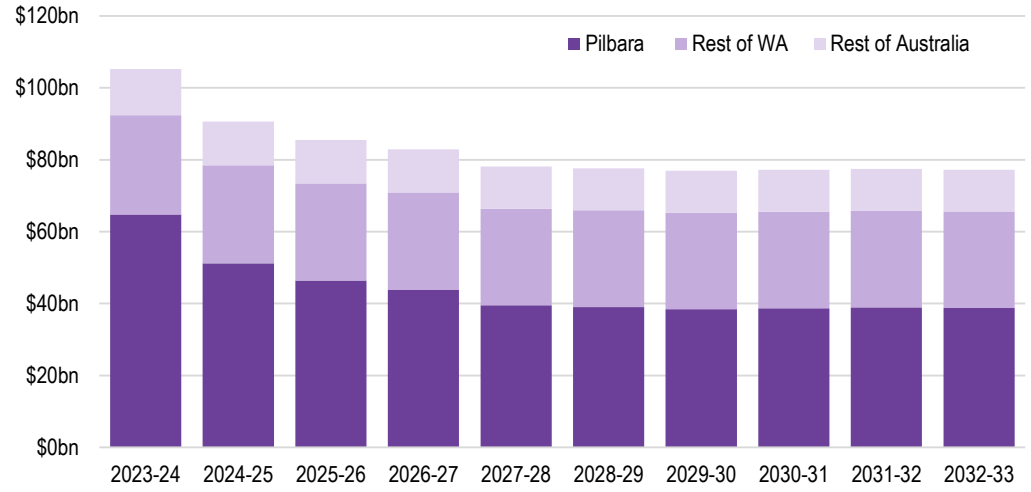
The normalisation of the economic contribution of the Port Hedland Port Supply Chain primarily occurs in the first half of the modelling period through to 2027-28 on the basis of forecast declines in commodity prices relative to the average prices recorded over the 2022-23 financial year.

In addition to the conservative basis of the price forecasts that underpin the economic modelling are the pipeline of investment projects that have not been modelled but will significantly add to the economic potential of the Port Hedland Port Supply Chain and the Pilbara Region more broadly.

The projected contribution to gross product over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to gross product in 2028-29 was estimated at $66.3 billion in the previous study, below the equivalent projected contribution of $77.6 billion in 2028-29 for this study.

The projected total economic contribution of the Port Hedland Port Supply Chain to gross product is expected to be concentrated primarily in the Pilbara region at an average share of approximately 53% over the modelling period.

Figure 5.1 Real Output Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33



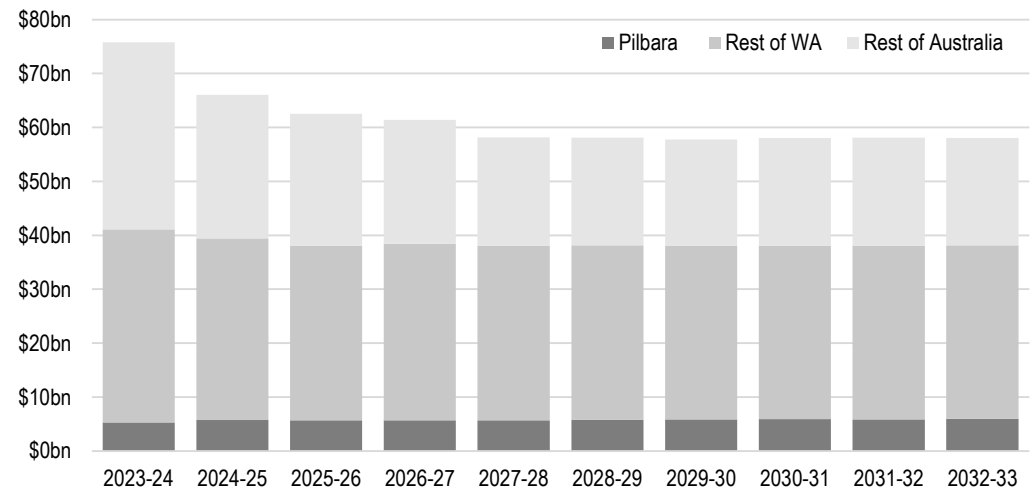
Source: ACIL Allen

5.2 Real income

The total economic contribution of the Port Hedland Port Supply Chain to income is estimated to decline over the modelling period from $75.8 billion in 2023-24 to $58.1 billion by the end of the modelling period in 2032-33 (**Figure 5.2**). The large majority of the decline is projected to occur over the first four years of the modelling period, with the total economic contribution to income estimated to subsequently remain relatively stable over the period between 2027-28 and 2032-33. **ACIL Allen estimates the Port Hedland Port Supply Chain will contribute a total of $614 billion in income to the Australian economy between 2023-24 and 2032-33.**

The projected total economic contribution of the Port Hedland Port Supply Chain to income is expected to be concentrated primarily in areas of Western Australia outside of the Pilbara region (i.e. rest of Western Australia), at an average share of approximately 53.6% over the modelling period.

Figure 5.2 Real Income Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33



Source: ACIL Allen

5.3 Employment

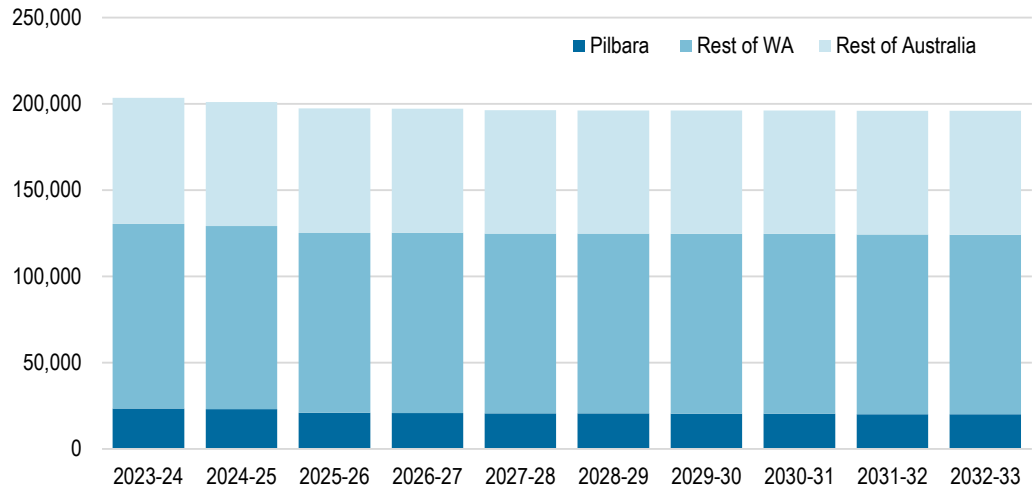
The total economic contribution of the Port Hedland Port Supply Chain to employment is estimated to remain relatively stable over the modelling period with only a marginal decline projected to be recorded from 203,497 FTE in 2023-24 to 195,976 FTE by the end of the modelling period in 2032-33 (**Figure 5.3**). **ACIL Allen estimates the Port Hedland Port Supply Chain will contribute on average 197,603 FTE jobs to the Australian economy over the ten-year period between 2023-24 and 2032-33.**

The pipeline of investment projects that have not been modelled will significantly add to the economic potential of the Port Hedland Port Supply Chain and the Pilbara Region more broadly, in the form of additional job creation.

The projected contribution to employment over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to employment in 2028-29 was estimated at approximately 137,000 FTE in the previous study, below the equivalent projected contribution of approximately 196,200 FTE in 2028-29 for this study.

Over the modelling period the majority of jobs directly and indirectly stimulated by the Port Hedland Port Supply Chain are expected to be located in the rest of Western Australia, at an average share of 53% over the modelling period, followed by the rest of Australia which accounts for an average share of 36.4% over the modelling period.

Figure 5.3 Employment Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33 (FTE)



Source: ACIL Allen

5.4 Taxation and Royalties

The total economic contribution of the Port Hedland Port Supply Chain to Commonwealth Government and WA Government taxation is estimated to decline over the modelling period from $19.8 billion in 2023-24 to $15.7 billion by the end of the modelling period in 2032-33 (**Figure 5.4**). In total, it is **estimated the Port Hedland Port Supply Chain will contribute $156.3 billion in taxation and royalty payments between 2023-24 and 2032-33.**

Company tax is the primary driver of the normalisation of taxation payments from the Port Hedland Port Supply Chain. Company tax payments are projected to decline from $11.9 billion in 2023-24 to $8.2 billion by the end of the modelling period in 2032-33.

Total taxation payments are projected to reach a low of $14.5 billion in 2027-28, before steadily increasing over the second half of the modelling period driven primarily by a projected increase in personal income tax payments.

The projected total contribution to taxation over the modelling period for this study is higher than the equivalent financial years in the previous study commissioned by the Port Hedland Industries Council in 2020. As an example, the projected total contribution to taxation in 2028-29 was estimated at approximately $5.75 billion in the previous study, below the equivalent projected contribution of approximately $14.8 billion in 2028-29 for this study.

Figure 5.4 Real Taxation Impact – Total Forecast Economic Contribution of Port Hedland Port Supply Chain, 2023-24 to 2032-33

Note: Local government fees, charges and rates, and other taxation payments, have been excluded from this analysis.
Source: ACIL Allen

5.5 Summary – Economic Impact

Table 5.1 provides a summary of the results of the economic impact assessment of the Port Hedland Port Supply Chain for the Pilbara Region, Western Australia and Australia across the key economic indicators presented in this section.

Table 5.1 Summary of Economic Impact Results

	Average (2023-24 to 2032-33)	Peak (Number, Year)
Gross Product		
Pilbara	$43,959m	$64,773m (2023-24)
Rest of Western Australia	$26,991m	$27,610m (2023-24)
Total Western Australia	**$70,949m**	**$92,383m (2023-24)**
Rest of Australia	$11,934m	$12,819m (2023-24)
Total Australia	**$82,883m**	**$105,203m (2023-24)**
Income		
Pilbara	$5,755m	$5,960m (2032-33)
Rest of Western Australia	$32,794m	$35,786m (2023-24)
Total Western Australia	**$38,549m**	**$41,098m (2023-24)**
Rest of Australia	$22,855m	$34,686m (2023-24)
Total Australia	**$61,404m**	**$75,784m (2023-24)**

	Average (2023-24 to 2032-33)	Peak (Number, Year)
Employment		
Pilbara	21,077 FTE jobs	23,506 FTE jobs (2023-24)
Rest of Western Australia	104,650 FTE jobs	106,835 FTE jobs (2023-24)
Total Western Australia	**125,727** FTE jobs	**130,341** FTE jobs **(2023-24)**
Rest of Australia	71,876 FTE jobs	73,155 FTE jobs (2023-24)
Total Australia	**197,603** FTE jobs	**203,497** FTE jobs **(2023-24)**

Source: ACIL Allen

5.6 Scenario Analysis: Future Impact of Lumsden Point

The Lumsden Point General Cargo Facility is a new multi-user marine infrastructure development within the Port of Port Hedland. Long-planned, the infrastructure is currently under construction following provision of funding by Commonwealth and State Governments over the past three years.

The facility is designed to:

- facilitate non-bulk commodity trade, such as emerging battery metal exports,
- provide capacity to support direct shipping of general cargo from South East Asia and other parts of the world,
- cater to the needs of emerging renewable energy and renewable hydrogen projects, particularly during the construction phase, and
- support the emergence of new major projects, including at the Boodarie Strategic Industrial Area located west of the Town of Port Hedland

The project is expected to catalyse and support a diverse range of projects across the Pilbara region, which are currently constrained in their access to international markets. It is therefore considered appropriate the outlook for the emerging value chains which flow through Lumsden Point are considered alongside the existing, predominately bulk mineral export value chains which access the port today. To provide this perspective, ACIL Allen was permitted by PHIC member Pilbara Ports to use a range of inputs and assumptions developed during the economic and commercial assessment of Lumsden Point between 2020 and 2023 to build a scenario which demonstrates the future economic value of the emerging Lumsden Point value chains.

A summary of relevant inputs and assumptions to support the Lumsden Point scenario are provided below in **Table 5.2**. Further information on the assessment has been made available as part of Infrastructure Australia's review of the project, released in 2023.

Table 5.2 Lumsden Point Scenario Analysis – Inputs and Assumptions

Assumption	Value	Source
Capital cost	$513.5 million	Pilbara Ports
Construction period	FY24-FY26	Pilbara Ports
Operations period	FY26-FY33	Pilbara Ports
List of trades facilitated	Lithium spodumene concentrate, copper concentrate, recycled rubber, Hot Briquetted Iron, lithium sulphate, potash, lead concentrate	ACIL Allen, from various sources

Source: ACIL Allen

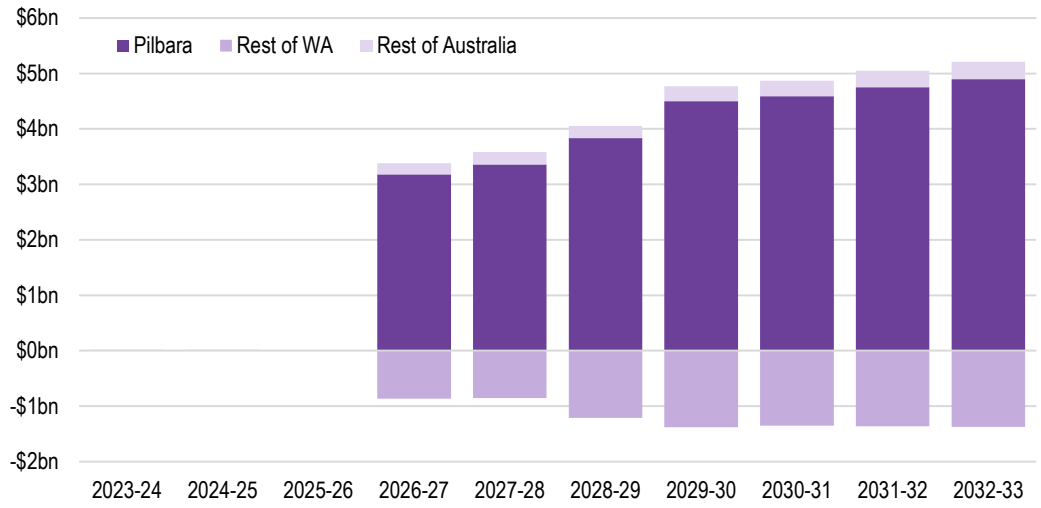
The assessment was limited to the economic value associated with new project value chains, to align the basis of the assessment with the broader Port Hedland Port Supply Chain analysis. The overall assessment of Lumsden Point completed by ACIL Allen included the quantification of impacts associated with changes to product import supply chains, and efficiencies in the operations of general cargo trade at the Port of Port Hedland more broadly.

5.6.1 Real output

The total economic contribution of the Lumsden Point project to gross product is estimated to average $3.22 billion over the operating period between 2026-27 and 2032-33 (**Figure 5.5**). ACIL Allen estimates the Lumsden Point project will contribute a total of $22.56 billion in gross product to the Australian economy between 2023-24 and 2032-33. The projected total economic contribution of the Lumsden Point project to gross product is expected to be concentrated primarily in the Pilbara region.

When combined into the broader analysis, ACIL Allen estimates the Port Hedland Port Supply Chain and Lumsden Point project will collectively contribute a total of $851.4 billion in gross product to the Australian economy between 2023-24 and 2032-33, at an average of $85.1 billion per annum.

Figure 5.5 Lumsden Point Scenario Analysis – Real output



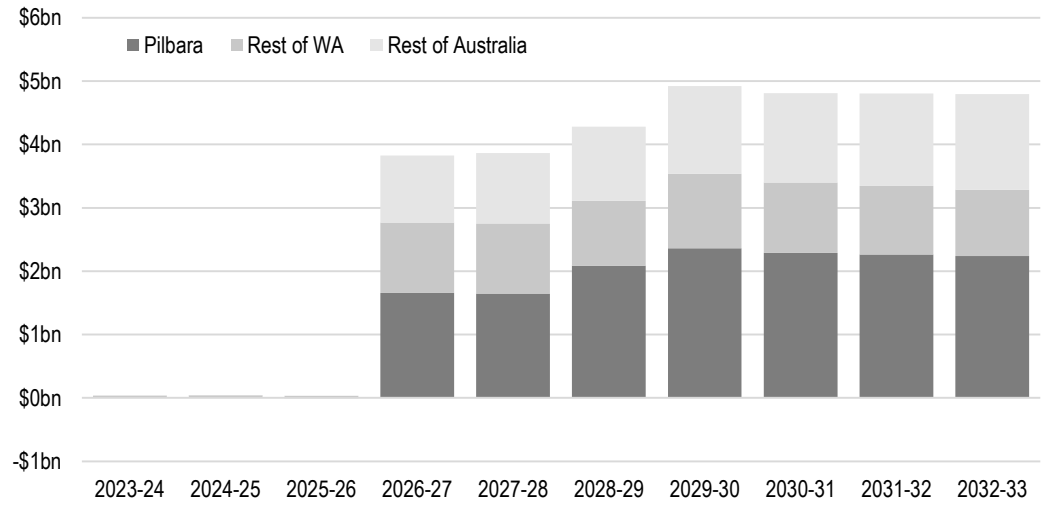
Source: ACIL Allen

5.6.2 Real income

The total economic contribution of the Lumsden Point project to income is estimated to average $4.47 billion over the operating period between 2026-27 and 2032-33 (**Figure 5.6**). ACIL Allen estimates the Lumsden Point project will contribute a total of $31.42 billion in income to the Australian economy between 2023-24 and 2032-33. The projected total economic contribution of the Lumsden Point project to income is expected to be concentrated primarily in the Pilbara region, at an average share of 46.3 per cent over the operating period between 2026-27 and 2032-33.

When combined into the broader analysis, ACIL Allen estimates the Port Hedland Port Supply Chain and Lumsden Point project will contribute a total of $645.5 billion in income to the Australian economy between 2023-24 and 2032-33, at an average of $64.5 billion per annum.

Figure 5.6 Lumsden Point Scenario Analysis – Real income



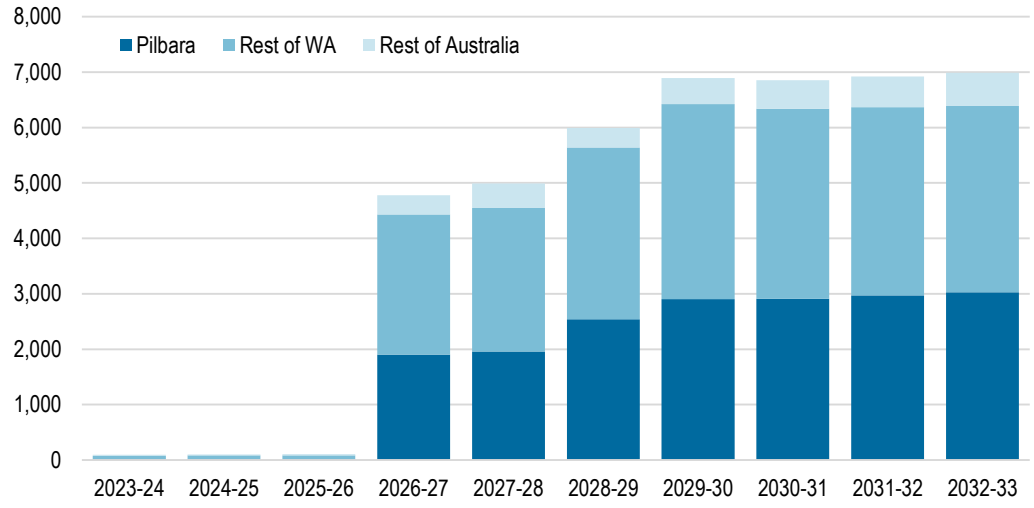
Source: ACIL Allen

5.6.3 Employment

The total economic contribution of the Lumsden Point project to employment is estimated to average 6,204 FTE over the operating period between 2026-27 and 2032-33 (**Figure 5.7**). Over the operating period, the majority of jobs directly and indirectly stimulated by the Lumsden Point project are expected to be located primarily in the rest of Western Australia, at an average share of 50.7%, followed by the Pilbara region which accounts for an average share of 41.8% over the operating period.

When combined into the broader analysis, ACIL Allen estimates the Port Hedland Port Supply Chain and Lumsden Point project will contribute on average 201,976 FTE jobs to the Australian economy over the ten-year period between 2023-24 and 2032-33.

Figure 5.7 Lumsden Point Scenario Analysis – Employment



Source: ACIL Allen

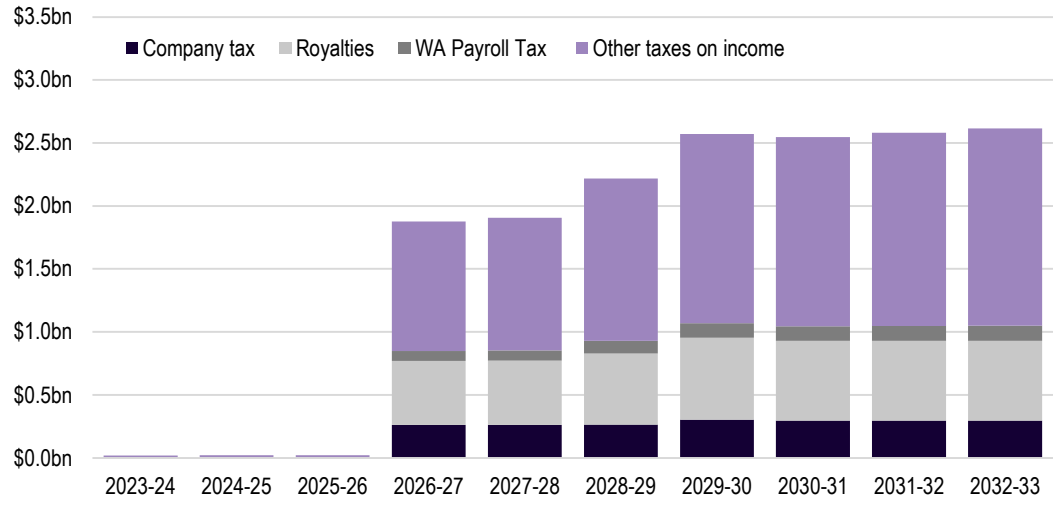
5.6.4 Taxation

The total economic contribution of the Lumsden Point project to Commonwealth Government and WA Government taxation is estimated to average $2.33 billion over the operating period between 2026-27 and 2032-33 (**Figure 5.8**).

Personal income tax (a component of the 'Other taxes on income' category) accounts for the largest share of the contribution of the Lumsden Point project to Commonwealth Government and WA Government taxation at an average share of 57.8 per cent over the operating period between 2026-27 and 2032-33.

When combined into the broader analysis, ACIL Allen estimates the Port Hedland Port Supply Chain and Lumsden Point project will contribute a total of $172.7 billion in taxation and royalty payments between 2023-24 and 2032-33, at an average of $17.3 billion per annum.

Figure 5.8 Lumsden Point Scenario Analysis – Taxation



Source: ACIL Allen

5.6.5 Summary

Table 5.3 provides a summary of the results of the economic impact assessment of the Lumsden Point project to the Pilbara Region, Western Australia and Australia across the key economic indicators presented in this section.

Table 5.3 Summary of Economic Impact Results – Lumsden Point Scenario Analysis

	Operations Average (2026-27 to 2032-33)	Peak (Number, Year)
Gross Product		
Pilbara	$4,158m	$4,895m (2032-33)
Rest of Western Australia	-$1,199m	$10m (2024-25)
Total Western Australia	**$2,958m**	**$3,523m (2032-33)**
Rest of Australia	$258m	$315m (2032-33)
Total Australia	**$3,217m**	**$3,838m (2032-33)**
Income		
Pilbara	$2,077m	$2,360m (2029-30)

	Operations Average (2026-27 to 2032-33)	Peak (Number, Year)
Rest of Western Australia	$1,093m	$1,175m (2029-30)
Total Western Australia	**$3,171m**	**$3,536m (2029-30)**
Rest of Australia	$1,301m	$1,507m (2032-33)
Total Australia	**$4,472m**	**$4,923m (2029-30)**
Employment		
Pilbara	2,603 FTE jobs	3,026 FTE jobs (2032-33)
Rest of Western Australia	3,132 FTE jobs	3,522 FTE jobs (2029-30)
Total Western Australia	**5,735** FTE jobs	**6,426** FTE jobs **(2029-30)**
Rest of Australia	469 FTE jobs	595 FTE jobs (2032-33)
Total Australia	**6,204** FTE jobs	**6,987** FTE jobs **(2032-33)**

Source: ACIL Allen

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Appendices

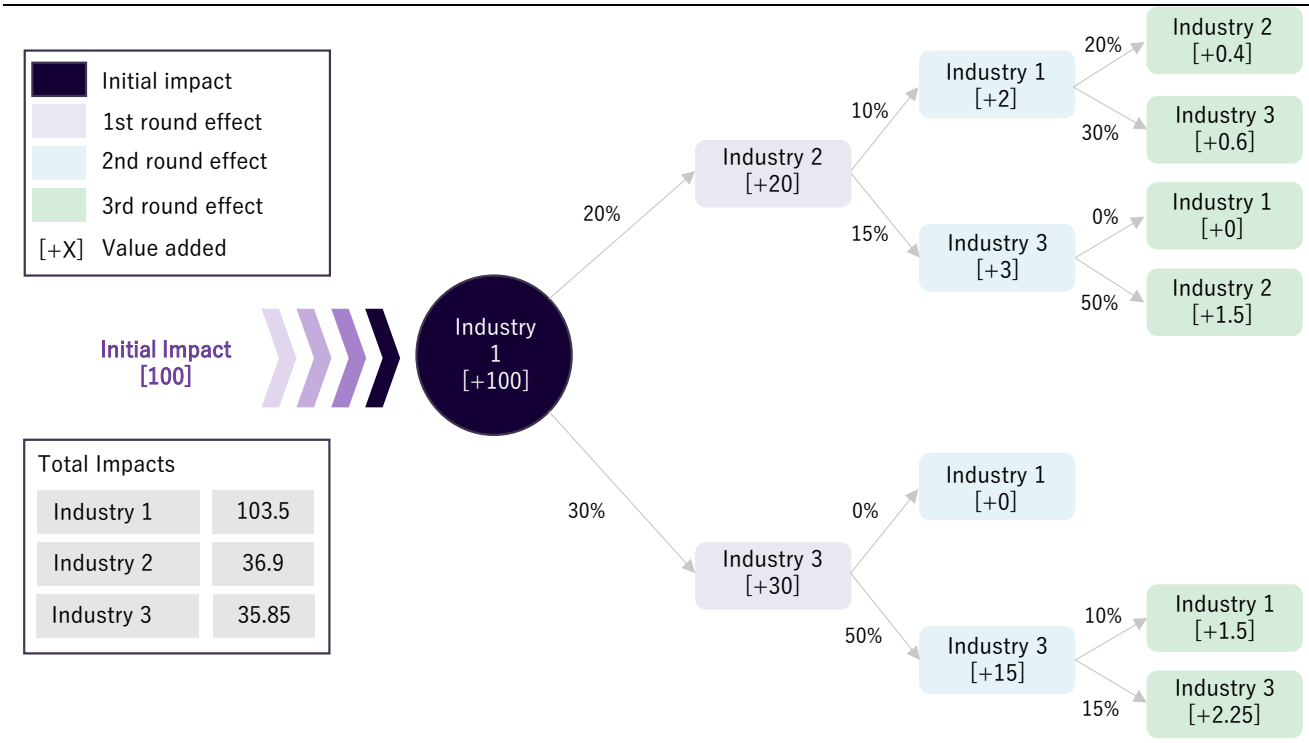
Source: Fortescue

Input Output Modelling

A

IO models capture the direct and indirect effects of expenditure by capturing, for each industry, the industries it purchases inputs from and also the industries it sells its outputs to. For example, the IO model for Western Australia captures purchases from and sales to industries located in Western Australia, as well as imports from outside Western Australia. **Figure A.1** depicts how an impact is traced through a (very simple) economy with three industries (1, 2 and 3), and is described below.

Figure A.1 "Trace Through" of an Input Output Model



Source: ACIL Allen

1. The initial impact occurs in Industry 1 where an additional 100 units of value are added to its output. In order to generate this additional output, Industry 1 requires additional inputs from Industry 2 and Industry 3.
2. Therefore, Industry 2 and 3 increase their output as well. This in turn requires input from Industry 1 and 3 and Industry 1 and 2 respectively which increase their output to satisfy this additional demand, and so on.
3. The impacts grow smaller with each iteration and ultimately converge to zero. This is because they always only share the impact that occurred in the preceding iteration.

Tasman Global B

B.1 Overview

ACIL Allen's computable general equilibrium model *Tasman Global* is a powerful tool for undertaking economic impact analysis at the regional, state, national and global level.

There are various types of economic models and modelling techniques. Many of these are based on partial equilibrium analysis that usually considers a single market. However, in economic analysis, linkages between markets and how these linkages develop and change over time can be critical. *Tasman Global* has been developed to meet this need.

Tasman Global is a large-scale computable general equilibrium model which is designed to account for all sectors within an economy and all economies across the world. ACIL Allen uses this modelling platform to undertake industry, project, scenario and policy analyses. The model is able to analyse issues at the industry, global, national, state and regional levels and to determine the impacts of various economic changes on production, consumption and trade at the macroeconomic and industry levels.

B.2 A Dynamic Model

Tasman Global is a model that estimates relationships between variables at different points in time. This is in contrast to comparative static models, which compare two equilibriums (one before a policy change and one following). A dynamic model such as *Tasman Global* is beneficial when analysing issues where both the timing of and the adjustment path that economies follow are relevant in the analysis.

B.3 The Database

A key advantage of *Tasman Global* is the level of detail in the database underpinning the model. The database we will use for this project is derived from the Global Trade Analysis Project (GTAP) database (version 8.1). This database is a fully documented, publicly available global data base which contains complete bilateral trade information, transport and protection linkages among regions for all GTAP commodities.

The GTAP model was constructed at the Centre for Global Trade Analysis at Purdue University in the United States. It is the most up-to-date, detailed database of its type in the world.

Tasman Global builds on the GTAP model's equation structure and database by adding the following important features:

— dynamics (including detailed population and labour market dynamics)

- detailed technology representation within key industries (such as electricity generation and iron and steel production)
- disaggregation of a range of major commodities including iron ore, bauxite, alumina, primary aluminium, brown coal, black coal and LNG
- the ability to repatriate labour and capital income
- a detailed emissions accounting abatement framework
- explicit representation of the states and territories of Australia
- the capacity to explicitly represent multiple regions within states and territories of Australia

Nominally the *Tasman Global* database divides the world economy into 141 regions (133 international regions plus the 8 states and territories of Australia) although in reality the regions are frequently disaggregated further. ACIL Allen regularly models Australian projects or policies at the regional level.

The *Tasman Global* database also contains a wealth of sectoral detail currently identifying up to 70 industries. The foundation of this information is the input-output tables that underpin the database. The input-output tables account for the distribution of industry production to satisfy industry and final demands. Industry demands, so-called intermediate usage, are the demands from each industry for inputs.

For example, electricity is an input into the production of communications. In other words, the communications industry uses electricity as an intermediate input. Final demands are those made by households, governments, investors and foreigners (export demand). These final demands, as the name suggests, represent the demand for finished goods and services. To continue the example, electricity is used by households – their consumption of electricity is a final demand.

Each sector in the economy is typically assumed to produce one commodity, although in *Tasman Global*, the electricity, transport and iron and steel sectors are modelled using a 'technology bundle' approach. With this approach, different known production methods are used to generate a homogeneous output for the 'technology bundle' industry. For example, electricity can be generated using brown coal, black coal, petroleum, base load gas, peak load gas, nuclear, hydro, geothermal, biomass, wind, solar or other renewable based technologies – each of which have their own cost structure.

The other key feature of the database is that the cost structure of each industry is also represented in detail. Each industry purchases intermediate inputs (from domestic and imported sources) primary factors (labour, capital, land and natural resources) as well as paying taxes or receiving subsidies.

B.4 Factors of Production

Capital, land, labour and natural resources are the four primary factors of production. The capital stock in each region (country or group of countries) accumulates through investment (less depreciation) in each period. Land is used only in agriculture industries and is fixed in each region. *Tasman Global* explicitly models natural resource inputs as a sector specific factor of production in resource based sectors (coal mining, oil and gas extraction, other mining, forestry and fishing).

B.5 Population Growth and Labour Supply

Population growth is an important determinant of economic growth through the supply of labour and the demand for final goods and services. Population growth for the 112 international regions and for the 8 states and territories of Australia represented in the *Tasman Global* database is projected using ACIL Allen's in-house demographic model. The demographic model projects how the

population in each region grows and how age and gender composition changes over time and is an important tool for determining the changes in regional labour supply and total population over the projection period.

For each of the 120 regions in *Tasman Global*, the model projects the changes in age-specific birth, mortality and net migration rates by gender for 101 age cohorts (0-99 and 100+). The demographic model also projects changes in participation rates by gender by age for each region, and, when combined with the age and gender composition of the population, endogenously projects the future supply of labour in each region. Changes in life expectancy are a function of income per person as well as assumed technical progress on lowering mortality rates for a given income (for example, reducing malaria-related mortality through better medicines, education, governance, etc.). Participation rates are a function of life expectancy as well as expected changes in higher education rates, fertility rates and changes in the workforce as a share of the total population.

Labour supply is derived from the combination of the projected regional population by age by gender and the projected regional participation rates by age by gender. Over the projection period labour supply in most developed economies is projected to grow slower than total population as a result of ageing population effects. For the Australian states and territories, the projected aggregate labour supply from ACIL Allen's demographics module is used as the base level potential workforce for the detailed Australian labour market module, which is described in the next section.

Table B.1 Sectors in the Tasman Global Database

	Sector		Sector
1	Paddy rice	36	Paper products, publishing
2	Wheat	37	Diesel (incl. nonconventional diesel)
3	Cereal grains nec	38	Other petroleum, coal products
4	Vegetables, fruit, nuts	39	Chemical, rubber, plastic products
5	Oil seeds	40	Iron ore
6	Sugar cane, sugar beef	41	Bauxite
7	Plant-based fibres	42	Mineral products nec
8	Crops nec	43	Ferrous metals
9	Bovine cattle, sheep, goats, horses	44	Alumina
10	Animal products nec	45	Primary aluminium
11	Raw milk	46	Metals nec
12	Wool, silk worm cocoons	47	Metal products
13	Forestry	48	Motor vehicle and parts
14	Fishing	49	Transport equipment nec
15	Brown coal	50	Electronic equipment
16	Black coal	51	Machinery and equipment nec
17	Oil	52	Manufactures nec
18	Liquified natural gas (LNG)	53	Electricity generation
19	Other natural gas	54	Electricity transmission and distribution
20	Minerals nec	55	Gas manufacture, distribution
21	Bovine meat products	56	Water
22	Meat products nec	57	Construction
23	Vegetables oils and fats	58	Trade
24	Dairy products	59	Road transport

	Sector		Sector
25	Processed rice	60	Rail and pipeline transport
26	Sugar	61	Water transport
27	Food products nec	62	Air transport
28	Wine	63	Transport nec
29	Beer	64	Communication
30	Spirits and RTDs	65	Financial services nec
31	Other beverages and tobacco products	66	Insurance
32	Textiles	67	Business services nec
33	Wearing apparel	68	Recreational and other services
34	Leather products	69	Public Administration, Defence, Education, Health
35	Wood products	70	Dwellings

Source: ACIL Allen

Note: nec = not elsewhere included

B.6 The Australian Labour Market

Tasman Global has a detailed representation of the Australian labour market which has been designed to capture:

- different occupations
- changes to participation rates (or average hours worked) due to changes in real wages
- changes to unemployment rates due to changes in labour demand
- limited substitution between occupations by the firms demanding labour and by the individuals supplying labour
- limited labour mobility between states and regions within each state.

Tasman Global recognises 97 different occupations within Australia – although the exact number of occupations depends on the aggregation. The firms who hire labour are provided with some limited scope to change between these 97 labour types as the relative real wage between them changes. Similarly, the individuals supplying labour have a limited ability to change occupations in response to the changing relative real wage between occupations. Finally, as the real wage for a given occupation rises in one state relative to other states, workers are given some ability to respond by shifting their location. The model produces results at the 97 3-digit ANZSCO (Australian New Zealand Standard Classification of Occupations) level.

The labour market structure of *Tasman Global* is thus designed to capture the reality of labour markets in Australia, where supply and demand at the occupational level do adjust, but within limits.

Labour supply in *Tasman Global* is presented as a three stage process:

- labour makes itself available to the workforce based on movements in the real wage and the unemployment rate;
- labour chooses between occupations in a state based on relative real wages within the state; and
- labour of a given occupation chooses in which state to locate based on movements in the relative real wage for that occupation between states.

By default, *Tasman Global*, like all CGE models, assumes that markets clear. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model).

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