CIVIL CONTRACTORS FEDERATION

REBUILDING AUSTRALIA

A Plan for a Civil Infrastructure Led Recovery

Prepared by

BIS OXFORD ECONOMICS

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01

INTRODUCTION AND SUMMARY

01: INTRODUCTION AND SUMMARY

BIS Oxford Economics (BISOE) has been commissioned by Civil Contractors Federation National to provide a study detailing how civil construction investment can be a tool for broader economic recovery in the face of the COVID-19 downturn. The following report is an independent assessment of the economic impact of civil construction activity to the financial year FY23, the impact on employment and activity under different scenarios, challenges and risks to an 'infrastructure-led' recovery and potential solutions.

The Australian heavy and civil engineering industry is a significant contributor to the Australian economy and has significant multipliers on investment.

For every $1 million invested in the Australian heavy and civil engineering industry[1]:

- 7.2 workers are employed in the construction and related industries
- $2.95m of output is contributed to the economy, and
- $1.3m is contributed to Australian GDP

After civil construction[2] rose to elevated levels through the early 2010's, activity weakened over subsequent years with the notable exception of a cycle in roads and utilities work around FY18. However, transport related civil construction is expected to see a sharp uptick in activity, driven by a large, existing pipeline of urban transport 'megaprojects' and smaller stimulus measures. Meanwhile, utilities activity is forecast to ease slightly with the completion of the National Broadband Network (nbn) and 5G rollout as well as a pause in renewable generation investment following an earlier surge to reach 2020 targets. While the broader Australian economy is recovering from the pandemic, raising investment in civil infrastructure may be instrumental in sustaining growth in jobs and activity once the initial rebound fades.

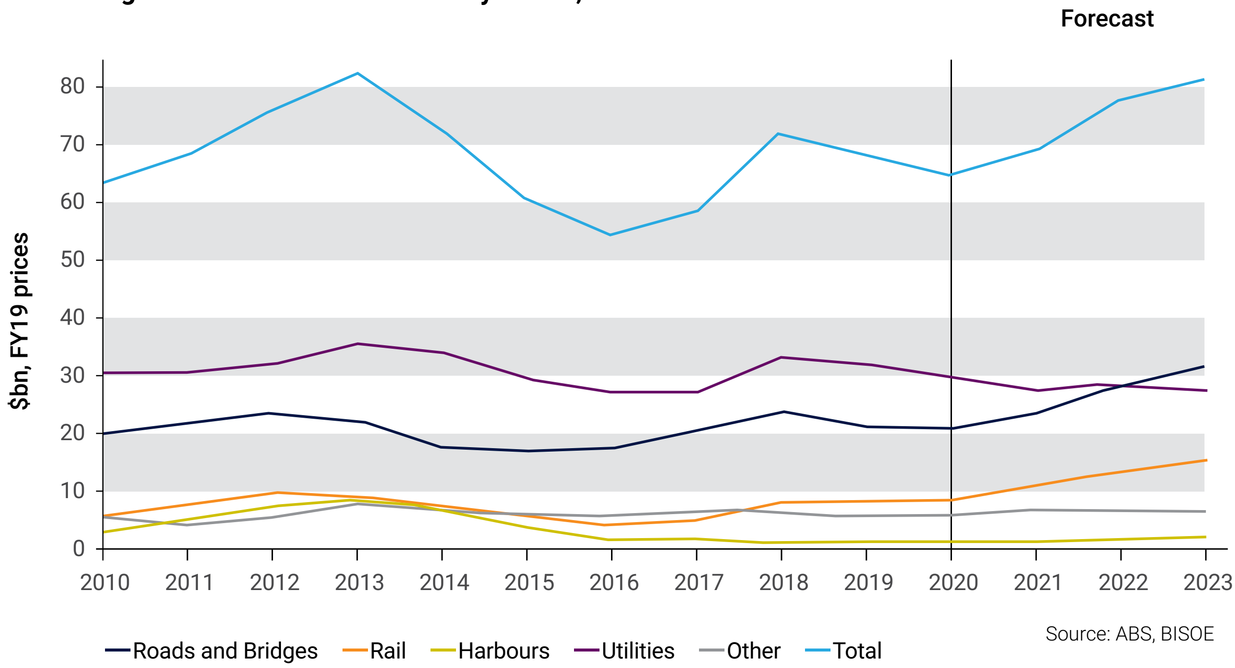
This report explores the potential broader economic benefits of increased civil infrastructure funding. For the purpose of this report we consider three scenarios:

- Base Case: BISOE forecasts of civil construction activity sits at 3.8% of GDP on average over the three years of the forecast period. This corresponds to the average historical spending on infrastructure among the countries that constitute more than 90% of global GDP.
- Scenario One: an upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.1% of GDP each year over the forecast period. This corresponds to a heightened historical level of infrastructure investment in Australia – specifically, the figure represents the percentage of construction activity during the boom in infrastructure investment between FY08 to FY14.
- Scenario Two: an upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.5% of GDP each year over the forecast period. This would represent a more significant boost on current expectations of civil construction work done.

1 The latest input-output data does not allow for analysis at a higher granularity than 'heavy and civil construction,' and the multipliers therefore account for a $1million investment spread across the civil construction sectors (including mining and heavy industry) based on the relative weightings of expenditure in the year the input-output table is sourced from (FY18).

2 Defined for the purposes of this study as the aggregate of: roads and bridges construction, rail construction, harbours construction, utilities construction, and other engineering construction.

Fig. 1: Total Civil Construction by Sector, Australia



Source: ABS, BISOE

Year Ended June

In dollar terms this translates to the following yearly figures in civil construction work done:

Fig. 2: Total Construction Activity, $bn (FY19 prices)

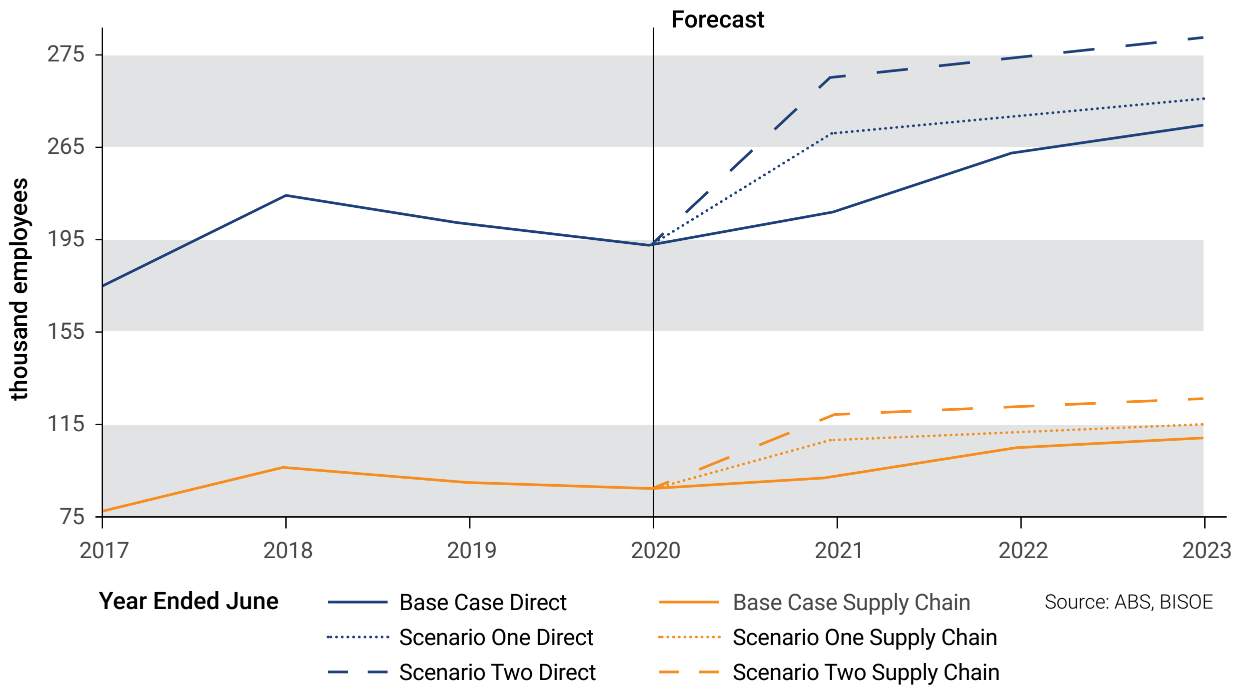
	2021	2022	2023
Base Case	69.2	78.0	82.0
Scenario 1	80.3	83.4	86.1
Scenario 2	88.6	91.2	94.3

Cumulatively, Scenario 1 would require $20.6bn in additional funding from FY21 to FY23 over the base case while Scenario 2 would require and additional $44.9bn in funding over the base case. An overview of the civil construction outlook and scenario implications for the individual civil construction sectors are included in Section 2 of this report.

Appendices at the back of this report detail BISOE's findings for the direct, indirect, and induced effects of investment in these scenarios across employment, industry output, and contribution to GDP. Our modelling shows that there are significant economic benefits to increasing civil infrastructure investment in terms of job creation, industry output and contribution to broader GDP – particularly as the economy emerges from its first recession in around 30 years driven by the COVID-19 pandemic

In terms of employment, our modelling indicates that by FY23 Scenario 1 would result in over 11,100 additional jobs in the civil construction supply chain, while Scenario 2 would yield more than 36,100 extra jobs in the civil construction supply chain compared to the base case, with much larger employment gains across the broader economy.

Fig. 3: Direct and Supply Chain Employment in the Civil Construction Industry, Australia



However, there may be substantial challenges to increasing the level of funding and spend in the civil construction industry. These threats to delivery have existed in the construction industry for many years and include: (i) poor productivity in the construction industry, (ii) weakening financial sustainability for construction contractors, (iii) pipeline capacity and capability challenges, and (iv) market concentration. These potential barriers are discussed in more detail in Section 3.

This report also provides solutions to these challenges. Many solutions are well known and were highlighted in CCF National's 2017 *Australian Infrastructure Outlook Report*. Further remedies are explored in Section 4 with recommendations including: (i) improved planning and risk management, (ii) streamlining and reforming the tendering process, (iii) considering collaborative models more seriously, (iv) more appropriate contractual risk allocation and (v) the inclusion of non-financial KPIs in engagements.

It is critical to maintain infrastructure investment in the long term to service the needs of the broader community as well as businesses which drive employment and economic growth. While population growth has slowed due to the impact of COVID-19, it is expected to return post-pandemic and changed behaviours due to the health crisis may see stronger population growth in regional Australia as opposed to capital cities which will have implications for the distribution of infrastructure investment.

To assist in tracking the state of the civil construction industry and its progress over time, key market metrics are discussed in Section 6. These cover industry related output (GVA), employment, work done spend per capita, and training numbers. These key metrics should be regularly reviewed and compared in subsequent updates of this report to ensure that infrastructure investment is being sustained, and that risks to successful delivery of projects are mitigated.

02

STATE OF PLAY

2.1 FY20 SNAPSHOT AND COVID-19 IMPACTS

2.1.1 Economic Impacts

The coronavirus pandemic continues to dominate the economic narrative both domestically and internationally.

The pandemic has led to major global socioeconomic disruptions, including national lockdowns, and has driven governments and central banks to rollout major stimulus packages. The unprecedented nature of both the pandemic and the response, and the speed at which governments and individuals are reacting, create a higher than normal level of uncertainty in nearly all aspects of the economy.

In 2020, the Australian economy entered its first recession in nearly 30 years. GDP shrank by 0.3% in the March quarter 2020, and COVID-19 related restrictions saw a much larger contraction in Q2 (June). Australia recorded its largest quarterly fall in output on record in Q2, with GDP contracting by 7%. Easing of restrictions (notwithstanding Victoria's second lockdown) and a partial recovery in sentiment drove a sharp rebound in GDP in Q3 (September), with the economy expanding by 3.4% q/q. Q4 (December) growth eased to 3.1%. Overall, despite the recovery over the second half of the year, GDP was still 2.5% lower in 2020 than it was in 2019.

The 2020-21 Federal Budget was brought down in October 2020, deploying a wide array of additional spending, tax cuts, and other supports to kick start the economy's recovery from the COVID-19 pandemic. Higher spending plans and lower revenue are expected to see the budget deficit reach 11% of GDP in FY21. Notwithstanding the pulling-forward of infrastructure projects and the announcement of road maintenance projects, there were few large infrastructure spending announcements. Rather, the government is aiming to bolster business investment and hiring through a large increase in asset write-offs, wage subsidies for young workers and other tax relief measures.

2.1.2 Civil Construction Impacts

Engineering construction activity was relatively insulated from domestic activity restrictions over 2020. The lack of movement restrictions targeted towards construction workers has allowed pre-existing projects to progress steadily, and civil projects located outside of dense population centres have been geographically shielded from any direct impacts. However, the industry is not entirely immune to the outbreak of COVID-19. Roads engineering construction stalled more than previously expected in FY20. This is attributed to some productivity losses due to social distancing guidelines and lockdowns, as well as far weaker than expected public works commencements. This was offset by an upgrade in nbn funding which is set to continue over the short run. Growth in civil construction is expected to resume in FY21.

Falling engineering construction commencements over FY20 (a trend which continued into the September quarter of 2020 according to the most recent data), reinforces that recent civil activity has been very much driven by existing projects. Lower commencements create a very weak lead into FY21, however, and suggests that while governments continue to advocate for quick stimulus, it often takes time for stimulus plans to translate into construction activity.

Most state and territory governments have made commitments to bring forward infrastructure spending, citing small, shovel-ready projects as the key channel. Additionally, the strong pipeline of major transportation projects was further strengthened by the FY20 Federal Budget, which emphasised the importance of infrastructure stimulus as an avenue to help re-start the domestic economy.

On the other hand, private funding is expected to be more constrained. The Federal Budget presented a much more bearish outlook for migration and therefore population growth. Combined with easing residential building activity (despite a pull forward in detached house approvals through the Federal Government's *HomeBuilder* initiative), subdivisions and private road construction are expected to be negatively impacted.

2.2 RECOVERY AND OUTLOOK

Looking ahead, Australia's economic growth momentum is forecast to slow as the recovery becomes patchier following Victoria's reopening (as well as the flagged easing of JobKeeper funding). Public demand will continue to support growth, as will net exports; the relative strength in commodity shipments will see exports remain more resilient than imports. Assuming trade and travel restrictions are lifted through FY21, with a 'return to normalisation' aided by the widespread dissemination of a vaccine over the second half of 2021, we expect economic growth to bounce back in FY22, both in Australia and overseas. However, an early return to the previous path or levels previously expected (pre-coronavirus) is unlikely.

Overall, Australian GDP declined -0.2% % in FY20 and is forecast to increase only 0.7% in FY21, before recovering to 3.5% growth in FY22 with GDP only projected to return to pre-pandemic levels by Q4 2021.

The value of total civil construction work is also expected to recover over the short run and is expected to reach $82bn by FY23 from a base of $65bn in FY20. An unprecedented pipeline of transport projects will likely peak over the medium run. This wave of urban transport works predates the COVID-19 pandemic and shapes the baseline civil construction profile. This central case is also accompanied by a number of State, Territory and Federal stimulus measures in response to the events of 2020. So far these include:

- In late-March 2020, the **South Australian** government announced a $1bn stimulus package where $120 million of new infrastructure projects have been fast tracked.
- In late-April 2020, the **Western Australian** government announced the formation of a new Construction Panel for accelerating procurement processes for projects under $20m. The panel aims to bring forward up to $140m of spending in road and maritime projects. The Western Australian State Budget, released in October 2020, showed that state government finances were being buoyed by iron ore royalties and indicated that several key infrastructure projects would be accelerated, while promising $27bn for infrastructure projects over the next four years.
- The **NSW** Government has added $500m for bringing forward capital works and maintenance on shovel ready projects, some of which will be spent on road infrastructure. In addition to this, the state government announced the Planning System Acceleration Program to fast track planning processes in the construction industry. Part of this program includes $70m to co-fund vital roads and other infrastructure in North West Sydney.
- The **Victorian** Government announced a $2.7bn first stage of the Building Works package in mid-May 2020. The package includes $328m for maintenance and construction across roads, rail and harbours. The Government expects to make further additions to the package in coming months and is establishing a $180m fund for the planning and acceleration of future projects.
- As part of the **Queensland** Government's response, a $400m Accelerated Works Program was announced in mid-May 2020. Around half of the program's cost is dedicated to upgrading key freight routes, while the broader program has an emphasis on rural development and local council funding. In line with this regional focus, the Queensland Government had previously mentioned an agreement with the Federal Government to bring forward the commencements of 22 projects funded by the Roads of Strategic Importance (ROSI) initiative.

In addition to state driven stimulus, the Commonwealth Government announced $1.5bn of funding for the Local Roads and Community Infrastructure Program (LRCI) over the next 2 years. The LRCI targets council level spending to fund smaller and immediate road construction and maintenance works across all states.

However, scope may exist for further spend, especially in the short run, to drive a sustained recovery in economic activity and employment. The economic impacts of such an "infrastructure-led recovery" are explored in this report.

03

CIVIL INFRASTRUCTURE IN AUSTRALIA: HISTORY AND OUTLOOK SCENARIOS

In this section we discuss the last decade of historic data and our forecasts over the next three financial years. We break this down by the funding source (public vs. private). This additional granularity yields further insight into the behaviour of government and private spending in the infrastructure space. As each of the funding sources has different key drivers, it is important to understand the idiosyncratic trends between them.

For the purpose of this report we consider three scenarios for the civil construction outlook:

- Base Case: these are BIS Oxford Economics' current forecasts of civil construction work done, with activity sitting at 3.8% of GDP on average over the three years of the forecast period. Interestingly, this corresponds to the average historical spending on infrastructure among the countries that constitute more than 90% of global GDP, and in a global infrastructure McKinsey report, the figure is indicated as a baseline for future infrastructure needs[3].
- Scenario One: an upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.1% of GDP each year over the forecast period. This corresponds to a heightened historical level of infrastructure investment in Australia – specifically, the figure represents the ratio of civil construction activity to GDP during the boom in infrastructure investment between FY08 to FY14.
- Scenario Two: a stronger upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.5% of GDP each year over the forecast period. This would represent a significant boost on current expectations of civil construction work done, and is more in line with prior peaks in FY13 & FY14 (4.6% and 4.9% respectively).

Fig. 4: Scenario Scaling for Construction Activity

	2021	2022	2023
Base Case	x1.00	x1.00	x1.00
Scenario 1	x1.16	x1.07	x1.05
Scenario 2	x1.28	x1.17	x1.15

The two upside scenarios are an indication of the direction the economic impact may take if the total amount of civil engineering activity or funding is higher than expected. Historically, the use of infrastructure spending has been a catalyst to broader economic recovery in Australia. Given the downward pressure the COVID19 pandemic has placed on the Australian economy, an increase of this magnitude in civil engineering is not unreasonable.

3 McKinsey Global Institute, 2013. Infrastructure Productivity: How to save $1 trillion a year, https://www.mckinsey.com/business-functions/operations/our-insights/infrastructure-productivity

In dollar terms this translates to the following yearly figures for civil work:

Fig. 5: Total Construction Activity, $bn (FY19 prices)

	2021	2022	2023
Base Case	69.2	78.0	82.0
Scenario 1	80.3	83.4	86.1
Scenario 2	88.6	91.2	94.3

Cumulatively, Scenario 1 would require $20.6bn in additional funding from FY21 to FY23 over the baseline case while Scenario 2 would require and additional $44.9bn in funding over the base case.

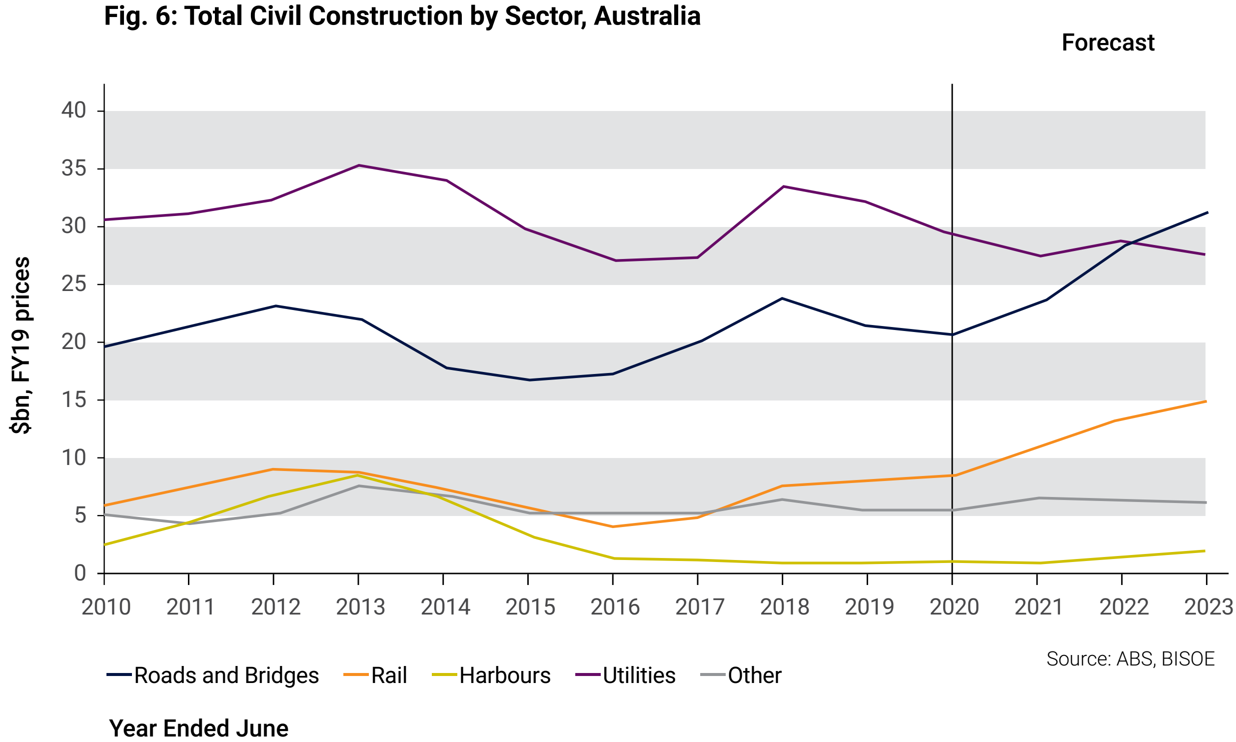
3.1 TOTAL CIVIL CONSTRUCTION OUTLOOK

Historical data of civil construction is sourced from the Australian Bureau of Statistics' (ABS) Engineering Construction Activity quarterly release (Cat. No. 8762.0). BIS Oxford Economics undertakes quarterly analysis based on this release, utilising an extensive repository of project data, and expert review to produce forecasts for our quarterly Engineering Construction in Australia subscription outlook service. For the purposes of this report, civil construction includes all construction that is not a building (non-residential building or dwelling) and not mining related.

Headline civil construction work peak around FY13 at over $87bn driven by privately funded infrastructure that supported the mining investment boom. Here, the largest contributors from the civil sector included rail, harbours, supporting utilities, and pipelines. During this time, publicly funded work remained relatively flat at around $36bn per annum.

Civil construction then slumped to FY16, dropping below $60bn, underpinned by declines in nearly all sectors across public and private funded work. Total work has since moved higher through rising publicly funded transport megaprojects across roads and rail, a private sector funded renewable energy generation boom in electricity, the rollout of the nbn and 5G networks in telecommunications, and a range of public water security projects.

Fig. 6: Total Civil Construction by Sector, Australia



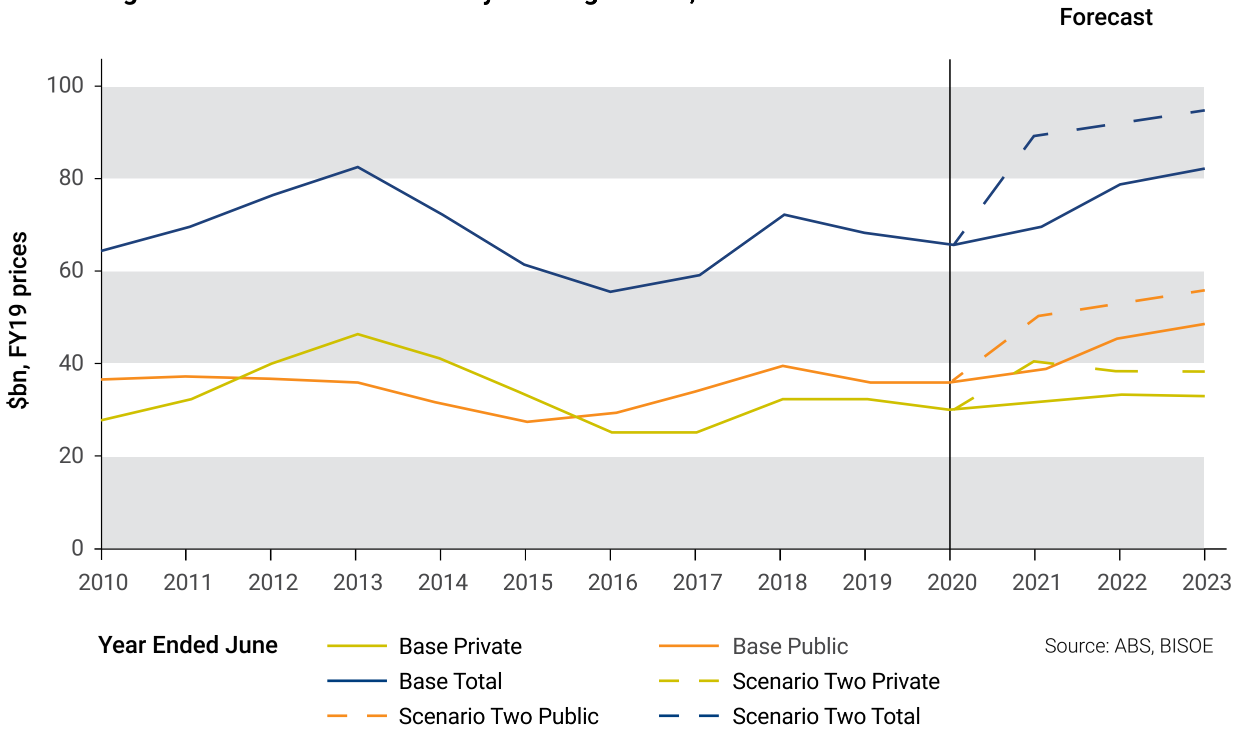
Source: ABS, BISOE

Both privately and publicly funded engineering construction activity continued to be relatively insulated from domestic activity pandemic restrictions over FY20. The lack of movement restrictions targeted towards construction workers has allowed pre-existing projects to progress steadily, and civil projects located outside of dense population centres have been geographically shielded from any direct impacts. However, the industry is not entirely immune to the outbreak of COVID-19. Roads engineering construction stalled more than expected in FY20. This is attributed to some productivity losses due to social distancing guidelines and lockdowns, as well as far weaker than expected public sector commencements. To some extent, this negative was offset by an upgrade in nbn funding which is set to continue over the short run. In FY20, national civil construction work done was valued at around $65bn.

Falling engineering construction commencements over FY20 reinforces our view that recent activity has been driven by existing projects. Lower levels of civil commencements does create a very weak lead into FY21, however, and suggests that while governments continue to advocate for quick stimulus, it often takes time for stimulus plans to translate into construction activity.

Over the next three years, total civil construction work done is expected to grow to between $82bn and $94bn, mainly driven by rising activity on roads and rail projects in the state capitals. Higher levels of transport work is expected to overshadow declining work across utilities. Here, telecoms work is set to fall as the nbn rollout moves to completion, despite additional funding in the 2020-21 Federal Budget. Most other sectors are forecast to see steady and/or rising work.

Fig. 7: Total Civil Construction by Funding Source, Australia

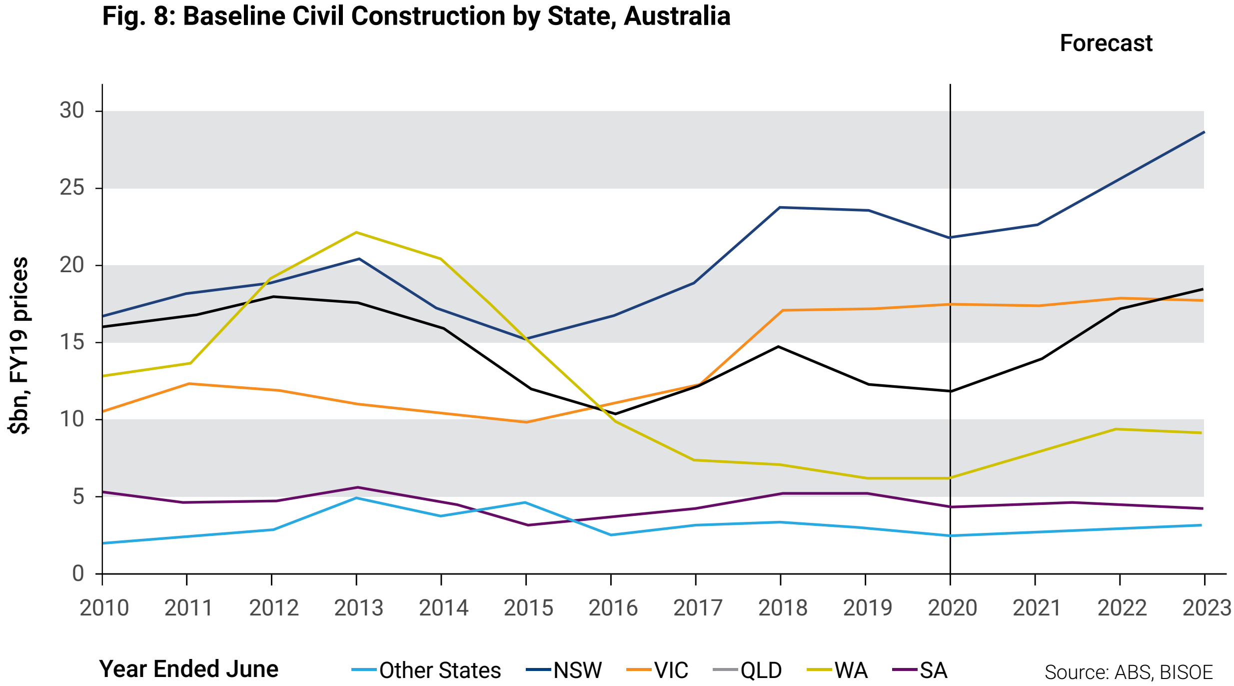


3.1.1 State by State Summary

- Over FY20, New South Wales saw a minor fall in total civil construction work. It is to be noted that this decline has come off a historically high base, driven mainly by roads and rail work in Sydney. NSW saw exceptionally low public transport commencements which restricted work done and creates a weak lead into FY21. However, looking ahead, growth is expected to return on the back of the commencement of several multi-billion-dollar urban transport projects including Metro West, Western Harbour Tunnel and Beaches Link, the M6 Stage 1, and parts of Inland Rail, as well as Snowy Hydro 2.0.
- Victoria maintained a high plateau of work across FY20 benefiting from large roads and rail projects (as in NSW). This level of activity is forecast to be maintained to FY23 as rising work work done on major transport projects (notably, Melbourne Metro, the North East Link and the Melbourne Airport Rail Link) is offset by falling utilities work (notably the end of the nbn rollout).
- Queensland saw another year of decline in work done over FY20 with continued weakness across roads and electricity as several projects moved to completion but were not replaced by new projects of equivalent size. However, a strong rebound is set for the near term off the back of Cross River Rail and Inland Rail projects.

- Civil construction in Western Australia continued to be relatively soft over FY20. However, over the next two years activity is expected to rise significantly in line with Metronet and numerous road projects. With mining activity also ramping up in the state, and risks to the interstate movement of people, there is expected to be significant challenges in securing skills from competing regions and sectors.
- South Australia has seen relatively stable civil construction activity in recent years. Work will be supported over the near term by further works along the North-South Corridor and several electricity projects.

Fig. 8: Baseline Civil Construction by State, Australia



Source: ABS, BISOE

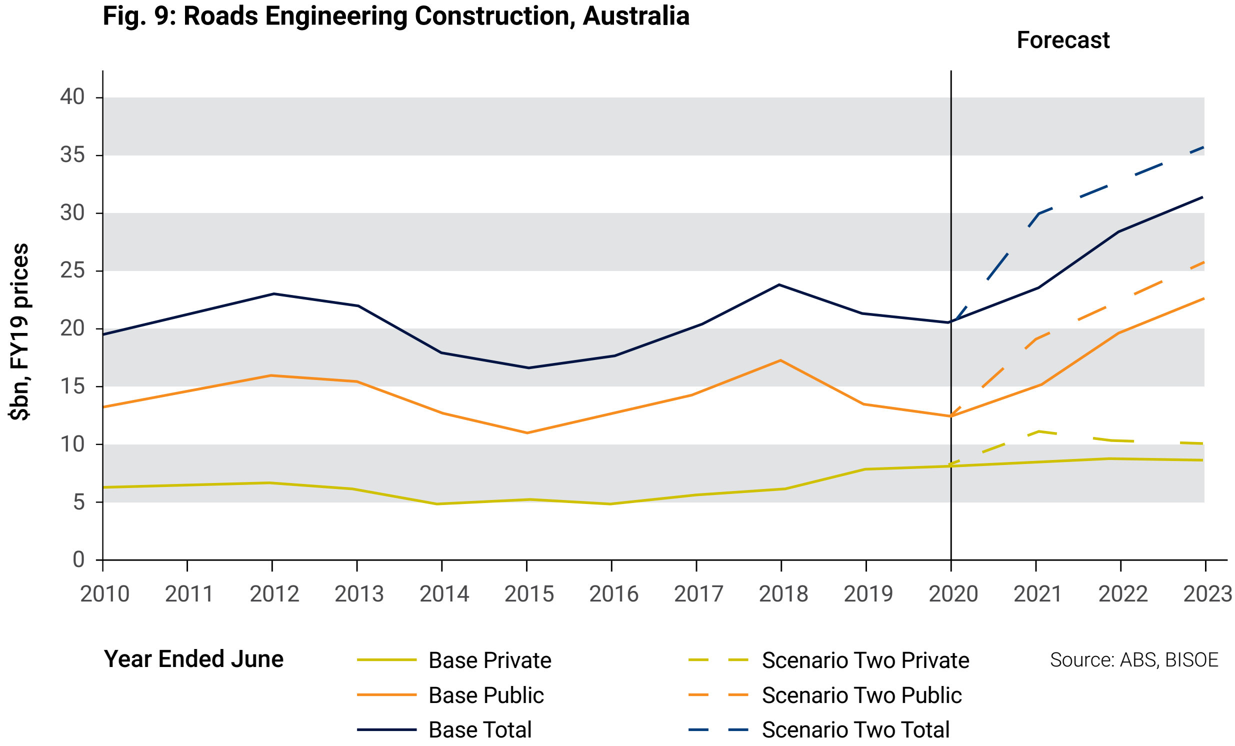
3.2 ROADS AND BRIDGES CONSTRUCTION

This section of analysis considers the trends in road and bridges construction over the period FY10 to FY23. Roads include highways, access roads, toll roads, local roads, subdivision development, arterial roads, runways and airport associated roads. Bridges includes those for the support of roads, railways, causeways and elevated highways.

Roads and bridges construction has moved in a cyclical manner over the past decade. This cycle is expected to continue over the short term as infrastructure spending reaches a post-pandemic peak in FY23. This is following the trough in public spending in FY19 and FY20.

Privately funded roads work has remained relatively consistent at around $5bn per annum over the past decade. This is expected to increase over the forecast period to reach a peak in FY22 of between $8.8bn and $10.3bn. Public spending is approximately three times the volume of private spending but is significantly more cyclical. This cyclicality drives the overall trend in roads construction. Public spending is expected to reach a peak in FY23 - a year later than the private road spending. Overall road construction is expected to range between $31.2bn and $35.9bn.

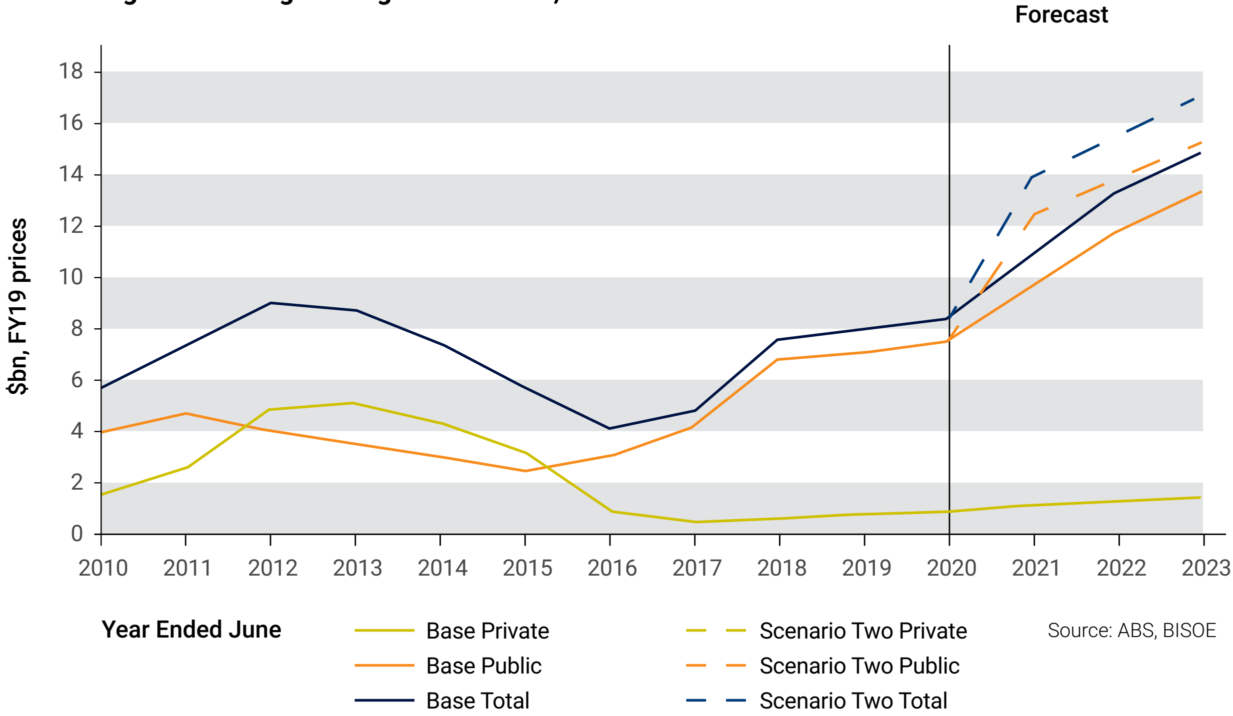
Fig. 9: Roads Engineering Construction, Australia



3.3 RAIL CONSTRUCTION

Rail construction has historically been driven by a combination of both private and public investment, which can be seen in the FY13 peaks in activity. Private investment has since declined, and we now expect record levels of rail construction in forthcoming years due to strong growth in publicly-funded rail projects, particularly focused across the eastern states. This large pipeline of work has included (and will include): Sydney Metro projects, Melbourne Metro Rail, Inland Rail and the Cross River Rail project. Total rail construction activity is forecast to range between $14.9bn and $17bn by FY23.

Fig. 10: Rail Engineering Construction, Australia



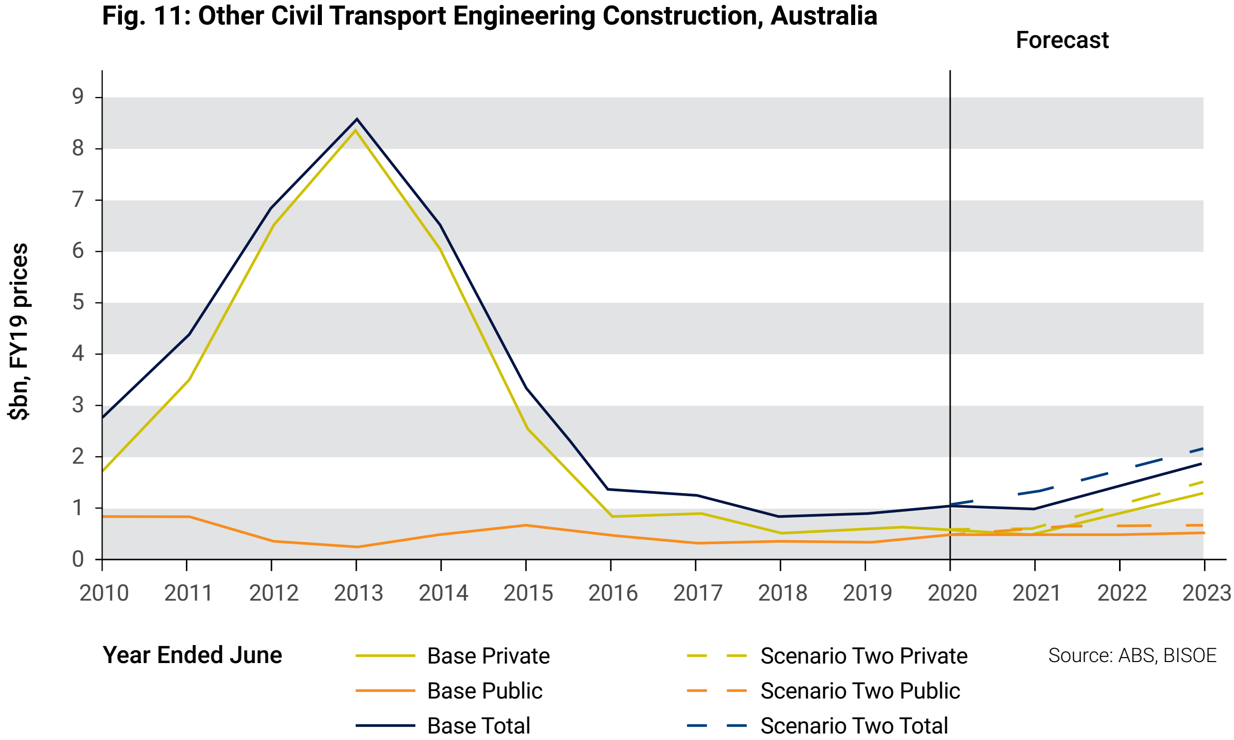
Source: ABS, BISOE

3.4 OTHER CIVIL TRANSPORT CONSTRUCTION

Harbours are the main infrastructure in the other civil transport construction. Publicly funded harbours construction has remained steady at around $400m per annum over the past decade, while private spending saw a significant peak in FY13 ($8bn) due to mining-boom related infrastructure, particularly large iron ore ports in Western Australia (Roy Hill and the Port Hedland expansion) and the port component of the several LNG projects in the Northern Territory, Queensland and Western Australia.

The peak in private investment was aimed at unlocking bottlenecks for the second phase of the mining boom and beyond, and as such, spending has shrunk and stabilised since FY16. The slow growth trend is expected to continue over the forward outlook with a slight uptick in activity towards FY23. Here, activity is forecast to reach between $1.9bn and $2.1bn.

Fig. 11: Other Civil Transport Engineering Construction, Australia



3.5 CIVIL UTILITIES CONSTRUCTION

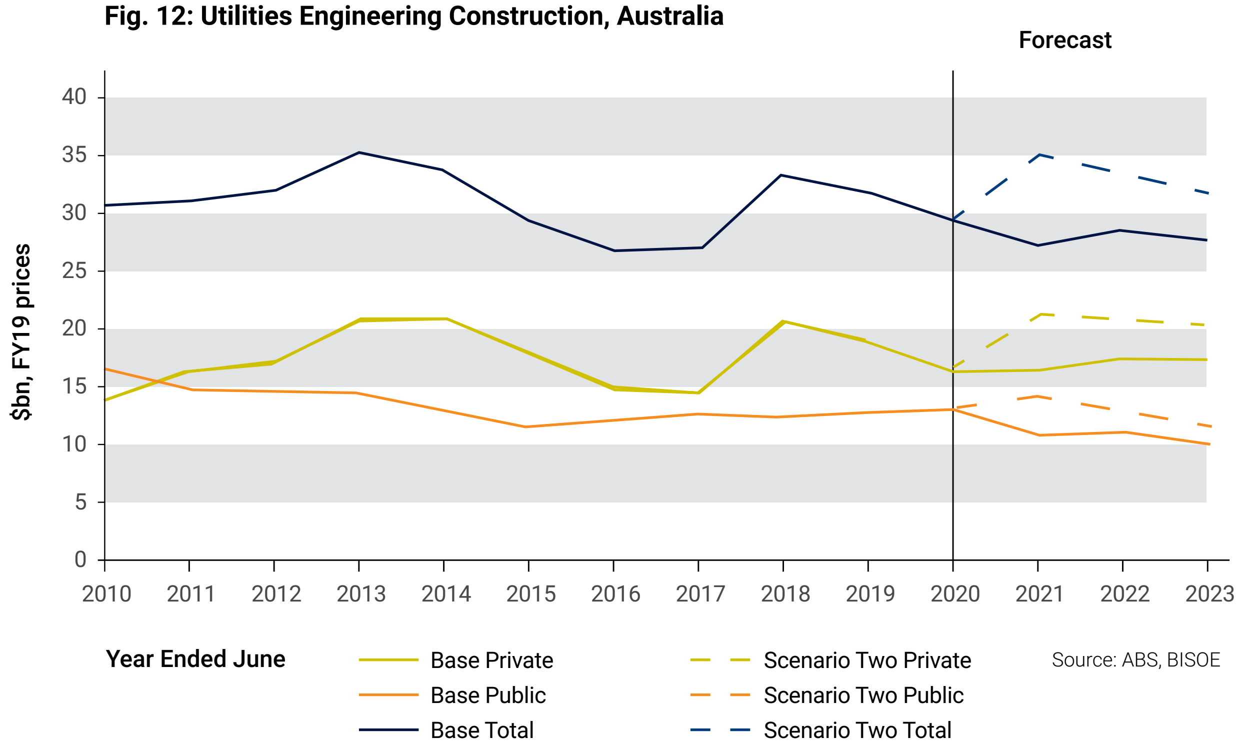
This aggregates the construction of electricity, water, sewerage, gas pipeline, and telecommunication infrastructure. This group has the highest level of spending across the civil engineering categories.

Civil utilities have the highest level of private investment activity out of the five civil engineering types considered in this report. This is due to the nature of the industry, with long networks which need regular expansion and/or upgrading and the rising share of private ownership amongst utilities companies.

The level of public investment in this segment has been on a slight upward trend since FY15, driven mainly by the telecommunications subsector and the associated nbn. This is set to reverse in upcoming years as the nbn moves to completion, seeing public investment move towards a 19-year low in FY21 (just under $11bn).

Private investment has been significantly more cyclical than public investment; reaching local peaks in FY14 and FY18. Given the stability of public investment, private investment is mainly responsible for the headline movements in total civil utilities construction. Over the forward period, rising private investment is expected to offset the decline in public investment (nbn) resulting in approximately stable total construction levels. Construction work in FY23 is expected to range between $27.7bn and $31.9bn.

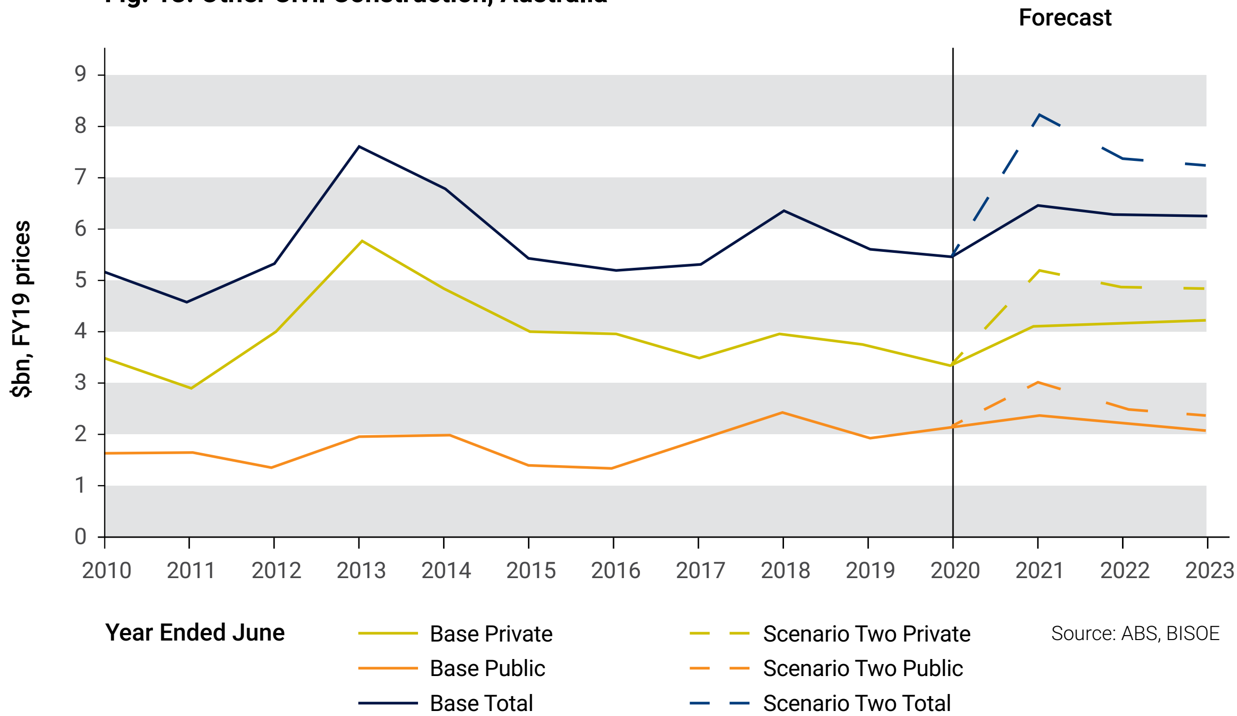
Fig. 12: Utilities Engineering Construction, Australia



3.6 OTHER CIVIL CONSTRUCTION

This aggregates recreation and other engineering construction. By FY23 other civil construction is expected to constitute between $6.3bn and $7.2bn in work done.

Fig. 13: Other Civil Construction, Australia



04

THE STATE OF THE INDUSTRY AND ACHIEVING AN INFRASTRUCTURE-LED RECOVERY

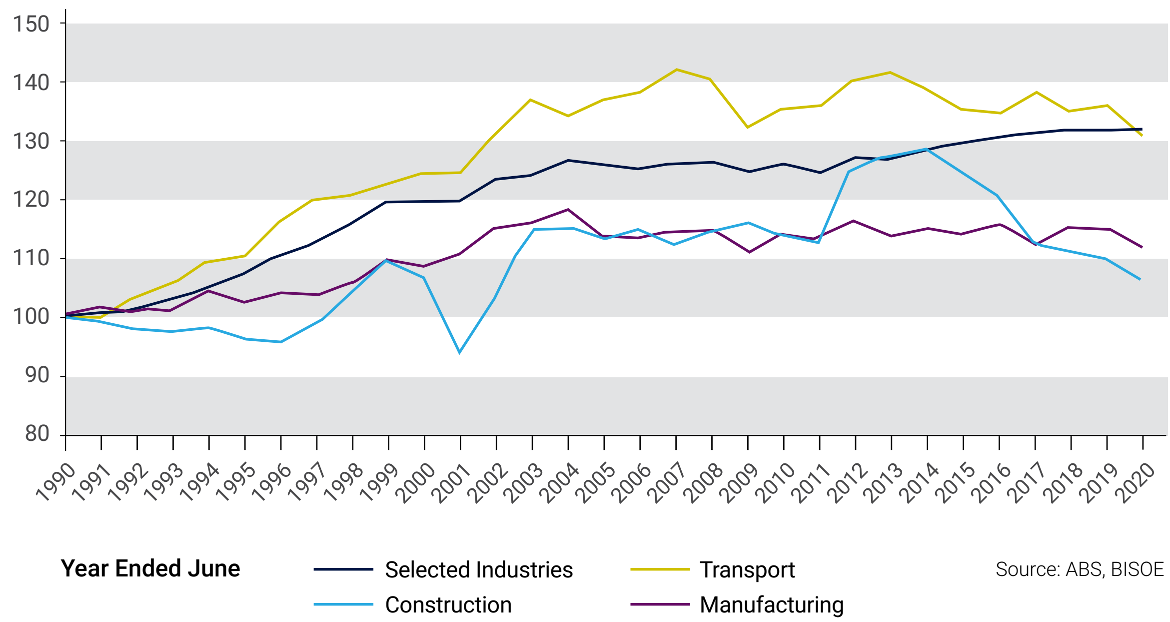
While the Australian construction industry has been able to deliver rising levels of work over the past two decades, the market and pipeline may face critical sustainability challenges if another ramp up – as per the baseline as well as scenarios considered for this report – is to occur over the next few years. If unaddressed, these issues threaten to jeopardise an 'infrastructure-led recovery' and the economic and employment benefits that derive from it.

4.1 PRODUCTIVITY OUTCOMES

One of the key problems facing the construction industry is worsening productivity. Here, poor industry financial outcomes together with difficult procurement and contractual conditions is impacting how industry and government work together to achieve efficiency outcomes, as shown in Figure 14 below. Falling productivity, by definition, means that more labour and capital is required to achieve a given level of output. This not only reduces capacity and capability, but increases costs in delivering infrastructure. The low profitability / low productivity spiral impacts not just the financial sustainability of civil contracting businesses but also non-financial goals, including work/life balance, mental health, training and upskilling, and innovation itself (which is required for productivity growth).

Poor productivity growth results in infrastructure being more expensive to plan and deliver. For governments and private project owners this threatens value for money in infrastructure delivery and deteriorates community expectations of infrastructure access, quality, and the price of patronage.

Fig. 14: Multifactor Productivity Indexes by Industry, 1990-2020, FY1990=100[4]



4 ABS (2020), Estimates of Industry Multifactor Productivity, 2019-20, Cat. No. 5260

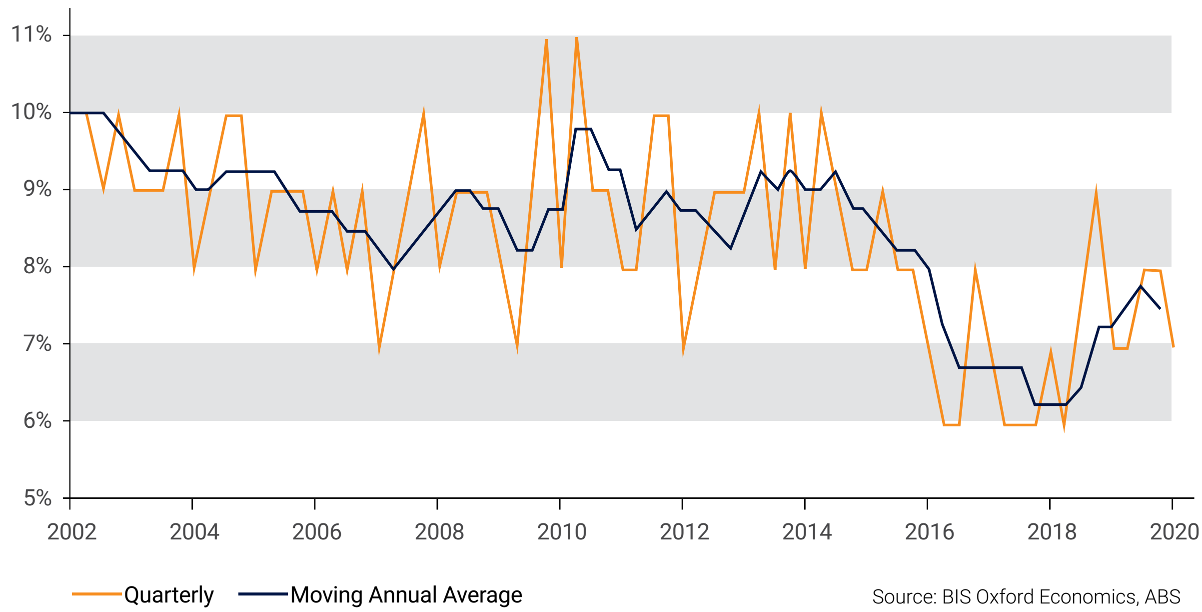
The construction industry has lagged well behind all other sectors in terms of multifactor productivity growth since 1990. Construction productivity has grown just 0.2% per annum compared to 1.0% per annum for other industries (excluding manufacturing) and 0.5% per annum for manufacturing. Historically, short lived productivity gains have been difficult to sustain. Productivity in the construction industry today stands at levels seen in the late 1990s.

Improving interactions between parties can help improve productivity. So too can enhancing contract design and building stronger industry relationships between industry participants, particularly on large, complex and riskier projects. Addressing these issues will also assist in attracting new talent or technologies. Section 05 identifies a number of causes of poor productivity in the industry, including planning and identification, tendering process and procurement and risk allocation, and proposes solutions to these challenges.

4.2 FINANCIAL OUTCOMES

In a synergistic spiral, weakening productivity has coincided with falling financial sustainability. Construction industry profits as a share of sales sharply receded between 2014 and 2018 before seeing a partial rebound in 2019. Further gains seen in 2020 are at risk as JobKeeper payments are poised to be unwound through 2021. Engineering construction has been shown to have the lowest profitability of the construction related sub-sectors (50% of building and one-third of construction services).[5]

Fig. 15: Construction Industry Gross Operating Profit to Sales Ratio: 2002-2019[6]



Source: BIS Oxford Economics, ABS

5 ABS (2021), Business Indicators, Australia, Cat. No. 5676, March 2021, Australia

6 ABS (2020), Australian Industry 2018-2029, Cat. No. 8155, October 2020, Australia.

Financial sustainability is the cornerstone of wider industry outcomes. Tighter margins are prohibitive to training and innovation, as well as creating challenges for work/life balance and mental health measures. Like low productivity, financial stress is a barrier for new talent and investment.

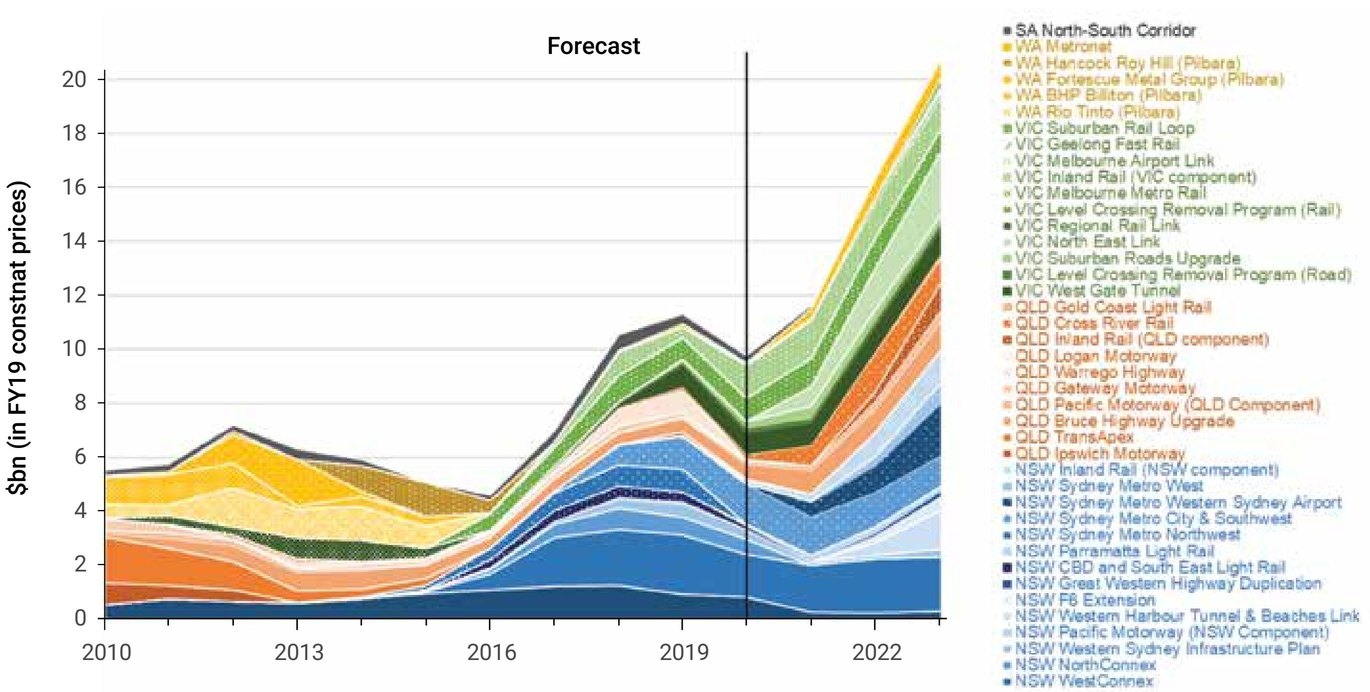
This is a critical issue given the increasing role played by the private sector in infrastructure delivery. In FY2019, the private sector delivered 83% of all transport and utilities infrastructure work in Australia, up from 44% in the mid-1980s.

4.3 PIPELINE CONDITIONS AND CAPACITY/CAPABILITY

The pipeline itself presents challenging capacity/capability conditions that industry must contend with. The high cyclicality of infrastructure rollouts often presents an unsustainable workload for contractors, with shortages of skills in upturns and loss of skills from the industry in downturns. Smoothing the demand for work may be itself a worthy goal for parties attempting to address capacity bottlenecks and costly lulls in the market. However, our forecasts for civil work, exemplified by the coming wave in transport-related investment – indicate that the boom/bust cycles of the pipeline have persisted and will likely continue over the medium run.

Fig. 16: Major Transport Projects (over $2bn), Australia

Notes: This chart is based on projects with over $2 billion in total value.
Solid areas are road projects, dotted areas are rail projects.



Year Ended June

Source: BIS Oxford Economics

Additionally, the nature of the current projects making up the near-term pipeline are adding difficulty to delivery. A growing proportion of the engineering construction outlook (especially in roads and rail) is composed of multi-billion dollar megaprojects located in dense urban environments. From FY20 to FY23 the work done value of transport mega-projects alone is expected to nearly double. These projects are increasingly complex and risky driven by the need to contend with busy brownfield environments and multiple project partners and phases. Large urban transport projects, for example, require more underground works and tunnelling, and hence face more extensive interface challenges than conventional greenfield developments.

In terms of competition, the market is becoming increasingly concentrated with the largest "tier-1" firms consolidating market share. This is a consequence of the nature of the pipeline and a risk-mitigation mind set from procurers. This has resulted in the award of multi-billion-dollar mega projects to tier-1 single contractors and joint ventures between the largest firms. These contracts often take the form of private-public partnerships or managing contractor arrangements which see delivery risk borne heavily by the firms involved rather than the procurers. Recent contracts which take this form have seen some major market players take enormous financial hits when delivery was delayed and overbudget. In addition, large single contracts can act as a barrier for market participation which restricts the ability for smaller firms to access the pipeline of work. The only work for smaller contractors in these deals is whatever is not performed in-house by the tier-1 firm and is allocated to specialists. As the pipeline becomes increasingly dominated by mega-projects, the prospects for non-tier-1 firms can be threatened.

4.4 COVID-19 IMPACTS

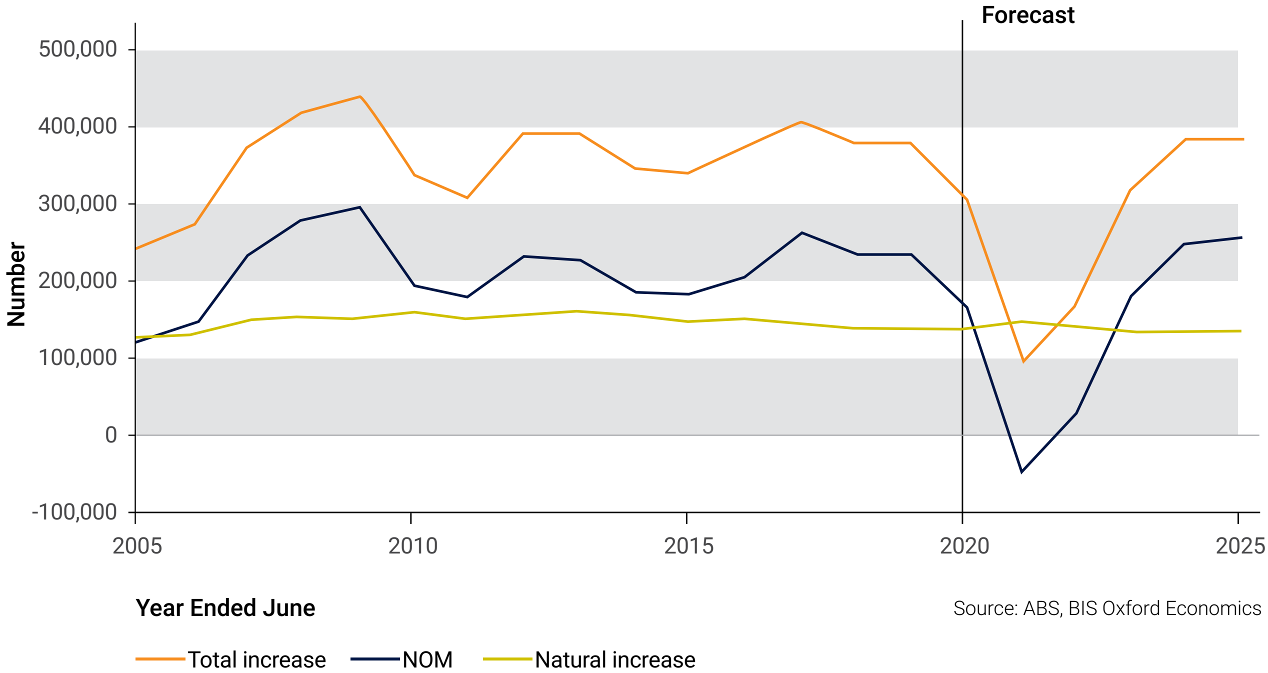
COVID-19 disrupted the civil construction market in FY20 (albeit not as extensively as it impacted building markets) and there will likely continue to be impacts to infrastructure delivery over the medium term. In addition to the challenges mentioned above, industry must deal with the uncertainty associated with the global pandemic and policy responses.

Significant COVID-19 impacts include:

- Increased cyclicality over the short run. Weakness in FY20 was caused by a stalling of private sector funding and productivity losses from social distancing. This will likely be followed up by a period of sharp escalation driven by an existing ramp up in the pipeline combined with stimulus measures that are directed towards infrastructure.
- State and international border closures temporarily (and possibly structurally) disrupting material supply chains and the supply of skills. Domestically, skilled labour and equipment may face limited mobility in the face of snap lockdowns and border closures. Meanwhile, global supply chains of inputs and specialised equipment will likely remain a risk factor for both cost and timing of project delivery.

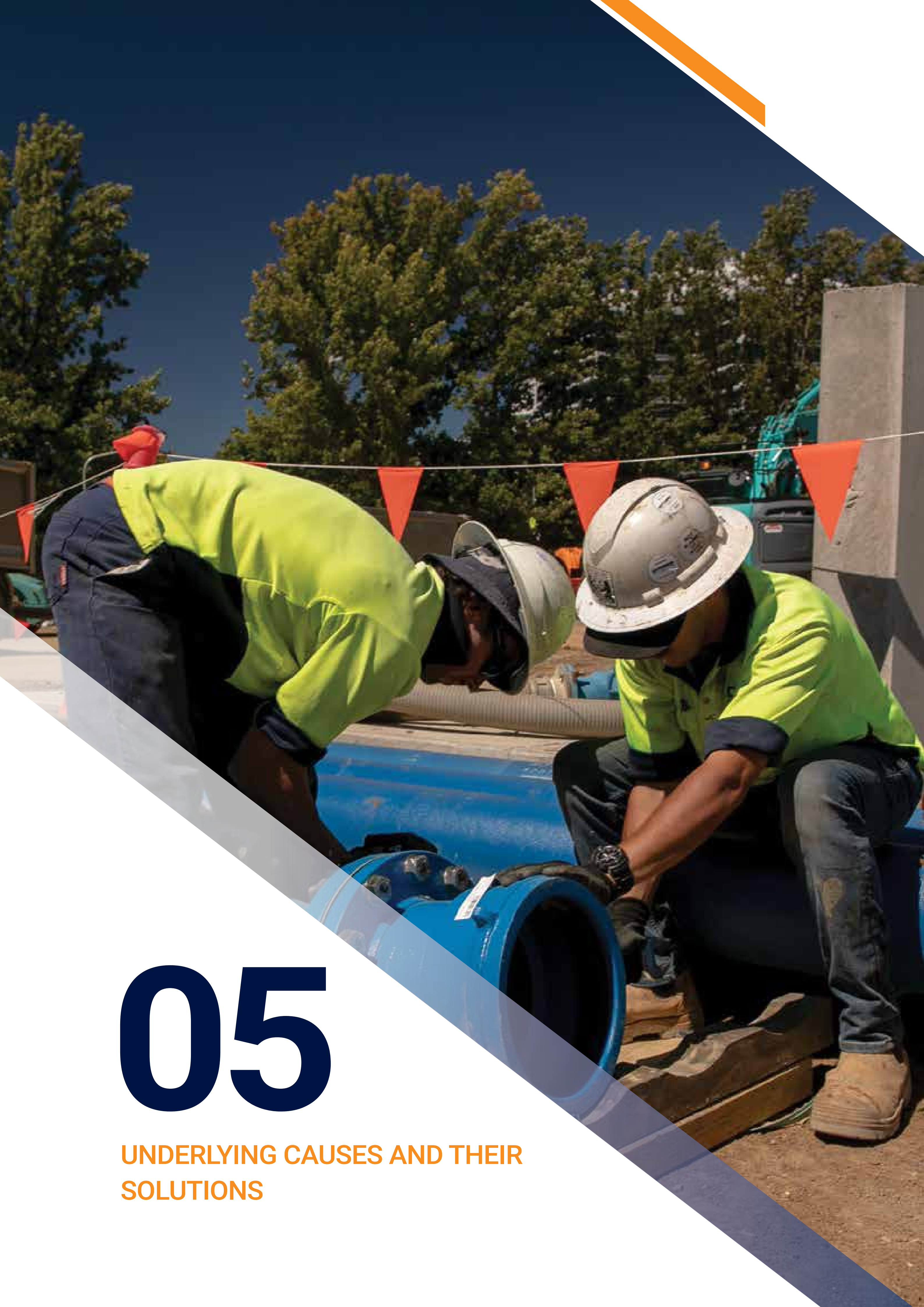
- As compared to pre-pandemic forecasts Australia's population is expected to see 455,000 fewer people by June 2024 (than in a 'no-COVID' world) due to migration restrictions. Recent data from the ABS shows that Australia's population actually declined in the September quarter of 2020 – the first such decline for 104 years.[7] Not only will this shrink the future pool of talent and skills, a smaller population base will likely see decreased demand for infrastructure assets in the longer run.

Fig. 17: Components of Population Increase, Australia[8]



7 ABS (2021), National, state and territory population, Cat. No. 3101, September 2020, Australia. https://www.abs.gov.au/media-centre/media-releases/population-grows-overseas-migration-decreases

8 Ibid.



05

UNDERLYING CAUSES AND THEIR SOLUTIONS

5.1 PLANNING AND RISK IDENTIFICATION

Addresses: project delivery, financial outcomes, market participation

Problem

In conjunction with increasingly complex projects, the quality of planning for projects has suffered in recent history due to weakening in-house technical capability of procurement agencies. These current conditions are a legacy issue tied to technical expertise lost during the scaling back of the public sector during the 1990s and 2000s. COVID-19 stimulus and ambitious timelines prescribed by policy announcements also can add time pressure to the planning of individual projects

As planning is the first and one of the most vital stages of infrastructure delivery, miscalculations or poor judgement can significantly impact the entire chain of works required for project execution. Poorly defined scope of work results in industry assuming an inappropriate amount of responsibility for identifying and managing risks, and long and costly bidding processes to participate. Firms are then incentivised to accept the most risk rather than presenting the best value offer, impacting outcomes for both contractors and funders. At its worst, under investigated or inadequately defined works can cause budget blowouts, delays, and financial hardship.

Solutions

Infrastructure Australia has defined best practise for infrastructure planning and delivery in its regularly revised "Better Infrastructure Decision Making Guidelines". Here, decision-making processes for infrastructure and planning principles are laid out which can yield more positive outcomes for all participants. Cost reducing principles include:

- Taking inspiration for future planning from previous successes and those which utilised Infrastructure Australia's guidelines and principles. Optimal planning and delivery follows a usual path: project identification in accordance with departmental strategies, thorough feasibility studies, proper risk assessment, and genuine engagement of stakeholders.
- Early involvement and collaboration with industry allows for better and earlier identification of risk. For the project funder it allows for more practical development of costings, timelines, and interface management. For industry this reduces specifications uncertainty, bid costs, and tendering times.
- Information is key in improving planning and delivery through previous experience. The best way to enable analytics is through consistent and unbiased collection of data. This allows for comparison of project delivery experiences including risk management and outcomes.

5.2 TENDERING PROCESS AND PROCUREMENT

Addresses: market participation, productivity, and financial outcomes (reduced bid costs)

Problem

Tendering processes require special attention as an infrastructure delivery stage faced by all industry participants. Here the key objectives are reduction of cost and time required to submit compliant bids. In doing so industry benefits through increased profitability and participation, and procurers benefit from boosted competition and faster rollout.

The costs of tendering include the preparation of bids, the development and acquisition of intellectual property, administration or bureaucratic hurdles, and legal resources to develop the contract. Unsuccessful candidates see at best some reimbursement of these costs and must price this risk into the bid for the project and future bids. This necessary process is a financial and time cost that can be reduced for an industry that is already facing profitability and productivity challenges.

When the tendering and bidding processes are longer than necessary, resources and skills are tied up until resolution. In the case of the upcoming transport boom, a number of large tenders are released at the same time. With limited budgets and personnel that may be occupied for extended periods, firms often are unable to participate in all available work. Additionally, work packages may be unappealing to contractors if the cost of bidding and riskiness of delivery are higher than potential returns or alternative jobs. In dissuading participation, competition and value for money is also threatened from a funder's perspective.

Tender cost typically make up 1-1.25% of project value but can take up to 40% of the entire project process in terms of time. Hence, faster short list definition can be achieved through simpler and lower cost processes. Additionally, clear and thorough identification of scope of works and risks is needed before a project is put out to tender to reduce time spent on bid development and revisions.

Another key avenue for streamlining the tendering process is the standardisation of contracts and processes. Standardisation reduces costs associated with legal consultation, contract negotiation, and establishes expectations for risk and reward allocation. While variation in projects requires variation in contracts, a consistent range of solutions is feasible which links the ideal procurement model to the risk profile faced. Industry consultation has revealed that recent contracts they have encountered are moving away from standardisation, which is resulting in higher costs in dollar terms, resources, and time. At the same time these contracts see inappropriate allocation on risk compared to the margins to be made. These contracts are consequently becoming more complex in a perceived effort to minimise risk to the funder over reducing infrastructure costs.

Standardisation of contracts is a difficult task due to the high cost for an individual procurer to develop a system that may have limited applicability depending on the centralisation of the industry. Additionally, there may be no immediate incentive for a funding agency to implement these structural changes. Collective effort and participation across engineering sectors is required to see optimal take up and benefits from such a scheme.

Solutions

Procurement model selection in response to the risk profile presented is one of the key determinants in managing risk allocation and driving positive outcomes. Depending on the nature or complexity of the project, certain approaches are better at allocating risk to the party that is best placed to identify it in planning and deal with it in rollout. Again, it may be necessary to collaborate with industry at early stages if expertise and specialisation means the contractors are the more appropriate party to manage risk. Ideally this results in better specified projects with less risk and shorter tendering times.

Streamlining the tendering process can benefit from a few practical considerations:

- The involvement of industry partners in the planning stage for risk identification and optimal delivery methods.
- Shedding of repetitive bureaucratic and administrative processes for initial bidding stages. Shortlisting is the key stage for industry participants and should optimally be simpler and faster to reach. Ideally this allows for participation in the maximum range of bids while reducing costs related to tendering.
- More consistently and broadly publish prioritisation of cost and non-cost factors for individual projects.
- Move towards a suite of standardised contracts which include a range of procurement models. Reform, here, requires a centralised approach with public procurers best placed to lead harmonisation across Federal, state, and local government.
- Industry data could be utilised to determine a realistic cost for a firm to bid on a specific project. This benchmark can then be used to include compensation measures for contractors in the process which attracts greater market participation and competition.

5.3 RISK ALLOCATION

Addresses: financial outcomes, productivity, market participation

Problem

As discussed in previous points, inefficient allocation of risk is one of the most significant threats to the construction industry. Inappropriate handling of risk identification and responsibility can be detrimental to project delivery, budget concerns, productivity, and the financial viability of the industry. Industry is increasingly being forced to assume greater risk in infrastructure contracts in order for funders to protect themselves. This can occur at the expense of fairness and efficiency overall, and contractors have very little bargaining power to counter these offers. A pipeline that is dominated by these styles of contracts is unsustainable and unattractive for firms to participate in.

As a consequence of higher risk derived from the work itself, firms are less willing to take on risk from other areas including training and skills development, R&D, and investment in innovation. Without the investment from industry into these areas, a cycle of productivity stagnation is entered and perpetuated. Procurers suffer in this situation too, with methods of tackling engineering problems never improving in terms of cost or the quality of the end product being constrained.

Funders may avoid risk by using particular models, but it does not eliminate risk. Risk is transferred to another party who may not be in the best position to manage it. This increases the chance of failure which drives the cost of infrastructure up across the sectors that engage in this behaviour.

Collaborative arrangements, on the other hand, have been used to appropriately distribute and manage risk across large and complicated works. Alliances partner funding agencies with the contractors tasked with delivering the infrastructure. Under this arrangement, all parties share in the successes and failures of delivery. This set up does not create incentive for any participant to shift risk to another. Rather it promotes effective risk identification and cooperative approaches to overcoming hurdles.[9]

Not every project will be best suited to alliance models. However, alliancing and collaborative models should be genuinely considered as part of a full suite of procurement arrangements.

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9 In 2015, the then Department of Infrastructure and Regional Development's National Alliance Contracting Guidelines considered an alliance a suitable project delivery method when the relevant project has one or more of the following characteristics:

- The project has risks that cannot be adequately defined or dimensioned in the Business Case nor during subsequent work prior to tendering;
- The cost of transferring risks is prohibitive in the prevailing market conditions;
- The project needs to start as early as possible before the risks can be fully identified and/or project scope can be finalised, and the Owner is prepared to take the commercial risk of a suboptimal price outcome;
- The Owner has superior knowledge, skills, preference and capacity to influence or participate in the development and delivery of the project (including for example, in the development of the design solution and construction method); and/or
- A collective approach to assessing and managing risk will produce a better outcome, e.g., where the preservation of safety to the public/project is best served through the collaborative process of an alliance.

More conventional (less collaborative) procurement models yield the lowest upfront bids for funding agencies and allows for a very simple comparison between bids. What is more difficult to quantify and compare are the non-cost aspects of infrastructure delivery. These factors are often related to long term benefits like better quality assets with lower whole of life costs, training and skills development amongst the workforce, and investment in productivity channels like innovative processes or technology. Additionally, traditional procurement models generally result in concentrated contracts where 1 or very few packages are awarded to a single firm or a joint venture of firms. As infrastructure projects (particularly transport related) become much larger and more complex than ever before these contracts inherently become large and complex. For a firm to accommodate such scope and risk they must be large, usually tier 1. This results in a concentration of work and risk to a handful of industry participants. Smaller firms with less capacity to absorb risk and ramp up quickly are left with smaller works or the specialised tasks outside of the capabilities of tier 1 firms.

Collaborative models are not widespread in Australia's engineering construction market despite increasingly complex projects with growing uncertainty tied to their rollout. Irrespective of risk profile, the most popular delivery models by far are hard dollar "lump sum" arrangements which heavily weight upfront cost in awarding work. These set ups are ill-equipped to handle projects which are increasing in size and taking place in messy brownfield environments with existing assets to contend with and extensive interfacing.

Solutions

An ideal approach to effective risk allocation would see a range of procurement models considered and accepted to suit individual project needs. Traditional price-focussed models are still the best options for situations where risk and solutions are known. However, collaborative set ups must be genuinely considered when the circumstance warrants it.

Simple approaches to this include early contractor involvement which engages contractors through the design and planning process to identify risks and advise on possible delivery methods. Procurers could also take steps to streamline the tendering process through narrowing contractors down based on experience and capabilities relevant to the works. Opportunities to collaborate and negotiate would then be extended to these firms.

Procurers may be reluctant to adopt collaborative arrangements for a number of reasons:

- The need to relinquish some bargaining power to industry rather than the contractor being the price taker
- Prioritisation of short run outcomes like cost to deliver rather than broader benefits
- Uncertain costs of delivery and perceived track records of previous alliances

The historical performances of alliances have been mixed. However, there is no definitive evidence that collaborative models involved in complex and risky projects drive up delivery costs. Comparisons here must take into account the eventual cost at the end of construction and the improvement of the sophistication and administration of collaborative arrangements. Well designed and implemented collaborative models may also have higher perceived cost than traditional set ups due to all risks being properly priced into the costs at the start than dealt with ad-hoc. Higher prices may also be a result of a higher quality product being approved, more commitment to training and skills development, or a more innovative solution being developed. All of these non-price benefits serve to reduce costs and improve productivity in future engagements.

Funders of the current wave of projects are becoming increasingly risk averse. This is true of both private sector investors, and state governments and the taxpayer in the public sector. The broad idea of risk reallocation is the protection of financial stakeholders by reducing exposure to uncertain infrastructure rollouts and returns. Public sector funding is also impacted by the political attitude to high upfront costs despite the lasting benefits outside the current electoral cycle.

Incentivising the genuine consideration of collaborative models means adjusting the mindset and priorities of the funders. Headline estimates of construction cost (which are often underestimated) must be given lower priority and greater weight allocated to non-price factors and whole of life cost. These alternative key performance indicators could include:

- Greater market participation and competition
- Increased training and upskilling on projects which yield long term benefits within the industry
- Worker conditions and diversity targets
- Local content prioritisation
- Achieving agreed delivery timeframes
- Minimising long term operating and maintenance costs across the life of the asset
- Use of new technology or innovative processes

However, as funders engage in a potentially riskier arrangement, industry must strive to deliver the benefits and success possible in the collaborative model. Industry has an obligation to prove that risk-sharing set ups are not perceived as just a way to boost their profits at the expense of other parties. Experience is integral in pulling off successful collaborations as well as fair terms established in the specific contract details.

In parallel, procuring agencies must consider the scope and risk appetite of the market. Instead of offloading the responsibility of package division to a managing contractor or head contractor, decentralisation of work can take place at the tendering stage in properly planned strategies. Diversification of works means better outcomes for SMEs and less concentrated risk on the tier 1 of the civil construction industry.

5.4 SKILLS AND TRAINING

Addresses: attracting talent, driving productivity

Problem

Skills development and training is often at the mercy of highly cyclical and erratic demand for talent in the construction industry. Some sectors of civil construction have low economies of scale for education due to small or highly heterogeneous environments. Here, only very small classes are commercially viable which cannot cater for rapid ramp ups in demand in specialised areas. More broadly, in periods of low demand educational institutions must cut back on staff and lose institutional expertise. However, in periods of high demand quality can be sacrificed for volume and speed of completions.

In civil construction sectors which suffer from varied jurisdictions and systems, the training burden can be especially taxing. The retraining of staff for different administrative requirements is often seen as a double up in certifications rather than development of productive skills and knowledge. Firms view these educational requirements as costly barriers which soak up much needed resources in times of volatile demand.

Additionally, many of the skills attained in the broad civil construction industry are applicable to other, at times, higher paying industries such as mining. If skilled workers achieve qualifications and can work under better conditions with higher remuneration, a net outflow of human capital is created. In turn this disincentivises firms from engaging in training programs if they do not see returns on this investment. This cycle also feeds into the pervasive view across industry and government of training being a cost rather than an investment.

Investment in skills and training is a necessity for productivity and the take up of new technology and innovations. While the current workforce may implement innovative processes with on-the-job experience, new talent with the cutting edge in education is required to unlock the productivity enhancements driven by research institutions and breakthroughs in technology. With strict and indefinite barriers for international supply of labour, the only solution to fulfil the skills through the development of the domestic labour pool.

Solutions

Attracting skills and training development is a combination of demand and supply side factors. On the demand side future workers looks for superior conditions and remuneration, as well as job security in the foreseeable future. Industry and government must support and promote an attractive market for candidates to appreciate. On the supply side government and private institutions need to provide incentive and capacity to facilitate demand. Additionally, industry must continue to play its part in developing productive human capital and skills through investing in on-the-job training and encouraging continued learning through sponsored courses.

Procurement is a powerful gatekeeper for industry reform and progress. As discussed, it is vital that funding agencies shift priorities from lowest upfront cost to whole of life cost and non-financial outcomes. In cases of very tight margins related to a contract, very little time or resources are left spare for training and skills development in preparation for and in delivery of infrastructure works. However, skills and training can benefit greatly from appropriate procurement. The inclusion of KPIs related to number of trainees, training hours, or education outcomes makes skills development as integral to successful delivery as budgets and deadlines. Consequently, national or state policy in regards to trades education can be progressed through each project that includes these requirements.

In addition to existing programs and commitments, a range of support initiatives have been rolled out over 2020 and 2021 from state and the Federal governments. Support, here, has been dedicated across a number of sectors including various industries related to civil construction. These programs include free trade qualification courses, wage subsidies to encourage businesses to maintain and take on new apprentices, and expansion of trade education facilities. However, in order to ensure that the civil construction sector is able to take full advantage of these support initiatives, the Federal Government needs to include civil occupations on the National Skills Needs List. Some states have also introduced programs targeting employers to take onboard mature age trainees, young tradespeople, and workers recently displaced. Initiatives in this space have been implemented to develop skills during the COVID-19 related downturn and prepare for the upcoming wave of work. In order to meet future demand and drive productivity, it is vital that government support continues past the immediate term. Infrastructure rollouts and human capital development will remain pressing issues after the normalisation of economic activity and it is critical that the flow of trade qualification commencements is able to keep pace.

06

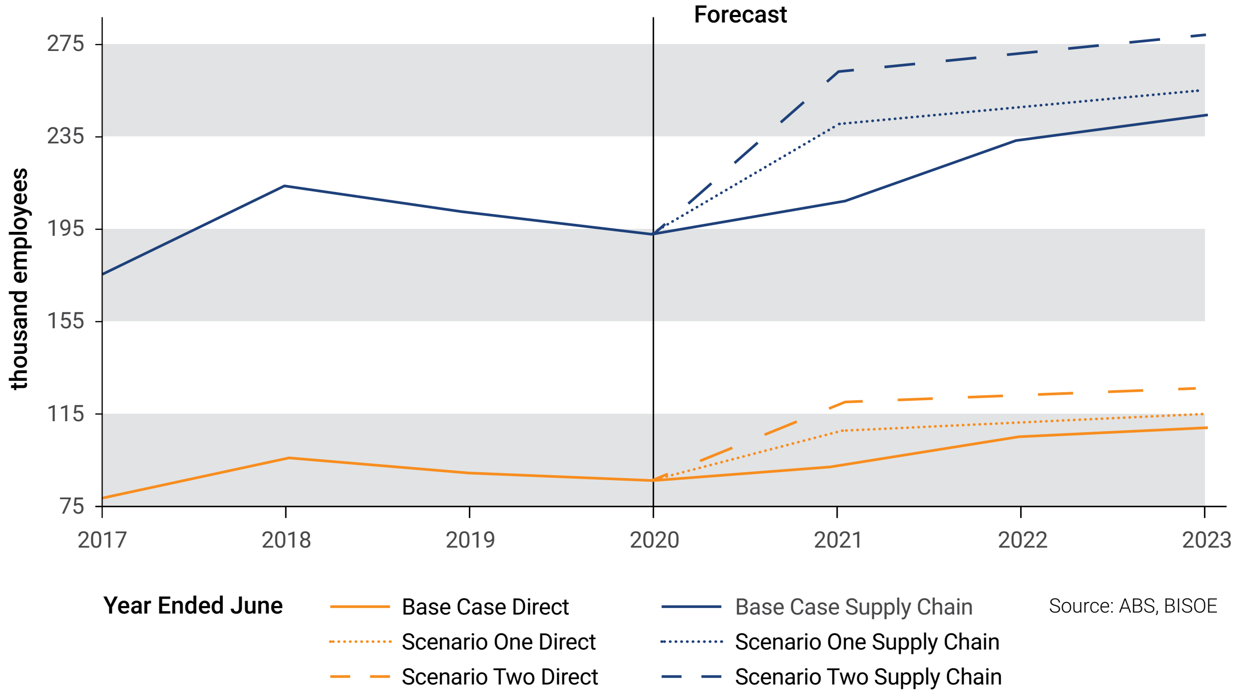
THE ECONOMIC IMPACT OF CIVIL CONSTRUCTION INVESTMENT: KEY METRICS

To assist in tracking the health and progress of the construction industry, key metrics related to several aspects of the market are discussed below.[10] These metrics will be reviewed and compared in each subsequent edition of this report.

6.1 EMPLOYMENT

Total direct employment in the industries considered is forecast to grow from around 87,400 in FY20 to between 110,400 to 126,700 by FY23. By FY23 scenario 1 would see over 5,000 additional jobs in the civil construction industry, while scenario 2 would see nearly 16,300 additional jobs in civil construction compared to the base case. Considering the supply chain (indirect effects plus direct effects) employment is expected to grow from 194,000 in FY20 to between 245,000 and 281,100 in FY23. By FY23 scenario 1 would see over 11,100 additional jobs in the civil construction supply chain, while scenario 2 would see more than 36,100 additional jobs in the civil construction supply chain compared to the base case.

Fig. 18: Direct and Supply Chain Employment in the Civil Construction Industry, Australia



10 Sources of inputs data for the IO modelling are included in Appendix A

6.2 OUTPUT

Across the industries considered in this report, total direct output is forecast to grow from $64.9bn in FY20 to between $82bn and $94bn by FY23 depending on the scenario. Considering the supply chain (indirect effects plus direct effects) output is expected to grow from $100.5bn in FY20 to between $126.9bn and $145.7bn in FY23.

6.3 GVA

Over the sectors covered, total direct GVA is forecast to grow from $25.6bn in FY20 to between $32.4bn and $37.2bn by FY23. Considering the supply chain (indirect effects plus direct effects) contribution to the Australian economy from the construction sectors included is expected to grow from $40.1bn in FY20 to between $50.7bn and $58.1bn in FY23.

6.4 TRAINING MEASURES[11]

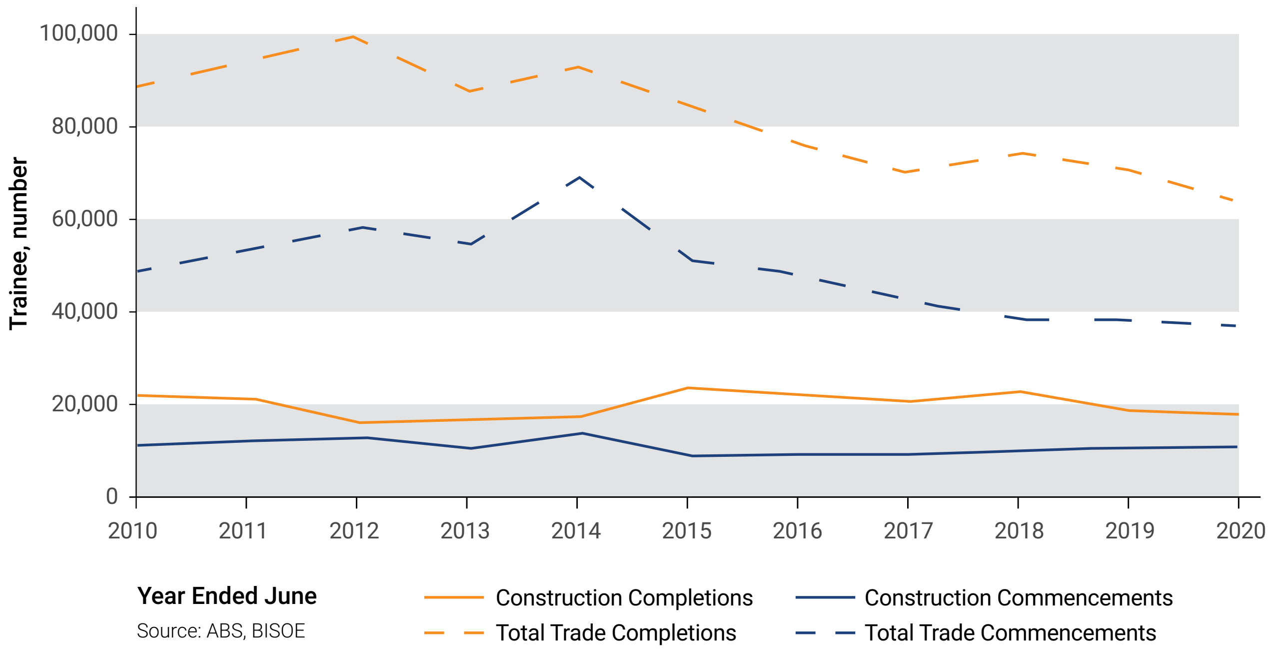
Headline trades commencements peaked during the mining construction boom in FY12 at about 99,100 places. Correspondingly, total trades completions peaking in FY14 at 69,000. Since this period, both measures – commencements and completions – have consistently trended downwards as resource-related construction tumbled and labour demand moved towards operations and maintenance. In FY20 total commencements hit just 64,500 (the lowest since FY02) while completions sat at 36,700 (the lowest level since FY06).

Construction specific measures (defined as construction trades workers by NCVER) have played out differently, being more sensitive to housing, apartment, and non-residential building demand. Additionally, civil construction does not exclusively require construction trades workers, also employing a variety of trades that at classified otherwise in NCVER data.

Construction related training saw completions peak in FY14, like headline training, at around 14,100. This slid to just 9,400 in FY15 and has been slowly regaining strength to FY20. However, construction training commencements have remained elevated since FY15 off the back of a residential building boom in the capital cities and support from non-residential projects. Activity has eased in line with building work done since FY18, sitting at 18,500 in FY20.

11 NCVER (2020), Historical time series of apprenticeships and traineeships in Australia from 1963 to 2020, <https://www.ncver.edu.au/research-and-statistics/data/all-data/historical-time-series-of-apprenticeships-and-traineeships-in-australia-from-1963-to-2020>

Fig. 19: Trades Training Commencements and Completions, Australia



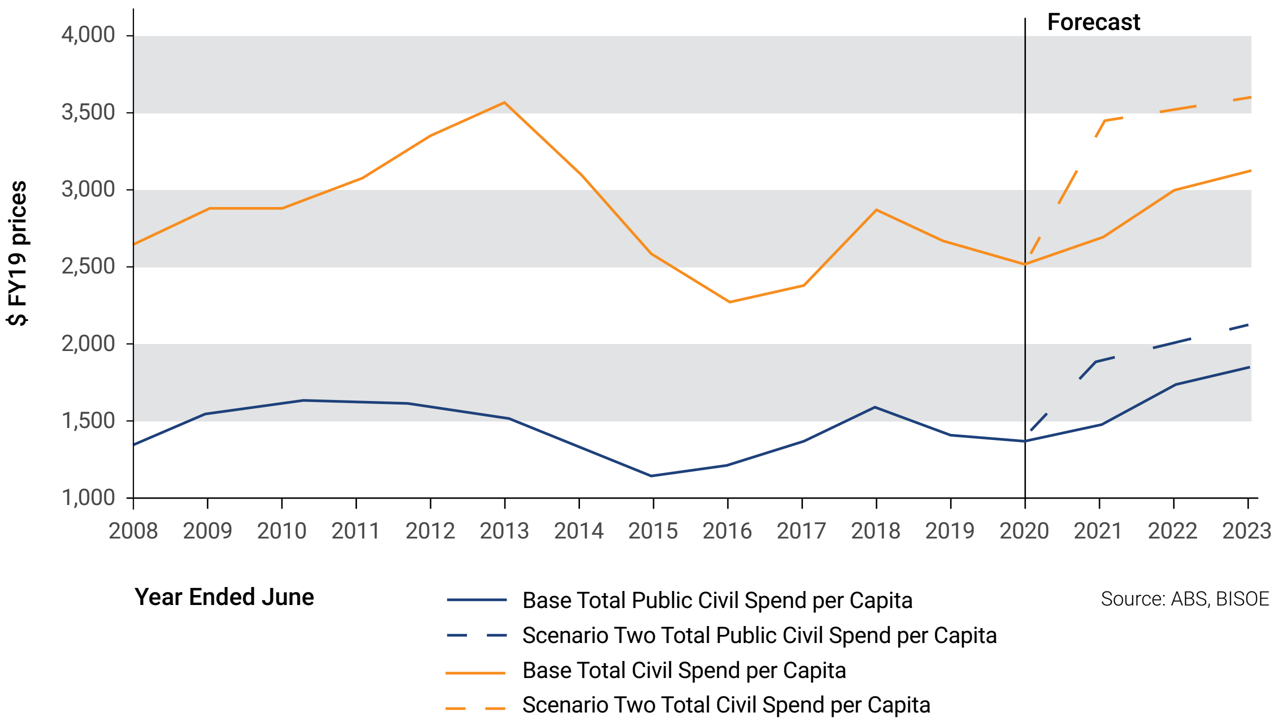
Source: ABS, BISOE

6.5 PER CAPITA CIVIL WORK DONE

Across the industries considered in this report, per capita civil work done over the 2000s and 2010s is well above that recorded in the 1980s and 1990s, reflecting the impact of the resources boom as well as the need for substantial catchup investment in transport and utilities to cater for faster-than anticipated population growth.

Per capita civil work done peaked for both total and publicly funded activity across the early 2010s at over $3,500 per person and over $1,500 per person, respectively. Since this period, however, per capita work done has eased substantially. Even the most recent peak around FY18 is notably smaller than peak work per capita in 2013. Over the last 2 years infrastructure spend relative to the population base has weakened as public and private spend has eased. Total per capita work done is forecast to grow from $2500 in FY20 to between $3100 and $3600 by FY23 depending on the scenario.

Fig. 20: Civil Construction per Capita, Total and Publicly Funded, Australia[12]



Source: ABS, BISOE

12 ABS (2020), National, state and territory population, Cat. No. 3101, December 2020, Australia. ABS (2021), Engineering Construction Activity, Cat. No. 8762, January 2021, Australia.

APPENDIX A

INPUT OUTPUT MODEL METHODOLOGY AND LIMITATIONS

BIS Oxford Economics relies on the Australian Bureau of Statistics' Input-Output (IO) tables published on an annual basis to generate the employment, output, and GVA multipliers. For the purposes of this report we have built our IO model using the latest tables from the ABS. These are the IO tables for the financial year 2017-18.[13]

It should be noted that these IO tables were constructed during the latest peak of the mining boom. Depending on the trajectory of the economy, and more importantly, the heavy and civil engineering industry, over the next decade, these multipliers may over- or understate the impact of the investment in the mining industry.

However, these are the latest industry standard tables for IO modelling.

We then take the multipliers and determine the increases in employment, output and GVA resulting from each $1 million invested in the given industry. For the purposes of this report the heavy and civil engineering is industry of interest.

There are three types of effects that are captured in IO modelling:

- **Direct effect:** this is the effect of the investment in the industry(ies) of interest. An increase in investment spending is likely to result in an increase in demand for labour increasing employment and an increase in capacity increasing output and GVA.

  For example, an increase in investment in the car manufacturing industry is likely to see an increase in employment in and output from the car manufacturing industry as a result of the investment.

- **Indirect effect:** this is the second-round effect of investment. The increase in direct output requires increases in both upstream and downstream industry activity.

  For example, an increase in car manufacturing requires an increase in parts supply (upstream) and an increase in car retailing (downstream). The increase in demand for upstream and downstream services is referred to as indirect as the investment in car manufacturing indirectly results in an increase in demand for supporting industries

- **Induced effect:** this is the effective third round effect. This is the increase in economic activity in other industries not directly related to the initial industry.

  Continuing the car manufacturing example, the increase in car manufacturing results in an increase in employment in the car manufacturing industry. The associated increase in income for these individuals will likely see increases in consumption in industries such retail, banking, and property. These industries are not related to the car manufacturing industry but still see benefits of the increase in car manufacturing investment.

The sum of the direct, indirect, and induced effects of investment in an industry is the total economic effect of the investment spending.

13 ABS (2020), Australian National Accounts : Input-Output Tables 2017-18, Cat. No. 5209.0.55.001

6.6 NOTABLE IO SPECIFIC ASSUMPTIONS

The IO model results are caveated with a number of assumptions. In particular, the model relies on the historical linkages between industries and their outputs. This implies that any future impacts of investment are assumed to take place in a structurally identical environment. This assumption is strengthened by the outbreak of COVID-19, which may create structural change within the Australian economy that is not reflected in the input-output tables. Additionally, IO modelling does not consider the opportunity cost of increased investment. As such, the model does not detail which industry is most deserving of further investment, but rather the model shows the strong economic outcomes of investment into construction. Furthermore, the model does not consider supply-side constraints that may limit the economic benefits of increased investment. This includes labour, which may be in short-supply or face educational constraints, or construction inputs, which may face logistical bottlenecks and other such risks of delivery.

6.7 RISKS OF DELIVERY

Input-Output analysis examines the flow on effects through the economy given a certain level of investment (i.e. the level of employment resulting from an additional $1 million expenditure into civil construction). The model requires numerous assumptions, of varying strength, to produce credible results – namely, no supply-side capacity constraints & bottlenecks which may not see the reported employment and output results come to fruition following increased investment. This is particularly pertinent for the construction industry which has seen periods of structural supply chain constraints across different input factors.

The model has equated construction work done (as reported by the Australian Bureau of Statistics) and investment/expenditure. This allows us to create future forecasts of indicators (employment, output, etc) based on anticipated levels of construction activity, following the logic of the input-output analysis.

However, we note that the gap between investment and construction work done will grow in-line with market capacity constraints – for instance, higher levels of investment would not translate into higher levels of construction activity if there are substantial market capacity issues – and as such, the output in Section 4 would overestimate the economic impacts of increased investment. This is particularly pertinent given the current unprecedented wave of multi-billion-dollar road and rail projects that are already in the works and will present delivery challenges in forthcoming years. We address the main market capacity risks beneath:

- **Skill Constraints:** The recent historical downturn in vocational education completions, particularly among construction skills & trades, in-combination with an aging workforce in certain sectors highlights a potential risk for the delivery of work. Recent government initiatives (see the 20/21 Federal Budget) towards vocational training and apprenticeships could help to alleviate this.
- **Procurement Constraints:** The increasing complexity of the procurement process leads to reduced efficiency, particularly with inconsistent standards and practices across Federal, State and Local Governments. An infrastructure led recovery requires coordination and harmonisation across all tiers of procurers, such that budget funding can be effectively translated into 'on-the-ground' work.

- **Cyclical Constraints:** The construction industry in Australia has typically undergone boom-and-bust periods of activity, this works to amplify constraints during periods of strong investment and then worsen structural issues during periods of low investment. This cyclicality is likely to be further strengthened with the outbreak of COVID-19 due to an extended period of lower than expected activity. An infrastructure led economic recovery should ensure proper long-term planning such that the industry won't face significant uncertainty beyond the near term.
- **Funding Constraints:** State governments, historically, have tended to be reluctant to maintain prolonged budget deficits and may revert to a more contractionary stance over the medium run.

APPENDIX B

INPUT-OUTPUT ANALYSIS RESULTS

6.8 MULTIPLIERS

The Australian heavy and civil engineering industry is a significant contributor to the Australian economy and has significant multipliers on investment.

For every $1 million invested in the Australian heavy and civil engineering industry[14]:

- 7.2 workers are employed in the construction and related industries
- $2.95m of output is contributed to the economy, and
- $1.3m is contributed to Australian GDP

	Direct	Indirect	Induced	Total
Employment	1.35	1.64	4.23	7.21
Output	1.00	0.55	1.34	2.89
GVA	0.40	0.22	0.67	1.29

6.9 SCENARIOS

For the purpose of this report we consider three scenarios

- Base Case: BISOE forecasts of civil construction activity, infrastructure activity sits at 3.8% of GDP on average over the three years of the forecast period. Interestingly, this corresponds to the average historical spending on infrastructure among the countries that constitute more than 90% of global GDP, and in a global infrastructure McKinsey report, the figure is indicated as a baseline for future infrastructure needs .
- Scenario One: an upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.1% of GDP each year over the forecast period. This corresponds to a heightened historical level of infrastructure investment in Australia – specifically, the figure represents the percentage of construction activity during the boom in infrastructure investment between FY08-14.
- Scenario Two: an upside scenario of civil construction activity (excluding mining and heavy industry) equating to 4.5% of GDP each year over the forecast period. This would represent a significant boost on current expectations of civil construction work done, the proportion of spending now approaching prior peaks in FY13 & FY14 (4.6% and 4.9% respectively).

14 The latest input-output data does not allow for analysis at a higher granularity than 'heavy and civil construction,' and the multipliers therefore account for a $1million investment spread across the civil construction sectors (including mining and heavy industry) based on the relative weightings of expenditure in the year the input-output table is sourced from (FY18).

Fig. 21: Scenario Multipliers for Construction Activity

	2021	2022	2023
Base Case	x1.00	x1.00	x1.00
Scenario 1	x1.16	x1.07	x1.05
Scenario 2	x1.28	x1.17	x1.15

The two upside scenarios are an indication of the direction the economic impact may take if the total amount of civil engineering activity or funding is higher than expected. Historically, the use of infrastructure spending has been a catalyst to broader economic recovery in Australia. Given the downward pressure the COVID19 pandemic has placed on the Australian economy, an increase of this magnitude in civil engineering is not unreasonable.

6.10 ROAD AND BRIDGES CONSTRUCTION

Approximately 27,700 people were directly employed in the Australian Roads and Bridges construction sector in 2020 following the input-output methodology[15]. This is a slight increase on the FY17 direct employment level but misses the nuance of the FY18 peak of roughly 31,800 people directly employed in the industry.

By the end of the forecast period, this is expected to increase to between 42,100 and 48,300 depending on the scenario. Across all streams (direct, indirect, induced), employment is expected to increase from 148,570 in FY20 to between 225,400 (51.2% gain) and 258,613 (74.1%) by FY23.

15 We note that the measure of expenditure in civil construction is in FY19 prices for all sectors and therefore the corresponding output, income and GVA will be in FY19 prices.

Fig. 22: Total Economic Impact - Road Construction

Variable	Type	Scenario	2017	2018	2019	2020	2021	2022	2023
		Base Case					31,528	38,124	42,063
	Direct	Scenario One	27,161	31,784	28,861	27,728	36,654	40,695	43,976
		Scenario Two					40,230	44,665	48,267
		Base Case					38,451	46,496	51,300
Employment	Indirect	Scenario One	33,125	38,764	35,198	33,817	44,702	49,631	53,633
		Scenario Two					49,064	54,473	58,865
		Base Case					98,948	119,652	132,013
	Induced	Scenario One	85,244	99,754	90,579	87,024	115,036	27,720	138,017
		Scenario Two					140,180	140,180	151,482
		Base Case					23,416	28,315	31,240
	Direct	Scenario One	20,172	23,606	21,435	20,594	27,223	30,224	32,661
		Scenario Two					29,878	33,173	35,847
		Base Case					12,839	15,526	17,130
Output	Indirect	Scenario One	11,061	12,944	11,753	11,292	14,927	16,573	17,909
		Scenario Two					16,383	18,189	19,656
		Base Case					31,472	38,057	41,989
	Induced	Scenario One	27,113	31,728	28,810	27,679	36,589	40,623	43,898
		Scenario Two					40,159	44,587	48,181
		Base Case					4,936	5,969	6,586
	Direct	Scenario One	4,253	4,976	4,519	4,341	5,739	6,372	6,885
		Scenario Two					6,299	6,993	7,557
		Base Case					3,027	3,660	4,038
Income	Indirect	Scenario One	2,608	3,052	2,771	2,662	3,519	3,907	4,222
		Scenario Two					3,862	4,288	4,634
		Base Case					7,558	9,139	10,083
	Induced	Scenario One	6,511	7,619	6,918	6,647	8,786	9,755	10,542
		Scenario Two					9,644	10,707	11,570
		Base Case					9,250	11,186	12,341
	Direct	Scenario One	7,969	9,326	8,468	8,136	10,754	11,940	12,903
		Scenario Two					11,803	13,105	14,162
		Base Case					5,217	6,308	6,960
GVA	Indirect	Scenario One	4,494	5,259	4,775	4,588	6,065	6,734	7,276
		Scenario Two					6,657	7,390	7,986
		Base Case					15,786	19,089	21,061
	Induced	Scenario One	13,599	15,914	14,450	13,883	18,352	20,376	22,018
		Scenario Two					20,143	22,364	24,167

Similarly, total output is expected to increase from a total of $59.6bn in FY20 to between $90.4bn and $103.7bn in FY23 (can be seen in the table above). Under the base scenario the $90.4bn is split between direct, indirect (supply chain), and induced (consumption) effects with a respective $31.2bn, $17.1bn, and $42.1bn each.

Turning to GVA, the road construction industry contributed an estimated total of $26.6bn to the Australian economy in FY20. This is expected to increase to between $40.4 and $46.3bn by FY2023 depending on the scenario. Roughly one third of the total contribution comes directly from the road construction industry while a sixth comes from related industries and the remaining coming from consumption driven industries.

6.11 RAIL CONSTRUCTION

In FY20, approximately 11,300 people were directly employed in the rail construction. This is expected to increase to between roughly 20,000 and 23,000 by FY23. An additional 24,400 to 28,000 are expected to be employed in related industries and a further 62,800 to 72,000 in consumption induced industries.

Direct output reached roughly $8.4bn in FY20. This is expected to increase to between $14.9bn and $17bn by the end of the forecast period. The indirect and induced output are expected to reach a combined total of between $28.1bn and $32.3bn. At the total level this is an increase from $24.3bn in FY20 to between $43.0bn and $49.3bn in FY23.

Total GVA was roughly $10.8bn in FY2020. This was an increase of 72% on the FY2017 total GVA of $6.3bn. Over the forecast period total GVA is expected to reach between $19.2bn and $22bn. This is split roughly 30% directly from the rail construction industry, 20% from related industries in the supply chain, and 50% from the consumption induced industries.

Fig. 23: Total Economic Impact - Rail Construction

Variable	Type	Scenario	2017	2018	2019	2020	2021	2022	2023
Employment	Direct	Base Case	6,539	10,237	10,699	11,301	14,618	17,850	20,003
		Scenario One					16,995	19,053	20,913
		Scenario Two					18,653	20,912	22,953
	Indirect	Base Case	7,975	12,485	13,048	13,783	17,828	21,770	24,395
		Scenario One					20,726	23,237	25,505
		Scenario Two					22,748	25,504	27,993
	Induced	Base Case	20,524	32,129	33,577	35,469	45,878	56,021	62,778
		Scenario One					53,337	59,798	65,633
		Scenario Two					58,540	65,632	72,036
Output	Direct	Base Case	4,857	7,603	7,946	8,394	10,857	13,257	14,856
		Scenario One					12,622	14,151	15,532
		Scenario Two					13,853	15,532	17,047
	Indirect	Base Case	2,663	4,169	4,357	4,602	5,953	7,269	8,146
		Scenario One					6,921	7,759	8,516
		Scenario Two					7,596	8,516	9,347
	Induced	Base Case	6,528	10,219	10,680	11,281	14,592	17,818	19,967
		Scenario One					16,965	19,020	20,876
		Scenario Two					18,620	20,875	22,912
Income	Direct	Base Case	1,024	1,603	1,675	1,769	2,289	2,795	3,132
		Scenario One					2,661	2,983	3,274
		Scenario Two					2,920	3,274	3,594
	Indirect	Base Case	628	983	1,027	1,085	1,403	1,714	1,920
		Scenario One					1,632	1,829	2,008
		Scenario Two					1,791	2,008	2,204
	Induced	Base Case	1,568	2,454	2,565	2,709	3,504	4,279	4,795
		Scenario One					4,074	4,567	5,013
		Scenario Two					4,471	5,013	5,502
GVA	Direct	Base Case	1,919	3,004	3,139	3,316	4,289	5,237	5,869
		Scenario One					4,986	5,590	6,136
		Scenario Two					5,473	6,136	6,734
	Indirect	Base Case	1,082	1,694	1,770	1,870	2,419	2,953	3,310
		Scenario One					2,812	3,153	3,460
		Scenario Two					3,086	3,460	3,798
	Induced	Base Case	3,274	5,126	5,357	5,659	7,319	8,937	10,015
		Scenario One					8,509	9,540	10,471
		Scenario Two					9,339	10,471	11,492

6.12 OTHER CIVIL TRANSPORT CONSTRUCTION

In FY20, there were roughly 1,400 people directly employed in the industry with a further 1,800 in related industries, and 4,500 in consumption induced industries. The total employment is expected to increase to between 13,400 and 15,400 by FY23.

Total output declined from $3.6bn in FY17 to roughly $3.1bn. a decline of approximately 15% over the 4-year period. This is expected to increase to between $5.4bn and $6.2bn by FY23. This total amount is split between direct contribution of the industry, contributions of related industries, and contributions of other industries with roughly 35%, 20%, and 45% respectively.

In FY20, GVA was approximately $1.4bn. this is expected to increase to be between $2.4bn and $2.8bn in FY23; driven by a steady increase in both public and private investment in the industry as discussed in the previous chapter.

Fig. 24: Total Economic Impact – Other Civil Transport Construction

Variable	Type	Scenario	2017	2018	2019	2020	2021	2022	2023
Employment	Direct	Base Case	1,695	1,180	1,285	1,445	1,380	1,977	2,509
		Scenario One					1,604	2,110	2,623
		Scenario Two					1,760	2,316	2,879
	Indirect	Base Case	2,067	1,440	1,567	1,762	1,682	2,411	3,060
		Scenario One					1,956	2,573	3,199
		Scenario Two					2,147	2,824	3,512
	Induced	Base Case	5,319	3,705	4,033	4,534	4,330	6,203	7,875
		Scenario One					5,033	6,622	8,233
		Scenario Two					5,525	7,268	9,036
Output	Direct	Base Case	1,259	877	954	1,073	1,025	1,468	1,864
		Scenario One					1,191	1,567	1,948
		Scenario Two					1,307	1,720	2,138
	Indirect	Base Case	690	481	523	588	562	805	1,022
		Scenario One					653	859	1,068
		Scenario Two					717	943	1,173
	Induced	Base Case	1,692	1,178	1,283	1,442	1,377	1,973	2,505
		Scenario One					1,601	2,106	2,619
		Scenario Two					1,757	2,312	2,874
Income	Direct	Base Case	265	185	201	226	216	309	393
		Scenario One					251	330	411
		Scenario Two					276	363	451
	Indirect	Base Case	163	113	123	139	132	190	241
		Scenario One					154	203	252
		Scenario Two					169	222	276
	Induced	Base Case	406	283	308	346	331	474	601
		Scenario One					384	506	629
		Scenario Two					422	555	690
GVA	Direct	Base Case	497	346	377	424	405	580	736
		Scenario One					471	619	770
		Scenario Two					516	679	845
	Indirect	Base Case	280	195	213	239	228	327	415
		Scenario One					265	349	434
		Scenario Two					291	383	476
	Induced	Base Case	849	591	643	723	691	990	1,256
		Scenario One					803	1,056	1,313
		Scenario Two					881	1,159	1,442

6.13 CIVIL UTILITIES CONSTRUCTION

Civil utilities are the largest of the five investment types and reached a local peak in FY18. Since then and over the remainder of the forecast period, we expect the investment and thus the economic impact to decline.

Employment peaked in FY18 with almost 44,800 people directly employed in the industry, a further 54,700 in related industries, and 140,600 in other industries; a total of 240,100. This has fallen to an estimated 39,600 directly employed, 48,200 indirectly employed, and 124,200 employed in other industries; a total of 212,000. By the end of the forecast period, we expect that total employment resulting from investment in the utilities construction industry will reach between 200,000 and 229,500.

Output is expected to follow a similar trajectory; having peaked at a total of $96.3bn in FY18, declining to $85bn in FY20 and expected to decline to between $80.2bn and $92bn by FY23. This is split 35% from the industry directly, 20% from related industries, and $45% from other industries.

In FY18, GVA peaked with a total of $43bn in contribution to the Australian economy. This contribution then declined to an estimated $38bn in FY2020. This is expected to reach between $35.8bn and $41.1bn by the end of the forecast period. Scenario Two is the only scenario resulting in an increase in the contribution of the industry to the Australian economy by FY23.

Fig. 25: Total Economic Impact –Civil Utilities Construction

Variable	Type	Scenario	2017	2018	2019	2020	2021	2022	2023
Employment	Direct	Base Case	36,493	44,812	42,911	39,567	36,969	38,546	37,330
		Scenario One					42,980	41,145	39,028
		Scenario Two					47,173	45,159	42,835
	Indirect	Base Case	44,506	54,652	52,334	48,256	45,087	47,010	45,527
		Scenario One					52,418	50,180	47,598
		Scenario Two					57,532	55,076	52,241
	Induced	Base Case	114,531	140,640	134,674	124,180	116,026	120,974	117,158
		Scenario One					134,890	129,131	122,487
		Scenario Two					148,050	141,730	134,436
Output	Direct	Base Case	27,103	33,282	31,870	29,386	27,457	28,628	27,725
		Scenario One					31,921	30,558	28,986
		Scenario Two					35,035	33,540	31,814
	Indirect	Base Case	14,861	18,249	17,475	16,113	15,055	15,697	15,202
		Scenario One					17,503	16,756	15,894
		Scenario Two					19,211	18,390	17,444
	Induced	Base Case	36,428	44,733	42,835	39,497	36,904	38,478	37,264
		Scenario One					42,904	41,072	38,959
		Scenario Two					47,090	45,079	42,760
Income	Direct	Base Case	5,714	7,016	6,718	6,195	5,788	6,035	5,845
		Scenario One					6,729	6,442	6,110
		Scenario Two					7,386	7,070	6,707
	Indirect	Base Case	3,504	4,302	4,120	3,799	3,549	3,701	3,584
		Scenario One					4,126	3,950	3,747
		Scenario Two					4,529	4,336	4,113
	Induced	Base Case	8,748	10,742	10,286	9,485	8,862	9,240	8,948
		Scenario One					10,303	9,863	9,355
		Scenario Two					11,308	10,825	10,268
GVA	Direct	Base Case	10,707	13,148	12,590	11,609	10,847	11,309	10,953
		Scenario One					12,610	12,072	11,451
		Scenario Two					13,841	13,250	12,568
	Indirect	Base Case	6,038	7,415	7,100	6,547	6,117	6,378	6,177
		Scenario One					7,112	6,808	6,458
		Scenario Two					7,805	7,472	7,088
	Induced	Base Case	18,272	22,437	21,485	19,811	18,510	19,300	18,691
		Scenario One					21,520	20,601	19,541
		Scenario Two					23,619	22,611	21,447

6.14 OTHER CIVIL CONSTRUCTION

Other Civil engineering is expected to increase over the forecast horizon. There was a moderate uptick in investment in the industry in FY18, this has since declined modestly to FY20. Over the forecast horizon, we anticipate expenditure to continue ticking up.

Total employment in the industry was an estimate 39,500 in FY20 with 7,400 of these people employed directly in the industry. Direct employment is expected to rise to between 8,500 and 9,700 by FY23. Total employment is expected to increase to between 45,400 and 52,100 over the same period.

Output fell from $18.4bn in FY17 to $15.8bn in FY20. We expect that total output will rise to between $18.2bn and $20.9bn over the forecast period. Under the base case, roughly $6.3bn of this final figure comes directly from the industry with the remaining $11.9bn from other industries. Under Scenario Two the contributions are $7.2bn and $13.7bn respectively.

In FY20, GVA contributed an estimated $7.1bn to the Australian economy. We expect that total GVA will increase to between $8.1bn and $9.3bn by the end of the forecast period. This total amount is split between direct, indirect, and induced GVA with approximately 31%, 17%, and 52% respectively.

Fig. 26: Total Economic Impact – Other Civil Construction

Variable	Type	Scenario	2017	2018	2019	2020	2021	2022	2023
Employment	Direct	Base Case	7,193	8,546	7,575	7,375	8,674	8,482	8,477
		Scenario One					10,084	9,053	8,862
		Scenario Two					11,068	9,937	9,727
	Indirect	Base Case	8,772	10,422	9,238	8,994	10,579	10,344	10,338
		Scenario One					12,299	11,042	10,808
		Scenario Two					13,499	12,119	11,863
	Induced	Base Case	22,574	26,820	23,772	23,145	27,223	26,619	26,604
		Scenario One					31,649	28,414	27,814
		Scenario Two					34,737	31,186	30,527
Output	Direct	Base Case	5,342	6,347	5,626	5,477	6,442	6,299	6,296
		Scenario One					7,490	6,724	6,582
		Scenario Two					8,220	7,380	7,224
	Indirect	Base Case	2,929	3,480	3,085	3,003	3,532	3,454	3,452
		Scenario One					4,107	3,687	3,609
		Scenario Two					4,507	4,047	3,961
	Induced	Base Case	7,180	8,531	7,561	7,362	8,659	8,467	8,462
		Scenario One					10,067	9,037	8,847
		Scenario Two					11,049	9,919	9,710
Income	Direct	Base Case	1,126	1,338	1,186	1,155	1,358	1,328	1,327
		Scenario One					1,579	1,417	1,388
		Scenario Two					1,733	1,556	1,523
	Indirect	Base Case	691	820	727	708	833	814	814
		Scenario One					968	869	851
		Scenario Two					1,063	954	934
	Induced	Base Case	1,724	2,049	1,816	1,768	2,079	2,033	2,032
		Scenario One					2,417	2,170	2,124
		Scenario Two					2,653	2,382	2,332
GVA	Direct	Base Case	2,110	2,507	2,222	2,164	2,545	2,489	2,487
		Scenario One					2,959	2,656	2,600
		Scenario Two					3,247	2,915	2,854
	Indirect	Base Case	1,190	1,414	1,253	1,220	1,435	1,403	1,403
		Scenario One					1,669	1,498	1,466
		Scenario Two					1,831	1,644	1,609
	Induced	Base Case	3,601	4,279	3,792	3,692	4,343	4,247	4,244
		Scenario One					5,049	4,533	4,437
		Scenario Two					5,542	4,975	4,870

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The modelling and results presented here are based on information provided by third parties, upon which BIS Oxford Economics has relied in producing its report and forecasts in good faith.

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