



ENGINEERS
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Western Australia Infrastructure Investment Update

2016

Engineers Australia Infrastructure in Western Australia Report 2016

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Infrastructure Investment Update 2016

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voice of the engineering profession.*

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engineering professionals
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a sustainable world.*

Key Points

Engineers Australia calls on the public sector to make some commitments to the state's infrastructure before it loses any traction.

Over the last 25 years there has been substantial pressure placed on Western Australia's infrastructure assets.

During this time the state's population and economy have both grown extensively: the population increased 58.8 per cent, while the state economy increased 214.3 per cent. At the same time, combined annual public and private sector engineering construction on infrastructure has also increased dramatically, by almost 600 per cent. Much of this growth has come through private sector investment due to the state's resources boom.

This growth trend has now reversed. Engineering construction on infrastructure slowed over the last five years, and fell in the last two years.

Since the last Engineers Australia Infrastructure Report Card in 2010, total engineering construction on infrastructure grew at an average of 7 per cent per year, lower than the average of 11.7 per cent per year recorded for the last 10 years. In the last two years engineering construction on infrastructure assets has in fact fallen by an average of 6.3 per cent per year.

The private sector has fuelled much of Western Australia's engineering construction on infrastructure growth in the last five years.

Many of the private sector projects responsible for engineering construction growth are now reaching completion. As private sector construction begins to slow, the public sector will need to assume more responsibility for new infrastructure development.

The public sector needs to reverse current engineering construction trends to ensure Western Australia's meets the needs of its future population, which will continue to grow.

The public sector's investment in engineering construction has fallen over the last five years, dropping 9.6 per cent in the last two years. It has now fallen below 2004-05 construction levels and, in the last year, only public sector construction on roads and telecommunications showed growth.

Engineering construction on infrastructure over the next few years will be vital to the state's prosperity.

Given Western Australia's public sector infrastructure trends, there is a danger these assets could drop to a 'just adequate' or even a 'poor and inadequate' state within the next 20 years. Although the state Government recently announced some new projects, these will not be enough to provide the infrastructure development needed to meet the expected pressures of the next 20 years.

The public sector does not necessarily need to match the high levels of construction seen by the private sector over the last five years, but it does need to commit to maintaining and improving the state's infrastructure assets if it wants to boost productivity growth and maintain the current standard of living.

Introduction

Long-term infrastructure planning and development is an enabler of productivity growth, and this growth has and will continue to be responsible for much of the improvements in Australia's living standards. Without productivity growth, Australian living standards will stagnate and as the population ages it is possible our standard of living could fall.

This is why Engineers Australia supports infrastructure planning and construction.

Since the Global Financial Crisis, Australia's Gross Domestic Product (GDP) growth (and growth in GDP per capita), have been at comparatively low levels and we've seen productivity growth fall below historical averages. However, Western Australia (WA) has performed much better than the nation as a whole. In WA, the state GDP and GDP per capita has consistently been higher than the national average, with this gap increasing over the last five years.

In its 2010 Infrastructure Report Card for WA, Engineers Australia rated infrastructure as being generally in an 'adequate to good' condition: it was fit for purpose to meet current and future needs. However, the report highlighted the potential for added pressure on infrastructure assets as population growth was expected to continue. The most pressure will be placed on the state's water, electricity, transport and telecommunications assets.

Five years on from this report, Engineers Australia now has concerns about the current trends in infrastructure construction in WA, given the falling growth in engineering construction on infrastructure. This is most significant in the public sector, as completion and new project commencement numbers have both fallen. It appears that WA is now at a crossroads, and the next few years may determine whether the state will continue to maintain high standards of living.

PUBLIC INVESTMENT NEEDS TO SET THE PACE

Private sector construction tends to be biased upwards because it includes both conventional infrastructure and infrastructure to service specific private service business activities (such as resource

sector projects). For this reason, public sector infrastructure investment is a better gauge on progress. Many of the projects behind WA's most recent growth in engineering construction on infrastructure are private sector projects to support mining or petroleum operations, and these works are now close to completion.

As these projects begin to wind down, the public sector must lead the way in new infrastructure development. Over the last decade, the resources boom has given the state government the financial means to renew its investment in infrastructure but instead it has underinvested in public infrastructure projects, resulting in a large deficit in infrastructure services¹.

Ongoing large infrastructure projects in WA include the \$1.6 billion Perth Freight link, the \$1 billion Gateway WA project, and the \$1.12 billion NorthLink WA project². As it guides the state through the next stages of planning for the future, the WA Government has also released a number of key documents which set out a plan for sustained growth and prosperity, including:

- State Planning Strategy 2050
- Directions 2031 and Beyond
- Public Transport for Perth 2031
- Western Australian Regional Freight Transport Network Plan
- Moving People Network Plan.

Engineers Australia acknowledges that this is a good start, but remains unconvinced it would be enough given current trends in engineering construction on infrastructure assets in the state.

All too often, political announcements celebrate government infrastructure achievements but are not aligned with delivery. We believe future infrastructure projects need to be undertaken to maximise economic benefit to the state, with a strong focus on enabling productivity and economic growth. To meet the demands of a growing population, carefully considered long-term public sector investment in infrastructure is still required.

¹ Civil Contractors Federation Western Australia, WA Infrastructure Report 2015, www.ccfwa.com.au

² Government of Western Australia, Mainroads Western Australia, Urban Projects, www.mainroads.wa.gov.au

The state of infrastructure in Western Australia

OUR APPROACH AND RESEARCH DATA

This report puts contemporary developments in WA into perspective by looking at Australian Bureau of Statistics (ABS) data on engineering construction³. It analyses trends in infrastructure construction in WA, and evaluates the current situation of the state's infrastructure for the different areas of engineering construction.

This data reliably and objectively measures current project progress, the amount of work still to be completed, and the likely consequences of new project approvals. It relates to additions to infrastructure stock through work completed on new infrastructure assets.

This report examined the period from June 1990 to June 2015 (25 years), as it is currently the best available data. For almost a decade, Engineers Australia has advocated that governments publish comprehensive statistics on the nation's infrastructure to inform community discussions and provide the basis for new infrastructure decisions.

Historically, Australia's infrastructure was primarily developed by governments, with nearly all work undertaken by public sector agencies. Gradually, more and more work was contracted to the private sector for implementation.

There is now increasing private sector involvement in the development, ownership and delivery of infrastructure services through new financial arrangements. Some governments have chosen to privatise certain infrastructure assets along with the ongoing responsibility for new investment in these infrastructure assets. This report focuses on both public and private sector engineering construction.

Unfortunately, ABS statistics do not delineate between cities in each state, so this report will analyse the state of WA as a whole. In this report we use Infrastructure Australia's definition of economic infrastructure, which includes roads, bridges, railways, harbours, the electricity sector, the water and sewerage sector and telecommunications assets. Changes in engineering construction in heavy industry, recreation facilities, and other uncategorised activities are also analysed briefly, but separate from economic infrastructure. The asset classes are examined for trends in public and private sector, and all statistics have been deflated and expressed in constant 2012-13 prices.

There is now increasing private sector involvement in the development, ownership and delivery of infrastructure services through new financial arrangements.

³ ABS, Engineering Construction, Australia, Cat No 8762.0, electronic releases, www.abs.gov.au

Western Australia: the state in context

According to projections from Infrastructure Australia's recent Australian Infrastructure Audit, WA's population is likely to reach 3.97 million people in 2031, which is an increase of 69 per cent on 2011 population levels, with high levels of growth expected in Perth⁴. The audit also predicts the state's economy will grow at a faster rate than the population, and that both are projected to grow at a higher rate than any other state or territory. This all puts added pressure on the state's infrastructure assets.

If this projected growth becomes reality, WA should lead the nation in major infrastructure projects for the next 20 years. In the five years since the last WA Infrastructure Report Card, the state's economy expanded by a significant 25.7 per cent in real terms. Over the same period, the state's population also increased by 10.3 per cent.

Table 1 shows how WA average annual growth compares with Australia as a whole. For the long term, 10-year, five-year and one-year averages, WA

TABLE 1: BENCHMARK STATISTICS

Period	WA Average Annual Growth (%) in			Australia Average Annual Growth (%) in		
	GDP	GDP per person	Population	GDP	GDP per person	Population
1990-91 to 2014-15	4.9	2.9	1.9	3.2	1.9	1.3
2005-06 to 2014-15	5.3	2.7	1.1	2.8	1.1	1.7
2010-11 to 2014-15	5.5	2.8	2.5	2.7	1.1	1.6
2014-15	3.5	1.9	1.5	2.4	1.0	1.4

recorded growth above the national average. Over the last 25 years, WA's real GDP grew from \$88 billion to \$276 billion; a total increase of 214.3 per cent. At the same time the state population grew from 1.6 million people to 2.6 million people, an increase of 58.8 per cent, and the standard of living for WA residents has boomed, rising from \$54,116 per person to \$107,247 per person in real terms. This is an increase of 98.2 per cent, the strongest outcome across all Australia's states and territories.

WA's long term average GDP growth of 4.9 per cent per year is strong, and this is even better in the last five years where average growth reflects the resources boom in the state, at 5.5 per cent.

However, the GDP improvement over the last five years seems to be predominately a result of the increased population growth. The long-term average for WA GDP per person was an average

of 2.9 per cent over the last 25 years, only slightly higher than the annual average of 2.8 per cent for the last five years. Meanwhile, population growth has trended higher in the last five years when compared to the long-term average. Over the 25-year period examined, population growth in WA grew at an average annual rate of 1.9 per cent, compared with 2.8 per cent for the past five years, as more people are moving to WA.

Comparing the WA figures to the Australian average, we can see that WA has consistently trended above the national average in GDP growth, GDP growth per person, and in population growth; highlighting WA's contribution to a greater share of the nation's GDP growth. In 2015 WA provided 17 per cent of the nation's GDP with only 11 per cent of the population, compared with just 12 per cent of the GDP and 10 per cent of the population in 1991.

⁴ Infrastructure Australia, Infrastructure Australia Audit, May 2015, www.infrastructureaustralia.gov.au

Engineers Australia's Principles for Infrastructure Development

To be effective, infrastructure must be fit for purpose, and the flow of infrastructure services needs to move ahead of population growth and economic growth. It should also use the best available technology to manage existing infrastructure assets and to develop new ones.

Any new infrastructure development should encompass the following principles:

- *Infrastructure must be managed to advance socio-economic goals not political ones.*
- *Infrastructure planning without land use planning is not sensible.*
- *Infrastructure planning is not optional – it is an integral role of government.*
- *The private sector is a key player, which means infrastructure is not the exclusive preserve of governments.*
- *Infrastructure must be managed sustainability and over its full expected life.*
- *Infrastructure governance must be rigorous and be removed from political agenda.*
- *ICT-enabled infrastructure delivers more value for money, especially in a coordinated system.*
- *Short-term acquisition practices should be discarded in favour of whole of life considerations.*

Trends in engineering construction

The construction figures in Figure 1 primarily fall within Engineers Australia’s definition of infrastructure and can be further broken down into the subcategories detailed in Table 2 including roads, bridges, electricity, water and telecommunications. The blue line below represents engineering construction completed by the private sector. The gap from the blue line to the red line represents engineering construction completed by the public sector. As demonstrated below, since 2000-01 the private sector has been the majority contributor to engineering construction.

In 1990-91, the public sector undertook the majority of engineering construction with almost \$1.4 billion in work completed, compared with \$283 million by the private sector (both figures expressed in real terms). By 2014-15 engineering construction completed by the private sector had grown to \$9.3 billion compared with almost \$2.4 billion by the public sector. In 2012-13 the private sector hit its peak of \$14.1 billion in funding for engineering construction, much higher than the public sector peak of \$3.98 billion in 2009-10.

FIGURE 1: CUMULATIVE PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION, WA, 1990-91 TO 2014-15

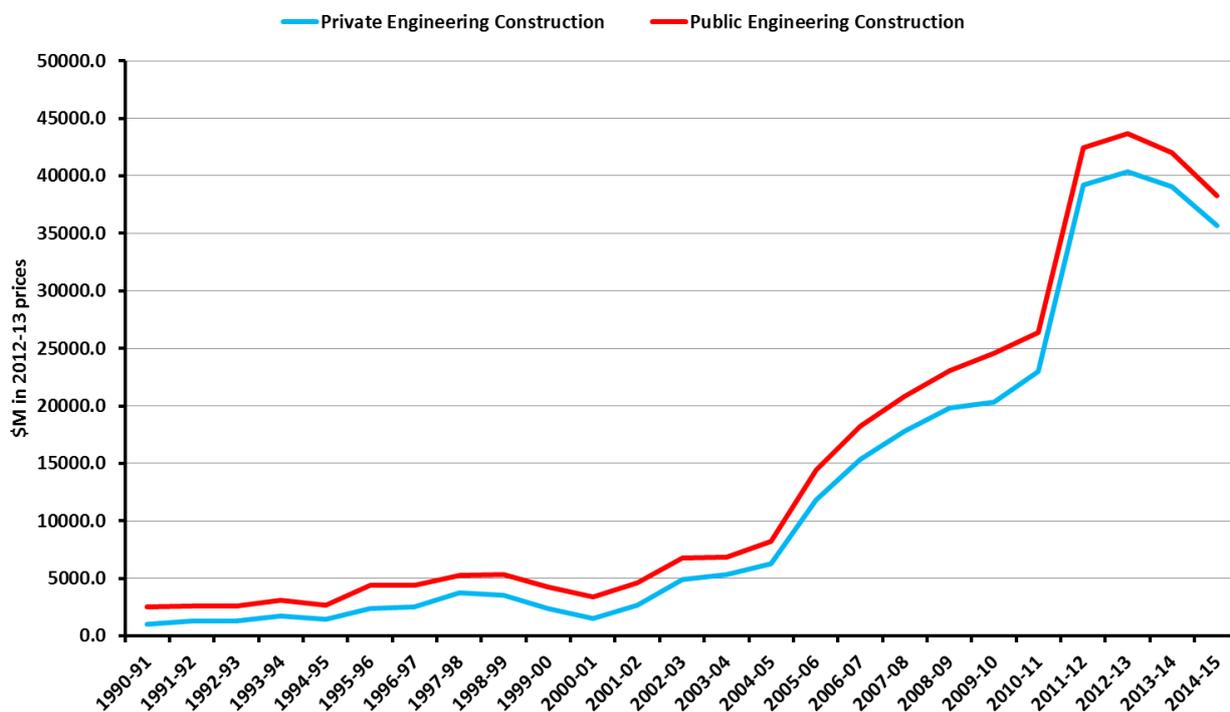
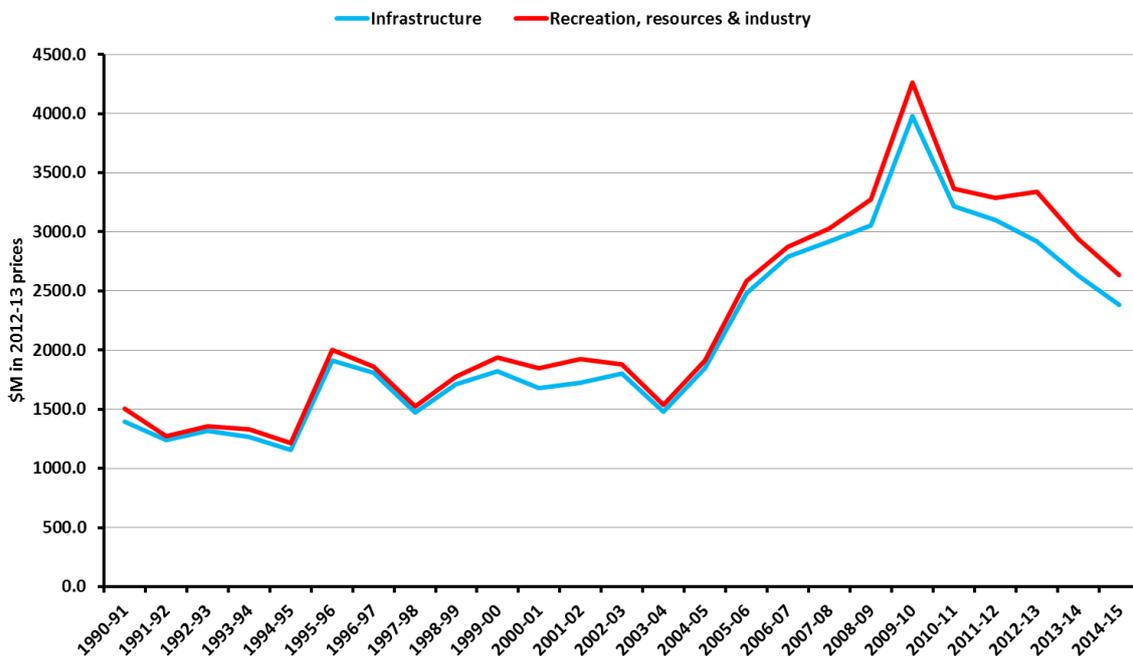


Figure 2 demonstrates the differences between public sector engineering construction on infrastructure, and construction on recreational, heavy industry and other construction. Public sector engineering construction is primarily infrastructure. Most of the gap that is shown between the infrastructure and total engineering construction trends is accounted for by engineering construction on recreational facilities.

FIGURE 2: TRENDS IN THE MAIN COMPONENTS OF PUBLIC SECTOR ENGINEERING CONSTRUCTION, WA, 1990-91 TO 2014-15



Detailed statistics for public sector engineering construction on the various types of infrastructure assets are shown in Table 2, with peaks in construction between 2009-10 and 2011-12.

TABLE 2: PUBLIC SECTOR ENGINEERING CONSTRUCTION ON INFRASTRUCTURE, 1990-91 TO 2014-15, \$M 2012-13 PRICES

Period	Roads	Bridges, railways & harbours	Electricity & pipelines	Water & sewerage	Telecommunications	Total infrastructure
1990-91	399.9	74.4	295.0	271.4	355.2	1395.9
1991-92	421.7	135.4	102.6	214.8	362.7	1237.2
1992-93	485.9	187.3	118.2	233.6	290.6	1315.6
1993-94	486.1	182.7	94.4	240.1	264.5	1267.7
1994-95	433.5	82.3	109.4	179.6	353.4	1158.2
1995-96	634.8	92.2	497.3	106.8	580.2	1911.3
1996-97	612.8	83.8	734.3	135.6	243.6	1810.0
1997-98	740.7	56.1	381.5	136.0	158.5	1472.7
1998-99	913.2	123.7	203.8	310.7	162.5	1714.0
1999-00	822.2	87.4	95.4	370.5	447.8	1823.5
2000-01	846.1	137.8	94.5	196.6	403.8	1678.8
2001-02	727.8	128.7	208.2	139.7	521.2	1725.7
2002-03	636.6	95.6	378.4	209.8	484.2	1804.6
2003-04	592.2	134.4	164.1	210.5	379.4	1480.6
2004-05	553.0	550.8	127.8	276.4	335.7	1843.7
2005-06	668.1	671.9	328.5	269.5	544.6	2482.5
2006-07	959.0	375.2	1029.7	216.1	211.1	2791.0
2007-08	1205.6	135.9	1310.0	265.1	1.4	2918.1
2008-09	1176.3	180.1	1346.5	336.6	15.3	3054.8
2009-10	1261.5	285.1	1663.7	756.7	11.7	3978.6
2010-11	1168.9	171.9	1154.1	706.8	16.8	3218.7
2011-12	1119.8	178.4	1216.2	526.4	59.8	3100.5
2012-13	1135.7	326.6	747.2	635.4	76.7	2921.6
2013-14	1129.8	343.1	569.7	467.8	117.1	2627.6
2014-15	1234.1	190.5	400.2	366.0	194.1	2385.0

Looking at private sector investment, Figure 3 highlights the gap between infrastructure and recreational and heavy industry construction, which is more pronounced in recent years, and the current downturn in engineering construction.

Private engineering construction on infrastructure facilities are needed to support resources sector facilities, and are included in private sector engineering construction on infrastructure.

FIGURE 3: TRENDS IN THE MAIN COMPONENTS OF PRIVATE SECTOR ENGINEERING CONSTRUCTION, WA, 1990-91 TO 2014-15

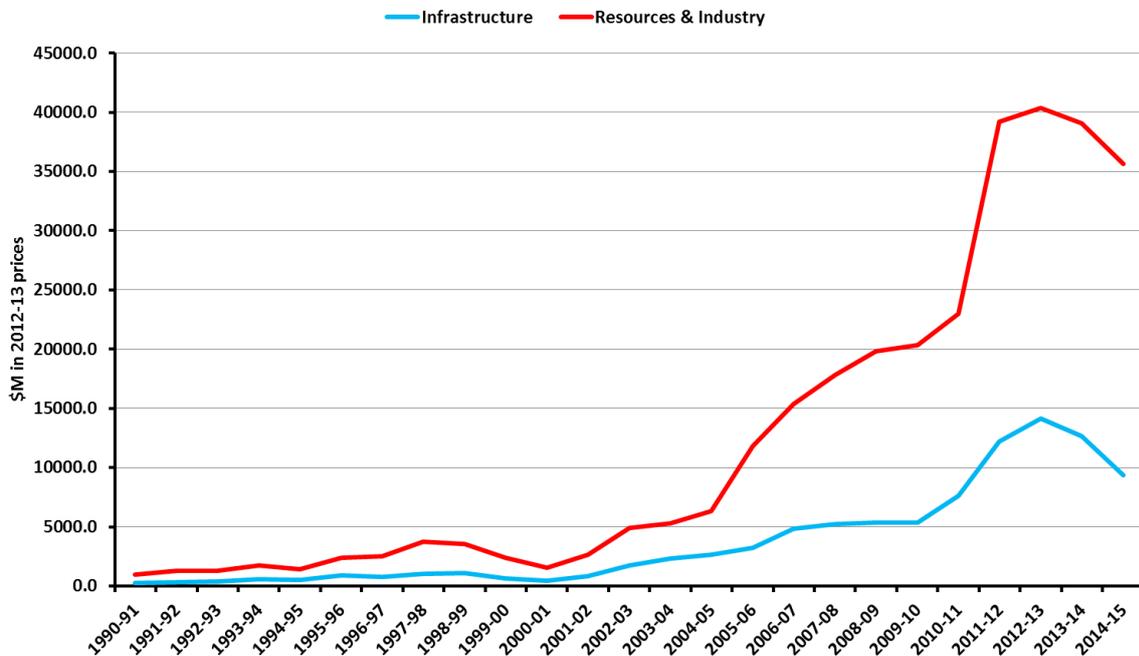


Table 3 details private sector engineering construction investment in specific types of infrastructure assets.

TABLE 3: PRIVATE SECTOR ENGINEERING CONSTRUCTION ON INFRASTRUCTURE, 1990-91 TO 2014-15, \$M 2012-13 PRICES

Period	Roads	Bridges, railways & harbours	Electricity & pipelines	Water & sewerage	Telecommunications	Total infrastructure
1990-91	129.8	33.6	64.4	44.4	10.9	283.1
1991-92	106.9	53.8	104.0	23.8	3.4	291.9
1992-93	188.5	22.2	132.1	44.0	1.5	388.4
1993-94	288.1	94.7	161.5	54.1	1.1	599.4
1994-95	286.2	26.0	128.7	58.7	15.9	515.5
1995-96	247.1	95.9	326.2	84.0	126.4	879.6
1996-97	302.1	143.7	205.5	81.1	13.2	745.6
1997-98	279.2	372.9	272.2	93.4	6.3	1024.1
1998-99	300.0	356.0	388.2	71.6	0.8	1116.6
1999-00	339.7	131.3	74.8	77.8	29.9	653.5
2000-01	263.0	49.6	44.5	78.7	40.2	476.0
2001-02	313.1	123.9	252.7	60.6	78.7	829.0
2002-03	594.2	380.4	582.5	149.8	41.3	1748.3
2003-04	815.9	383.5	796.8	213.4	89.2	2298.8
2004-05	742.6	966.5	665.4	180.8	93.0	2648.2
2005-06	836.8	981.8	1099.7	212.9	99.6	3230.7
2006-07	819.9	1856.1	1642.7	173.7	368.5	4860.9
2007-08	1036.0	2379.8	1004.8	394.0	443.7	5258.2
2008-09	1465.0	2127.8	1114.2	342.7	328.2	5377.9
2009-10	999.1	2602.2	1114.1	352.6	287.1	5355.0
2010-11	1120.9	4274.8	1234.7	664.0	333.0	7627.5
2011-12	1127.6	8132.8	1978.1	514.8	422.1	12175.5
2012-13	1164.2	8758.1	3506.7	233.6	458.3	14120.9
2013-14	893.5	7116.6	3858.8	294.8	492.1	12655.9
2014-15	675.8	4224.3	3818.6	157.2	473.2	9349.1

Asset growth rates



It's important to understand how specific asset classes are growing over these time periods.

Table 4 summarises average annual growth rates for different infrastructure components for both the private and public sectors combined, while Table 5 summarises average annual growth rates for the main components of engineering construction.

As demonstrated in Table 4 both public and private sector growth in the last year has been poor. After a period of significant growth in investment, it's clear

that growth has now declined—by 16.8 per cent between 2013 and 2015—with the most significant drop (18.3 per cent) from the private sector. The assets with the highest levels of declining growth are bridges, railways and harbours, and water and sewerage—all still essential services for a growing population.

As demonstrated in Table 5, recreation infrastructure is still growing slightly, but big falls in infrastructure and heavy industry can be seen in the most recent year, after a period of strong growth.

TABLE 4: SUMMARY OF AVERAGE ANNUAL PERCENTAGE GROWTH RATES, INFRASTRUCTURE COMPONENTS BY PRIVATE AND PUBLIC SECTORS (PER CENT)

Period	Roads	Bridges, railways & harbours	Electricity & pipelines	Water & sewerage	Telecommunications	Total infrastructure
Private sector						
1990-91 to 2014-15	10.9	56.1	42.7	15.4	250.4	21.1
2005-06 to 2014-15	1.5	23.3	24.4	10.7	31.4	16.4
2010-11 to 2014-15	-6.3	20.6	31.5	-1.8	11.0	16.3
2013-14 to 2014-15	-23.8	-29.7	4.5	-10.2	1.8	-18.3
Public sector						
1990-91 to 2014-15	6.0	21.3	26.2	8.3	61.1	3.8
2005-06 to 2014-15	9.3	1.3	30.7	9.3	133.1	3.9
2010-11 to 2014-15	-0.3	1.6	-23.5	-11.9	89.2	-9.6
2013-14 to 2014-15	4.4	-19.7	-26.8	-24.1	59.2	-9.6
Both sectors combined						
1990-91 to 2014-15	6.2	28.1	27.2	6.8	10.8	10.2
2005-06 to 2014-15	4.8	16.5	22.5	6.1	7.0	11.7
2010-11 to 2014-15	-3.2	18.3	10.5	-12.1	17.9	7.0
2013-14 to 2014-15	-8.8	-29.4	-0.3	-21.8	11.7	-16.8

TABLE 5: SUMMARY OF AVERAGE ANNUAL PERCENTAGE GROWTH RATES, MAIN COMPONENTS BY PRIVATE AND PUBLIC SECTORS (PER CENT)

Period	Infrastructure	Recreation	Heavy Industry	Non-Engineering Total	Total
Private Sector					
1990-91 to 2014-15	21.1	23.2	32.3	22.2	20.9
2005-06 to 2014-15	16.4	28.9	23.7	27.2	22.2
2010-11 to 2014-15	16.3	16.2	11.1	15.2	14.9
2013-14 to 2014-15	-18.3	1.5	-20.4	0.2	-5.9
Public Sector					
1990-91 to 2014-15	3.8	1048.9	16.9	15.2	4.0
2005-06 to 2014-15	3.9	2389.0	21.1	24.2	4.6
2010-11 to 2014-15	-9.6	388.1	6.5	11.7	-8.8
2013-14 to 2014-15	-9.6	-75.4	-14.4	-23.1	-11.2
Both Sectors Combined					
1990-91 to 2014-15	10.2	22.3	20.9	20.8	14.6
2005-06 to 2014-15	11.7	28.9	22.3	27.0	19.2
2010-11 to 2014-15	7.0	16.2	9.9	14.9	11.7
2013-14 to 2014-15	-16.8	1.4	-19.7	-0.2	-6.3

The assets with the highest levels of declining growth are bridges, railways and harbours, and water and sewerage – all still essential services for a growing population.

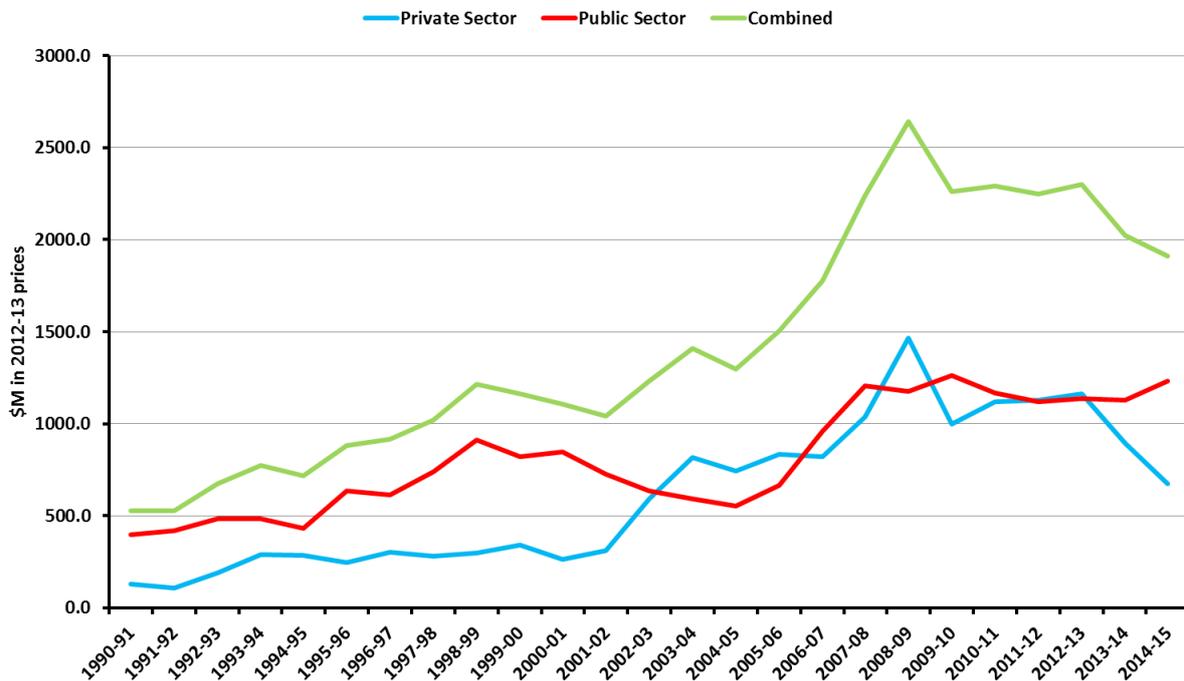
Roads

Looking at trends in private and public sector engineering construction on roads over the last 25 years, we can see how construction has fallen.

Figure 4 expresses this in constant 2012-13 prices and covers infrastructure construction on roads, highways and subdivisions including:

- Parking areas
- Cycle paths
- Airport runways
- Pedestrian and vehicle overpasses
- Traffic lights
- Roundabouts
- Associated road drainage works
- Street and highway lighting
- Road resurfacing
- Kerbing and guttering
- Road tunnels.

FIGURE 4: TRENDS IN PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION ON ROADS IN WA, 1990-91 TO 2014-15



In 1990-91 total construction on roads was \$530 million, and this grew to \$1.9 billion in 2014-15.

The 2010 WA Infrastructure Report Card noted that national and state roads had maintained a reasonable standard, but local roads had deteriorated. Since this report, construction on roads has fallen, and the public sector only improved in the most recent year.

PUBLIC INVESTMENT

Public sector construction on roads has grown from \$400 million in 1990-91 to \$1.2 billion in 2014-15 at an average increase of 6 per cent per year. The biggest yearly increases in roads construction occurred in 1995-96 with a 46 per cent increase, followed by a 43.5 per cent increase in 2006-07. At its peak of construction in 2007-08, public sector construction on roads accounted for 39.8 per cent of all infrastructure construction. A slight improvement in public sector spending can be seen in 2014-15, most likely due to large projects including the Gateway WA project, the Perth Freight Link and the NorthLink WA project⁵.

As a result of these projects, we would expect to see the public sector road infrastructure continue to grow in the coming years.

PRIVATE INVESTMENT

Private sector construction on roads has grown from \$130 million in 1990-91, to \$676 million in 2014-15 at an average increase of 11 per cent per year, which is a higher rate than public sector construction. Two large periods of growth occurred in the last 25 years, with growth of 90 per cent recorded in 2002-03 and growth of 41.4 per cent in 2008-09. However, even at its peak period of spending in 2008-09, private sector spending on roads only accounted for 7.4 per cent of total private sector construction on infrastructure.

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5 Government of Western Australia, Mainroads Western Australia, Urban Projects, www.mainroads.wa.gov.au

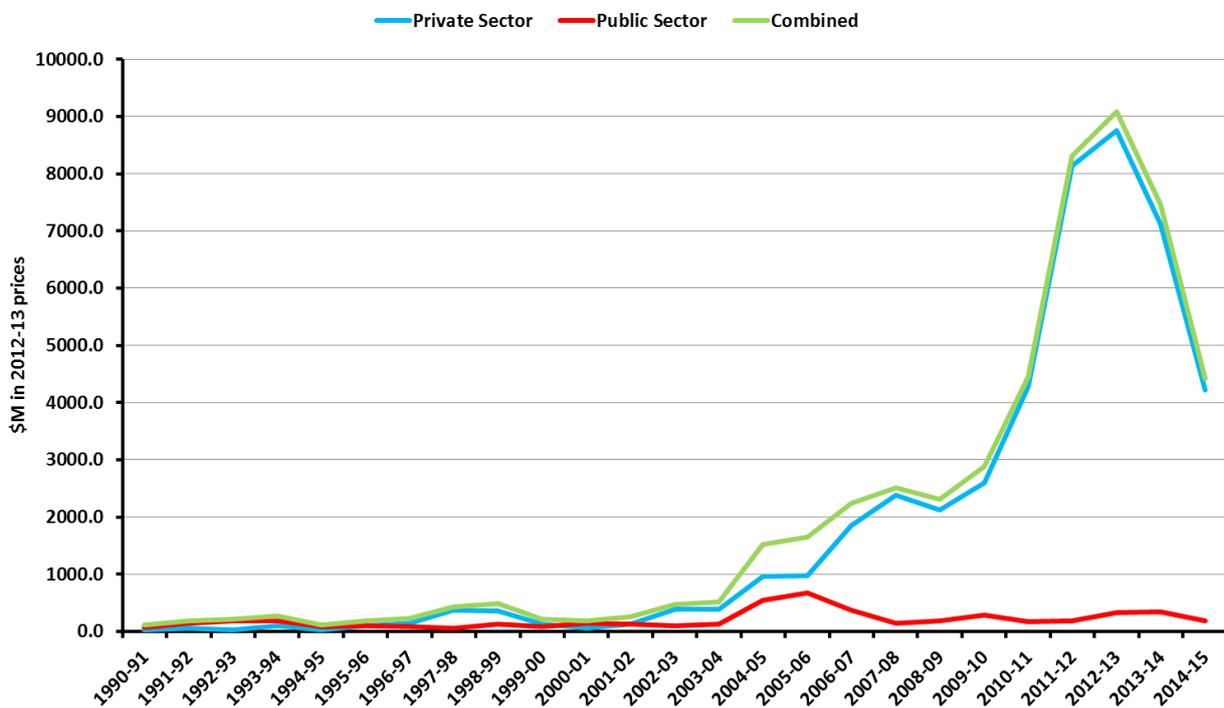
Bridges, railways and harbours

Over the last 25 years, and especially since 2002, investment in bridges, railways and harbours has largely been funded by the private sector. This has gone into sharp decline since 2012.

Figure 5 represents the following types of engineering infrastructure, expressed in constant 2012-13 prices:

- **Bridges** that support roads, railways, causeways and elevated highways
- **Railways:** tracklaying, overhead power lines and signals, platforms, tramways, tunnels for underground railways and fuel hoppers
- **Harbours:** boat and yacht basins, breakwaters, retaining walls, docks and piers, terminals, wharves, dredging works and marinas.

FIGURE 5: TRENDS IN PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION ON BRIDGES, RAILWAYS AND HARBOURS IN WA, 1990-91 TO 2014-15



6 Railway Gazette International, Fortescue opens the world's heaviest haul railway July 2008, www.railwaygazette.com

In 1990-91, total engineering construction spent on bridges, railways and harbours was \$108 million, growing to \$4.4 billion in 2014-15. Since the 2010 WA Infrastructure Report Card, where these assets were just adequate, construction numbers on these assets boomed before falling away in the most recent years.

PUBLIC INVESTMENT

Public infrastructure construction on bridges, railways and harbours grew from \$74 million in 1990-91 to \$191 million in 2014-15 at an average annual increase of 21 per cent. Growth in public sector construction was most predominant between 2003-04 and 2005-06 with average annual growth of 124 per cent for that three-year period. In 2005-06 public construction on these assets accounted for 26 per cent of total infrastructure construction by the public sector.

PRIVATE INVESTMENT

Private infrastructure construction on bridges, railways and harbours grew from \$33.6 million in 1990-91 to \$4.2 billion in 2014-15 at an average annual increase of 56 per cent. From 2005-06, private sector spending on these assets easily outstripped public sector spending. This growth in private sector construction is largely due to the development of rail infrastructure around mining activities in the Pilbara region. For example, the Fortescue Railway was constructed between 2006 and 2012 at an estimated cost of \$2.5 billion, and was built as a rail network to carry iron ore⁶. At its time of peak spending in 2012-13, private construction on these assets accounted for 21.7 per cent of total private sector construction.

From 2005-06, private sector spending on these assets easily outstripped public sector spending. This growth in private sector construction is largely due to the development of rail infrastructure around mining activities in the Pilbara region.

Electricity generation, distribution and pipelines

Growth in WA's electricity generation and distribution infrastructure, as well as investment in pipelines, has been fuelled by the resources boom over the last 25 years.

Figure 6 shows trends in private and public sector engineering construction in constant 2012-13 prices and includes:

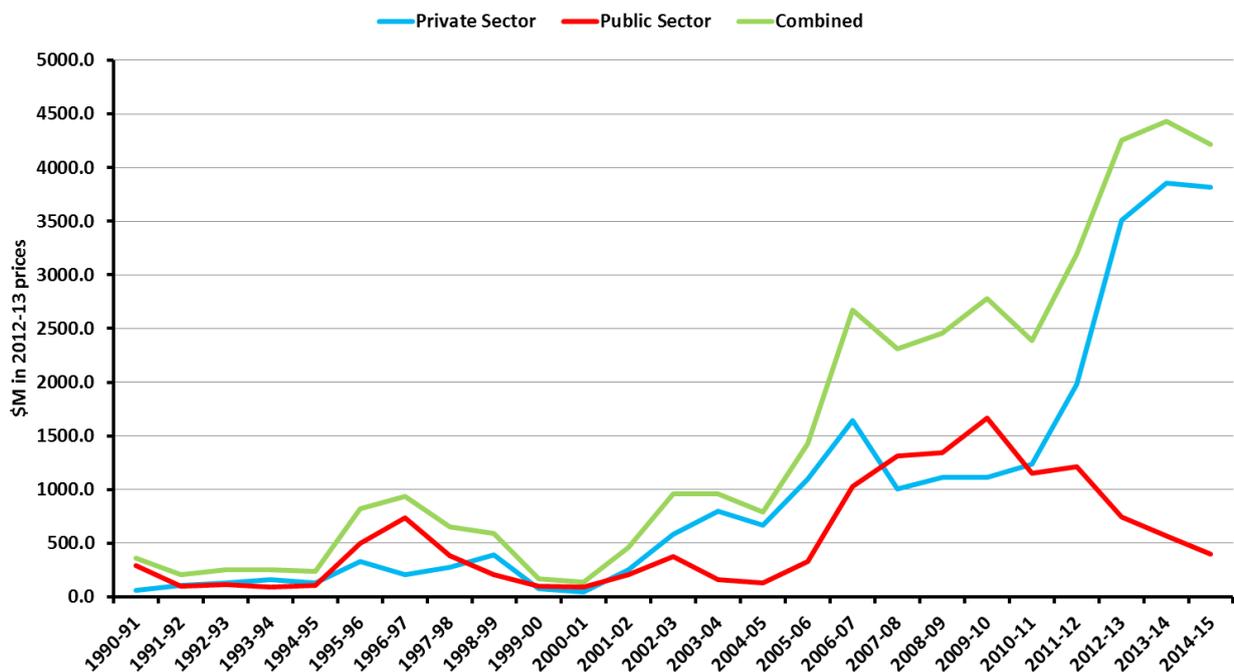
Electricity facilities:

- Power stations
- Substations
- Hydro-electric generating plants
- Associated work for towers
- Chimneys
- Transmission and distribution lines.

Pipelines:

- Oil and gas pipelines
- Urban supply mains for gas
- Pipelines for refined petroleum products, chemicals and foodstuffs.

FIGURE 6: TRENDS IN PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION ON ELECTRICITY GENERATION AND DISTRIBUTION AND PIPELINES IN WA, 1990-91 TO 2014-15



In 1990-91, total engineering construction spent on electricity and pipelines was \$359 million, which grew to \$4.4 billion in 2014-15.

The 2010 WA Infrastructure Report Card rated WA's electricity assets as good, and since this time construction on these assets has grown strongly thanks to investment by the private sector.

PUBLIC INVESTMENT

In 1990-91, public sector construction was at \$295 million rising to \$1.67 billion in 2009-10 before falling to \$400 million in 2014-15. Construction by the public sector on these assets was most prevalent between 2005-06 and 2007-08, when growth averaged over 100 per cent for these three years. In 2009-10, at its peak of construction, public sector construction on these assets accounted for 39 per cent of total construction.

PRIVATE INVESTMENT

Private sector infrastructure construction on electricity and pipelines has grown substantially over the last 25 years. In 1990-91, the private sector construction on these assets was \$64.4 million growing to \$3.8 billion in 2014-15, averaging growth of 42.7 per cent per year. In 2010-11 the private sector began to dominate construction of electricity generation and distribution and pipeline assets, and at its peak in 2013-14, construction on these assets accounted for 9.9 per cent of all infrastructure completed by the private sector.

This private sector trend is most likely related to the development of mining, gas and petroleum projects in the state, including the development of pipelines, and electricity generation infrastructure to support these projects.

In 2010-11 the private sector began to dominate construction of electricity generation and distribution and pipeline assets.

Water, sewerage and drainage facilities

This sector is dominated by public sector construction, which peaked in 2010-11 with several major projects including the Southern Seawater Desalination project.

Figure 7 shows trends in water storage and supply, sewerage and drainage construction over the last 25 years, at 2012-13 constant prices. This infrastructure includes:

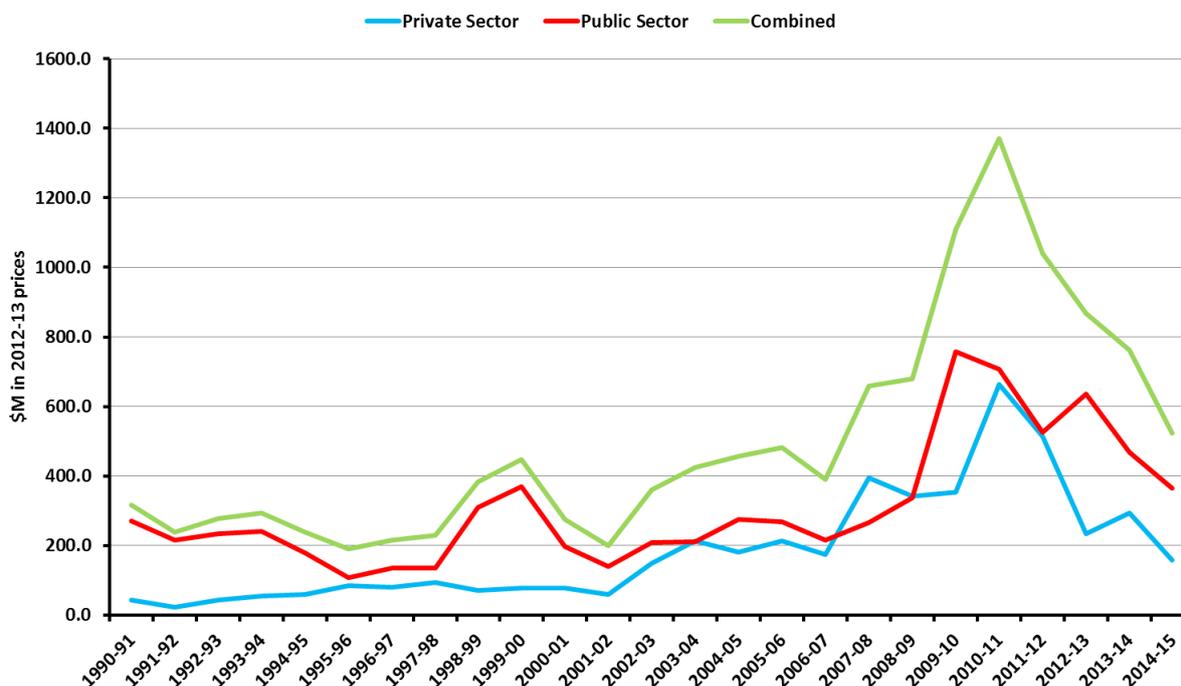
Water storage and supply

- Dams, weirs and reservoirs
- Embankments for water diversion
- Water pipelines, mains and treatment plants
- Prevention and erosion
- Aqueducts and water conduits
- Systems conveying water to residences, commercial and industrial establishments.

Sewerage and drainage

- Sanitary and storm sewers
- Sewerage treatment plants
- Stormwater drains and drainage systems.

FIGURE 7: TRENDS IN PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION ON WATER, SEWERAGE AND DRAINAGE FACILITIES IN WA, 1990-91 TO 2014-15



In 1990-91, total engineering construction on water and sewerage was \$316 million, growing to \$523 million in 2014-15 with a significant peak of close to \$1.4 billion around 2010-11.

The 2010 WA Infrastructure Report Card said that water assets in the state were generally in good condition, noting improvements in water security, and wastewater infrastructure. Since 2010, there was an improvement in construction on these assets, before construction numbers fell in recent years.

PUBLIC INVESTMENT

Public sector infrastructure construction on these assets grew from \$271 million in 1990-91, to \$366 million in 2014-15. Construction by the public sector peaked in 2009-10 with \$757 million recorded in that year. In 2010-11 when construction was at its peak, construction on these assets accounted for 21 per cent of total infrastructure construction by the public sector, mainly due to a number of water construction projects at the time – including a desalination plant and the construction of a number of wastewater treatment plant projects. The Southern Seawater Desalination project itself was completed in 2013, and cost over \$1 billion⁷.

PRIVATE INVESTMENT

Private sector construction on these assets grew from \$44.4 million in 1990-91 to \$157 million in 2014-15. Construction by the private sector peaked in 2010-11, with \$664 million being spent in that year. Although spending was at its peak in 2010-11, construction on these assets still only accounted for 2.9 per cent of total infrastructure construction for the private sector.

The 2010 WA Infrastructure Report Card said that water assets in the state were generally in good condition, noting improvements in water security, and wastewater infrastructure.

⁷ Australian Government Department of the Environment, Southern Seawater desalination Project, www.environment.gov.au

Telecommunications

Over the past 25 years, the balance of public and private sector telecommunications infrastructure investment has changed, largely due to the privatisation of Telstra. The rollout of the National Broadband Network (NBN) has led to a more recent uplift in public sector engineering construction.

The telecommunications engineering construction covered by Figure 8 includes:

- Mobile phone, radio, television, microwave and radar transmission towers
- Telephone lines
- Underground cables and coaxial cables.

In 1990-91, total engineering construction on telecommunications was \$366 million, which grew to \$667 million in 2014-15.

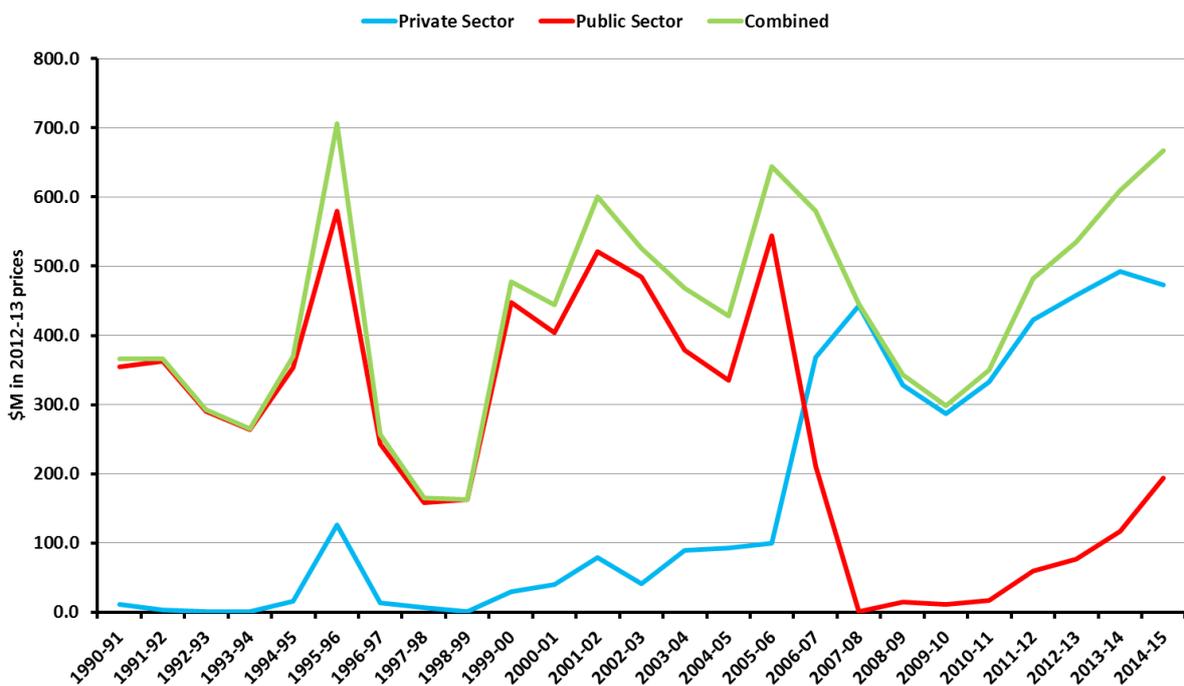
The federal Government’s privatisation of Telstra, 31 per cent of which was in 2006, explains the significant changes seen in Figure 8.

Since the 2010 WA Infrastructure Report Card, there has been improvement in construction on these assets by both the public and private sectors.

PUBLIC INVESTMENT

Public sector infrastructure construction on these assets fell from \$355 million in 1990-91, to \$194 million in 2014-15. Construction by the public sector was the predominant sector for construction on these assets up until 2005-06. At the peak of construction in 1995-96, telecommunications assets accounted for 29 per cent of all construction spending by the public sector.

FIGURE 8: TRENDS IN PRIVATE AND PUBLIC SECTOR ENGINEERING CONSTRUCTION ON TELECOMMUNICATIONS IN WA, 1990-91 TO 2014-15



PRIVATE INVESTMENT

Private sector construction on these assets grew strongly from \$11 million in 1990-91 to \$473 million in 2014-15. Since 2005-06 the private sector has been responsible for the majority of telecommunications construction as the private sector invests in telecommunication networks, including networks to connect remote mining and offshore gas regions. Private sector construction on telecommunications only accounts for a small percentage of overall private sector construction. At its peak in 2013-14 it only made up 1.3 per cent of total private sector construction.

Since 2005-06 the private sector has been responsible for the majority of telecommunications construction as the private sector invests in telecommunication networks, including networks to connect remote mining and offshore gas regions.

Non-infrastructure engineering construction

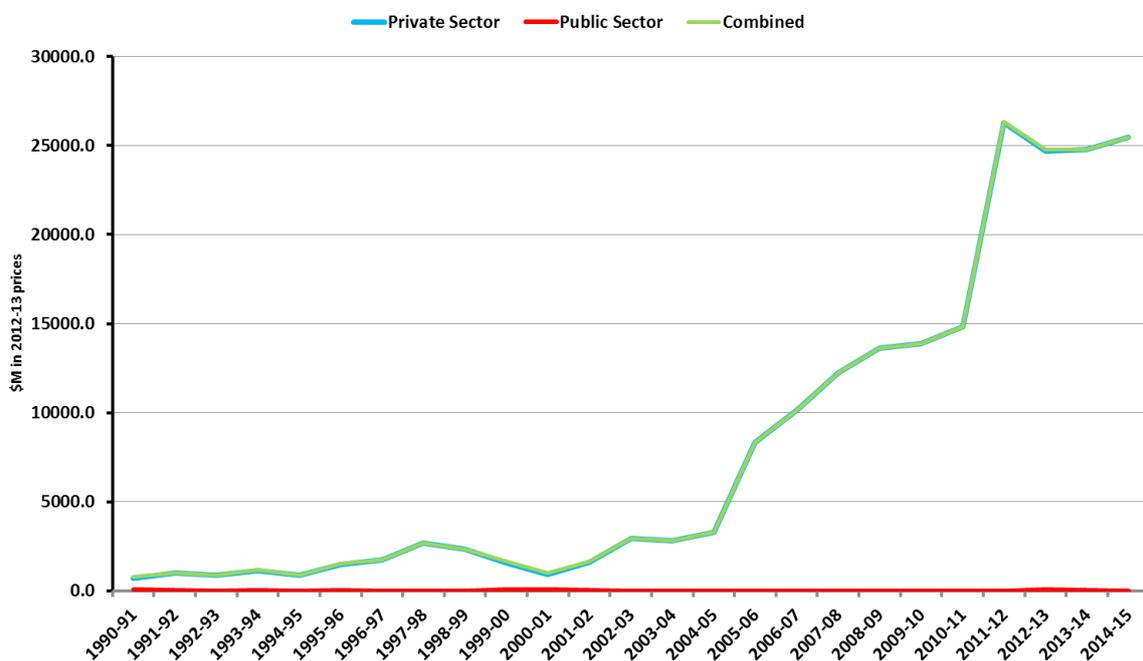
There are some elements of engineering construction that fall outside our definition of infrastructure. It is debatable whether recreational facilities should be included in infrastructure or not, but as these areas contribute to economic growth we believe it is worth discussing these construction trends.

RESOURCES AND HEAVY INDUSTRY

Figure 9 shows trends in public and private sector engineering construction in heavy industry in the last 25 years, in 2012-13 constant prices. This includes:

- Construction and production of oil, gas, coal, bauxite, alumina (and other materials)
- Storage and distribution facilities
- Refineries, pumping stations and mines
- Chemical plants
- Blast furnaces
- Steel mills and other industrial processing plants and ovens.

FIGURE 9: TRENDS IN PUBLIC AND PRIVATE SECTOR ENGINEERING CONSTRUCTION ON RESOURCES AND HEAVY INDUSTRY IN WA, 1990-91 TO 2014-15



As you would expect, the vast majority of construction in heavy industry is from the private sector and it has increased significantly in the last decade through the resources boom. At its peak in 2011-12 private sector construction on these assets accounted for 67 per cent of total private sector construction.

In 1990-91, total engineering construction in heavy industry grew from \$766 million to almost \$25.5 billion in 2014-15. Over this time period, construction on these assets grew at an average rate of 22.3 per cent per year.

PUBLIC INVESTMENT

Public sector construction on heavy industry remained very low for the majority of the last 25 years; for most years it has not surpassed \$10 million. There were two minor boosts in construction: \$90 million recorded in 2000-01 and \$88.4 million recorded in 2012-13.

PRIVATE INVESTMENT

Meanwhile, private sector construction on heavy industry has grown from \$687 million in 1990-91 to nearly \$25.5 billion in 2014-15. The biggest growth period for private sector construction on heavy industry occurred within the last ten years with growth averaging 29 per cent per year during this time frame.

Most of this investment has come from mining and petroleum companies investing

heavily in their assets. Notable heavy industry projects include liquefied natural gas projects such as Gorgon, Wheatstone and Prelude floating LNG, and the continuation of a number of iron ore mining projects in the Pilbara⁸.

RECREATION FACILITIES

This class of engineering construction includes:

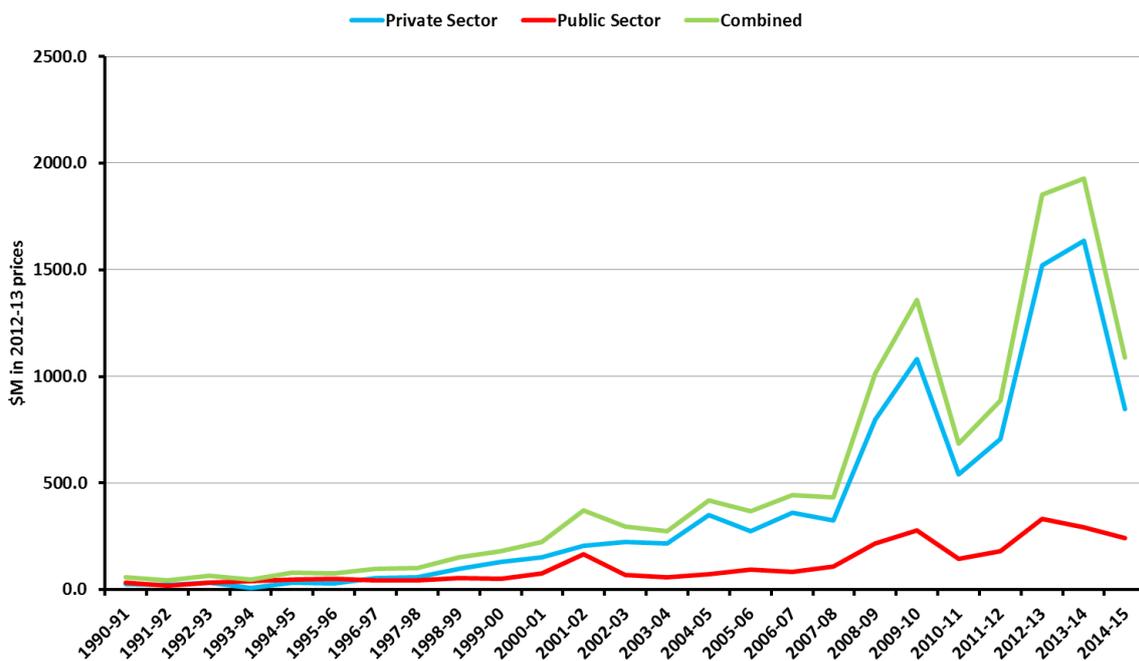
- Golf courses
- Playing fields and stadiums
- Racecourses
- Swimming pools
- Landscaping and park construction.

In 1990-91, total engineering construction on recreation facilities grew from \$58.5 million to just over \$1 billion in 2014-15, at an average rate of 20.9 per cent per year.

Public sector construction on recreation facilities has grown from \$33 million in 1990-91 to \$243 million in 2014-15. The height of public sector construction on these assets was in 2012-13 when construction reached \$340 million, making up 9.9 per cent of all public sector construction for that year.

The private sector has been responsible for the majority of construction of recreation facilities. In 1990-91, private sector construction for these assets was \$26 million, which grew to \$846 million in 2014-15. However, this has never been a major area of construction. At its peak in 2013-14, construction of recreation facilities accounted for 4.2 per cent of total private sector construction.

FIGURE 10: TRENDS IN PUBLIC AND PRIVATE SECTOR ENGINEERING CONSTRUCTION ON RECREATION FACILITIES IN WA, 1990-91 TO 2014-15



8 Department of Mines and Petroleum, Prospect Magazine June 2015, www.dmp.wa.gov.au

Looking forward

Having reviewed infrastructure and engineering construction in WA over the last 25 years, we now need to look towards the future. By their nature these are long running projects with lengthy periods of planning and design, negotiation, approval, financing and then the build process itself. The data discussed so far only details engineering construction completed, so what is now in the pipeline?

NEW PROJECTS

Unfortunately there is no complete data on construction work still to be completed. Since 2012, private sector construction statistics for a number of categories are incomplete, so some of these graphs can only show work yet to finish up to 2012.

Additionally, we cannot be certain all these projects will eventually reach completion, which is worth noting for subsequent reports because uncompleted work will not necessarily convert into completion statistics.

Figure 11 shows trends for infrastructure projects in WA, comparing projects that have commenced, that are yet to be completed, and that have been completed. Consistent with Figure 1, completed work saw a boost in the last five years, before slowing down more recently. Commencement numbers for engineering construction boosted soon after the GFC, but have fallen more sharply in recent years.

The green line represents work that is still in the system and is yet to be completed (note that this may include cost variations during construction). As discussed, data for work yet to be finished is only available up until 2012, as private sector data is not available after this date in the asset areas of bridges, railways and harbours, electricity generation, and resources and heavy industry.

As of 30 June 2012 there was \$78.9 billion in uncompleted infrastructure construction. This compares to \$15.3 billion in work completed in that year, and the lower number of \$11.7 billion

completed in 2014-15.

The amount of work in the system at that time suggests that there was a sufficient amount of construction work to cover a number of years, but until we have the complete figures for the last three years it will remain unknown. To add to this, the amount of work commencing has fallen at a rate of 62 per cent from 2011-12 levels suggesting that the work still in the system would most likely be decreasing.

Figures 12 and 13 compare public and private sector investment in the WA infrastructure pipeline.

Most notably for the public sector, commencements, completed work, and work yet to be completed are all recording falling numbers in recent years. At the current rate of completion for the public sector there is only 1.9 years of work still to be completed.

Commencement numbers for engineering construction boosted soon after the GFC, but have fallen more sharply in recent years.

FIGURE 11: THE INFRASTRUCTURE PIPELINE IN WA, PUBLIC AND PRIVATE SECTORS

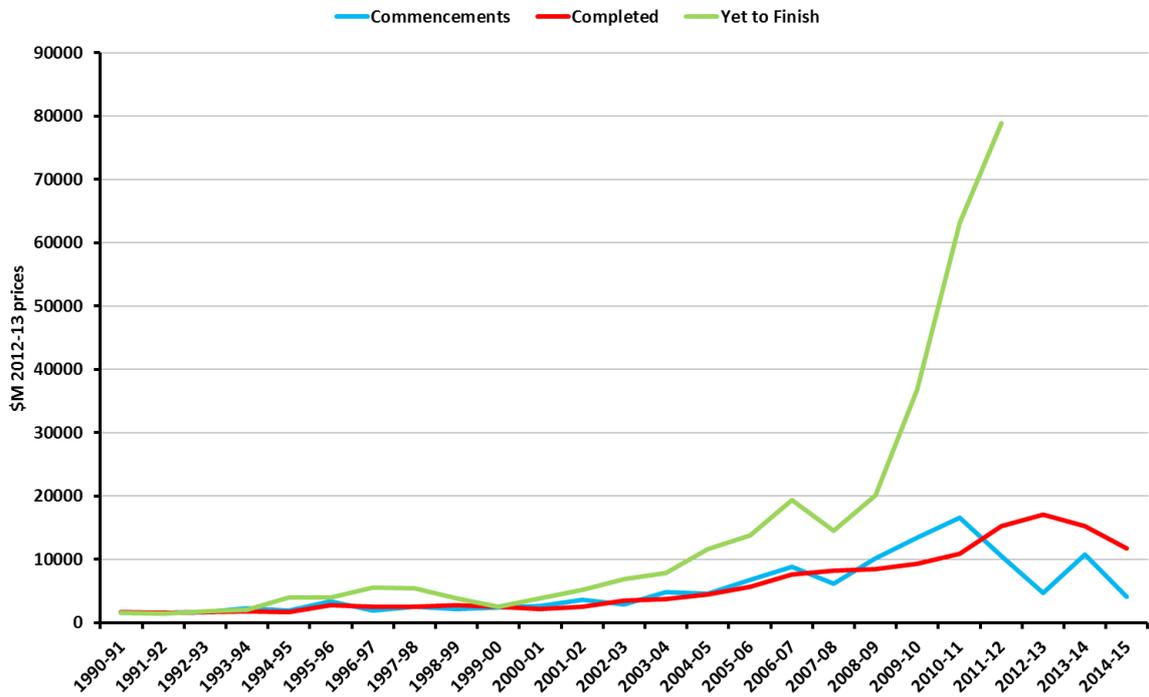


FIGURE 12: THE PUBLIC SECTOR INFRASTRUCTURE PIPELINE, WA

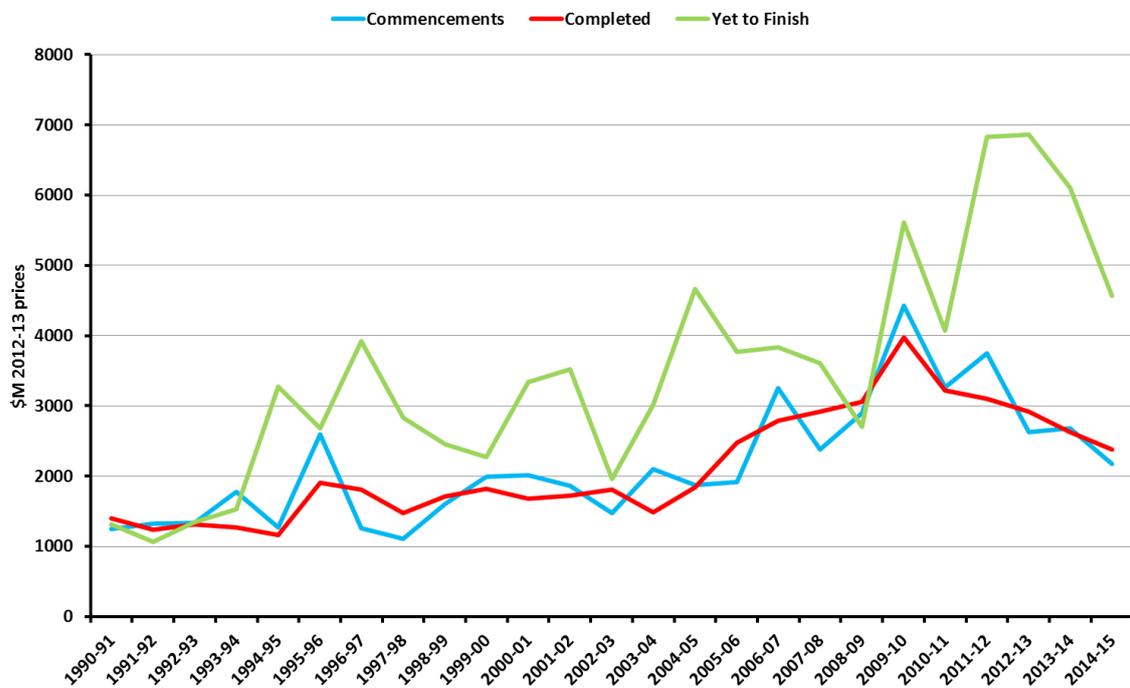
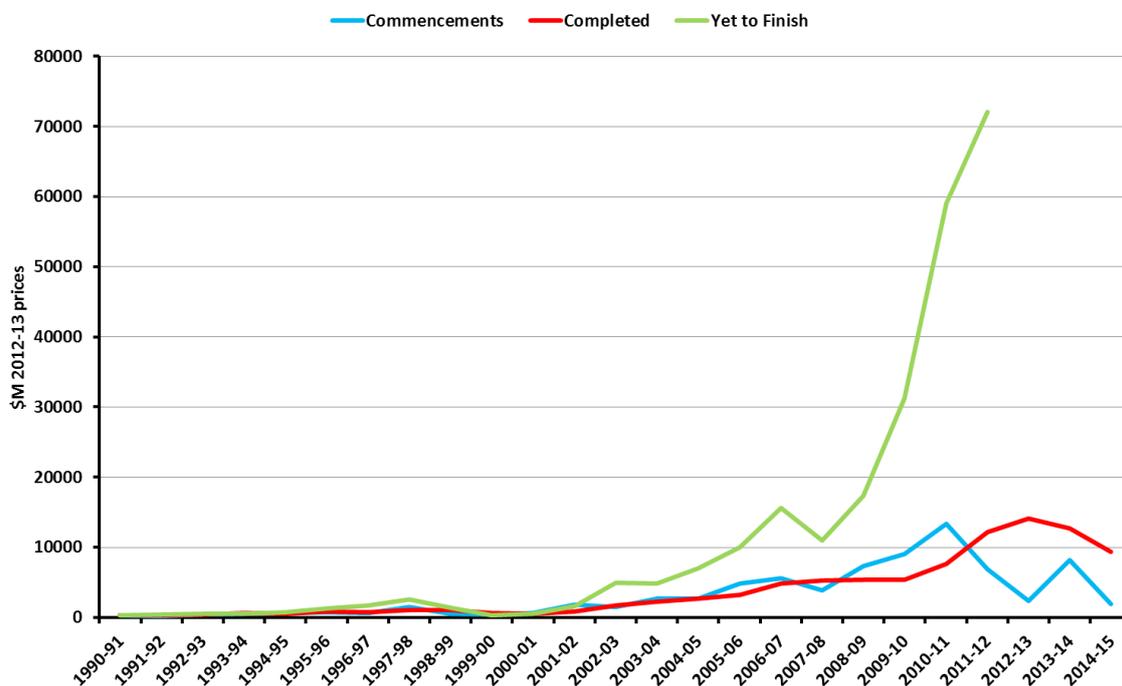


FIGURE 13: THE PRIVATE SECTOR INFRASTRUCTURE PIPELINE, WA



Due to the unavailable statistics for the private sector, we cannot calculate a similar amount of work yet to be completed for the last three years. However, looking at Figure 13, it is obvious that the private sector had a huge quantity of work yet to be completed up until 2012, far outstripping the numbers recorded for commencements and completions.

Looking at the 2014-15 trend directions for the components of infrastructure construction in Table 6, we can see only one section of infrastructure construction—telecommunications—improved over the last 12 months. This is the same for engineering construction commencements. Of the three areas where data was available for work yet to be finished, all three showed a downward trend in the last year.

TABLE 6: OVERVIEW OF CHANGES, INFRASTRUCTURE COMPONENTS, WA PIPELINE

Component	Commencements	Completed	Yet to finish
Roads	↓	↓	↓
Bridges etc	↓	↓	Not Available
Electricity etc	↓	↓	Not Available
Water & sewerage	↓	↓	↓
Telecommunications	↑	↑	↓
Infrastructure	↓	↓	Not Available

FIGURE 14: THE PIPELINE OF NON-INFRASTRUCTURE ENGINEERING CONSTRUCTION IN WA, PUBLIC AND PRIVATE SECTORS

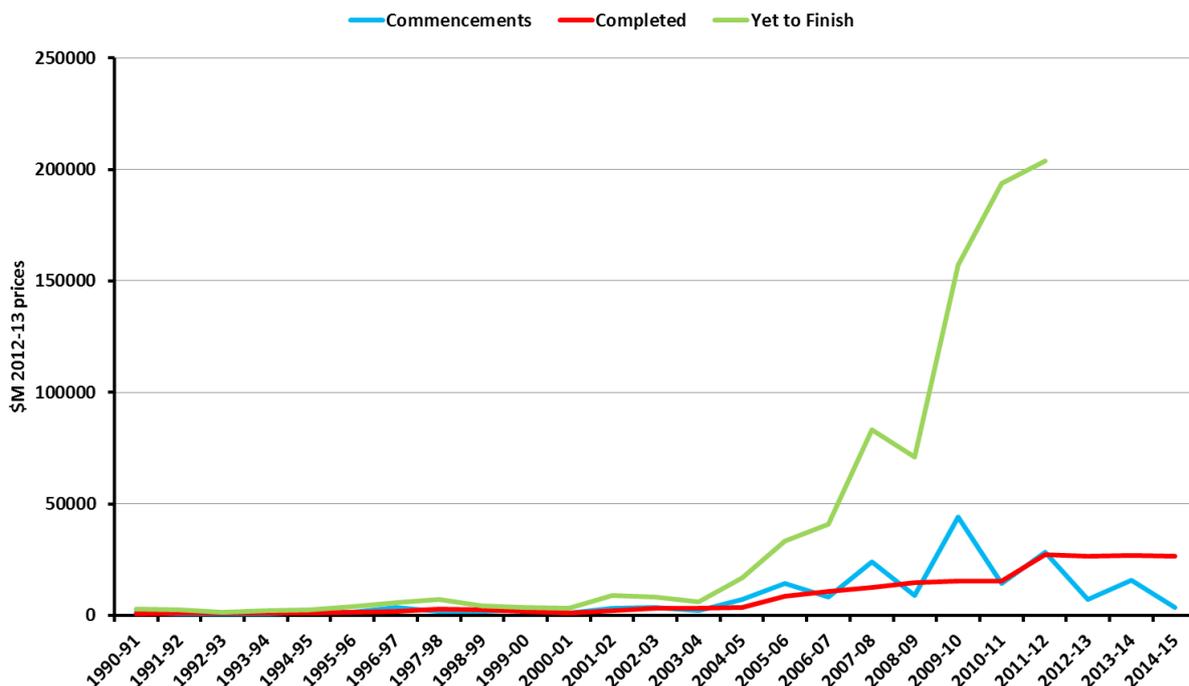


Figure 14 shows the trends in non-infrastructure components of engineering construction, principally the resource and heavy industry sectors, and recreation facilities. Figure 14 shows how steady construction completions in these areas have been over the last decade, compared with commencements and work yet to be finished.

Ten years ago, there was not much work that was yet to be completed in the system, represented by the green line. Now this work has boomed, and as of June 2012 there was \$203.9 billion worth of construction still to be completed.

In the same year, there was only \$27.2 billion in non-infrastructure engineering construction completed. Construction on non-infrastructure

components has been steady over the past few years, and in 2014-15 there was \$27.2 billion completed. This would suggest that even at the current rate there is a large amount of non-infrastructure construction being completed.

With such high levels in 2011-12 alone, the rates of completion at that time meant that there was 7.5 years of work in the system. It must be remembered that infrastructure construction completed by the private sector includes work that supports specific projects, rather than for general access, so much of this work will not directly benefit the general WA population.

Conclusion

Over the last 25 years there has been substantial pressure placed on Western Australia's infrastructure assets as the state's economy and population has grown significantly. At the same time, combined annual public and private sector engineering construction on infrastructure has also increased dramatically. Much of this growth has come through private sector investment, driven by the resources boom in the state, which has fuelled engineering construction growth in WA to levels never seen before in the state.

This has also led to extremely high GDP growth. However this does not paint a completely accurate picture of the state of WA's infrastructure assets because so much of the growth was in the private sector, and mainly in heavy industry. Much of the mining boom windfall should have been invested in the state's public infrastructure assets to benefit the general population.

In the five years since the last Engineers Australia's Infrastructure Report Card, engineering construction on infrastructure is showing signs of a slow down. Total engineering construction on infrastructure only improved by 8.1 per cent in the last five years and in the last two years construction fell at an average of 16.7 per cent. Construction on non-infrastructure assets may have grown 71 per cent over the last five years, but it has fallen 0.2 per cent in the last two years.

Many private sector projects have been responsible for the fuelled growth in engineering construction statistics, but the infrastructure phases of this work are now reaching completion. As private sector construction begins to slow, the public sector will need to assume more responsibility for new infrastructure development, to continue driving productivity growth and the state's standards of living.

Given almost all of the growth recorded in the last five years has come from the private sector, it's time for a change. However, the public sector has also recorded falls in engineering construction for the last five years, including a fall of 9.6 per cent in the last two years, and it is now below 2004-05 construction levels.

Meanwhile both population growth and economic growth will continue to increase pressure on the state's infrastructure assets.

Additionally, commencement of engineering construction on infrastructure for both sectors has fallen in recent years, and the public sector work still in the system is also falling. Some recent state Government project announcements should provide a slight increase in road projects, but this will not be enough to kick-start infrastructure development for the expected pressures of the next 20 years. In the past year, only public sector construction on roads and telecommunications showed growth.

Engineers Australia does not expect the public sector to match the high levels of construction seen in the private sector over the last five years during the infrastructure phase of many resources projects, but the government does have a responsibility to maintain and improve the current state of the state's infrastructure assets, boost productivity growth and maintain the current high standards of living. Without this investment, WA could soon be in danger of dropping to a 'just adequate' or 'poor and inadequate' state of infrastructure within the next 20 years.

As private sector construction begins to slow, the public sector will need to assume more responsibility for new infrastructure development.



Contact us

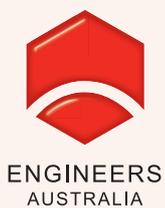
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